



CITY OF MODESTO

**ENGINEER'S REPORT
JUSTIFICATION AND COST ALLOCATION FOR
PROPOSED WASTEWATER COLLECTION SYSTEM
AND TREATMENT PLANT IMPROVEMENTS**

FINAL
January 2016



1/29/2016

CITY OF MODESTO
ENGINEER'S REPORT
JUSTIFICATION AND COST ALLOCATION FOR PROPOSED WASTEWATER
COLLECTION SYSTEM AND TREATMENT PLANT IMPROVEMENTS

TABLE OF CONTENTS

	<u>Page No.</u>
1.0 INTRODUCTION	1
2.0 SUMMARY OF RECOMMENDED COST ALLOCATIONS.....	1
3.0 COLLECTION SYSTEM SERVICE AREA AND PROJECTED WASTEWATER CONTRIBUTIONS.....	2
3.1 Study Area and Population Projections	2
3.2 Existing Wastewater Facilities	2
3.3 Wastewater Flow Categories.....	6
4.0 JUSTIFICATION FOR COLLECTION SYSTEM IMPROVEMENTS	8
5.0 JUSTIFICATION OF WASTEWATER TREATMENT IMPROVEMENTS	20
5.1 Sutter Plant Improvements	25
5.2 Outfall Pipelines Improvements	27
5.3 Jennings Plant Improvements	28
5.4 Engineering Studies	30
6.0 COST ALLOCATION METHODOLOGY	30
6.1 Cost Allocations between Customers	30
6.2 Allocation to Billable Constituents.....	36
7.0 PROJECT PHASING AND CASH FLOW PROJECTIONS.....	40
 APPENDIX A COLLECTION SYSTEM CAPITAL IMPROVEMENT PROGRAM	
APPENDIX B WASTEWATER TREATMENT CAPITAL IMPROVEMENT PROGRAM	

LIST OF TABLES

Table 1	Recommended Cost Allocations	3
Table 2	Domestic Wastewater Flows.....	7
Table 3	Can Seg Water Flows and Loadings.....	7
Table 4	Collection System Capital Cost Summary by Project Type	9
Table 5	Total Project Capital Costs for Recommended Project	25
Table 6	Allocation of Collection System Costs to Existing and Future Users	31
Table 7	Allocation of Wastewater Treatment Improvements to Customers	33
Table 8	Allocation of Project Costs to Billable Constituents	37
Table 9	Wastewater Treatment CIP Phasing	41

LIST OF FIGURES

Figure 1	Sewer Service Study Area	4
Figure 2	Wastewater Treatment Facilities Site Location	5
Figure 3	Collection System Improvements.....	10
Figure 4	Schematic of Recommended Project.....	21
Figure 5	Sutter Plant Site Layout	22
Figure 6	Outfall Pipelines Layout	23
Figure 7	Jennings Plant Site Layout	24
Figure 8	CIP Cash Flow.....	43

ENGINEER'S REPORT - JUSTIFICATION AND COST ALLOCATION FOR PROPOSED WASTEWATER COLLECTION SYSTEM AND TREATMENT PLANT IMPROVEMENTS

1.0 INTRODUCTION

The purpose of the Engineer's Report is to provide the basis for establishing wastewater sewer service charges and connection fees to fund the wastewater Capital Improvement Program (CIP). This report lists project costs, describes project phasing, and explains the methodologies used to allocate costs to different categories of customers.

The wastewater CIP was developed from the draft 2016 Wastewater Master Plan currently in progress. This plan identified deficiencies and capacity needs for the wastewater treatment system and collection system (sewers) from now until the year 2035. These needs were based on projected growth and land use patterns for the City's current service area and unserved areas that extend to the sphere of influence (SOI) boundaries.

The CIP includes improvements in the following areas:

- Collection System Improvements, including:
 - Pipeline replacement/addition to provide hydraulic capacity for peak wet weather flows (PWWFs).
 - New sewers or extensions of sewers to serve future customers.
 - Rehabilitation and replacement improvements.
 - Upgrades to improve reliability.
 - Removal of storm drain cross connections.
- Sutter Avenue Primary Treatment Plant (Sutter Plant) improvements to improve treatment reliability and increase capacity.
- Outfall Pipelines to improve reliability and increase capacity.
- Jennings Road Secondary/Tertiary Treatment Plant (Jennings Plant) improvements to improve reliability and increase capacity.

2.0 SUMMARY OF RECOMMENDED COST ALLOCATIONS

Estimated costs and recommended cost allocations to customers are summarized in Table 1.

3.0 COLLECTION SYSTEM SERVICE AREA AND PROJECTED WASTEWATER CONTRIBUTIONS

3.1 Study Area and Population Projections

The study area for this report includes current city limits, a portion of north Ceres, the unincorporated community of Empire, and isolated unincorporated Stanislaus County land ("islands") within city limits. For north Ceres and unincorporated areas, the City treats wastewater under separate sewer service agreements. The study area (shown in Figure 1) encompasses the City's SOI boundary, Empire, and north Ceres, which is consistent with the City's updated Urban Area General Plan.

The City provides wastewater (sewer) service for over 200,000 customers within city limits and approximately 900 customers within the Empire Sanitary District. Population and land use projections prepared for the Master Plan indicate that areas extending to the SOI boundaries will be only partially developed by the end of 2035. In fact, full build-out of the SOI is not expected until the year 2057. By 2035, the number of municipal customers is projected to increase at an average growth rate of 1.3 percent to a total service population of 270,900.

In addition to municipal customers, the City serves industries in the Beard Industrial Park. These industries include seasonal canneries and year-round food processors. The City's conveyance and treatment systems will be modified to accommodate these flows separately from the domestic wastewater treatment systems. To do this, process water leaving the industries, known locally as "Can Seg" flow, will flow directly to the Jennings Plant by separate piping. At the Jennings Plant, Can Seg flow will either be used to irrigate ranch land or will be treated with the upgraded secondary treatment facilities. This will depend on the season or the current conditions.

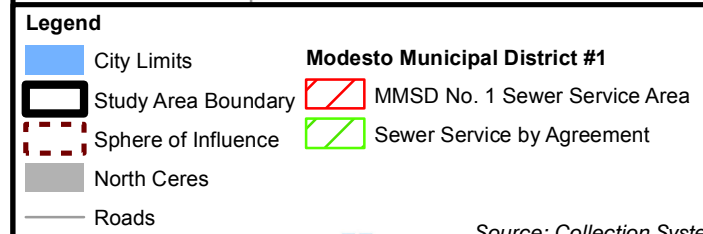
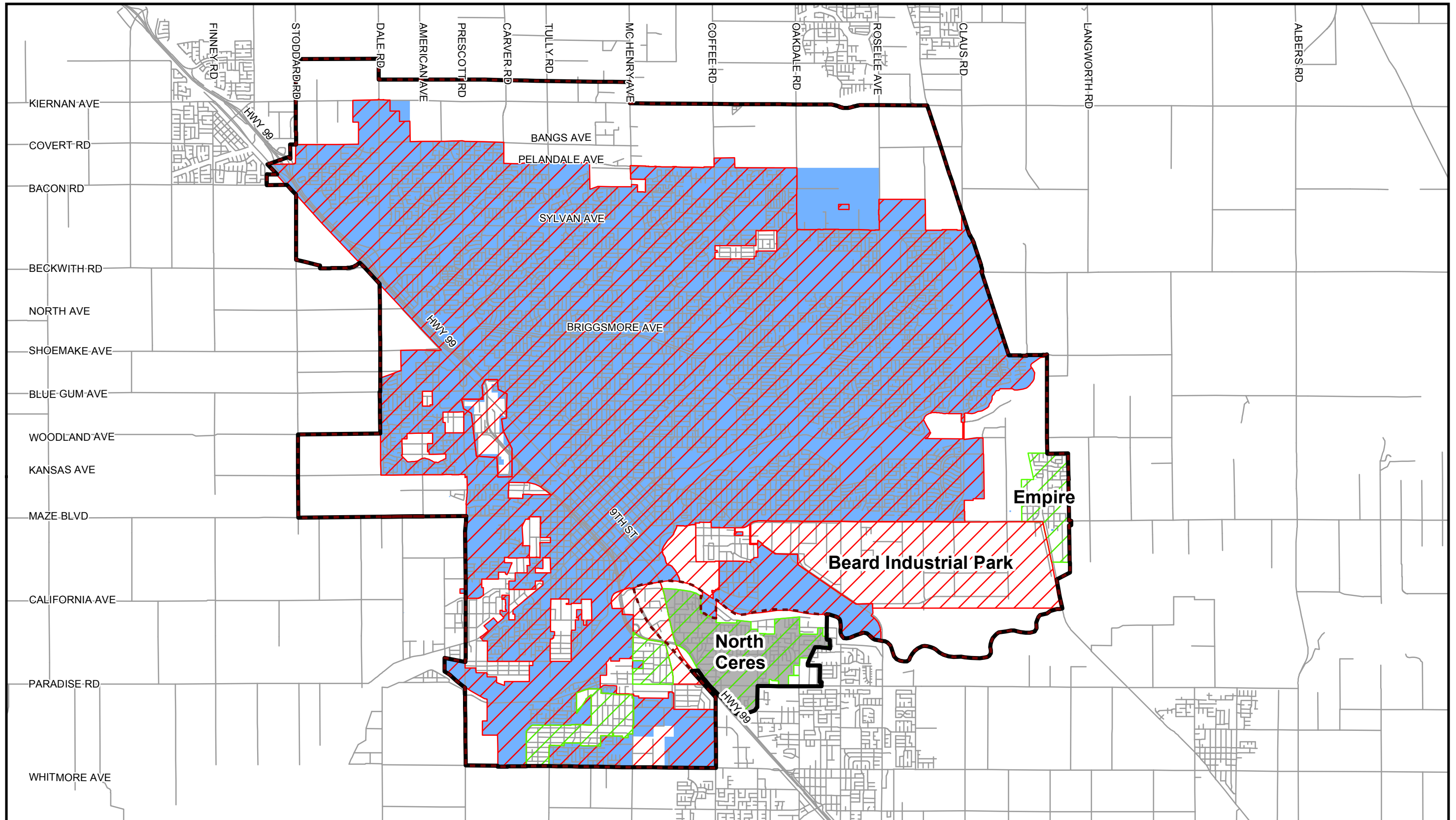
3.2 Existing Wastewater Facilities

The City's wastewater collection system consists of approximately 620 miles of sanitary sewer lines, ranging from 4 inches to 66 inches in diameter, and 41 lift stations. Another 32 miles of sewers that are either privately owned or associated with north Ceres are connected to the City's collection system.

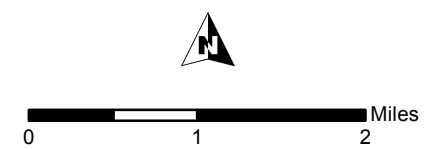
With the exception of localized septic systems, all wastewater generated within the service area receives treatment at the City's treatment facilities. These facilities consist of two treatment plants that operate in series and are connected by two 6.5-mile long outfall pipelines (see Figure 2).

The Sutter Plant is located at the south end of Sutter Avenue adjacent to the Tuolumne River. There, the plant provides primary treatment and solids handling. Most of the primary

Table 1 Recommended Cost Allocations Engineer's Report City of Modesto, California								
Project Component	Total Project Cost⁽¹⁾	Domestic Users				Can Seg Users		Comments
		Existing Users		Future Users		\$	%	
		\$	%	\$	%			
Collection System								
Capacity Improvements	\$103.6	\$65.1	62.8%	\$38.6	37.2%	\$ -	-	Improvements are primarily for existing deficiencies. Where future capacity is provided, allocations are based on PWWF.
New Growth Improvements	35.4	-	0.0	35.4	100.0	-	-	Includes extensions for future capacity.
Rehabilitation and Replacement	56.0	50.1	89.3	6.0	10.7	-	-	Project-by-project allocation is based on relative PWWF.
Reliability Improvements	5.6	3.5	61.8	2.1	38.2	-	-	Project-by-project allocation is based on relative PWWF.
Storm Drain Removal	17.0	17.0	100.0	-	0.0	-	-	Improvements are for existing deficiencies.
Total - Collection System	\$217.7	\$135.6	62.3%	\$82.1	37.7%	-	-	
Wastewater Treatment Improvements								
Sutter Plant Improvements								
Influent Pump Station Improvements	\$ 2.2	\$ -	0.0%	\$ 2.2	100.0%	\$ -	0.0%	Improvement for future growth.
Headworks Improvements ⁽²⁾	14.8	7.6	51.5	1.5	10.4	5.7	38.1	Includes replacement and expansion. Allocation is based on relative PWWF.
Outfall Pump Station Replacement	17.3	14.4	83.2	2.9	16.8	-	0.0	Includes replacement and expansion. Allocation is based on relative PWWF.
Decommission of Abandoned Facilities	4.9	3.7	74.5	1.2	25.5	-	0.0	Allocation is based on relative maximum month flow (MMF).
Allowance for Flood Protection	2.0	2.0	100.0	-	0.0	-	0.0	Improvements for an existing condition.
Subtotal - Sutter Plant	\$41.3	\$27.7	67.1%	\$ 7.9	19.2%	\$ 5.7	13.7%	
Outfall Pipelines Improvements								
Tuolumne River Crossings	\$26.0	\$ 9.1	35.0%	\$ 1.8	7.1%	\$15.1	58.0%	Includes upgrade and expansion; 100% of Can Seg Outfall crossing and 20% of Domestic Outfall and Third Outfall crossings allocated to Can Seg. Domestic allocation is based on relative PWWF.
Constructing a Third Outfall	60.7	40.4	66.5	8.2	13.5	12.1	20.0	Allocates 20% to Can Seg. Domestic allocation is based on relative PWWF.
Slip Lining the Can Seg Outfall	10.5	-	0.0	-	0.0	10.5	100.0	Benefits only Can Seg customers.
Subtotal - Outfall Facilities	\$97.2	\$49.5	50.9%	\$10.0	10.3%	\$37.7	38.8%	
Jennings Plant Improvements								
Secondary Treatment/Can Seg Treatment Facilities ⁽³⁾	\$ 52.4	\$ 8.6	16.4%	\$ 2.9	5.6%	\$40.9	78.0%	Includes upgrade and expansion. Allocation is based on BOD loading to secondary treatment facilities.
Primary Treatment and Solids Handling Facilities ⁽⁴⁾	93.5	69.6	74.5	23.9	25.5	-	0.0	Includes replacement and upgrade. Allocation is based on relative MMF.
Miscellaneous Repairs	0.9	0.1	16.6	<0.1	5.7	0.7	77.6	Allocation is based on BOD loading to secondary treatment facilities.
Subtotal - Jennings Plant	\$146.8	\$78.4	53.4%	\$26.9	18.3%	\$41.6	28.3%	
Engineering Studies								
Master Plan Updates	\$2.0	\$1.1	54.5%	\$0.3	15.7%	\$0.6	29.8%	Allocation is based on overall allocation percentages for total CIP.
Land Application Study	0.3	-	0.0	-	0.0	0.3	100.0	Includes a study to determine BOD loading for the land application of Can Seg flows.
Subtotal - Engineering Studies	\$2.3	\$1.1	48.4%	\$0.3	14.0%	\$0.8	37.6%	
Total - Wastewater Treatment	\$287.6	\$156.7	54.5%	\$45.1	15.7%	\$85.8	29.8%	
Total - Collection System and Wastewater Treatment Improvements	\$505.3	\$292.3	57.8%	\$127.2	25.2%	\$85.8	17.0%	
Notes:								
(1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. The collection system costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. The wastewater treatment costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include allowances for contingencies, engineering, legal, administration, and permitting costs.								
(2) Includes New Dryden Box, New West Junction Structure, Influent Screening Improvements, Grit Removal Improvements, Ventilation Improvements, Influent Flume Improvements, and Pumping Plant No. 3 Improvements.								
(3) Includes Fixed Film Reactors and Pump Station Rehabilitation, Nutrient Feed and pH Control Systems, Peroxide Feed System, Aerator Addition in Recirculation Channel, and DAF Piping Modifications.								
(4) Includes Primary Treatment Facilities, Yard Piping and Structures, Anaerobic Digesters, WAS Thickening and Biosolids Dewatering, and Sludge Cake Drying Beds.								



Source: Collection System Master Plan

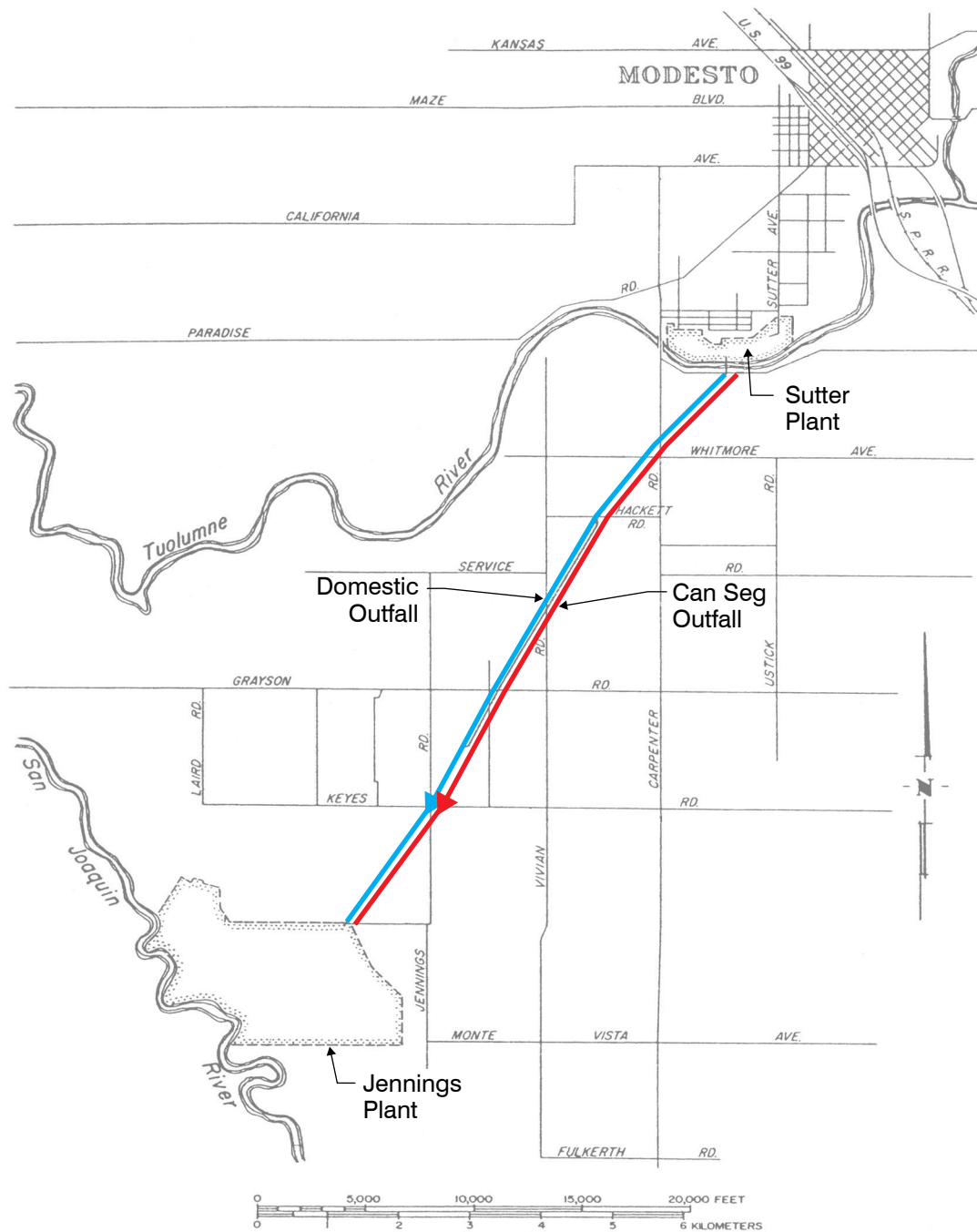


SEWER SERVICE STUDY AREA

FIGURE 1

CITY OF MODESTO
ENGINEER'S REPORT





WASTEWATER TREATMENT FACILITIES SITE LOCATION

FIGURE 2

CITY OF MODESTO
ENGINEER'S REPORT

Source: Wastewater Treatment Master Plan



treatment and solids handling facilities are old and nearing the ends of their useful lives. The Sutter Plant's location near the Tuolumne River also creates a flood risk.

Primary effluent from the Sutter Plant flows through the two 6.5-mile long outfall pipelines to the Jennings Plant, which is located next to the San Joaquin River (SJR) on Jennings Road near the intersection with West Zeering Road. The Jennings Plant treatment processes include secondary treatment, tertiary treatment, and a 2,526-acre ranch irrigated with secondary effluent during the irrigation season and Can Seg flows during the canning season. During the non-irrigation season, secondary effluent is either stored in the City's two storage ponds or discharged to the SJR from October to May. Tertiary effluent is used in the same manner. Although this is the current practice, the City will implement an offsite tertiary recycled water project by early 2018 that will utilize all tertiary flows.

3.3 Wastewater Flow Categories

Wastewater from the Modesto service area comes from two main sources: domestic flows and Can Seg flows.

3.3.1 Domestic Flows

Domestic wastewater consists of the following categories:

- Domestic sources (residential and commercial).
- Minor industrial sources, which consist of 26 industries with a total combined flow averaging about 0.7 million gallons per day (mgd) (2013–2014 average).
- Major non-Can Seg industrial sources, which consist of 12 industries with a total combined flow averaging 1.5 mgd (2012–2014 average).

Flows from the minor industries have characteristics similar to domestic wastewater from residents, whereas major industrial flows have higher concentrations of organic constituents than typical domestic flows. Nonetheless, for this report, flows from minor industries, major industries, and residential sources will be collectively referred to as "domestic" flows. Projected domestic flows and loadings are summarized in Table 2.

3.3.2 Can Seg Flows

Can Seg flows consist of process water from canneries and food processors. The Can Seg Line (CSL) conveys these flows separately to ranch land at the Jennings Plant, where they are combined with secondary effluent and used for irrigation. During the non-canning season, process flows from year-round food processors are combined with the influent wastewater at the Sutter Plant and treated with domestic flows. However, as previously mentioned, after improvements are made to the secondary treatment system at the Jennings Plant, this practice will be discontinued and Can Seg flows will be processed solely at the Jennings Plant.

Table 2 Domestic Wastewater Flows Engineer's Report City of Modesto, California			
Parameter	Units	Current^(1,2) (2015)	Projected^(1,2) (2035)
Average			
Flow (AAF)	mgd	18.5	24.9
BOD	mg/L	340	360
BOD	ppd	52,300	75,800
TSS	mg/L	310	320
TSS	ppd	48,500	66,400
Peak 30-Day			
Flow (MMF)	mgd	20.4	27.4
BOD	mg/L	400	430
BOD	ppd	68,200	98,700
TSS	mg/L	420	430
TSS	ppd	72,200	99,000
Peak Hour			
Dry Weather Flow (PDWF)	mgd	36.5	48.6
Wet Weather Flow (PWWF)	mgd	70.7	93.7
Notes:			
(1) This is the total flow to the domestic collection system, including domestic, minor industrial, and major non-Can Seg industrial flows. This information is from the draft Wastewater Treatment Master Plan (Carollo 2016).			
(2) The loadings in pounds per day were rounded to the nearest hundred. The concentrations were rounded to the nearest ten.			

Projected Can Seg flows and loadings are summarized in Table 3.

Table 3 Can Seg Water Flows and Loadings Engineer's Report City of Modesto, California					
Parameter	Units	Current (2015)		Projected Canning Season	
		Non-Canning Season^(1,2)	Canning Season^(1,2)	Additional Treatment Capacity^(1,2,3)	Total^(1,2)
Average					
Flow (AAF)	mgd	1.60	14.8		
BOD	mg/L	1,510	2,450		
BOD	ppd	20,200	301,000		
TSS	mg/L	310	880		
TSS	ppd	4,200	108,000		
Peak 30-Day					
Flow (MMF)	mgd	1.77	20.3	5	25.3
BOD	mg/L	1,760	2,620	2,620	2,620
BOD	ppd	26,100	444,000	109,000	553,000
TSS	mg/L	470	840	840	840
TSS	ppd	6,900	143,000	35,000	178,000
Notes:					
(1) From the draft Wastewater Treatment Master Plan (Carollo 2016).					
(2) The loadings in pounds per day were rounded to the nearest hundred. The concentrations were rounded to the nearest ten.					
(3) The Secondary Treatment/Can Seg Treatment Facilities upgrade project will provide treatment capacity for 5 mgd of Can Seg flow at the peak 30-day loadings. These upgrades are scheduled to be completed at the end of 2019.					

4.0 JUSTIFICATION FOR COLLECTION SYSTEM IMPROVEMENTS

The 2016 Master Plan has identified necessary wastewater collection system improvements over the next 20 years to the year 2035. These improvements are categorized below.

- **Capacity Improvements:** Capacity improvements include either replacing existing trunk sewers or pump stations or adding new trunk sewers or pump stations to adequately convey current PWWFs. As growth continues and more users contribute to the system, flow will increase. This will, in some cases, create additional capacity deficiencies. Therefore, the existing collection system was also evaluated to identify flow capacity deficiencies during peak flow conditions at build-out of the service area. Projects identified for these conditions are considered capacity related and are not considered an expansion of the system to connect future users.
- **New Growth Improvements:** These include new pump stations and/or extensions of existing trunk sewers to serve new customers.
- **Rehabilitation and Replacement (R&R) Improvements:** These include improvements to the existing trunk sewers or pump stations to extend their useful lives, repair structural deficiencies, and/or improve performance for adequate capacity throughout the planning period.
- **Reliability Improvements:** These include adding parallel sewers where existing sewers cross below major obstacles and prevent access. The sewer crossing below Highway 99 is an example of this.
- **Storm Drain Cross Connection Removal:** Currently, the City has 60 known storm drain cross connection where storm water runoff discharges to the sanitary sewer system. On the basis of discussions with the City, Carollo developed the hydraulic model, capacity evaluation, and proposed improvements assuming these connections will be removed in the future.

Justifications for capital improvement projects for the wastewater collection system are provided in the following sections. The recommended collection system projects are shown on Figure 3 and listed in Appendix A. Table 4 summarizes the cost for each project category, which is then described in the following sections.

The estimated costs are in 2015 dollars and are referenced to the 20-City Average Engineering News Record Construction Cost Index (ENR CCI) of 10037 (July 2015). Construction costs include a 25 percent estimating contingency. Project costs include construction costs and a 30 percent allowance for engineering, legal, and administration costs.

Table 4 Collection System Capital Cost Summary by Project Type Engineer's Report City of Modesto, California	
Improvement Type	Total Project Cost⁽¹⁾
Capacity Improvements	\$103.6
New Growth Improvements	\$35.4
R&R Improvements	\$56.0
Reliability Improvements	\$5.6
Storm Drain Removal	\$17.0
Total	\$217.7
Note: (1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. Costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. Costs are not escalated to future years. Total project costs include an allowance for contingencies, engineering, legal, and administration costs.	

4.1.1 Capacity Improvement Projects

4.1.1.1 *Assumptions and Criteria*

According to the design criteria established in the Master Plan, gravity sewers must be able to convey PWWFs while maintaining a maximum flow depth to pipe diameter (d/D) ratio of 0.85. In other words, the sewers should not be more than 85 percent full during PWWF conditions. The collection system lift stations must also be able to reliably pump PWWF. This means that pump station capacity should meet the standards of "firm capacity," which is the pumping capacity with the largest pump out of service.

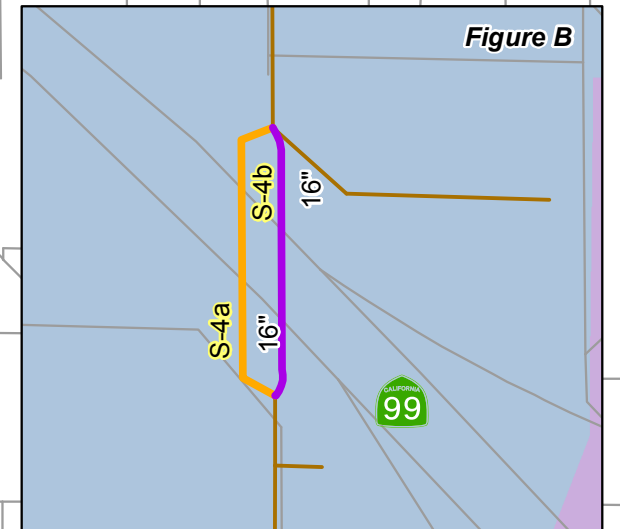
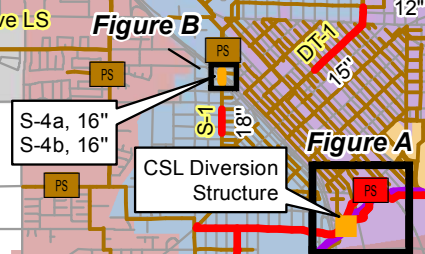
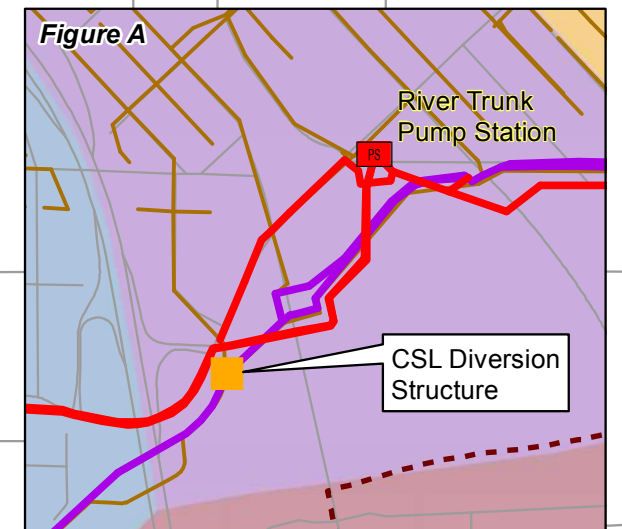
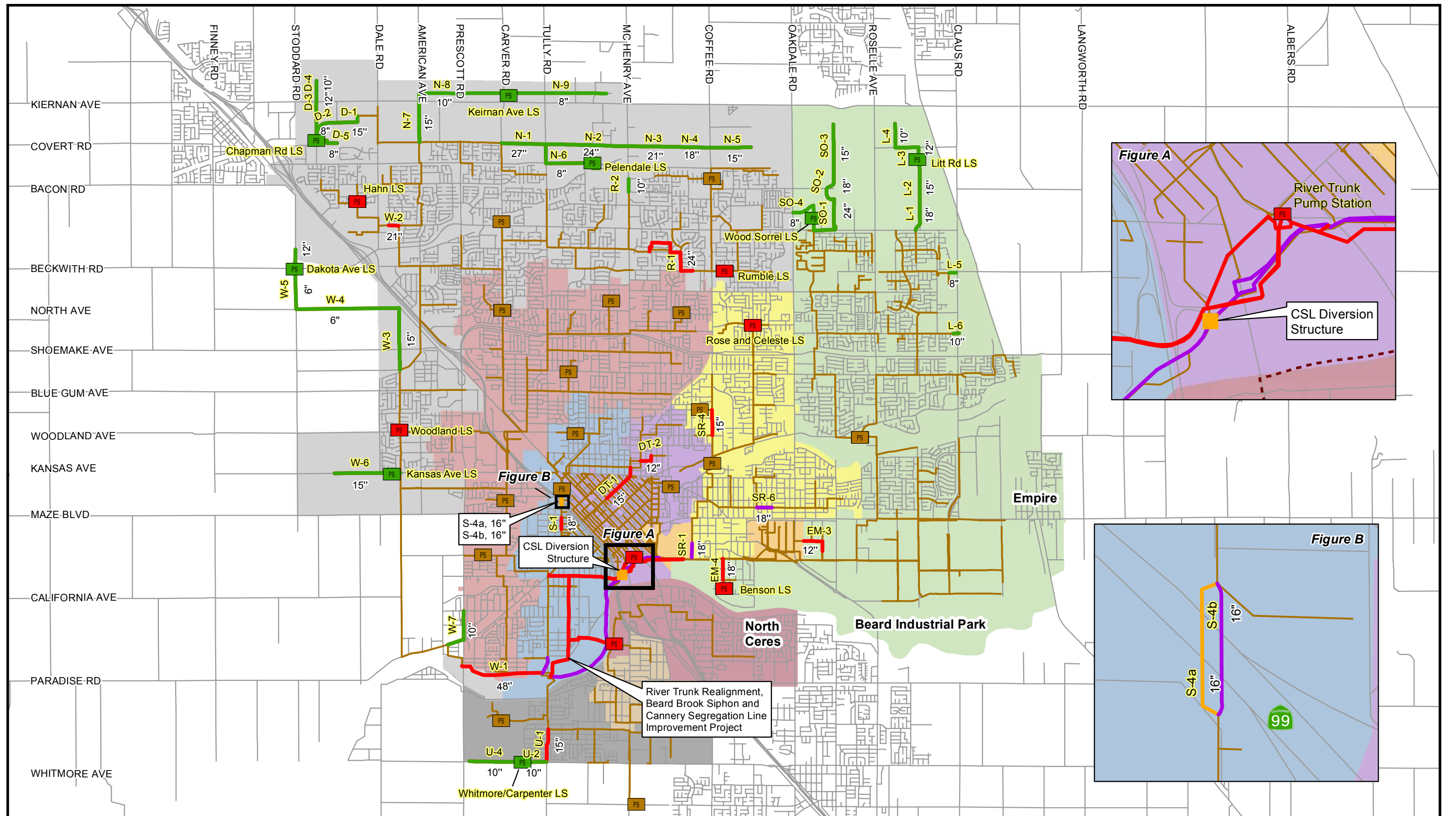
The hydraulic model developed for the Master Plan simulated peak flows during a 10-year, 24-hour storm. This model identified both pipeline sections that exceeded the maximum allowable d/D criteria of 0.85 as well as lift stations that lacked sufficient firm capacity.

4.1.1.2 *Improvements for Current PWWF Conditions*

The following sections summarize recommended improvements to accommodate PWWFs under current conditions. For each tributary area's designated area number, refer to Figure 3.

4.1.1.2.1 Area 1

- **Hahn Lift Station (Project LS 19):** Improvements to this lift station are currently under design to increase the firm capacity from 0.65 mgd to 1.3 mgd. The two existing pumps will be replaced with two 900-gpm pumps. In addition, the station will be relocated from the southwest corner of Nightingale Drive and Honey Creek Road to the southeast corner.



Legend

Capacity Pump Station Improvements	Rehabilitation Pipeline Improvements	Tributary Areas	Area 4	Area 8/Northern Ceres
Capacity Pipeline Improvements	Reliability Pipeline Improvements	Area 1	Area 5	Area 9
New Service Pump Station Improvements	Existing Lift Station	Area 2	Area 6	Area 10
New Service Pipeline Improvements	Existing Pipelines	Area 3	Area 7	

Source: Collection System Master Plan

COLLECTION SYSTEM IMPROVEMENTS

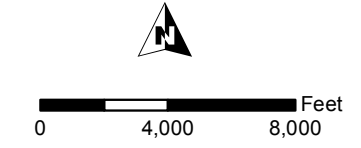


FIGURE 3

CITY OF MODESTO
ENGINEERS REPORT



- **Rumble Lift Station (Project LS 30):** The Rumble Lift Station is located on Rumble Road near Bay Lane. The two existing 950-gpm pumps will be replaced with larger pumps to increase the pumping capacity from 1.37 mgd to 2.33 mgd.

4.1.1.2.2 Area 3

Major projects recommended for Area 3 include the River Trunk Realignment and the River Trunk Pump Station. In 2015, the City completed a Preliminary Design Report (PDR) for improvements to bypass the capacity constraints in the River Trunk and eliminate the inverted siphons at the Dry Creek crossing near the Gallo property. These projects will consist of a new alignment for the gravity flow section of the River Trunk and a new River Trunk pump station.

The projects in Area 3 are described below.

- **48-inch Gravity Sewer along Tuolumne Blvd (Project RT-1):** This project consists of 2,300 feet of 48-inch diameter gravity sewer in Tuolumne Boulevard between Neece Drive and Colorado Avenue. This segment will convey flow from the River Trunk Pump Station force mains to a new 54-inch gravity diameter sewer along Colorado Avenue.
- **54-inch Gravity Sewer along Colorado Ave (Project RT-2):** The pipeline will be located in Colorado Boulevard between Tuolumne Boulevard and Pelton Avenue. Flows from the River Trunk and Sutter Trunk will combine at the intersection of Tuolumne and Colorado and continue south to the Sutter Plant. The total length of the sewer will be 4,000 feet.
- **Gravity Sewer along Colorado Ave to Sutter Plant (Project RT-3):** This project adds a gravity sewer ranging from 60 inches to 84 inches in diameter. The sewer will extend 3,300 feet south along Colorado Avenue and terminate at the Sutter Plant. It will convey flows from the River Trunk, Sutter Trunk, and Shakelford Pump Station.
- **21-inch Gravity Sewer along Tuolumne Blvd (Project RT-4):** This project will relieve PWWFs from the Sutter Trunk to the River Trunk. It consists of 1,300 feet of 21-inch diameter pipeline in Tuolumne Boulevard that will connect to the new River Trunk at Colorado Boulevard.
- **Dual Force Mains along Tuolumne Blvd (Project RT-5):** This project adds new parallel 30-inch and 42-inch diameter force mains that will convey flow pumped from the River Trunk Pump Station to a discharge structure in Tuolumne Boulevard. At the structure, flow will transition from pumped flow to gravity flow. The two new force mains will be 2,600 feet long.
- **Beard Brook North Gravity Alignment (Project RT-6):** This project will replace the existing Beard Brook Siphon with a 48-inch diameter gravity pipeline. The new

pipeline will run from west of Beard Brook Park to the River Trunk Pump Station and will cover a distance of 3,900 feet. This project will eliminate the need for an inverted siphon under Dry Creek and address maintenance and odor issues associated with the siphon.

- **36-inch and 48-inch Gravity Sewer from B St to Pumping Station (Project RT-7):** This project adds 36-inch and 48-inch gravity sewers that will run from Calaveras Street to the inlet of the River Trunk Pump Station. They will cover a distance of 1,500 feet.
- **14-inch Shackelford Force Main and 18-inch Gravity Sewer (Project RT-8):** This project adds a 14-inch diameter force main that will convey flows from the new Shackelford pump station beneath the Tuolumne River. The new force main will be inserted in a recently completed inverted siphon under the Tuolumne River. Beyond the crossing, the force main will continue north through the Dryden Park Golf Course and terminate at an 18-inch diameter gravity pipeline in Roselawn Avenue. Flows will be conveyed to the River Trunk at Colorado and Pelton.
- **Shackelford Pump Station:** This pump station will pump flows through a new force main under the Tuolumne River and discharge into the River Trunk. It will be expanded to provide a firm capacity of 4.2 mgd.
- **River Trunk Pump Station:** This pump station will allow the River Trunk to be moved from the Tuolumne River bank, which is susceptible to erosion and flooding during high river flows. The pump station's pumping capacity will be 54.5 mgd.

4.1.1.2.3 Area 4

- **Downtown Trunk (Project DT-1):** Flow levels in the 12-inch trunk sewer in J Street cause the pipeline to surcharge, meaning the flow exceeds the crown of the pipe. Therefore, the pipeline will be replaced with a new 15-inch diameter pipeline extending approximately 2,400 feet from McHenry Avenue to 12th Street.
- **Downtown Trunk (Project DT-2):** PWWFs in the existing 10-inch diameter pipelines in Kimble Street and Floto Street result in a d/D of 0.90, which exceeds the maximum d/D criteria of 0.85. These pipelines will be replaced with approximately 1,000 feet of 12-inch diameter pipeline.

4.1.1.2.4 Area 5

- **Santa Rosa Trunk (Project SR-4):** The flow level in the existing 10-inch diameter pipelines in Coffee Road between Fairmont Avenue and Lucern Avenue exceeds the maximum d/D criteria under PWWF conditions, which causes the pipeline to surcharge above the crown. Accordingly, the pipeline will be replaced with 1,600 feet of new 15-inch diameter pipeline.

- **Rose and Celeste Lift Station (Project LS 29):** The existing Rose and Celeste Lift Station is located on Rose Avenue and Celeste Drive. This project will increase the firm capacity from 0.86 mgd to 1.3 mgd to accommodate PWWFs.

4.1.1.2.5 Area 6

- **Empire Trunk (Project EM-3):** This project will replace the existing 10-inch diameter pipeline in Hoover Avenue and Doherty Avenue with approximately 1,800 feet of 12-inch diameter pipeline. This improvement is required because the flow level under PWWF conditions is at 95 percent full, which exceeds the design d/D.
- **Empire Trunk (Project EM-4):** The flow level in the 15-inch diameter trunk in Benson Avenue between Monterey Avenue and Oregon Drive reaches 93 percent capacity under PWWF conditions. The existing pipeline will be replaced with 1,400 feet of 18-inch diameter pipeline.
- **Benson Lift Station (Project LS 03):** The existing Benson Lift Station is located on Benson Avenue between Hillside Drive and Trenary Way. This project will increase the firm capacity from 0.22 mgd to 1.3 mgd to provide reliable capacity for current and future PWWFs.

4.1.1.3 *Improvements for Future PWWF Conditions*

The following sections summarize recommended improvements to accommodate PWWFs at build-out of the service area.

4.1.1.3.1 Area 1

- **West Trunk (Project W-1):** At build-out of Area 1, the increased flow from new growth and infill will cause flow levels in the lower reach of the West Trunk to exceed the maximum depth criteria. The deficient pipelines extend 5,300 feet and range from 54 inches to 60 inches in diameter. To increase capacity within this reach, a new parallel 48-inch diameter pipeline will be added, extending 5,200 feet from Carpenter Road to Sutter Plant. The project will not be required until Area 1 is built-out.
- **West Trunk (Project W-2):** Future PWWFs in the 18-inch diameter trunk in Veneman Avenue, located between Hahn Drive and Dale Road, will exceed the maximum depth criteria. To mitigate the deficiency, the pipeline will be replaced with 650 feet of 21-inch diameter pipeline.
- **Woodland Lift Station (Project LS 39):** The firm capacity of the Woodland Lift Station, located near the Woodland Avenue and Poust Road intersection, lacks sufficient capacity for the PWWFs at build out. Accordingly, its firm capacity will be expanded from 20.9 mgd to 25.2 mgd.

- **Rumble Trunk (Project R-1):** The flow depth in the Rumble Trunk from Rumble Road to Maud Kump Terrace will exceed the maximum depth criteria at build-out. Currently, this project is in the planning phase and will replace 4,200 feet of existing 21-inch diameter pipeline from Claremont Avenue to Don Caster Lane with 5,100 feet of 24-inch diameter pipeline. A portion of the existing pipeline alignment is in an alley and will be abandoned. The new alignment will continue north to Barringham Lane and connect to the existing system in Don Caster Lane.

4.1.1.3.2 Area 3

- **Sutter Trunk (Project S-1):** The existing 16-inch diameter trunk in Jefferson Avenue between Maze Boulevard and Oak Street will exceed the maximum depth criteria. This project will replace the existing pipeline with 760 feet of 18-inch diameter pipeline.

4.1.1.3.3 Area 10

- **Ustick Trunk (Project U-1):** New growth in Area 10 will cause the Ustick Trunk to surcharge. The 12-inch diameter pipeline, extending from Whitmore Avenue to Imperial Avenue, will be replaced with 2,100 feet of 15-inch diameter pipeline.

4.1.2 New Growth Improvement Projects

The projects described below are required to extend existing trunk sewers and/or add new pump stations to serve new customers.

4.1.2.1 Area 1

- **West Trunk (Projects W-3 through W-5 and Dakota Avenue LS 64):** These projects are recommended to serve future growth within the Beckwith-Dakota and College West comprehensive planning districts (CPDs). In this area, a new lift station and force main will be required. The force main will convey flow from the lift station to the existing West Trunk on the west side of Highway. The project consists of the following segments:
 - Project W-3 consists of 4,000 feet of 15-inch diameter pipeline from North Avenue to McDonald Avenue, which is where the pipeline will connect to the West Trunk.
 - Project W-4 consists of 9,000 feet of 6-inch diameter force main to connect LS 64 to Project W-3. The force main will be aligned down Dakota Avenue and North Avenue.
 - Project W-5 consists of 1,200 feet of 12-inch diameter pipeline in Dakota Avenue to LS 64. LS 64 will have a firm capacity of 0.5 mgd.
- **West Trunk (Projects W-6 and Kansas Avenue LS 63):** These improvements will service future growth within the Highway 132 CPD. Project W-6 consists of a 4,300-ft

long, 15-inch diameter pipeline that will connect to the West Trunk. Lift Station 63 will convey future flows from the Highway 132 CPD and will have a firm capacity of 1.0 mgd.

- **West Trunk (Project W-7):** This project consists of 2,900 feet of 10-inch diameter pipeline in Carpenter Road and Paradise Road. The project will extend the area served by the West Trunk to include existing county islands in the City's southwest section.
- **Rumble Trunk (Project R-2):** This sewer trunk extension will provide service to future development in the Pelandale/McHenry CPD. This project extends the sub trunk on McHenry Avenue 900 feet with a 10-inch diameter pipeline from Grecian Avenue to the existing sewer at the intersection of McHenry and Coralwood Road.
- **Dale Trunk (Projects D-1 through D-5 and Chapman Road LS 60):** These projects will service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs, which was previously discussed in the 2007 Master Plan as a separate study (Kaiser Hospital Special Study, August 2004). It has since been incorporated into the current Master Plan, except that the pipeline diameter recommended in the 2007 Master Plan has been reduced due to lower projected flows. Improvements to the Dale Trunk will consist of a lift station, force main, and gravity pipelines. The project consists of the following segments:
 - Segment D-1 is located in undeveloped land west of Kaiser Permanente and consists of 1,200 feet of 15-inch diameter pipeline.
 - Segment D-2 continues across undeveloped land between Chapman Road and Quinturn Lane. This segment will consist of 2,600 feet of 6-inch diameter force main.
 - Segment D-3 consists of 1,700 feet of 12-inch diameter pipeline in Chapman Road between Kiernan Avenue and a Modesto Irrigation District (MID) Canal.
 - Segment D-4 consists of 2,200 feet of 10-inch diameter pipeline in Chapman Road from Kiernan Avenue to south of Pirrone Road.
 - Segment D-5 runs parallel to an MID canal and is currently in undeveloped space. This reach will consist of 1,500 feet of 8-inch diameter pipeline.
 - The Chapman Road Lift Station (LS 60) will have a firm capacity of 0.80 mgd to convey flows from the Kiernan/Carver and Kiernan/Carver North CPDs.
- **North Trunk (Projects N-1 through N-5):** Future development within the Kiernan/Carver, Kiernan/McHenry, Pelandale/McHenry, and Hetch Hetchy CPDs will require the construction of several trunk sewers to serve customers in the northern portion of the study area. The North Trunk is a tributary of the West Trunk.

The 2007 Master Plan proposed the construction of a large trunk sewer in Bangs Avenue from Carver Road to east of Coffee Road, which is shown in Figure 6.4. For

the current Master Plan, this alignment was not changed, but the pipeline diameters were decreased due to reduced estimated future flows. The proposed improvements will extend the North Trunk into the Hetch Hetchy CPD. The North Trunk project consists of the following segments:

- Segment N-1 consists of 2,800 feet of 27-inch diameter pipeline in Bangs Avenue between Tully Road and Carver Road.
 - Segment N-2 consists of 6,100 feet of 24-inch diameter pipeline along Bangs Avenue from McHenry Avenue to Tully Road.
 - Segment N-3 continues across undeveloped land from an MID canal to McHenry Road. This reach will consist of 1,600 feet of 21-inch diameter pipeline.
 - Segment N-4 consists of 3,100 feet of 18-inch diameter pipeline in undeveloped land from Coffee Road to an MID Canal.
 - Segment N-5 consists of 2,400 feet of 15-inch diameter pipeline in undeveloped land from east of Oakdale Road to Coffee Road.
- **North Trunk (Project N-6 and Pelandale LS 59):** This project is recommended under the Pelandale/McHenry Specific Plan (Final, June 2006), which identified facilities needed to service future growth within the Pelandale/McHenry CPD. The project includes a lift station and a 10-inch trunk within Pelandale Avenue and Tully Road. This lift station will pump flow under the MID Lateral Canal No. 6 and will have a firm capacity of 0.14 mgd. The 10-inch diameter pipeline will extend approximately 4,800 feet and connect to the existing sewer in Bangs Avenue.
 - **North Trunk (Projects N-7 through N-9 and Kiernan LS 65):** Future development within the Kiernan/Carver North CPD will require the construction of several trunk sewers and a lift station to serve future users. This project is separated into the following segments:
 - Segment N-7 consists of 2,600 feet of 15-inch diameter pipeline located in American Avenue between Kiernan Avenue and Bangs Avenue.
 - Segment N-8 consists 5,600 feet of 10-inch diameter pipeline along Kiernan Road from American Avenue to Carver Road.
 - Segment N-9 continues in Kiernan Avenue between Carver Road and Stratos Way and consists of 6,300 feet of 8-inch diameter pipeline.
 - The Kiernan Avenue Lift Station (LS 65) will have a firm capacity of 0.24 mgd to convey PWWF from the Kiernan/Carver North CPD.

4.1.2.2 Area 6

- **Sonoma Trunk Extension (Projects SO-1 through SO-4 and Wood Sorrel LS 61):** These improvements have incorporated and modified future recommendations from the 2007 Master Plan to extend the Sonoma Trunk to the Roselle-Claribel CPD.

This project will extend the Sonoma Trunk to service future growth. The following segments are included:

- Segment SO-1 consists of 3,300 feet of 24-inch diameter pipeline that connects to an existing 27-inch diameter trunk. The proposed trunk will continue west in Sylvan Avenue and then north along an unimproved road.
 - Segment SO-2 is an 18-inch diameter pipeline that extends 2,600 feet from Segment SO-1 to an area north of Mabel Avenue.
 - Segment SO-3 consists of 2,800 feet of 15-inch diameter pipeline that extends from Segment SO-2 to an area south of Claribel Road.
 - Segment SO-4 consists of 3,100 feet of 8-inch diameter pipeline that will convey flows from the southwest area of the Rose Claribel CPD. The 8-inch diameter pipeline will extend north from an existing 27-inch diameter sewer in Wood Sorrel Drive.
 - The Wood Sorrel Drive Lift Station (LS 61) will have a firm capacity of 0.07 mgd.
- **Lakewood Trunk Extension (Projects L-1 through L-4 and LS 67):** Currently, the existing trunk is stubbed and plugged at the intersection of Litt Road and Sylvan Avenue. The Lakewood Trunk extension will service the eastern half of the Roselle-Claribel CPD. This project consists of the following segments:
 - Segment L-1 is located in Litt Road and extends from the end of Lakewood Trunk at Sylvan Avenue. This reach will consist of 2,900 feet of 18-inch diameter pipeline.
 - Segment L-2 continues in Litt Road and consists of 1,700 feet of 15-inch diameter pipeline.
 - Segment L-3 consists of 800 feet of 12-inch diameter pipeline that begins in Plainview Road and runs in Litt Road.
 - Segment L-4 consists of a 10-inch diameter pipeline that extends 3,000 feet from south of Claribel Road to Plainview Road.
 - The Litt Road Lift Station (LS 67) will have a firm capacity of 0.64 mgd.
- **Lakewood Sub-trunks (projects L-5 and L-6):** This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD. Project L-5 will extend from an existing 15-inch diameter pipeline, located at the intersection of Ruffed Goose Lane and Crested Bobwhite Street, within the Falling Leaf Subdivision. The existing pipeline will extend east beyond the development and will stub in an undeveloped area. A proposed 8-inch diameter pipeline will extend 220 feet and terminate in Claus Road. Project L-6 is a 10-inch diameter pipeline that will extend the existing subtrunk in Merle Avenue to serve future growth.

4.1.2.3 Area 10

- **Ustick Sub-Trunks and Lift Station (Projects U-2 through U-4 and LS 62):** This group of improvements will service commercial and residential growth within the Fairview CPD. This project consists of three segments and a lift station, which are described below:
 - Segment U-2 consists of 3,400 feet of 10-inch diameter pipeline in Whitmore Avenue from Tuscan Avenue to Ustick Road.
 - Segment U-3 consists of 400 feet of 4-inch force main in Whitmore Avenue from Yuma Avenue to west of Tuscan Avenue. The force main will allow the proposed 10-inch diameter sewer (Segment U-2) to connect with the existing pipeline in Ustick Road.
 - Segment U-4 continues in Whitmore Avenue and extends from Carpenter Road to the proposed lift station near Yuma Avenue. This reach consists of 3,400 feet of 10-inch diameter pipeline.
 - The lift station at Whitmore and Carpenter Lift Station (LS 62) will have a firm capacity of 0.4 mgd.

4.1.3 Rehabilitation and Replacement Improvement Projects

It is recommended that the City rehabilitate existing trunk sewers and lift stations to extend the lives of these facilities for existing and future users and to improve operational reliability. These projects are described below.

- **Rehabilitation and Replacement (R&R) Program:** The City will implement an R&R program either to replace sewer pipelines susceptible to failure or to line corroded pipelines. This program will target small diameter pipelines and large diameter sewer mains throughout the City. Funding will be at a rate of \$3.0 million per year for the first five years and will decrease to \$1.67 million per year thereafter.
- **Sutter Trunk (Project S-4b):** This project will rehabilitate 400 feet of the existing 16-inch diameter pipeline under Highway 99 near Jefferson Street. Prior to implementing this project, a permanent parallel sewer (Project S-4a) will be constructed as a bypass.

4.1.3.1 Area 3

- **24-inch Rehabilitation along Sutter Trunk (Project RT-9):** Based on the results of the condition assessment, a portion of the Sutter Trunk will require rehabilitation directly upstream of the Sutter Plant. The recommended approach is to add cured-in-place pipe lining. Since much of the pipeline's interior is inaccessible for a condition assessment, it is assumed that half of the pipeline's length will be lined.

- **48-inch River Trunk Rehabilitation (Project RT-10):** Excessive corrosion is present in the entire reach of the River Trunk from Beard Brook to the Sutter Plant. For this reason, rehabilitation is recommended within the next five years.

4.1.3.2 Area 5

- **Santa Rosa Trunk (Project SR-1):** This project will rehabilitate 1,300 feet of the 30-inch diameter and 400 feet of the 24-inch diameter pipeline within Santa Rosa Avenue between Organ Drive and Mono Drive.
- **Santa Rosa Trunk (Project SR-6):** This segment of the Santa Rosa Trunk in Miller Road between Conejo Avenue and Phoenix Avenue is over 50 years old and shows signs of significant deterioration. This project will rehabilitate 1,000 feet of the 18-inch diameter pipeline.

4.1.4 Reliability Improvement Projects

It is recommended that the City construct parallel pipelines where the collection system crosses Highway 99. This would increase reliability and allow the existing pipeline to be rehabilitated without disrupting service. These projects are described below.

4.1.4.1 Area 2

- **Sutter Trunk (Project S-4a):** This project will construct a parallel pipeline under Highway 99 near Jefferson Street. The parallel sewer line will consist of 400 feet of 16-inch diameter pipeline and will serve as a bypass when rehabilitating the existing sewer. In addition, the sewer line will provide a redundant pipeline under Highway 99.

4.1.4.2 Area 3

- **River Bank Armament (Project RT-11):** Riverbank armament is required to prevent future erosion and exposure of the River Trunk and the CSL.
- **CSL Diversion Structure (Project RT-12):** This project is a new diversion structure that will divert flows between the CSL and the existing River Trunk if a pipeline fails. This project provides reliability to the CSL and River Trunk.

4.1.5 Storm Drain Cross Connection Removal Program

For areas of the City lacking storm drainage systems, storm water is conveyed into the sanitary sewer system via cross connections. However, removing some of these cross connections is necessary to reduce the amount of storm run-off that enters the sewer system. This is because increased storm run-off in a system increases the risk of sanitary sewer overflow.

Currently, the City has planned to remove three cross connections located downtown, one cross connection at Hahn Sewer Lift Station, and four cross connections in the Roosevelt

Park neighborhood. In the next 5 years, it is estimated that up to eight more cross connections could be removed City-wide. The remaining cross connections would be removed between years 2021 and 2035.

5.0 JUSTIFICATION OF WASTEWATER TREATMENT IMPROVEMENTS

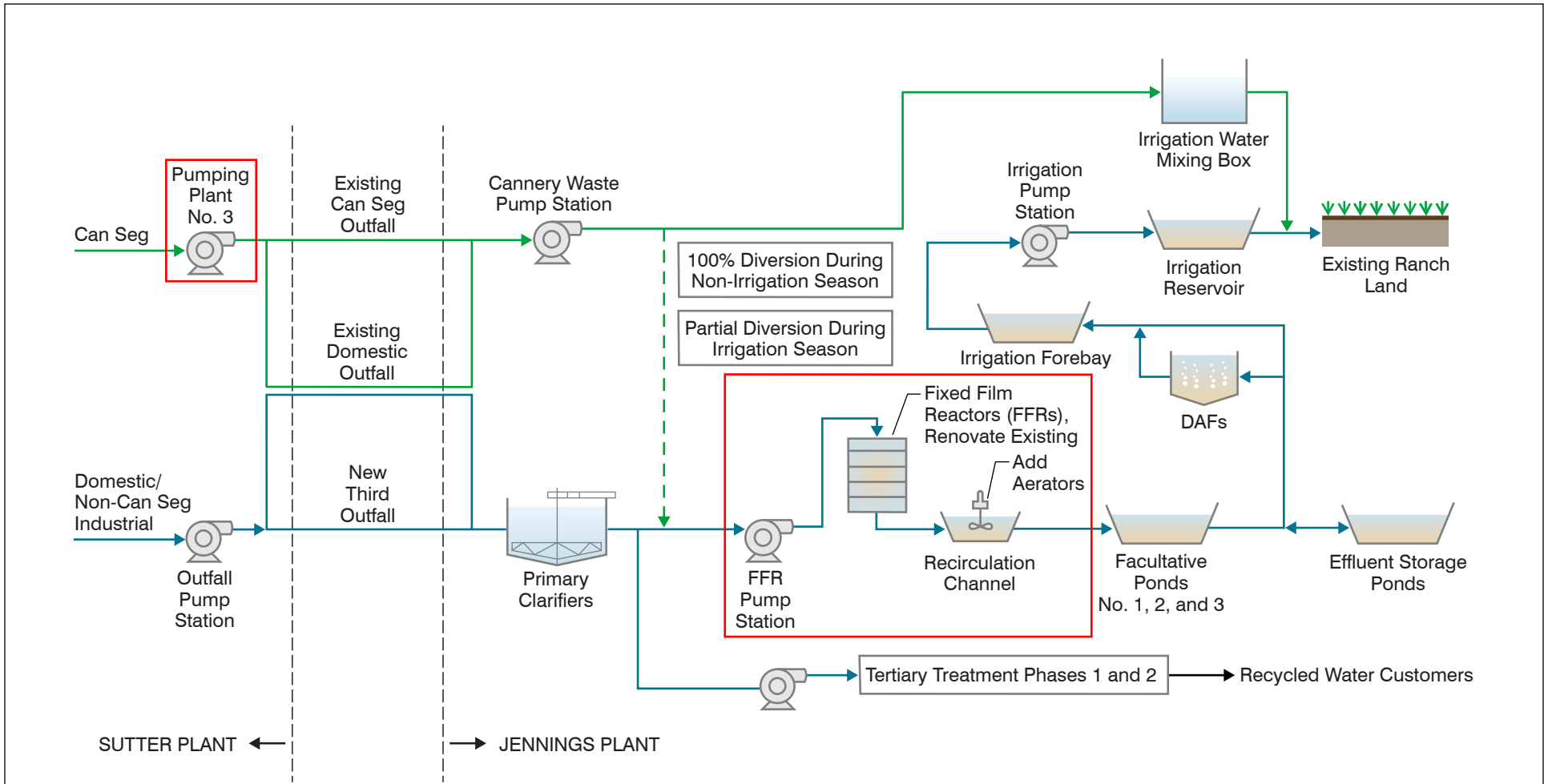
Per the 2016 Master Plan, improvements to the wastewater treatment facilities are recommended to improve reliability, to provide an increased level of treatment, and to increase treatment capacity to accommodate growth.

The recommended projects consist of the following components, which are described below.

- **Sutter Plant Improvements:** These improvements expand the Sutter Plant's hydraulic capacity and decommission abandoned facilities.
- **Outfall Pipelines:** This part of the project constructs a third outfall and new river crossings for the Domestic Outfall and Can Seg Outfall. It also adds slip lining to a portion of the Can Seg Outfall.
- **Can Seg Flow Treatment Improvements:** These improvements include upgrading the existing secondary treatment facilities so that they can treat combined primary effluent and a portion of the Can Seg flows.
- **Primary Treatment at Jennings Plant:** This part of the project adds new primary treatment and solids handling facilities to the Jennings Plant.

Recommended projects and estimated costs are shown in Table 5, and additional details from the Wastewater Treatment Master Plan CIP are presented in Appendix B. The estimated costs are in 2015 dollars and are referenced to the 20-City Average Engineering News Record Construction Cost Index (ENR CCI) of 10270 (December 2015). Construction costs include a 30 percent estimating contingency. Project costs include construction costs and a 32 percent allowance for engineering, legal, administration, and permitting costs.

A schematic of the recommended project is shown in Figure 4. Site layouts for the Sutter Plant, Outfall Pipelines, and Jennings Plant are shown on Figures 5, 6, and 7, respectively.



LEGEND	
—	Can Seg Flow
—	Domestic/Non-Can Seg Industrial Flow
—	Tertiary Effluent


NOTE:
 Red Box – New/modified facilities during Phase 1 of CIP.

SCHEMATIC OF RECOMMENDED PROJECT

FIGURE 4

CITY OF MODESTO
ENGINEER'S REPORT

LEGEND

 Facilities to be Demolished

Facility List:

- | | |
|----------------------------------|--|
| 1. Collection Storage Yard | 22. Odor Control Bio Filter |
| 2. Collection & Electrical | 23. Sludge Thickener No. 1 (abandoned) |
| 3. Admin & Lab Building | 24. Sludge Thickener No. 2 (abandoned) |
| 4. Water Well 15A | 25. Gravity Belt Thickener Building |
| 5. Overflow Parking | 26. Polymer Mixing |
| 6. Crane Storage Building | 27. Clarifier #1 |
| 7. Septic Receiving Station | 28. Clarifier #2 |
| 8. Digester #1 | 29. Sludge Handling Building |
| 9. Digester #2 | 30. Collection Storage Yard |
| 10. Digester #3 | 31. Vac Con Dump Site |
| 11. Digester #4 | 32. Water Well 15B |
| 12. Digester #5 | 33. Aeration Basin/Holding Basin |
| 13. Electrical Sub-Station 1 | 34. Emergency Generator #2 |
| 14. Ferric Chloride Station | 35. Outfall Control Building |
| 15. Maintenance (Staff Building) | 36. Solid Waste Storage |
| 16. Maintenance (Shop Building) | 37. Outfall Pump Station |
| 17. Emergency Generator #1 | 38. Outfall Control Valves |
| 18. Electrical Sub-Station 2 | 39. Emergency Holding Basin |
| 19. Pumping Plant No.3 | 40. Vactor Dump Station |
| 20. Headworks | 41. Sludge Drying Beds |
| 21. Air Handling Building | |

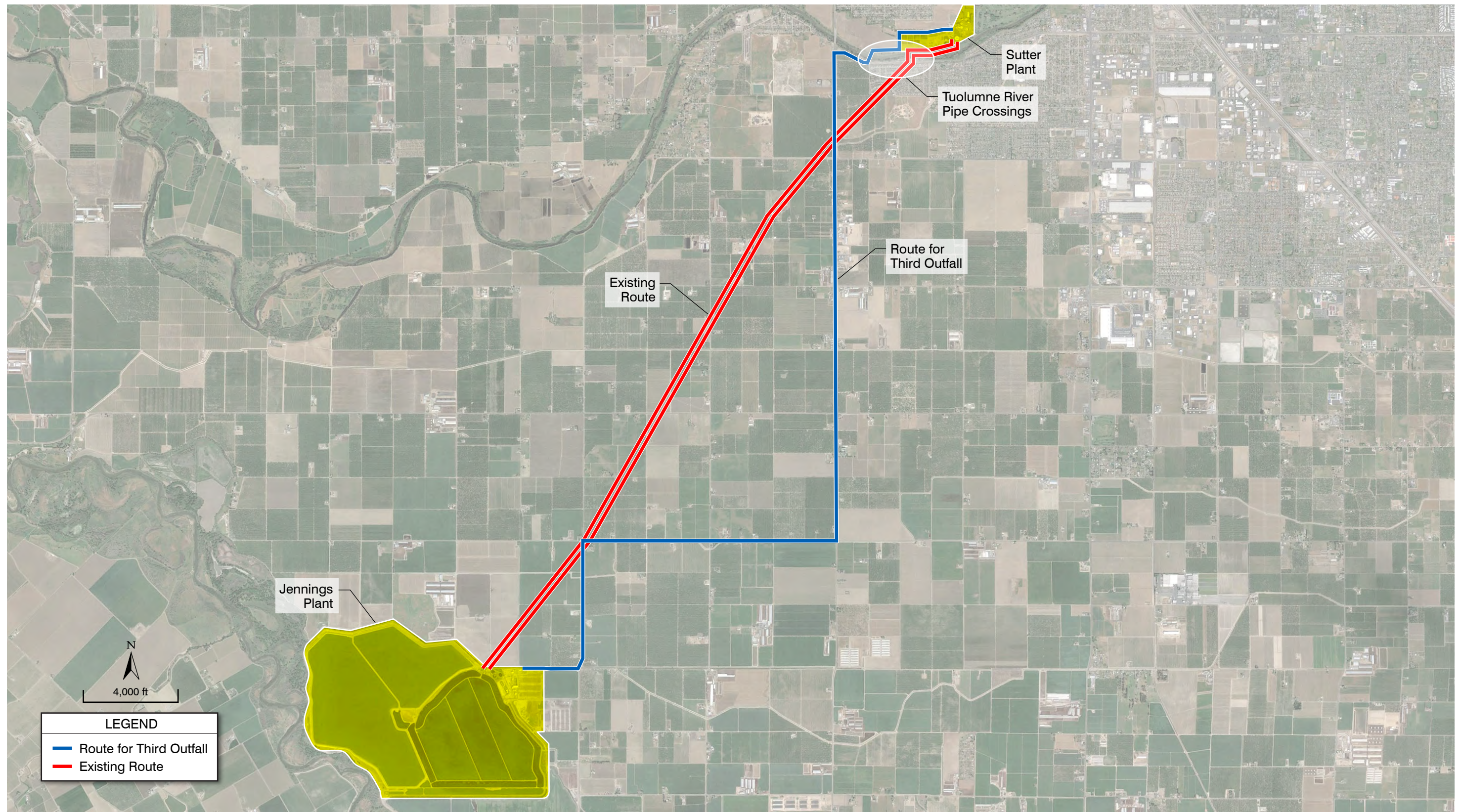


**SUTTER PLANT
SITE LAYOUT**

FIGURE 5

CITY OF MODESTO
ENGINEER'S REPORT

W:\Clients\125 Carolo\08-14-09 Modesto WWP\CAD\Figures\Demolition Figure_V2.dwg 9-09-15 08:52:27 AM chardy



OUTFALL PIPELINES LAYOUT

FIGURE 6

CITY OF MODESTO
ENGINEER'S REPORT



**JENNINGS PLANT
SITE LAYOUT**

FIGURE 7

CITY OF MODESTO
ENGINEER'S REPORT

Source: Wastewater Treatment Master Plan

Table 5 Total Project Capital Costs for Recommended Project Engineer's Report City of Modesto, California	
Project Component	Total Project Cost⁽¹⁾
Sutter Plant Improvements	
Influent Pump Station Improvements	\$2.2
Headworks Improvements	\$14.9
Outfall Pump Station Replacement	\$17.3
Decommissioning of Abandoned Facilities	\$4.9
Allowance for Flood Protection of Existing Sutter Facilities	\$2.0
Subtotal for Sutter Plant	\$41.3
Outfall Pipelines Improvements	
Tuolumne River Crossings	\$26.0
Constructing a Third Outfall	\$60.7
Slip Lining Portion of the Can Seg Outfall	\$10.5
Subtotal for Outfall Pipelines	\$97.2
Jennings Plant Improvements	
Secondary Treatment/Can Seg Treatment Facilities	\$52.4
Primary Treatment and Solids Handling Facilities	\$93.5
Miscellaneous Repairs	\$0.9
Subtotal for Jennings Plant	\$146.8
Engineering Studies	
Master Plan Updates	\$2.0
Land Application Study	\$0.3
Subtotal for Engineering Studies	\$2.3
Total Project Capital Cost for Recommended Project	\$287.6
Note: (1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include an allowance for contingencies, engineering, legal, administration, and permitting costs.	

The following sections describe the treatment and outfall pipeline projects.

5.1 Sutter Plant Improvements

5.1.1 SP - 1 Influent Pump Station Improvements

The influent pump station consists of four enclosed screw-type pumps as well as space planned for a fifth pump. Based on flow projections, the fifth pump will be required to provide sufficient capacity to convey the projected PWWF. However, this pump is not needed until near the end of the 20-year planning period.

5.1.2 SP - 2 Headworks, Dryden Box, and Influent Flume Improvements

- **SP - 2.1 New Dryden Box:** The existing corroded Dryden Box will be demolished and replaced with a smaller box designed to receive and combine flow from the existing CSL and the old River Trunk. The River Trunk will be repurposed as a redundant CSL.
- **SP - 2.2 New West Junction Structure:** A new West Trunk Junction Structure will be constructed, and modifications to the existing Junction Box No. 1 will be made. This includes adding yard piping that connects the two structures to provide a connection point for the new River Trunk.
- **SP - 2.3 Influent Screening:** The influent bar screens will be replaced with new chain-driven multi-rake screens with 1/4-inch bar spacing. These new screens will improve efficiency and reduce maintenance on downstream treatment facilities. A 4-foot wide chain-driven multi-rake screen with 1/2-inch bar spacing will also be installed in the bypass channel, with 1-foot wide bypass gates on either side of the screen to divert peak flows. Additionally, a new screenings washer compactor will be skid-mounted and installed. The existing washer compactor will be removed, skid-mounted as well, and stored for standby use.
- **SP - 2.4 Grit Removal:** A grit removal mechanism will be installed in Grit Basin No. 4 along with an additional grit pump. Improvements to increase the capture of fine particles include placing deflector baffles on the inlets to the grit basins, raising the elevation of the grit chamber effluent weirs, and installing new motor belt drives to reduce the impeller speed in all four grit basins. Additionally, the existing cyclone/grit classifiers will be replaced with two COANDA vortex-type grit washers.
- **SP - 2.5 Headworks Building Odor Control Improvements:** In the Bar Screen Room and Building as well as the Grit and Screening Handling Room, the ventilation rate will be increased to improve working conditions. In addition, the existing air handling unit (AHU) will be replaced with two new AHUs, and the existing metal air ductwork from the AHU to the Headworks Building will be replaced with FRP ductwork.

The existing biofilter consists of two cells with a 4-foot soil media bed. To accommodate increased ventilation airflows, this biofilter will be expanded into the space currently occupied by the access ramps.

- **SP - 2.6 Influent Parshall Flumes:** Upstream flow straightening baffles will be installed to even out the flow pattern upstream of the flumes and to improve measurement accuracy. The third standby flume will be brought online to accommodate projected PWWF.

- **SP - 2.7 Pumping Plant No. 3 (Can Seg Pump Station):** Pumping Plant No. 3 will be expanded to add a new wet well and submersible pumps dedicated to lower flows during non-canning season. Two small dry pit submersible pumps (4 mgd and 8 mgd) will be installed in the new wet well to improve turn-down capacity so that cannery process water can be segregated from domestic flows year-round. Additionally, the two existing Can Seg climber screens on the inlet channel to the existing Pumping Plant No. 3 will be replaced with new 3/8-inch chain-driven multi-rake type screens. A third screen will be installed in the existing bypass channel.

5.1.3 SP - 3 Outfall Pump Station Replacement

The existing Primary Effluent Pump Station will be replaced with a new Outfall Pump Station located above the 100-year flood elevation. This new pump station will provide the capacity and pumping head required for the projected PWWF.

5.1.4 SP - 4 Demolition of Sutter Treatment Facilities

After relocating the Primary Treatment and Solids Handling Facilities to the Jennings Plant, the abandoned facilities at the Sutter Plant will be demolished to below grade and buried to provide space for future facilities.

5.1.5 SP - 5 Allowance for Flood Protection of Remaining Sutter Treatment Facilities

The facilities that remain at the Sutter Plant after relocating the Primary Treatment and Solids Handling Facilities will be modified to protect against a 100-year flood.

5.2 Outfall Pipelines Improvements

5.2.1 OP - 1 Replacement of Tuolumne River Pipe Crossings

- **OP - 1.1 Replacement of Existing Crossings:** For the Primary Domestic Outfall and Can Seg Outfall, the existing pipe crossings under the Tuolumne River will be replaced with new pipe crossings. The new crossings will allow the outfalls to operate under pressure and will increase their flow capacities. In addition, since the existing river crossings are likely in poor condition from corrosion, the new crossings will be designed with materials that prevent or delay corrosion and provide a long service life.
- **OP - 1.2 Crossing for Third Outfall.** A river crossing will also be provided for the new Third Domestic Outfall. For more on this, see CIP Project OP - 2.

5.2.2 OP - 2 Third Outfall

A new third outfall from the Sutter Plant to the Jennings Plant will be added to convey only domestic flows. The Third Outfall will have a 54-inch diameter and a length of

approximately 45,500 ft. This outfall will provide redundancy for the existing Domestic Outfall, which will allow it to provide redundancy for the Can Seg Outfall.

5.2.3 OP - 3 Slip Lining Portion of the Can Seg Outfall

A portion of the Can Seg Outfall will be lined with a plastic liner to improve its condition and reliability. Currently, the condition of the Can Seg Outfall interior is unknown. However, it is assumed that half of the pipeline's length will be lined. Nonetheless, the actual extent of the pipeline needing to be lined will be defined once the pipeline's condition is assessed.

5.3 Jennings Plant Improvements

5.3.1 JP - 1 Secondary Treatment/Can Seg Treatment Facilities Upgrade

- **JP - 1.1 Fixed Film Reactors (FFRs) and Pump Station Rehabilitation:** The existing FFR media, media support system, rotary distributor, and air supply fans will be replaced to increase the FFRs' performance. The pumps in the FFR Pump Station will also be replaced and equipped with variable frequency drives (VFDs) to meet minimum hydraulic loading requirements. In addition, the FFR Effluent Box will be expanded, and a new pipe will connect it to the existing pipeline from the Recirculation Diversion Box to the FFR Mixing Box. This will allow FFR effluent to be recirculated to the FFR influent instead of drawing make-up water from the Recirculation Channel.
- **JP - 1.2 Nutrient Feed and pH Control Systems:** Chemical feed pumps, storage tanks, and feed systems will be provided for each chemical. Nutrient addition and pH control of the Can Seg flow will be necessary for proper treatment process performance.
- **JP - 1.3 Peroxide Feed System:** Chemical feed pumps, storage tanks, and a feed system will be provided for peroxide to control odors from the FFRs.
- **JP - 1.4 Aerators in Recirculation Channel:** Fifty-eight 50-horsepower (hp) surface mechanical aerators, or another aeration system, will be installed in the Recirculation Channel to increase the secondary treatment capacity. A new electrical system, including transformers, motor control centers, and new ductbanks, will replace the mostly abandoned existing electrical service.
- **JP - 1.5 Dissolved Air Flotation (DAF) Piping Modifications:** The DAFs are used to remove algae and suspended solids from the pond effluent. The DAF effluent piping will be modified to convey the flow into the Irrigation Forebay. Flow from the Irrigation Forebay will then be used to irrigate the City's ranch land.

5.3.2 JP - 2 Primary Treatment and Solids Handling Facilities

- **JP - 2.1 Primary Treatment Facilities (Liquid Stream):** New Primary Treatment Facilities at the Jennings Plant will replace the aging Primary Treatment Facilities at the Sutter Plant. The new facilities will consist of three 110-foot diameter primary clarifiers, primary sludge pumping, and scum pumping.
- **JP - 2.2 Yard Piping and Structures:** Additional yard piping will be built to connect the primary treatment and solids handling facilities to the existing treatment facilities at the Jennings Plant. Flow splitting structures will also be provided.
- **JP - 2.3 Anaerobic Digesters:** Three anaerobic digesters will be built at the Jennings Plant to replace the aging digesters at the Sutter Plant and provide a means for treating the solids from waste activated sludge (WAS) generated by the BNR/tertiary facilities. Each digester will have a 115-foot diameter and a 31-foot side-water depth and will treat the combination of WAS and primary sludge from the new primary clarifiers. The digester complex will include a Digester Control Building to house electrical, instrumentation and control, digester mixing, and heating equipment.
- **JP - 2.4 Solids Processing Building (WAS Thickening and Biosolids Dewatering Facilities):** Two sieve drum concentrators will thicken the WAS before it is sent to the digesters. This thickening is necessary to reduce the volume requirements for the anaerobic digesters. After thickening, four belt filter presses, or another process, will dewater the digested sludge before it is sent to the sludge cake drying beds. The WAS thickening and biosolids dewatering equipment will be located in an enclosed building.
- **JP - 2.5 Sludge Cake Drying Beds:** Sludge cake (the dewatered digested sludge) will be solar-dried in new drying beds to reduce the volume and weight of the solids and treat it to Class I standards for land application at the City's ranch. The drying beds will consist of an asphalt-paved area with concrete containment walls and piping for drainage, as well as decant return to the existing tailwater pump station TPS-A. TPS-A will also be rehabilitated, and drying bed facilities will be constructed to accommodate additional flows.

5.3.3 JP - 3 Miscellaneous Repairs

The equipment at the Jennings Plant will require general replacement, and the existing facilities will need to be upgraded. Areas in need of repair include the Outfall Flowmeter Pit, FFR Mixing Box, Storage Pump Station, and DAF Facilities.

5.4 Engineering Studies

5.4.1 ES - 1 Master Plan Updates

The Master Plan will undergo an update every five years.

5.4.2 ES - 2 Land Application Study

The land application of cannery process water as irrigation water at current loadings is expected to continue for the duration of the planning period. However, a detailed scientific study is recommended to verify appropriate long-term land application rates and methodologies. If this study resulted in revised Waste Discharge Permit (WDR) requirements and loading rates, the requirements would likely be implemented over several five-year WDR permit cycles, which could continue beyond the 20-year planning period. For this reason, the CIP does not include projects to accommodate lower Can Seg land application rates.

6.0 COST ALLOCATION METHODOLOGY

This section describes the methodology used to allocate costs between existing and future domestic customers and Can Seg customers. Also described is the basis for cost allocations among the wastewater loading components, flow, biochemical oxygen demand (BOD), and total suspended solids (TSS).

6.1 Cost Allocations between Customers

6.1.1 Collection System Improvements

As discussed in Section 4.1, collection system improvements are categorized as capacity, new growth, rehabilitation and replacement (R&R), reliability, or storm drain cross connection removal. The methodology used to allocate costs for these categories is described below, and a summary of the collection system project cost allocations for each category is shown in Table 6. Detailed allocation criteria are presented in Appendix A.

6.1.1.1 *Hydraulic Capacity Improvements*

An existing hydraulic deficiency occurs where the flow levels in gravity sewers exceed the allowable d/D. A project to correct an existing hydraulic deficiency is allocated entirely to existing users.

An existing sewer or lift station may have sufficient capacity to convey current PWWFs, but as growth continues and more users are added to the system, flow will increase, resulting in capacity deficiencies. These projects, as well as new trunk sewers to extend wastewater collection system service to future growth areas, are considered future improvements and are allocated to future users.

Table 6 Allocation of Collection System Costs to Existing and Future Users Engineer's Report City of Modesto, California					
Project Category	Total Project Cost⁽¹⁾	Cost Allocation⁽¹⁾			
		Existing Customers		Future Customers	
		\$	%	\$	%
Capacity Improvements	\$103.6	\$ 65.1	62.8%	\$38.6	37.2%
New Growth Improvements	35.4	-	0.0	35.4	100.0
R&R Improvements	56.0	50.1	89.3	6.0	10.7
Reliability Improvements	5.6	3.5	61.8	2.1	38.2
Storm Drain Removal	17.0	17.0	100.0	-	0.0
Total	\$217.7	\$135.6	62.3%	\$82.1	37.7%

Note:
 (1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. Costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. Costs are not escalated to future years. Total project costs include an allowance for contingencies, engineering, legal, and administration costs.

In some cases, a project is needed to correct an existing capacity deficiency, but it is sized to accommodate additional flows from future development. In these cases, the hydraulic modeling results are used to determine the cost breakdown between existing and future users based on the ratio of existing and build-out average dry weather flow.

6.1.1.2 New Growth Improvements

Projects to serve future growth include extensions of existing trunk sewers and the construction of new pump stations. Costs were allocated 100 percent to future use where growth improvements served only future customers.

6.1.1.3 R&R Improvements

R&R projects include improvements to existing trunk sewers or pump stations to extend their useful lives, to repair structural deficiencies, and/or to improve performance so that the facilities have adequate capacity throughout the planning period. These improvements benefit both existing and future customers by upgrading and extending the facilities' useful lives. Therefore, allocations are based on the relative ratio of average dry weather flows for existing and build-out conditions.

6.1.1.4 Reliability Improvements

These projects add parallel sewers where existing pipes cross below major obstacles. Since all users see long-term benefits from these upgraded facilities, allocations are based on relative average dry weather flows, similar to capacity improvements.

6.1.1.5 Storm Drain Removal

These projects mitigate extensive surcharging within the existing collection system and reduce the chances of overflow. These projects are assigned entirely to existing users, since the deficiencies are current.

6.1.2 Wastewater Treatment Improvements

Wastewater treatment improvements are allocated between existing and future domestic customers and Can Seg customers based on relative benefit. The methodology used to allocate each improvement is described in the following sections, and a summary of each cost allocation is shown in Table 7. Detailed allocation criteria are presented in Appendix B.

6.1.2.1 Sutter Plant Improvements

6.1.2.1.1 SP - 1 Influent Screw Pump Addition

Because the additional screw pump provides expansion capacity, it benefits only future domestic customers. For this reason, costs are allocated 100 percent to future domestic customers.

6.1.2.1.2 SP - 2 Headworks, Dryden Box, and Influent Flume Improvements

- **SP - 2.1 New Dryden Box:** This benefits only Can Seg customers. Costs are allocated 100 percent to Can Seg customers.
- **SP - 2.2 New West Junction Structure:** This benefits only domestic customers. The Allocation between existing and future users is in proportion to projected PWWF.
- **SP - 2.3 Influent Screening:** The new screens benefit only domestic customers. Allocation between existing and future users is in proportion to projected PWWF.
- **SP - 2.4 Grit Removal:** These improvements benefit only domestic customers. Allocation between existing and future users is in proportion to projected PWWF.
- **SP - 2.5 Headworks Building Odor Control Improvements:** This benefits only domestic customers. Allocation between existing and future users is in proportion to the projected PWWF.
- **SP - 2.6 Influent Parshall Flumes:** This benefits only domestic customers. Allocation between existing and future users is in proportion to the projected PWWF.
- **SP - 2.7 Pumping Plant No. 3 (Can Seg Pump Station):** This benefits only Can Seg customers. All costs are allocated 100 percent to Can Seg customers.

Table 7 Allocation of Wastewater Treatment Improvements to Customers Engineer's Report City of Modesto, California							
Project Component	Total Project Cost⁽¹⁾	Domestic Customers				Can Seg Customers	
		Existing Users		Future Users			
		\$	%	\$	%	\$	%
Sutter Plant Improvements							
Influent Pump Station Improvements	\$ 2.2	\$ -	0.0%	\$ 2.2	100.0%	\$ -	0.0%
Headworks Improvements	14.8	7.6	51.5	1.5	10.4	5.7	38.1
Outfall Pump Station Replacement	17.3	14.4	83.2	2.9	16.8	-	0.0
Decommissioning of Abandoned Facilities	4.9	3.7	74.5	1.2	25.5	-	0.0
Allowance for Flood Protection	2.0	2.0	100.0	-	0.0	-	0.0
Subtotal for Sutter Plant	\$41.3	\$27.7	67.1%	\$ 7.9	19.2%	\$ 5.7	13.7%
Outfall Pipelines Improvements							
Tuolumne River Crossings	\$26.0	\$ 9.1	35.0%	\$ 1.8	7.1%	\$15.1	58.0%
Constructing a Third Outfall	60.7	40.4	66.5	8.2	13.5	12.1	20.0
Slip Lining Portion of the Can Seg Outfall	10.5	-	0.0	-	0.0	10.5	100.0
Subtotal for Outfall Pipelines	\$97.2	\$49.5	50.9%	\$10.0	10.3%	\$37.7	38.8%
Jennings Plant Improvements							
Secondary Treatment/Can Seg Treatment Facilities	\$ 52.4	\$ 8.6	16.4%	\$ 2.9	5.6%	\$40.9	78.0%
Primary Treatment and Solids Handling Facilities	93.5	69.6	74.5	23.9	25.5	-	0.0
Miscellaneous Repairs	0.9	0.1	16.6	<0.1	5.7	0.7	77.6
Subtotal for Jennings Plant	\$146.8	\$78.4	53.4%	\$26.9	18.3%	\$41.6	28.3%
Engineering Studies							
Master Plan Updates	\$2.0	\$1.1	54.5%	\$0.3	15.7%	\$0.6	29.8%
Land Application Study	0.3	-	0.0	-	0.0	0.3	100.0
Subtotal for Engineering Studies	\$2.3	\$1.1	48.4%	\$0.3	14.0%	\$0.8	37.6%
Total	\$287.6	\$156.7	54.5%	\$45.1	15.7%	\$85.8	29.8%
Note: (1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include an allowance for contingencies, engineering, legal, administration, and permitting costs.							

6.1.2.1.3 SP - 3 Outfall Pump Station Replacement

The new Outfall Pump Station benefits only domestic customers. Allocation between existing and future users is in proportion to projected PWWF.

6.1.2.1.4 SP - 4 Demolition of Sutter Treatment Facilities

Demolishing the abandoned facilities at the Sutter Plant benefits only the existing domestic customers. Allocation between existing and future users is in proportion to projected average day MMF.

6.1.2.1.5 SP - 5 Allowance for Flood Protection of Remaining Sutter Treatment Facilities

The potential for flooding at the Sutter Plant is an existing condition. For this reason, costs are allocated 100 percent to existing domestic customers.

6.1.2.2 Outfall Pipelines

6.1.2.2.1 OP - 1 Replacement of Tuolumne River Pipe Crossings

OP - 1.1 Replacement of Existing Crossings: The new crossings benefit both domestic and Can Seg customers. Since Can Seg customers use the Can Seg Outfall, the entire cost of the Can Seg Outfall was allocated to Can Seg customers. However, both domestic and Can Seg customers benefit from the Primary Domestic Outfall after the completion of the Third Outfall. During the peak canning season, the Primary Outfall acts as a redundant pipeline for the Can Seg Outfall. This season lasts approximately 70 to 80 days, which is approximately 20 percent of the year. For this reason, the Primary Domestic Outfall was allocated 80 percent to domestic customers and 20 percent to Can Seg customers. The domestic allocation was then further allocated to existing and future users in proportion to projected PWWF.

- **OP - 1.2 Crossing for Third Outfall:** The new crossings benefit both the domestic and Can Seg customers. The cost of the crossing for the Third Outfall was allocated 80 percent to domestic customers and 20 percent to Can Seg customers. The domestic allocation was then further allocated to existing and future users in proportion to projected PWWF.

6.1.2.2.2 OP - 2 Third Outfall

The cost of the Primary Domestic Outfall's crossing was allocated 80 percent to domestic customers and 20 percent to Can Seg customers. The domestic allocation was then further allocated to existing and future users in proportion to projected PWWF.

6.1.2.2.3 OP - 3 Slip Lining Portion of the Can Seg Outfall

Lining a portion of the Can Seg Outfall benefits only Can Seg customers. Costs are allocated 100 percent to Can Seg customers.

6.1.2.3 Jennings Plant Improvements

6.1.2.3.1 JP - 1 Secondary Treatment/Can Seg Treatment Facilities Upgrade

- **JP - 1.1 Fixed Film Reactors (FFRs) and Pump Station Rehabilitation:** This benefits both the domestic and Can Seg customers. Costs are allocated between the domestic and Can Seg customers based on design maximum month BOD loading (design MM BOD loading = 140,900 ppd; Can Seg = 109,400 ppd [77.6%]; domestic = 31,500 ppd [22.4%]).

The domestic allocation was then further allocated to existing and future users in proportion to projected ADMMF (projected ADMMF = 27.4 mgd; existing = 20.4 mgd [74.5%]; future = 7.0 mgd [25.5%]).

- **JP - 1.2 Nutrient Feed and pH Control Systems:** This benefits only Can Seg customers. Costs are allocated 100 percent to Can Seg customers.
- **JP - 1.3 Peroxide Feed System:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.
- **JP - 1.4 Aerators in Recirculation Channel:** This benefits both domestic and Can Seg customers. Costs are allocated between the domestic industrial and Can Seg customers based on design maximum month BOD loading. The domestic allocation was then further allocated to existing and future users in proportion to projected ADMMF.
- **JP - 1.5 DAF Piping Modifications:** This benefits both domestic and Can Seg customers. Costs are allocated between the domestic and Can Seg customers based on design maximum month BOD loading. The domestic allocation was then further allocated to existing and future users in proportion to projected ADMMF.

6.1.2.3.2 JP - 2 Primary Treatment and Solids Handling Facilities

- **JP - 2.1 Primary Treatment Facilities:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.
- **JP - 2.2 Yard Piping and Structures:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.
- **JP - 2.3 Anaerobic Digesters:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.

- **JP - 2.4 Solids Processing Building (WAS Thickening and Biosolids Dewatering Facilities):** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.
- **JP - 2.5 Sludge Cake Drying Beds:** This benefits only domestic customers. Allocation between existing and future users is in proportion to projected ADMMF.

6.1.2.3 JP - 3 Miscellaneous Repairs

These projects benefit both domestic and Can Seg customers. Costs were allocated between the domestic and Can Seg customers based on design maximum month BOD loading. The domestic allocation was then further allocated to existing and future users in proportion to projected MMF.

6.1.2.4 Engineering Studies

6.1.2.4.1 ES - 1 Master Plan Updates

Updates to the Master Plan will benefit both domestic and Can Seg customers. Costs were allocated based on the overall total cost allocation to domestic and Can Seg customers from all of the CIP projects for the Sutter Plant, Outfall Pipelines, and Jennings Plant (total = \$285.3M; Can Seg = \$84.9M [29.8%]; domestic = \$200.4M [70.2%]).

The domestic allocation was then further allocated to existing and future users in proportion to total cost allocation from the CIP projects (domestic = \$200.4M; existing = \$156.8M [78.3%]; future = \$43.6M [21.7%]).

6.1.2.4.2 ES - 2 Land Application Study

This benefits only Can Seg customers. Costs were allocated 100 percent to Can Seg customers.

6.2 Allocation to Billable Constituents

This section allocates project capital costs to the billable constituents of flow, BOD, and TSS. The basis of this analysis is to evaluate each project component or unit process and assess which constituent determines the function of the unit process and/or causes the capital costs incurred. A summary of recommended billable constituent cost allocations for each project component is presented on Table 8, and a discussion of the allocation for various project elements is provided below.

Table 8 Allocation of Project Costs to Billable Constituents Engineer's Report City of Modesto, California							
Project Components	Total Project Cost⁽¹⁾	Cost Allocation					
		Flow		BOD		TSS	
		\$	%	\$	%	\$	%
Collection System Improvements							
All Collection System Projects	\$217.7	\$217.7	100.0%	\$ -	0.0%	\$ -	0.0%
Sutter Plant Improvements							
Influent Pump Station Improvements	\$ 2.2	\$ 2.2	100.0%	\$ -	0.0%	\$ -	0.0%
Headworks Improvements	14.8	14.8	100.0	-	0.0	-	0.0
Outfall Pump Station Replacement	17.3	17.3	100.0	-	0.0	-	0.0
Decommissioning of Abandoned Facilities	4.9	1.7	34.0	1.6	33.0	1.6	33.0
Allowance for Flood Protection	2.0	0.7	34.0	0.7	33.0	0.7	33.0
Subtotal for Sutter Plant	\$41.3	\$36.7	88.9%	\$ 2.3	5.5%	\$ 2.3	5.5%
Outfall Pipelines Improvements							
Tuolumne River Crossings	\$26.0	\$26.0	100.0%	\$ -	0.0%	\$ -	0.0%
Constructing a Third Outfall	60.7	60.7	100.0	-	0.0	-	0.0
Slip Lining Portion of the Can Seg Outfall	10.5	10.5	100.0	-	0.0	-	0.0
Subtotal for Outfall Pipelines	\$97.2	\$97.2	100.0%	\$ -	0.0%	\$ -	0.0%
Jennings Plant Improvements							
Secondary Treatment/Can Seg Treatment Facilities	\$ 52.4	\$21.8	41.5%	\$29.2	55.7%	\$ 1.4	2.8%
Primary Treatment and Solids Handling Facilities	93.5	24.4	26.0	20.9	22.4	48.3	51.6
Miscellaneous Repairs	0.9	0.3	34.0	0.3	33.0	0.3	33.0
Subtotal for Jennings Plant	\$146.8	\$46.4	31.6%	\$50.4	34.3%	\$50.0	34.1%
Engineering Studies							
Master Plan Updates	\$ 2.0	\$ 0.7	34.0%	\$ 0.7	33.0%	\$ 0.7	33.0%
Land Application Study	0.3	0.0	0.0	0.3	100.0	0.0	0.0
Subtotal for Engineering Studies	\$ 2.3	\$ 0.7	30.2%	\$ 0.9	40.4%	\$ 0.7	29.3%
Total - Wastewater Treatment Improvements	\$287.6	\$181.0	62.9%	\$53.6	18.6%	\$53.0	18.4%
Total - Collection System and Wastewater Treatment	\$505.3	\$398.7	78.9%	\$53.6	10.6%	\$53.0	10.5%

Note:

(1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. The collection system costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. The wastewater treatment costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include allowances for contingencies, engineering, legal, administration, and permitting costs.

6.2.1 Collection System Improvements

Sizing for all trunk sewer and pump station facilities is dictated by the flows they must accommodate. Consequently, the capital costs associated with all collection system improvements are allocated entirely to flow.

6.2.2 Wastewater Treatment Improvements

6.2.2.1 Sutter Plant Improvements

6.2.2.1.1 SP - 1 Influent Screw Pump Addition

Design criteria and allocation are based exclusively on flow.

6.2.2.1.2 SP - 2 Headworks, Dryden Box, and Influent Flume Improvements

- **SP - 2.1 New Dryden Box:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.2 New West Junction Structure:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.3 Influent Screening:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.4 Grit Removal:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.5 Headworks Building Odor Control Improvements:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.6 Influent Parshall Flumes:** Design criteria and allocation are based exclusively on flow.
- **SP - 2.7 Pumping Plant No. 3 (Can Seg Pump Station):** Design criteria and allocation are based exclusively on flow.

6.2.2.1.3 SP - 3 Outfall Pump Station Replacement

Design criteria and allocation are based exclusively on flow.

6.2.2.1.4 SP - 4 Demolition of Sutter Treatment Facilities

This is a general project required for improvements to the site. Therefore, costs are allocated equally to all three wastewater constituents.

6.2.2.1.5 SP - 5 Allowance for Flood Protection of Remaining Sutter Treatment Facilities

This is a general project required for improvements to the site. Therefore, costs are allocated equally to all three wastewater constituents.

6.2.2.2 Outfall Pipelines

All outfall facility improvements are designed for increased capacity. Design criteria and allocation for each outfall is based exclusively on flow.

6.2.2.3 Jennings Plant Improvements

6.2.2.3.1 JP - 1 Secondary Treatment/Can Seg Treatment Facilities Upgrade

- **JP - 1.1 Fixed Film Reactors and Pump Station Rehabilitation:** Design criteria for the FFR Pump Station are based exclusively on flow, and design criteria for the FFRs are based on BOD. Cost allocation is split equally between flow and BOD.
- **JP - 1.2 Nutrient Feed and pH Control Systems:** Nutrient and pH control are required for secondary treatment to perform properly. Cost allocation is 40 percent to flow, 30 percent to BOD, and 30 percent to TSS.
- **JP - 1.3 Peroxide Feed System:** Design criteria and allocation are based exclusively on flow.
- **JP - 1.4 Aerators in Recirculation Channel:** Design criteria and allocation are based exclusively on BOD.
- **JP - 1.5 DAF Piping Modifications:** The DAFs are required for TSS removal. Therefore, allocation is based exclusively on TSS.

6.2.2.3.2 JP - 2 Primary Treatment and Solids Handling Facilities

- **JP - 2.1 Primary Treatment Facilities:** Design criteria are based on flow. Primary treatment also removes TSS and BOD. Cost allocation is 70 percent to flow, 10 percent to BOD, and 20 percent to TSS.
- **JP - 2.2 Yard Piping and Structures:** Design criteria and allocation are based exclusively on flow.
- **JP - 2.3 Anaerobic Digesters:** Primary sludge and WAS will both be digested. Of the total sludge sent to the digesters, approximately 70 percent will be primary sludge, which corresponds with TSS removal during primary treatment. The other 30 percent will be WAS, which consists of solids from BOD generated biomass. Therefore, cost allocation is 30 percent to BOD and 70 percent to TSS.

- **JP - 2.4 Solids Processing Building (WAS Thickening and Biosolids Dewatering Facilities):** Cost allocation is 30 percent to BOD and 70 percent to TSS on the same basis as anaerobic digesters.
- **JP - 2.5 Sludge Cake Drying Beds:** Cost allocation is 30 percent to BOD and 70 percent to TSS on the same basis as anaerobic digesters.

6.2.2.3.3 JP - 3 Miscellaneous Repairs

These are general projects required for improvements to the site. Costs are allocated equally to all three billable constituents.

6.2.2.4 Engineering Studies

6.2.2.4.1 ES - 1 Master Plan Updates

Costs are allocated equally to all three billable constituents.

6.2.2.4.2 ES - 2 Land Application Study

The study will determine BOD loading rates for the ranch land. Costs are allocated exclusively to BOD.

7.0 PROJECT PHASING AND CASH FLOW PROJECTIONS

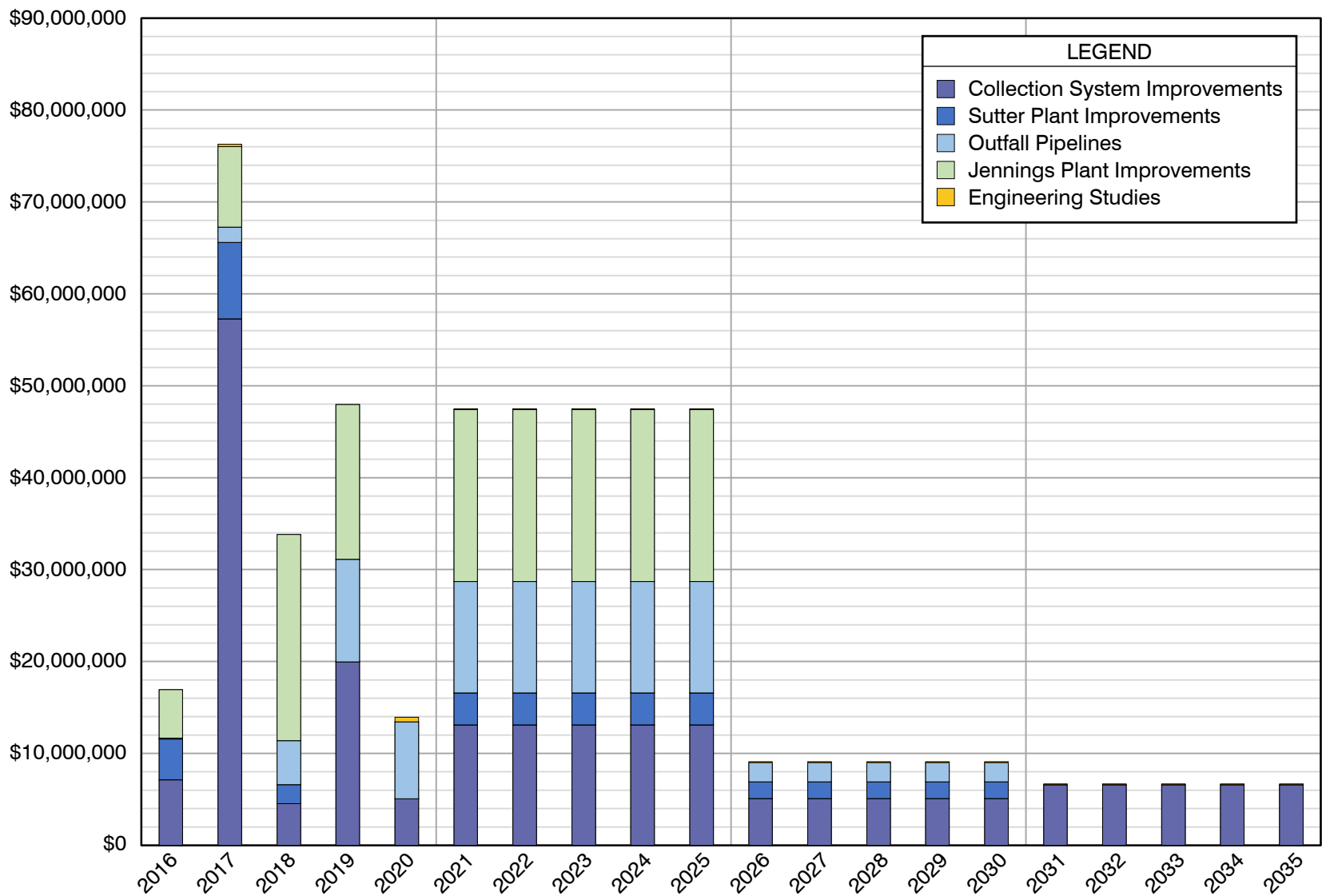
The wastewater collection system and treatment improvements program outlined will be constructed in phases throughout the 20-year planning period. These improvements will be implemented in five-year periods. Table 9 summarizes the phasing of the collection system projects, and Appendix A shows the capital expenditures associated with the collection system implementation plan in more detail. Phasing costs are driven by reliability priority and anticipated new development.

The wastewater treatment improvements will also be constructed in phases. Timing for the projects was determined for each year for the first five years and for each five-year period for the remaining 15 years of the CIP. Similarly, the CIP cash flow was developed on a year-by-year basis for the first five years and on an average annual basis for each five-year period thereafter. Table 9 also summarizes the capital costs for each phase.

Combining the entire wastewater capital improvement program for the collection system and treatment improvements results in the cost flow presented in Figure 8.

Table 9 Wastewater Treatment CIP Phasing Engineer's Report City of Modesto, California										
Project	Project Number	Total Project Cost (\$) ⁽¹⁾	Capital Improvement Program Cost per Phase (\$) ⁽¹⁾							
			Phase 1					Phase 2	Phase 3	Phase 4
			2016	2017	2018	2019	2020	2021-2025	2026-2030	2031-2035
Collection System Improvements										
Capacity Improvements	-	103,642,000	2,324,000	34,283,000	-	16,967,000	2,071,000	40,769,000	1,589,000	5,639,000
New Growth Improvements	-	35,420,000	-	-	-	-	-	11,050,000	10,486,000	13,884,000
R&R Improvements	-	56,033,000	3,589,500	17,125,500	3,961,000	3,000,000	3,000,000	8,691,000	8,333,000	8,333,000
Reliability Improvements	-	5,601,000	186,500	4,854,500	560,000	-	-	-	-	-
Storm Drain Removal	-	17,040,000	1,020,000	1,020,000	-	-	-	5,000,000	5,000,000	5,000,000
Total - Collection System Improvements		217,736,000	7,120,000	57,283,000	4,521,000	19,967,000	5,071,000	65,510,000	25,408,000	32,856,000
Sutter Plant Improvements										
Influent Pump Station Improvements	SP-1	2,198,000	-	-	-	-	-	-	2,198,000	-
Headworks, Dryden Box, and Influent Flume Improvements Project	SP-2	14,849,000	4,454,900	8,315,600	2,078,900	-	-	-	-	-
Outfall Pump Station Replacement	SP-3	17,332,000	-	-	-	-	-	17,332,000	-	-
Demolition of Sutter Treatment Facilities	SP-4	4,942,000	-	-	-	-	-	-	4,942,000	-
Allowance for Flood Protection of Remaining Sutter Facilities	SP-5	2,000,000	-	-	-	-	-	-	2,000,000	-
Subtotal - Sutter Plant Improvements		41,321,000	4,454,900	8,315,600	2,078,900	-	-	17,332,000	9,140,000	-
Outfall Pipelines										
Tuolumne River Pipe Crossings	OP-1	26,045,000	98,700	1,657,600	4,779,900	11,148,000	8,361,000	-	-	-
Third Outfall Pipeline	OP-2	60,679,000	-	-	-	-	-	60,679,000	-	-
Slip Lining Portion of the Can Seg Outfall	OP-3	10,456,000	-	-	-	-	-	-	10,456,000	-
Subtotal Outfall Pipelines		97,180,000	98,700	1,657,600	4,779,900	11,148,000	8,361,000	60,679,000	10,456,000	-
Jennings Plant Improvements										
Secondary Treatment/Can Seg Treatment Facilities Upgrades	JP-1	52,422,000	4,822,400	8,332,700	22,438,400	16,828,800	-	-	-	-
Primary Treatment and Solids Handling Facilities	JP-2	93,530,000	-	-	-	-	-	93,530,000	-	-
Miscellaneous Repairs	JP-3	873,000	436,400	436,400	-	-	-	-	-	-
Subtotal - Jennings Plant Improvements		146,825,000	5,258,800	8,769,100	22,438,400	16,828,800	-	93,530,000	-	-

Table 9 Wastewater Treatment CIP Phasing Engineer's Report City of Modesto, California										
Project	Project Number	Total Project Cost (\$)⁽¹⁾	Capital Improvement Program Cost per Phase (\$)⁽¹⁾							
			Phase 1					Phase 2	Phase 3	Phase 4
			2016	2017	2018	2019	2020	2021-2025	2026-2030	2031-2035
Engineering Studies										
Master Plan Updates	ES-1	2,000,000	-	-	-	-	500,000	500,000	500,000	500,000
Land Application Study	ES-2	250,000	-	250,000	-	-	-	-	-	-
Subtotal - Engineering Studies		2,250,000	-	250,000	-	-	500,000	500,000	500,000	500,000
Total - Wastewater Treatment Improvements		287,576,000	9,812,400	18,992,300	29,297,800	27,976,800	8,861,000	172,041,000	20,096,000	500,000
Total - Collection System and Wastewater Treatment Improvements		505,312,000	16,932,400	76,275,300	33,818,200	47,943,800	13,932,000	237,551,000	45,504,000	33,356,000
Note: (1) Total project costs are presented in millions of dollars and rounded to the nearest hundred thousand. The collection system costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in July 2015. The wastewater treatment costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years. Total project costs include allowances for contingencies, engineering, legal, administration, and permitting costs.										



CIP CASH FLOW

FIGURE 8

CITY OF MODESTO
ENGINEER'S REPORT

Source: Collection System Master Plan and Wastewater Treatment Master Plan



**APPENDIX A – COLLECTION SYSTEM CAPITAL
IMPROVEMENT PROGRAM**

Table A.1 Collection System Capital Improvement Program Engineer's Report City of Modesto, California																					
Project	Project Number	Description/ Street	Purpose	Improvement Category	Project Length/Size and Cost					Capital Improvement Program Cost per Phase (\$)							Future Users Benefit (%)	Cost Allocation			
					Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost (\$)	Capital Improvement Cost ⁽¹⁾⁽²⁾ (\$)	Phase 1					Phase 2		Phase 3	Phase 4	Existing Improvements (\$)	Future Improvements (\$)
											2016	2017	2018	2019	2020	2021-2025		2026-2030	2031-2035		
Existing System Improvements																					
Area 1																					
West Trunk																					
Hahn Lift Station	LS # 19 - Hahn	Honey Creek Road and Nightingale Drive	Increase the firm capacity from 0.65 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	0.6 mgd	2.6 mgd	Replace	-	\$ 1,102,000	\$ 1,791,000	\$ 1,791,000								14%	\$ 1,537,000	\$ 254,000
Rumble Trunk																					
Rumble Lift Station	LS # 30 - Rumble	Rumble Road near Bay Lane	Increase the firm capacity from 1.37 mgd to 2.33 mgd to meet existing and future PWWFs.	Capacity	1.4 mgd	3.5 mgd	Replace	-	\$ 1,403,000	\$ 2,280,000				\$ 2,280,000				28%	\$ 1,645,000	\$ 635,000	
Area 2																					
Sutter Trunk																					
Gravity Pipeline	S-4a	Highway 99	Increase reliability by constructing a parallel 16-inch diameter trunk under Highway 99.	Reliability	-	16	New	-	\$ 373,000	\$ 373,000	\$ 186,500	\$ 186,500							0%	\$ 373,000	\$ -
Gravity Pipeline	S-4b	Highway 99	Rehabilitate existing 16-inch diameter trunk.	Rehabilitation	16	-	Rehab	-	\$ 113,000	\$ 113,000	\$ 56,500	\$ 56,500							0%	\$ 113,000	\$ -
Area 3																					
River Trunk																					
Gravity Pipeline ⁽³⁾	RT-1	Tuolumne Avenue	Provides gravity conveyance of the River Trunk flows from the discharge of the River Trunk force mains to the Sutter Plant.	Capacity	-	48	New	-	\$ 3,211,000	\$ 3,211,000				\$ 3,211,000				41%	\$ 1,896,000	\$ 1,315,000	
Gravity Pipeline ⁽³⁾	RT-2	Colorado Avenue	Provides gravity conveyance of the River Trunk flows from the discharge of the River Trunk force mains to the Sutter Plant.	Capacity	-	54	New	-	\$ 8,648,000	\$ 8,648,000				\$ 8,648,000				41%	\$ 5,105,000	\$ 3,543,000	
Gravity Pipeline ⁽³⁾	RT-3	Colorado Avenue	Provides gravity conveyance of the River Trunk flows from the discharge of the River Trunk force mains to the Sutter Plant.	Capacity	-	60/72	New	-	\$ 7,442,000	\$ 7,442,000				\$ 7,442,000				41%	\$ 4,393,000	\$ 3,049,000	
Gravity Pipeline ⁽³⁾	RT-4	Tuolumne Boulevard	Provide peak wet weather diversion for the existing Sutter Trunk.	Capacity	-	21	New	-	\$ 1,137,000	\$ 1,137,000				\$ 1,137,000				41%	\$ 671,000	\$ 466,000	
Force Main ⁽³⁾	RT-5	Tuolumne Boulevard	Two force mains allows the system to maintain flushing velocities through a wide range of flows and will convey flows from the River Trunk Pump Station.	Capacity	-	24 & 36	New	-	\$ 5,818,000	\$ 5,818,000				\$ 5,818,000				41%	\$ 3,435,000	\$ 2,383,000	
Gravity Pipeline ⁽³⁾	RT-6	Beard Brook North Gravity Alignment	A gravity extension of the Dry Creek crossing that conveys flows to the River Trunk Pump Station.	Capacity	-	-	New	-	\$ 16,967,000	\$ 16,967,000		\$ 16,967,000						41%	\$ 10,017,000	\$ 6,950,000	
Gravity Pipeline ⁽³⁾	RT-7	B Street	Reroute flows to the River Trunk Pump Station.	Capacity	-	36 & 48	New	-	\$ 2,071,000	\$ 2,071,000		\$ 2,071,000						41%	\$ 1,223,000	\$ 848,000	
Gravity Pipeline ⁽³⁾	RT-8	Open Space	Convey flows from the new Shackelford PS to the new River Trunk in Colorado.	Capacity	-	14 & 18	New	-	\$ 1,944,000	\$ 1,944,000				\$ 1,944,000				44%	\$ 1,086,000	\$ 858,000	
Gravity Pipeline ⁽³⁾	RT-9	Sutter Avenue	Based on the results of the condition assessment, the Sutter Ave Trunk will require rehabilitation.	Rehabilitation	-	24	New	-	\$ 533,000	\$ 533,000	\$ 533,000							41%	\$ 315,000	\$ 218,000	
Gravity Pipeline ⁽³⁾	RT-10	Open Space	Based on the results of the condition assessment, a segment of the River Trunk will require rehabilitation.	Rehabilitation	-	48	New	-	\$ 14,069,000	\$ 14,069,000		\$ 14,069,000						41%	\$ 8,306,000	\$ 5,763,000	
River Bank Armament ⁽³⁾	RT-11	Tuolumne River Bank	Armoring the riverbank to prevent future erosion and expose of the CSL and River Trunk.	Reliability	-	-	New	-	\$ 4,668,000	\$ 4,668,000		\$ 4,668,000						41%	\$ 2,756,000	\$ 1,912,000	
CSL Diversion Structures ⁽³⁾	RT-12	North or Sutter Plant	A contingency to divert flows between the CSL and River Trunk.	Reliability	-	-	New	-	\$ 560,000	\$ 560,000		\$ 560,000						41%	\$ 331,000	\$ 229,000	
Shackelford Lift Station ⁽³⁾	LS-Shackelford	East of Crows Landing	Eliminate the siphon below the Tuolumne River.	Capacity	-	4.2 mgd	New	-	\$ 2,989,000	\$ 2,989,000				\$ 2,989,000				44%	\$ 1,670,000	\$ 1,319,000	
River Trunk Lift Station ⁽³⁾	LS-River Trunk	Morton Boulevard	Eliminate River Trunk inverted siphon and associated issues.	Capacity	-	54.5 mgd	New	-	\$ 33,483,000	\$ 33,483,000		\$ 33,483,000						41%	\$ 19,767,000	\$ 13,716,000	
Area 4																					
Downtown Trunks																					
Gravity Pipeline	DT-1	J Street	The trunk in J Street exceeds the maximum d/D criteria under PWWF and causes the existing 12-inch pipeline to surcharge.	Capacity	12	15	Replace	2,400	\$ 205	\$ 800,000		\$ 800,000						4%	\$ 765,000	\$ 35,000	
Gravity Pipeline	DT-2	Kimble Street and Floto Street	The existing 10-inch diameter pipelines exceed the maximum d/D criteria under PWWF at approximately 90-percent capacity.	Capacity	10	12	Replace	1,000	\$ 163	\$ 265,000				\$ 265,000				4%	\$ 254,000	\$ 11,000	
Area 5																					
Santa Rosa Trunk																					
Gravity Pipeline	SR-1	Kimble Street and Floto Street	This segment has significant deterioration to a point where the structural integrity of the pipe is compromised.	Rehabilitation	24/30	-	Rehab	1,700	\$ 961,000	\$ 961,000		\$ 961,000						0%	\$ 961,000	\$ -	
Gravity Pipeline	SR-4	Coffee Road	The existing 10-inch diameter pipelines in Coffee Road exceed the maximum d/D criteria under PWWF and cause the existing 10-inch pipelines to surcharge.	Capacity	10	15	Replace	1,600	\$ 205	\$ 533,000	\$ 533,000							0%	\$ 533,000	\$ -	
Gravity Pipeline	SR-6	Kimble Street and Floto Street	This reach is over 50 years old and has significant deterioration to a point where the structural integrity of the pipe is compromised.	Rehabilitation	18	-	Rehab	1,000	\$ 358,000	\$ 358,000				\$ 358,000				0%	\$ 358,000	\$ -	
Rose and Celeste Trunk																					
Rose & Celeste Lift Station	LS # 29 - Rose & Celeste	Rose Avenue and Celeste Drive	Increase the firm capacity from 0.86 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	0.9 mgd	2.6 mgd	Replace	-	\$ 1,102,000	\$ 1,791,000				\$ 1,791,000				0%	\$ 1,791,000	\$ -	
Area 6																					
Empire Trunk																					
Gravity Pipeline ⁽⁴⁾	EM-1	McClure Road	The existing pipelines in McClure Road exceed the maximum d/D criteria under PWWF and cause the 10-inch pipelines to surcharge.	Capacity	10	15	Replace	200	\$ -	In Progress								0%	\$ -	\$ -	
Gravity Pipeline ⁽⁴⁾	EM-2	Garner Road	This relief pipeline will alleviate surcharging within the Empire Trunk along Yosemite Boulevard and McClure Road.	Capacity	-	18	New	3,300	\$ -	In Progress								0%	\$ -	\$ -	
Gravity Pipeline	EM-3	Hoover Avenue	The existing pipelines exceed the maximum d/D under PWWF at approximately 95-percent capacity.	Capacity	10	12	Replace	1,800	\$ 163	\$ 476,000				\$ 476,000				14%	\$ 409,000	\$ 67,000	
Gravity Pipeline	EM-4	Benson Avenue	The 15-inch diameter trunk in Benson Avenue exceeds the d/D criteria under PWWF at approximately 93 percent capacity.	Capacity	15	18	Replace	1,400	\$ 223	\$ 507,000				\$ 507,000				3%	\$ 491,000	\$ 16,000	
Benson Lift Station	LS # 03 - Benson	Benson Avenue	Increase the firm capacity from 0.22 mgd to 1.3 mgd to meet existing and future PWWFs.	Capacity	0.2 mgd	2.6 mgd	Replace	-	\$ 1,102,000	\$ 1,791,000				\$ 1,791,000				0%	\$ 1,785,000	\$ 6,000	

Table A.1 Collection System Capital Improvement Program Engineer's Report City of Modesto, California																						
Project	Project Number	Description/ Street	Purpose	Improvement Category	Project Length/Size and Cost						Capital Improvement Program Cost per Phase (\$)							Future Users Benefit (%)	Cost Allocation			
					Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost (\$)	Capital Improvement Cost ⁽¹⁾⁽²⁾ (\$)	Phase 1					Phase 2	Phase 3		Phase 4	Existing Improvements (\$)	Future Improvements (\$)	
											2016	2017	2018	2019	2020	2021-2025	2026-2030		2031-2035			
Sonoma/Lakewood Trunk																						
Scenic Lift Station ⁽⁴⁾	LS # 31 - Scenic	Scenic Drive	Increase the firm capacity from 2.3 mgd to 18.4 mgd to meet existing and future PWWFs.	Capacity	13.0 mgd	25.6 mgd	Replace	-	\$ -	In Progress									52%	\$ -	\$ -	
Area 8																						
Ceres Trunk																						
Gravity Pipeline ⁽⁴⁾	C-1	Parallel to Tuolumne River	This project rehabilitates the oldest and most deteriorated segment of the Ceres Trunk.	Rehabilitation	18/21/24	-	Replace	2,900	\$ -	In Progress									0%	\$ -	\$ -	
Gravity Pipeline ⁽⁴⁾	C-2a	Highway 99 crossing	Increase reliability by constructing a parallel 24-inch diameter trunk under Highway 99.	Reliability	-	24	New	150	\$ -	In Progress									0%	\$ -	\$ -	
Gravity Pipeline ⁽⁴⁾	C-2b	Highway 99 crossing	Rehabilitate existing 24-inch diameter trunk.	Reliability	-	24	New	150	\$ -	In Progress									0%	\$ -	\$ -	
City-wide																						
Storm Drain	SDR	Various Locations	Remove storm drain connections from the sewer collection system.	Storm Drain Removal	-	-	-	-		\$17,040,000	\$ 1,020,000	\$ 1,020,000				\$ 5,000,000	\$ 5,000,000	\$ 5,000,000	0%	\$ 17,040,000	\$ -	
Rehabilitation & Replacement	R&R	Various Locations	Small and Large Diameter Rehabilitation and Replacement Program.	Rehabilitation	-	-	-	-		\$ 39,999,000	\$ 3,000,000	\$ 3,000,000	\$ 3,000,000	\$ 3,000,000	\$ 3,000,000	\$ 8,333,000	\$ 8,333,000	\$ 8,333,000	0%	\$ 39,999,000	\$ -	
Existing Improvements Cost Estimate										172,618,000	7,120,000	57,283,000	4,521,000	19,967,000	5,071,000	51,990,000	13,333,000	13,333,000		129,025,000	43,593,000	
Future System Improvements																						
Area 1																						
West Trunk																						
Gravity Pipeline	W-1	Carpenter Road to Sutter Plant	Build-out PWWF causes the lower reach of the West Trunk to exceed the maximum depth criteria at approximately 90 percent capacity.	Capacity	-	48	New	5,200	\$ 552	\$ 4,664,000						\$ 4,664,000			34%	\$ 3,069,000	\$ 1,595,000	
Gravity Pipeline	W-2	Veneman Avenue	The trunk in Veneman Avenue exceeds the d/D criteria at approximately 90 percent capacity.	Capacity	18	21	Replace	700	\$ 260	\$ 296,000					\$ 296,000				13%	\$ 257,000	\$ 39,000	
Gravity Pipeline	W-3	Undeveloped Area	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	15	New	4,000	\$ 205	\$ 1,333,000						\$ 1,333,000			100%	\$ -	\$ 1,333,000	
Force Main	W-4	North Avenue	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	6	New	9,000	\$ 147	\$ 2,150,000						\$ 2,150,000			100%	\$ -	\$ 2,150,000	
Gravity Pipeline	W-5	Dakota Avenue	These improvements are recommended to service future growth within the Beckwith-Dakota and College West CPDs.	New Growth	-	12	New	1,200	\$ 163	\$ 319,000						\$ 319,000			100%	\$ -	\$ 319,000	
Gravity Pipeline	W-6	Kansas Avenue	This improvement is recommended to service future growth within the Highway 132 CPD.	New Growth	-	15	New	4,300	\$ 205	\$ 1,433,000						\$ 1,433,000			100%	\$ -	\$ 1,433,000	
Gravity Pipeline	W-7	Carpenter Road and Paradise Road	This improvement is recommended to service infill as the sewer service area extends to include county islands.	New Growth	-	12	New	2,900	\$ 163	\$ 769,000					\$ 769,000				100%	\$ -	\$ 769,000	
Kansas Lift Station	LS # 63	Kansas Avenue and Altamont Court	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	2.0 mgd	New	-	\$ 909,000	\$ 1,477,000						\$ 1,477,000			100%	\$ -	\$ 1,477,000	
Dakota Lift Station	LS # 64	Dakota Road and Beckwith Court	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.0 mgd	New	-	\$ 605,000	\$ 983,000						\$ 983,000			100%	\$ -	\$ 983,000	
Woodland Lift Station ⁽⁵⁾	LS # 39	Woodland Avenue and Poust Road	It is proposed that the firm capacity be increased to 25.2 mgd from its current capacity of 20.9 mgd to meet future PWWFs.	Capacity	27.4 mgd	32.4 mgd	Expand	-	\$ -	\$ 1,293,000					\$ 1,293,000				39%	\$ 790,000	\$ 503,000	
Rumble Trunk																						
Gravity Pipeline	R-1	Claremont Avenue and Maud Kump Terrace	Under PWWF conditions, this reach of the Rumble Trunk experiences flow depths in excess of the maximum d/D at approximately 90-percent capacity.	Capacity	21	24	Replace	5,100	\$ 298	\$ 2,470,000					\$ 2,470,000				19%	\$ 1,993,000	\$ 477,000	
Gravity Pipeline	R-2	McHenry Avenue	This sewer trunk extension will provide service to future development in the Pelandale/McHenry CPD.	New Growth	-	10	New	900	\$ 137	\$ 200,000					\$ 200,000				100%	\$ -	\$ 200,000	
Dale Trunk																						
Gravity Pipeline	D-1	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	15	New	1,200	\$ 205	\$ 400,000					\$ 400,000				100%	\$ -	\$ 400,000	
Force Main	D-2	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	6	New	2,600	\$ 147	\$ 621,000					\$ 621,000				100%	\$ -	\$ 621,000	
Gravity Pipeline	D-3	Chapman Road	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	12	New	1,700	\$ 163	\$ 450,000					\$ 450,000				100%	\$ -	\$ 450,000	
Gravity Pipeline	D-4	Chapman Road	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	10	New	2,200	\$ 137	\$ 489,000					\$ 489,000				100%	\$ -	\$ 489,000	
Gravity Pipeline	D-5	Undeveloped Area	This group of improvements is recommended to service future growth within the Kiernan-Carver and Kiernan-Carver North CPDs.	New Growth	-	8	New	1,500	\$ 109	\$ 267,000					\$ 267,000				100%	\$ -	\$ 267,000	
Chapman Lift Station	LS # 60	Chapman Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.6 mgd	New	-	\$ 785,000	\$ 1,276,000					\$ 1,276,000				100%	\$ -	\$ 1,276,000	
North Trunk Extension																						
Gravity Pipeline	N-1	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	27	New	2,800	\$ 335	\$ 1,524,000					\$ 1,524,000				100%	\$ -	\$ 1,524,000	
Gravity Pipeline	N-2	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	24	New	6,100	\$ 298	\$ 2,954,000					\$ 2,954,000				100%	\$ -	\$ 2,954,000	
Gravity Pipeline	N-3	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	21	New	1,600	\$ 260	\$ 676,000					\$ 676,000				100%	\$ -	\$ 676,000	
Gravity Pipeline	N-4	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	18	New	3,100	\$ 223	\$ 1,123,000					\$ 1,123,000				100%	\$ -	\$ 1,123,000	
Gravity Pipeline	N-5	Bangs Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	15	New	2,400	\$ 205	\$ 800,000					\$ 800,000				100%	\$ -	\$ 800,000	
Gravity Pipeline	N-6	Tully Road and Pelandale Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	10	New	4,800	\$ 137	\$ 1,069,000					\$ 1,069,000				100%	\$ -	\$ 1,069,000	
Gravity Pipeline	N-7	American Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	15	New	3,100	\$ 205	\$ 1,034,000						\$ 1,034,000				100%	\$ -	\$ 1,034,000
Gravity Pipeline	N-8	Kiernan Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	10	New	5,600	\$ 137	\$ 1,246,000						\$ 1,246,000				100%	\$ -	\$ 1,246,000
Gravity Pipeline	N-9	Kiernan Avenue	Future development within the northern portion of the City will require the construction of several trunk sewers to serve customers.	New Growth	-	8	New	6,300	\$ 109	\$ 1,116,000						\$ 1,116,000				100%	\$ -	\$ 1,116,000

**Table A.1 Collection System Capital Improvement Program
Engineer's Report
City of Modesto, California**

Project	Project Number	Description/ Street	Purpose	Improvement Category	Project Length/Size and Cost					Capital Improvement Program Cost per Phase (\$)							Future Users Benefit (%)	Cost Allocation				
					Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Replace/ New	Length (ft)	Unit Cost (\$)	Capital Improvement Cost ^{(1),(2)} (\$)	Phase 1					Phase 2		Phase 3	Phase 4	Existing Improvements (\$)	Future Improvements (\$)	
											2016	2017	2018	2019	2020	2021-2025		2026-2030	2031-2035			
Pelandale Lift Station	LS # 59	Pelandale Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.3 mgd	New	-	\$ 397,000	\$ 645,000						\$ 645,000			100%	\$ -	\$ 645,000	
Kiernan Lift Station	LS # 65	Kiernan Avenue and Carver Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.5 mgd	New	-	\$ 454,000	\$ 738,000								\$ 738,000	100%	\$ -	\$ 738,000	
Area 3																						
Sutter Trunk																						
Gravity Pipeline	S-1	Jefferson Street	The trunk in Jefferson Avenue exceeds the d/D criteria at approximately 89 percent capacity.	Capacity	16	18	Replace	760	\$ 223	\$ 275,000								\$ 275,000	26%	\$ 204,000	\$ 71,000	
Area 6																						
Sonoma Trunk Extension																						
Gravity Pipeline	SO-1	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	24	New	3,300	\$ 298	\$ 1,597,000						\$ 1,597,000			100%	\$ -	\$ 1,597,000	
Gravity Pipeline	SO-2	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	18	New	2,600	\$ 223	\$ 943,000						\$ 943,000			100%	\$ -	\$ 943,000	
Gravity Pipeline	SO-3	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	15	New	2,800	\$ 205	\$ 933,000						\$ 933,000			100%	\$ -	\$ 933,000	
Gravity Pipeline	SO-4	Undeveloped Area	This group of improvements is recommended to service future growth within the Roselle-Claribel CPD.	New Growth	-	8	New	3,100	\$ 109	\$ 549,000						\$ 549,000			100%	\$ -	\$ 549,000	
Wood Sorrel Lift Station	LS # 61	North of Wood Sorrel Drive and Sylvan Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.1 mgd	New	-	\$ 358,000	\$ 582,000						\$ 582,000			100%	\$ -	\$ 582,000	
Lakewood Trunk Extension																						
Gravity Pipeline	L-1	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	18	New	2,900	\$ 223	\$ 1,051,000							\$ 1,051,000		100%	\$ -	\$ 1,051,000	
Gravity Pipeline	L-2	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	15	New	1,700	\$ 205	\$ 567,000							\$ 567,000		100%	\$ -	\$ 567,000	
Gravity Pipeline	L-3	Litt Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	12	New	800	\$ 163	\$ 211,000							\$ 211,000		100%	\$ -	\$ 211,000	
Gravity Pipeline	L-4	Plainview Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	10	New	3,000	\$ 137	\$ 668,000							\$ 668,000		100%	\$ -	\$ 668,000	
Gravity Pipeline	L-5	Claus Road	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	8	New	300	\$ 109	\$ 54,000						\$ 54,000			100%	\$ -	\$ 54,000	
Gravity Pipeline	L-6	Merle Ave	This group of improvements will service business, commercial, and residential growth to the east within the Village One CPD.	New Growth	-	10	New	400	\$ 137	\$ 89,000							\$ 89,000		100%	\$ -	\$ 89,000	
Litt Lift Station	LS # 67	Litt Road	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	1.3 mgd	New	-	\$ 688,000	\$ 1,118,000							\$ 1,118,000		100%	\$ -	\$ 1,118,000	
Area 10																						
Ustick Trunk																						
Gravity Pipeline	U-1	Ustick Road	At build-out of Area 10, the PWWF from new growth will cause the Ustick Trunk to surcharge.	Capacity	12	15	Replace	2,100	\$ 205	\$ 700,000								\$ 700,000	56%	\$ 306,000	\$ 394,000	
Gravity Pipeline	U-2	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	10	New	1,000	\$ 137	\$ 223,000								\$ 223,000	100%	\$ -	\$ 223,000	
Force Main	U-3	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	4	New	427	\$ 144	\$ 99,000								\$ 99,000	100%	\$ -	\$ 99,000	
Gravity Pipeline	U-4	Whitmore Avenue	This group of improvements will service commercial and residential growth to the southwest within the Fairview CPD.	New Growth	-	10	New	3,400	\$ 137	\$ 757,000								\$ 757,000	100%	\$ -	\$ 757,000	
Whitmore/Carpenter Lift Station	LS # 62	Whitmore Avenue	The proposed lift station is necessary due to the extensive length, minimum slope of the proposed pipelines, and flat topography of the area.	New Growth	-	0.8 mgd	New	-	\$ 546,000	\$ 887,000								\$ 887,000	100%	\$ -	\$ 887,000	
Future Improvements Cost Estimate										45,118,000						13,520,000	12,075,000	19,523,000		6,619,000	38,499,000	
Total Capital Improvement Cost Estimate										217,736,000	7,120,000	57,283,000	4,521,000	19,967,000	5,071,000	65,510,000	25,408,000	32,856,000		135,644,000	82,092,000	

- Notes:
1. Costs are provided as present value based on an ENR CCI number of 10037 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years.
 2. Total construction cost includes the baseline construction cost plus a 25 percent allowance to account for unforeseen events and unknown conditions. Total project cost includes a 30 percent allowance to cover other costs including engineering, construction management, and project administration.
 3. Cost estimates are from the River Trunk Realignment, Beard Brook Siphon and Cannery Segregation Line Improvement Project PDR.
 4. Cost for project is not included in CIP because the improvement is currently in progress.
 5. The cost for Woodlake Lift Station is based on the 2007 Master Plan and was escalated to reflect the most probable current cost.
 6. Lift station capacities refer to the total capacity unless noted otherwise.

**APPENDIX B – WASTEWATER TREATMENT CAPITAL
IMPROVEMENT PROGRAM**

Table B.1 Wastewater Treatment CIP Engineer's Report City of Modesto, California					
Project	Project Number	Description	Purpose	Improvement Category	Total Project Cost (\$)⁽¹⁾
Sutter Plant Improvements					
Influent Screw Pump Addition	SP-1	Installation of a fifth influent screw pump.	Increases influent pumping capacity to meet the projected PWWF.	Capacity	2,198,000
Headworks, Dryden Box, and Influent Flume Improvements Project	SP-2				
New Dryden Box	SP-2.1	New Dryden Box and associated yard piping	Replaces corroded box and provides improved and connection with existing Can Seg sewers.	Reliability/Capacity	2,600,000
New West Junction Structure	SP-2.2	West Trunk Junction Structure, improvements to the existing Junction Box No. 1, and associated yard piping.	Provides connection with new River Trunk	Reliability/Capacity	300,000
Influent Screening	SP-2.3	Four new multi-rake screens with 1/4 inch bar spacing, one new multi-rake with emergency bypass. Also includes the installation of a new skid mounted washer compactor.	Improves screenings capture and reduces maintenance on downstream processes.	Reliability/Capacity	4,075,000
Grit Removal	SP-2.4	Installation of a grit removal mechanism in Grit Basin No. 4 and an additional grit pump; modifications will be made to all grit basins.	Increases grit removal capacity at PHWWF. Improves grit capture and reduces maintenance on downstream processes.	Reliability/Capacity	1,469,000
Headworks Building Odor Control Improvements	SP-2.5	Installation of higher capacity fans, duct replacement, and expanding the biofilter.	Complies with new ventilation standards.	Reliability/Capacity	3,009,000
Influent Parshall Flumes	SP-2.5	Installation of flow straightening baffles and bring the third, standby flume online.	Improves accuracy of influent flow metering.	Reliability/Capacity	336,000
Pumping Plant No. 3	SP-2.7	Two additional low capacity pumps for pumping Can Seg flow to Jennings Plant; three new multi-rake screens with 3/8" bar spacing.	Extends turndown capability of Can Seg pumping to allow year-round segregation; improves screenings capture to reduce maintenance on downstream processes.	Reliability/Capacity	3,060,000
Headworks, Dryden Box, and Influent Flume Improvements Project Subtotal					14,849,000
Outfall Pump Station Replacement	SP-3	New pump station to replace the existing Primary Effluent Pump Station.	Provides expanded capacity and pumping head for peak wet weather flows; raises walls of wet well above the floodplain.	Reliability/Capacity	17,332,000
Demolition of Sutter Treatment Facilities	SP-4	Remove concrete structures to below grade and backfill.	Provides space for future facilities.	Reliability	4,942,000
Allowance for Flood Protection of Remaining Sutter Facilities	SP-5	Flood walls, raising grade, raising structures.	Provides protection for a 100-year flood.	Reliability	2,000,000
Subtotal - Sutter Plant Improvements					41,321,000
Outfall Pipelines					
Tuolumne River Pipe Crossings	OP-1				
Replacement of Existing Crossings	OP-1.1	River crossing replacement for Primary Domestic Outfall and Can Seg Outfall.	Replaces corroded pipeline and improves reliability at critical location.	Rehabilitation/Capacity	19,780,000
Crossing for Third Outfall	OP-1.2	New river crossing for third outfall.		Reliability/Capacity	6,265,000
Tuolumne River Pipe Crossings Subtotal					26,045,000
Third Outfall Pipeline	OP-2	New domestic outfall pipeline from the Sutter Plant to the Jennings Plant.	Provides additional PWWF capacity for Primary Domestic Outfall and redundancy for Can-Seg Outfall during DWF conditions.	Reliability/Capacity	60,679,000
Slip Lining Portion of the Can-Seg Outfall	OP-3	Pipe lining and appurtenances.	Repairs corroded sections and Improves reliability of Can Seg Outfall.	Rehabilitation	10,456,000
Subtotal - Outfall Pipelines					97,180,000

Table B.1 Wastewater Treatment CIP Engineer's Report City of Modesto, California					
Project	Project Number	Description	Purpose	Improvement Category	Total Project Cost (\$)⁽¹⁾
Jennings Plant Improvements					
Secondary Treatment/Can Seg Treatment Facilities Upgrades	JP-1				
Fixed Film Reactors and Pump Station Rehabilitation	JP-1.1	New media, rotary distributor, and pumps.	Improves reliability and performance of secondary treatment.	Rehabilitation/Capacity	40,929,000
Nutrient Feed and pH Control Systems	JP-1.2	Chemical feed pumps, storage tanks, and feed system.	Adds nutrients and adjusts the pH of the Can-Seg flows to facilitate biological treatment process.	Reliability	2,283,000
Peroxide Feed System	JP-1.3	Chemical feed pumps, storage tanks, and feed system.	Controls odors from FFRs.	Reliability	391,000
Aerators in Recirculation Channel	JP-1.4	New aerators and electrical system.	Increases secondary treatment capacity for domestic and Can-Seg flows.	Rehabilitation/Capacity	8,062,000
Dissolved Air Flotation (DAF) Piping Modifications	JP-1.5	Modification of DAF effluent piping to route the flow to the Irrigation Forebay.	Allows the DAF effluent to be used as irrigation water.	Rehabilitation/Capacity	757,000
Secondary Treatment/Can Seg Treatment Facilities Upgrades Subtotal					52,422,000
Primary Treatment and Solids Handling Facilities	JP-2				
Primary Treatment Facilities	JP-2.1	Three 110-foot diameter primary clarifiers and a primary sludge pump station.	Replaces aging primary treatment facilities at the Sutter Plant.	Reliability/Capacity	15,969,000
Yard Piping and Structures	JP-2.2		Provides connections between the new treatment facilities with the existing facilities at the Jennings Plant.	Reliability/Capacity	13,174,000
Anaerobic Digesters	JP-2.3	Three 115-foot diameter digesters with a 31-foot sidewater depth with a Digester Control Building.	Replaces aging digesters at the Sutter Plant and provides treatment of the WAS generated by the BNR/tertiary facilities.	Reliability/Capacity	40,855,000
Solids Processing Building (WAS thickening and biosolids dewatering facilities)	JP-2.4	Two sieve drum concentrators for WAS thickening and two belt filter presses for dewatering housed in building.	Concentrates sludge and biosolids to reduce solar drying costs.	Reliability/Capacity	11,756,000
Sludge Cake Drying Beds	JP-2.5	Asphalt-paved beds with concrete containment walls.	Provides solar drying of dewatered biosolids to reduce disposal costs.	Reliability/Capacity	11,776,000
Primary Treatment and Solids Handling Facilities Subtotal					93,530,000
Miscellaneous Repairs	JP-3	General replacement and upgrades of existing facilities.	Improves reliability and extends life of existing facilities.	Rehabilitation	873,000
Subtotal - Jennings Plant Improvements					146,825,000
Engineering Studies					
Master Plan Updates	ES-1	The Master Plan will undergo an update every five years.	Allows for revised strategies to adapt to changing conditions.		2,000,000
Land Application Study	ES-2	Organic Loading Study	Identifies the maximum BOD loading rates on ranch land per new Waste Discharge Requirements.		250,000
Subtotal - Engineering Studies					2,250,000
WTMP CIP TOTAL					287,576,000
Notes:					
(1) Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years.					

Table B.2 Wastewater Treatment CIP Cost Allocation - Customers
Engineer's Report
City of Modesto, California

Project	Project Number	Total Project Cost (\$) ⁽¹⁾	Domestic Customers				Can-Seg Customers		Comments
			Existing Users		Future Users		\$	%	
			\$	%	\$	%			
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	2,198,000	-	0.0%	2,198,000	100.0%	-	0.0%	Improvements for future growth
Headworks, Dryden Box, and Influent Flume Improvements Project									
New Dryden Box	SP-2.1	2,600,000	-	0.0%	-	0.0%	2,600,000	100.0%	
New West Junction Structure	SP-2.2	300,000	249,500	83.2%	50,500	16.8%	-	0.0%	Allocation based on relative PWWF, current PWWF is 70.7 mgd and projected future PWWF is 85 mgd.
Influent Screening	SP-2.2	4,075,000	3,389,400	83.2%	685,600	16.8%	-	0.0%	Allocation based on relative PWWF.
Grit Removal	SP-2.3	1,469,000	1,221,900	83.2%	247,100	16.8%	-	0.0%	Allocation based on relative PWWF.
Headworks Building Odor Control Improvements	SP-2.4	3,009,000	2,502,800	83.2%	506,200	16.8%	-	0.0%	Allocation based on relative PWWF.
Influent Parshall Flumes	SP-2.5	336,000	279,500	83.2%	56,500	16.8%	-	0.0%	Allocation based on relative PWWF.
Pumping Plant No. 3	SP-2.6	3,060,000	-	0.0%	-	0.0%	3,060,000	100.0%	
Headworks, Dryden Box, and Influent Flume Improvements Project Subtotal		14,849,000	7,643,100	51.5%	1,545,900	10.4%	5,660,000	38.1%	
Outfall Pump Station Replacement	SP-3	17,332,000	14,416,100	83.2%	2,915,900	16.8%	-	0.0%	Allocation based on relative PWWF.
Demolition of Sutter Treatment Facilities	SP-4	4,942,000	3,679,400	74.5%	1,262,600	25.5%	-	0.0%	Allocation based on relative MMF.
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,000,000	2,000,000	100.0%	-	0.0%	-	0.0%	
Subtotal - Sutter Plant		41,321,000	27,738,600	67.1%	7,922,400	19.2%	5,660,000	13.7%	
Outfall Pipelines Improvements									
Tuolumne River Pipe Crossings									
Replacement of Existing Crossings	OP-1.1	19,780,000	4,935,700	25.0%	998,300	5.0%	13,846,000	70.0%	100% of Can-Seg Outfall crossing and 20% of Domestic Outfall crossing allocated to Can-Seg. Domestic allocation based on relative PWWF.
Crossing for Third Outfall	OP-1.2	6,265,000	4,168,800	66.5%	843,200	13.5%	1,253,000	20.0%	20% of allocated to Can-Seg. Domestic allocation based on relative PWWF.
Tuolumne River Pipe Crossings Subtotal		26,045,000	9,104,500	35.0%	1,841,500	7.1%	15,099,000	58.0%	
Third Outfall Pipeline	OP-2	60,679,000	40,376,500	66.5%	8,166,700	13.5%	12,135,800	20.0%	20% of Third Outfall allocated to Can-Seg. Domestic allocation based on relative PWWF.
Lining of Can-Seg Outfall Pipeline	OP-3	10,456,000	-	0.0%	-	0.0%	10,456,000	100.0%	
Subtotal - Outfall Pipelines		97,180,000	49,481,000	50.9%	10,008,200	10.3%	37,690,800	38.8%	

Table B.2 Wastewater Treatment CIP Cost Allocation - Customers
Engineer's Report
City of Modesto, California

Project	Project Number	Total Project Cost (\$) ⁽¹⁾	Domestic Customers				Can-Seg Customers		Comments
			Existing Users		Future Users		\$	%	
			\$	%	\$	%			
Jennings Plant Improvements									
Secondary Treatment/Can Seg Treatment Facilities Upgrades		JP-1							
Fixed Film Reactors and Pump Station Rehabilitation	JP-1.1	40,929,000	6,812,600	16.6%	2,337,600	5.7%	31,778,800	77.6%	Can-Seg and domestic allocation based on BOD loading to secondary treatment. Domestic BOD loading is 31,500 ppd and Can-Seg loading is 109,400 ppd.
Nutrient Feed and pH Control Systems	JP-1.2	2,283,000	-	0.0%	-	0.0%	2,283,000	100.0%	Nutrients for Can-Seg flow.
Peroxide Feed System	JP-1.3	391,000	291,100	74.5%	99,900	25.5%	-	0.0%	Odor control for primary effluent. Allocation based on relative MMF, current MMF is 20.4 mgd and projected future MMF is 27.4 mgd.
Aerators in Recirculation Channel	JP-1.4	8,062,000	1,341,900	16.6%	460,500	5.7%	6,259,600	77.6%	Can-Seg and domestic allocation based on BOD loading to secondary treatment.
Dissolved Air Flotation (DAF) Piping Modifications	JP-1.5	757,000	126,000	16.6%	43,200	5.7%	587,800	77.6%	Can-Seg and domestic allocation based on BOD loading to secondary treatment.
Secondary Treatment/Can Seg Treatment Facilities Upgrades Subtotal		52,422,000	8,571,600	16.4%	2,941,200	5.6%	40,909,200	78.0%	
Primary Treatment and Solids Handling Facilities		JP-2							
Primary Treatment Facilities	JP-2.1	15,969,000	11,889,300	74.5%	4,079,700	25.5%	-	0.0%	Allocation based on relative MMF.
Yard Piping and Structures	JP-2.2	13,174,000	9,808,400	74.5%	3,365,600	25.5%	-	0.0%	Allocation based on relative MMF.
Anaerobic Digesters	JP-2.3	40,855,000	30,417,600	74.5%	10,437,400	25.5%	-	0.0%	Allocation based on relative MMF.
Solids Processing Building (WAS thickening and biosolids dewatering facilities)	JP-2.4	11,756,000	8,752,600	74.5%	3,003,400	25.5%	-	0.0%	Allocation based on relative MMF.
Sludge Cake Drying Beds	JP-2.5	11,776,000	8,767,500	74.5%	3,008,500	25.5%	-	0.0%	Allocation based on relative MMF.
Primary Treatment and Solids Handling Facilities Subtotal		93,530,000	69,635,400	74.5%	23,894,600	25.5%	-	0.0%	
Miscellaneous Repairs	JP-3	873,000	145,300	16.6%	49,900	5.7%	677,800	77.6%	Can-Seg and domestic allocation based on BOD loading to secondary treatment.
Subtotal - Jennings Plant		146,825,000	78,352,300	53.4%	26,885,700	18.3%	41,587,000	28.3%	
Engineering Studies									
Master Plan Updates	ES-1	2,000,000	1,089,500	54.5%	314,500	15.7%	596,000	29.8%	Allocation based on overall allocation percentages for total CIP.
Land Application Study	ES-2	250,000	-	0.0%	-	0.0%	250,000	100.0%	Study to determine BOD loading for land application of Can-Seg flows.
Subtotal - Engineering Studies		2,250,000	1,089,500	48.4%	314,500	14.0%	846,000	37.6%	
Total		287,576,000	156,661,400	54.5%	45,130,800	15.7%	85,783,800	29.8%	

Notes:
(1) Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years.

Table B.3 Wastewater Treatment CIP Cost Allocation - Billable Constituents
Engineer's Report
City of Modesto, California

Project	Project Number	Total Project Cost (\$) ⁽¹⁾	Cost Allocation						Comments
			Flow		BOD		TSS		
			\$	%	\$	%	\$	%	
Sutter Plant Improvements									
Influent Screw Pump Addition	SP-1	2,198,000	2,198,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Headworks, Dryden Box, and Influent Flume Improvements Project	SP-2								
New Dryden Box	SP-2.1	2,600,000	2,600,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
New West Junction Structure	SP-2.2	300,000	300,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Influent Screening	SP-2.2	4,075,000	4,075,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Grit Removal	SP-2.3	1,469,000	1,469,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Headworks Building Odor Control Improvements	SP-2.4	3,009,000	3,009,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Influent Parshall Flumes	SP-2.5	336,000	336,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Pumping Plant No. 3	SP-2.6	3,060,000	3,060,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Headworks, Dryden Box, and Influent Flume Improvements Project Subtotal		14,849,000	14,849,000	100.0%	-	0.0%	-	0.0%	
Outfall Pump Station Replacement	SP-3	17,332,000	17,332,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Demolition of Sutter Treatment Facilities	SP-4	4,942,000	1,680,300	34.0%	1,630,900	33.0%	1,630,900	33.0%	This is a general project required for the improvement of the site. Therefore, costs are allocated equally to all three billable constituents.
Allowance for Flood Protection of Remaining Sutter Treatment Facilities	SP-5	2,000,000	680,000	34.0%	660,000	33.0%	660,000	33.0%	This is a general project required for the improvement of the site. Therefore, costs are allocated equally to all three billable constituents.
Subtotal - Sutter Plant		41,321,000	36,739,300	88.9%	2,290,900	5.5%	2,290,900	5.5%	
Outfall Pipelines Improvements									
Tuolumne River Pipe Crossings	OP-1								
Replacement of Existing Crossings	OP-1.1	19,780,000	19,780,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Crossing for Third Outfall	OP-1.2	6,265,000	6,265,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Tuolumne River Pipe Crossings Subtotal		26,045,000	26,045,000	100.0%	-	0.0%	-	0.0%	
Third Outfall Pipeline	OP-2	60,679,000	60,679,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Lining of Can-Seg Outfall Pipeline	OP-3	10,456,000	10,456,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Subtotal - Outfall Pipelines		97,180,000	97,180,000	100.0%	-	0.0%	-	0.0%	

Table B.3 Wastewater Treatment CIP Cost Allocation - Billable Constituents Engineer's Report City of Modesto, California									
Project	Project Number	Total Project Cost (\$) ⁽¹⁾	Cost Allocation						Comments
			Flow		BOD		TSS		
			\$	%	\$	%	\$	%	
Jennings Plant Improvements									
Secondary Treatment/Can Seg Treatment Facilities Upgrades									
Fixed Film Reactors and Pump Station Rehabilitation	JP-1.1	40,929,000	20,464,500	50.0%	20,464,500	50.0%	-	0.0%	Design criteria for the FFR Pump Station are based exclusively on flow. Design criteria for the FFRs are based on BOD. Allocation of cost is split equally between flow and BOD.
Nutrient Feed and pH Control Systems	JP-1.2	2,283,000	913,200	40.0%	684,900	30.0%	684,900	30.0%	The nutrients and pH control are required for proper secondary treatment performance.
Peroxide Feed System	JP-1.3	391,000	391,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Aerators in Recirculation Channel	JP-1.4	8,062,000	-	0.0%	8,062,000	100.0%	-	0.0%	Design criteria based on BOD.
Dissolved Air Flotation (DAF) Piping Modifications	JP-1.5	757,000	-	0.0%	-	0.0%	757,000	100.0%	Design criteria based on flow.
Secondary Treatment/Can Seg Treatment Facilities Upgrades Subtotal		52,422,000	21,768,700	41.5%	29,211,400	55.7%	1,441,900	2.8%	
Primary Treatment and Solids Handling Facilities									
Primary Treatment Facilities	JP-2.1	15,969,000	11,178,300	70.0%	1,596,900	10.0%	3,193,800	20.0%	Design criteria based on flow. Primary treatment also removes TSS and BOD.
Yard Piping and Structures	JP-2.2	13,174,000	13,174,000	100.0%	-	0.0%	-	0.0%	Design criteria based on flow.
Anaerobic Digesters	JP-2.3	40,855,000	-	0.0%	12,256,500	30.0%	28,598,500	70.0%	Approximately 70 percent of the total sludge sent to the digesters will be primary sludge, which corresponds to TSS removal during primary treatment. The WAS consists of solids from BOD generated biomass.
Solids Processing Building (WAS thickening and biosolids dewatering facilities)	JP-2.4	11,756,000	-	0.0%	3,526,800	30.0%	8,229,200	70.0%	Allocation based on same basis as anaerobic digesters.
Sludge Cake Drying Beds	JP-2.5	11,776,000	-	0.0%	3,532,800	30.0%	8,243,200	70.0%	Allocation based on same basis as anaerobic digesters.
Primary Treatment and Solids Handling Facilities Subtotal		93,530,000	24,352,300	26.0%	20,913,000	22.4%	48,264,700	51.6%	
Miscellaneous Repairs	JP-3	873,000	296,800	34.0%	288,100	33.0%	288,100	33.0%	This is a general project required for the improvement of the site. Therefore, costs are allocated equally to all three billable constituents.
Subtotal - Jennings Plant		146,825,000	46,417,800	31.6%	50,412,500	34.3%	49,994,700	34.1%	
Engineering Studies									
Master Plan Updates	ES-1	2,000,000	680,000	34.0%	660,000	33.0%	660,000	33.0%	Costs are allocated equally to all three billable constituents.
Land Application Study	ES-2	250,000	-	0.0%	250,000	100.0%	-	0.0%	The study will determine BOD loading rates for the ranch land.
Subtotal - Engineering Studies		2,250,000	680,000	30.2%	910,000	40.4%	660,000	29.3%	
Total		287,576,000	181,017,100	62.9%	53,613,400	18.6%	52,945,600	18.4%	

Notes:

(1) Costs are provided as present value based on an ENR CCI number of 10270 corresponding to the 20-City Average Index in December 2015. Costs are not escalated to future years.

