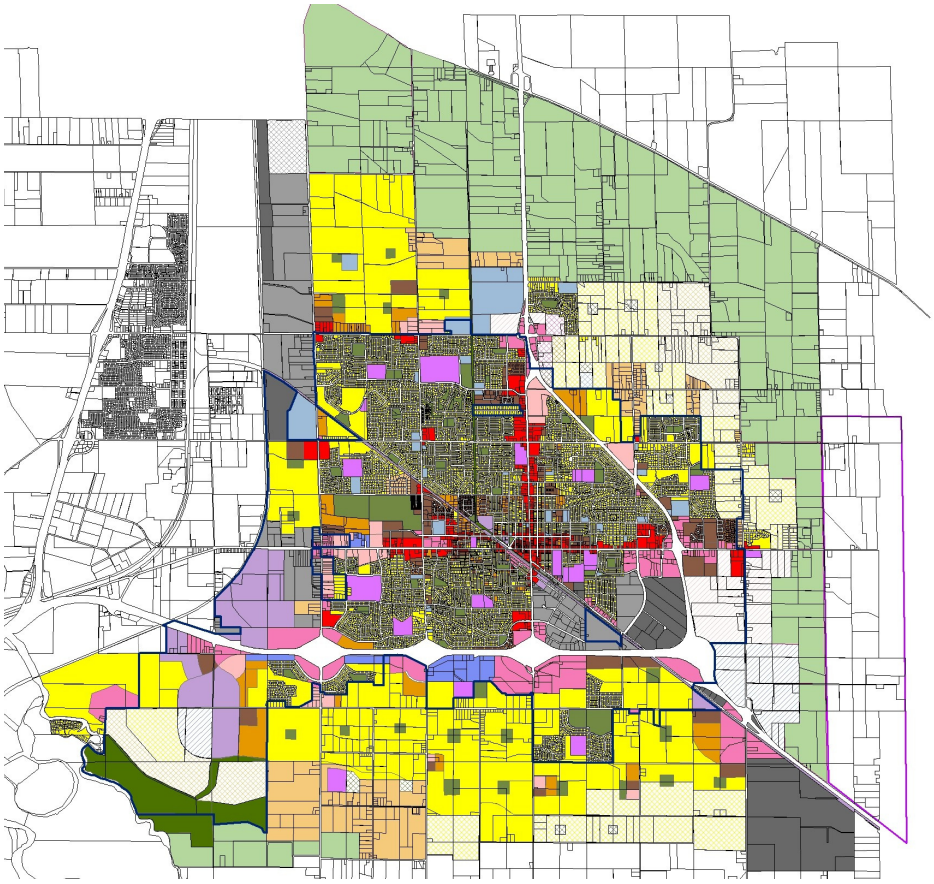
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE



January 2013

NOLTE VERTICALFIVE

CITY OF MANTECA

2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE

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Submitted to:

City of Manteca
Department of Public Works
1001 West Center Street
Manteca, CA 95337

Prepared by:

Nolte Associates, Inc.
(a NV5, Inc. company)
1215 West Center Street, Suite 201
Manteca, CA 95337
(209) 239-9080 ▪ (209) 239-4166 (Fax)

Executive Summary

The City of Manteca (City) desires to update the 2006 Wastewater Collection System Master Plan (2006 Master Plan) with current planning and sewer alignment information, revised wastewater generation factors (WGFs) incorporating water conservation requirements and historic commercial and industrial water use data, and updated construction costs.

The primary objective of this 2012 Wastewater Collection System Master Plan Update (2012 Master Plan) is to ensure that the City's trunk system can cost-effectively meet the demands of development goals adopted in the General Plan with appropriate consideration of construction costs and operation and maintenance issues. In particular, the 2012 Master Plan will address the following:

1. Current and future land uses from the General Plan 2023 Policy Document (General Plan).

2. Design of trunk sewers, force mains, pump stations, and lift stations to accommodate service areas.

3. Capacity of the trunk sewer system.

4. Phased capital improvement plan (CIP) for the proposed conveyance option.

As part of the 2012 Master Plan, residential WGFs for future development have been reduced to reflect upcoming water conservation legislation for residential development based on a generation factors study. The study also focuses on reduction of industrial and general commercial WGFs to reflect historical water use data from local businesses.

The overall collection sewer strategy will consist of a combination trunk sewer gravity collection system with pump or lift stations located along the alignment to convey wastewater to an influent pump station located at the City Wastewater Quality Control Facility (WQCF). The North Manteca Collection Strategy (NMCS) and South Manteca Collection Strategy (SMCS) will collect flow from areas where future growth is expected. The Central Manteca Collection Strategy (CMCS) will connect the existing collection system to the NMCS.

The continued use of existing pump stations and addition of pump and lift stations allows for a reduction in the depth of the trunk sewers proposed in previous master plans. Additionally, an increase in the ratio of liquid depth to pipe diameter (d/D) design criteria for pipe capacity from 40-60 percent full in previous master plans to 70-80 percent full at peak flow resulted in the downsizing of several links within the proposed trunk sewer strategy.

Unit construction costs for sewers were updated and used to estimate construction costs for the overall trunk sewer strategy. Construction of the NMCS, SMCS, and CMCS were grouped into potential projects for implementation in the future as part of the City CIP. The total wastewater collection system CIP cost is approximately $54,936,000. Revisions to the overall collection system strategy reflect savings of approximately $32.1 million as compared to the 2006 Master Plan.

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The following abbreviations are used in this report:

ac	Acre
ADWF	Average Dry Weather Flow
AG	Agriculture
BIP	Business Industrial Park
cfs	Cubic Foot/Feet per Second
CIP	Capital Improvement Plan
CMCS	Central Manteca Collection Strategy
CMTS	Central Manteca Trunk Sewer
CMU	Commercial Mixed Use
cy	Cubic Yard
d/D	Ratio of Liquid Depth to Pipe Diameter
ea	Each
edu	Equivalent Dwelling Unit
ENR	Engineering News Record
ft	Foot/Feet
GC	General Commercial
GIS	Geographic Information Systems
gpd	Gallons per Day
gpm	Gallons per Minute
HDR	High Density Residential
HI	Heavy Industrial
hp	Horsepower
I/I	Inflow and Infiltration
LDR	Low Density Residential
lf	Lineal Foot
LI	Light Industrial
MDR	Medium Density Residential
mgd	Million Gallons per Day
NC	Neighborhood Commercial
NMCS	North Manteca Collection Strategy
NMTS	North Manteca Trunk Sewer
OS	Open Space
OSFM	Oakwood Shores Force Main
P	Park
PF	Peaking Factor (diurnal)
PFIP	Public Facilities Implementation Plan
PQP	Public/Quasi-Public
PWWF	Peak Wet Weather Flow
RCP	Reinforced Concrete Pipe
sec	Second
SMCS	South Manteca Collection Strategy
SMTS	South Manteca Trunk Sewer
SR	State Route
SWMTS	Southwest Manteca Trunk Sewer
TDH	Total Dynamic Head
UR	Urban Reserve

VCP	Vitrified Clay Pipe
VLDR	Very Low Density Residential
vlf	Vertical Lineal Foot
WFM	Woodward Force Main
WGF	Wastewater Generation Factor
WQCF	Wastewater Quality Control Facility

1 Introduction

In support of the City of Manteca (City) General Plan 2023 Policy Document (General Plan) and Public Facilities Implementation Plan (PFIP), a wastewater collection system master plan is required. Background information and intended master planning tasks are presented in this chapter.

1.1 Background and Purpose

On October 6, 2003, the City adopted the General Plan [1] which identifies areas to be developed within the City to the year 2023. The General Plan expanded the areas to be served by the sewer collection system in comparison to those areas identified in prior master planning documents. The City adopted an updated Housing Element to the General Plan on June 15, 2010 [2].

The 2006 Wastewater Collection System Master Plan Update (2006 Master Plan) [3] proposed the construction of three large diameter trunk sewers to collect wastewater from the north, central, and south sections of the City for conveyance to an influent pump station located at the Wastewater Quality Control Facility (WQCF). This strategy of deep gravity trunk sewers was consistent with previous master plans.

The depth and size of trunk sewers required to implement the strategy set forth in the 2006 Master Plan presented significant capital costs. A revised conveyance strategy including a combination of gravity sewers, force mains, lift stations, and pump stations was evaluated as part of the 2008 Addendum to the Wastewater Collection System Master Plan (2008 Addendum) [4].

The City desires to update the 2008 Addendum with current planning and alignment information, revised wastewater generation factors (WGFs) incorporating water conservation requirements and historic commercial and industrial water use data, and updated construction costs. The conveyance strategy to be evaluated as part of this 2012 Wastewater Collection System Master Plan Update (2012 Master Plan) seeks to minimize pipe size and depth based on pipes flowing 70-80 percent full at peak flows. Lift or pump stations will be constructed as needed to reach the trunk sewers.

The primary objective of this 2012 Master Plan is to ensure that the City trunk system can cost-effectively meet the demands of development goals adopted in the General Plan. In particular, the 2012 Master Plan will address the following:

1. Current and future land uses from the General Plan 2023.

2. Design of trunk sewers, force mains, pump stations, and lift stations to accommodate service areas.

3. Capacity of the trunk sewer system.

4. Phased capital improvement plan (CIP) for the proposed conveyance option.

1.2 Scope of 2012 Master Plan

The following tasks were completed as part of the 2012 Master Plan:

1. Summarize current and future land use by sewer catchment.

2. Revise WGFs based on recent water conservation legislation and historic water use data.

3. Estimate wastewater flows using data from Tasks 1 and 2 (above) and peaking factor (PF) and inflow/infiltration (I/I) values established in the 2008 Addendum.

4. Update the trunk sewer hydraulic model, with emphasis on minimizing sewer size and depth while incorporating lift/pumping stations.

5. Develop a CIP which identifies capital projects required for the proposed conveyance option.

Each of these tasks is summarized in the following chapters.

2 Summary of Previous Sewer Master Plans

This 2012 Master Plan was developed based on information provided in previous sewer master plans. The two preceding sewer master plans and a subsequent addendum are summarized in the following chapter.

2.1 1993 Sewer System Master Plan

The 1993 Sewer System Master Plan (1993 Master Plan) [5] addressed a 17-year planning period (1993-2014) and concentrated on areas of future growth, referred to as the Expanded Service Area. The Expanded Service Area accounted for growth in areas around the existing core of the City.

The 1993 Master Plan separated the Expanded Service Area into two principal sections, the North and South Service Areas, divided by Yosemite Avenue. Additionally, the North Service Area was subdivided into the North Shed and Central Shed and the South Service Area was subdivided into the South Shed and Southwest Shed. Figure 2-1 shows the boundaries of the different service areas and sheds.

The 1993 Master Plan proposed construction of two major trunk sewers: the North Manteca Trunk Sewer (NMTS) and South Manteca Trunk Sewer (SMTS). Two other trunk sewers, the Central Manteca Trunk Sewer (CMTS) and Southwest Manteca Trunk Sewer (SWMTS), would connect to the NMTS and SMTS. The NMTS extended gravity service to new development north of State Route (SR) 120. Additionally, the CMTS, serving the developed core of the City, would be constructed along Yosemite Avenue and drain to the NMTS. Construction of the CMTS would allow for the decommissioning of the Union Road Pump Station. The SMTS and SWMTS extended gravity service to areas south of SR-120. The SMTS would extend south from Austin Road, west along Woodward Avenue to Airport Way, then north to the WQCF. A collector would receive flow from areas along Spreckels Road north of SR-120. The Southwest Service Area is west of the WQCF and south of SR-120, beyond the gravity service limits of the SMTS. Due to the low ground elevations and large size of this area, a regional pump station was recommended. Trunk sewers from the southwest areas would flow into the regional pump station. A force main would extend from the regional pump station to the SMTS. The NMTS and SMTS would converge at the influent pump station for the WQCF. The trunk sewer alignments presented in the 1993 Master Plan are shown in Figure 2-2.

Figure 2-1 1993 Master Plan Sewer Shed Boundaries

Figure 2-2 1993 Master Plan Trunk Shed and System Map

2.2 2006 Wastewater Collection System Master Plan Update

The 2006 Update [3] addressed future expansion of the tributary areas served by the NMTS and SMTS and proposed alternate trunk sewer alignments to mitigate potential traffic disruption and to reduce total construction costs. To assess the overall condition of the collection system, existing system deficiencies were identified through discussions with City staff and a review of historical records.

Based on historical data, WGFs for residential services were revised. I/I rates and a system-wide diurnal PF were established through a flow monitoring program. The data were utilized to develop a hydraulic model to assess the capacity of the trunk sewer system. Trunk sewers were designed to flow 40-60 percent full at peak flow. The results of the trunk sewer assessment were used to update preliminary NMTS and SMTS design information and in the development of a phased CIP to support the demands of future development. The total construction cost for the proposed trunk sewers was approximately $87 million.

2.3 2008 Addendum to 2006 Wastewater Collection System Master Plan Update

The 2008 Addendum [4] presented a revised conveyance strategy which included a combination of gravity sewers, force mains, pump stations, and lift stations. The addition of pump and lift stations to the strategy allowed for reduced depths of the trunk sewers. The 2008 Addendum presented revised design criteria for diurnal peaking and I/I as well as pump selection and pump station design criteria. Probable construction costs for elements of the revised conveyance strategy were developed on a unit basis. These costs were applied to the revised improvement recommendations for the development of a revised CIP. The total construction cost for the revised CIP was approximately $71 million.

3 Design Criteria

Design criteria for the 2012 Master Plan include a discussion of the study area boundaries, land use, WGFs, and hydraulic parameters. Each is discussed in this chapter.

3.1 Study Area

The study area for the 2012 Master Plan is based on the secondary urban service boundary, the total planning area presented in the General Plan land use diagram. For master planning purposes, the study area extends beyond the current City limits and primary urban service boundary. Land use information was provided by City staff.

3.2 Land Use

Land use information from the General Plan land use diagram provided by the City in September 2010 was used to project wastewater flows. City Geographic Information Systems (GIS) data were reviewed to determine the development status of all parcels within the study area. The General Plan land use diagram is provided as Plate 3-A.

3.3 Wastewater Generation Factors

WGFs for land uses defined in the General Plan are summarized in Table 3-1. Residential WGFs for future development are proposed to reflect upcoming water conservation legislation for residential development based on a generation factors study (Appendix A). The study also focused on updating industrial and general commercial WGFs to reflect historical water use data from local businesses. A portion of the existing industrial and general commercial businesses within the City have low water usage. Reviewing historical water use data provided an improved basis for appropriate WGFs.

Residential WGFs for existing development were updated in the 2006 Update based on a flow monitoring study. Heavy Industrial (HI) and Light Industrial (LI) WGFs are based on historical water use from Spreckels Park industrial properties (Appendix A), and rounded to 1,000 gallons per day per acre (gpd/ac) incorporating comments from City staff. The Urban Reserve (UR) land use has been assigned a WGF typical of Very Low Density Residential (VLDR).

All other WGFs presented in Table 3-1 are from the 1993 Master Plan. However, the Business Industrial Park (BIP) WGF was reduced by 10 percent from the 2006 Update to the 2008 Addendum to reflect information obtained from water use data.

TABLE 3-1
CITY OF MANTECA
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WASTEWATER GENERATION FACTORS

Land Use	Designation	Density[a] (edu/ac)	Wastewater Generation Factor[b] (gpd/ac)
Residential – Existing Development			
Very low density residential	VLDR	Less than 2	530[c]
Low density residential	LDR	2.1-8	1,338[d]
Medium density residential	MDR	8.1-15	2,183[e]
High density residential	HDR	15.1-25	3,789[f]
Residential – New Development			
Very low density residential	VLDR	Less than 2	320[g]
Low density residential	LDR	2.1-8	808[h]
Medium density residential	MDR	8.1-15	1,346[i]
High density residential	HDR	15.1-25	2,337[j]
Other – Existing and New Development			
Commercial mixed use	CMU	--	2,473
General commercial	GC	--	750[k]
Heavy industrial	HI	--	1,000[l]
Light industrial	LI	--	1,000[l]
Public/quasi-public	PQP	--	425
Park	P	--	400
Agriculture	AG	--	0
Open space	OS	--	0
Neighborhood commercial	NC	--	1,120
Business industrial park	BIP	--	1,200
Urban reserve	UR	--	320[m]

[a] Based on the adopted General Plan [1]
[b] Nonresidential generation rates based on the 1993 Master Plan [5], unless otherwise noted
[c] Generation rate based on 265 gpd/equivalent dwelling unit (edu) [6] and density of 2 dwelling units per acre
[d] Generation rate based on 265 gpd/edu [6] and density of 5.05 dwelling units per acre
[e] Generation rate based on 189 gpd/edu [6] and density of 11.55 dwelling units per acre
[f] Generation rate based on 189 gpd/edu [6] and density of 20.05 dwelling units per acre
[g] Generation rate based on 160 gpd/edu [7] and density of 2 dwelling units per acre
[h] Generation rate based on 160 gpd/edu [7] and density of 5.05 dwelling units per acre
[i] Generation rate based on 117 gpd/edu [7] and density of 11.55 dwelling units per acre
[j] Generation rate based on 117 gpd/edu [7] and density of 20.05 dwelling units per acre
[k] Generation rate based on historical water use from Big League Dreams and Spreckels Park commercial properties [7]
[l] Generation rate based on historical water use from Spreckels Park industrial properties, rounded per City comments [7]
[m] Generation rate assumed typical of VLDR (new development)

3.4 Peaking Factor

As described in the 2008 Addendum, peak wet weather flow (PWWF) was calculated using a PF to approximate the effect of both daily peak flow and I/I. The PF curve, shown in Figure 3-1, was developed based on the following criteria:

1. For low flows, the PF should approach 4, a typical PF value for low flows.

2. For higher flows, the PF should approach the hourly peaking factor observed at the WQCF, which was 2.05. This PF represents the anticipated lower limit for a PF. The PF decreases due to attenuation of flow at downstream points in the collection system. The WQCF is the furthest downstream point of the collection system.

The algorithm for the revised PF curve presented in Figure 3-1 is:

$$PF = 2 \times e^{(-2 \times ADWF_{MGD})} + 2.05$$

To determine the hourly PF for the WQCF, average hourly WQCF flow data for January, February, July, and August 2008 were analyzed. The average dry weather daily flow (ADWF) was 5.92 million gallons per day (mgd) for the months of July and August. For reference, Figure 3-2 shows a graph of the ADWF flow for July and August.

Figure 3-1 Peaking Factor Curve

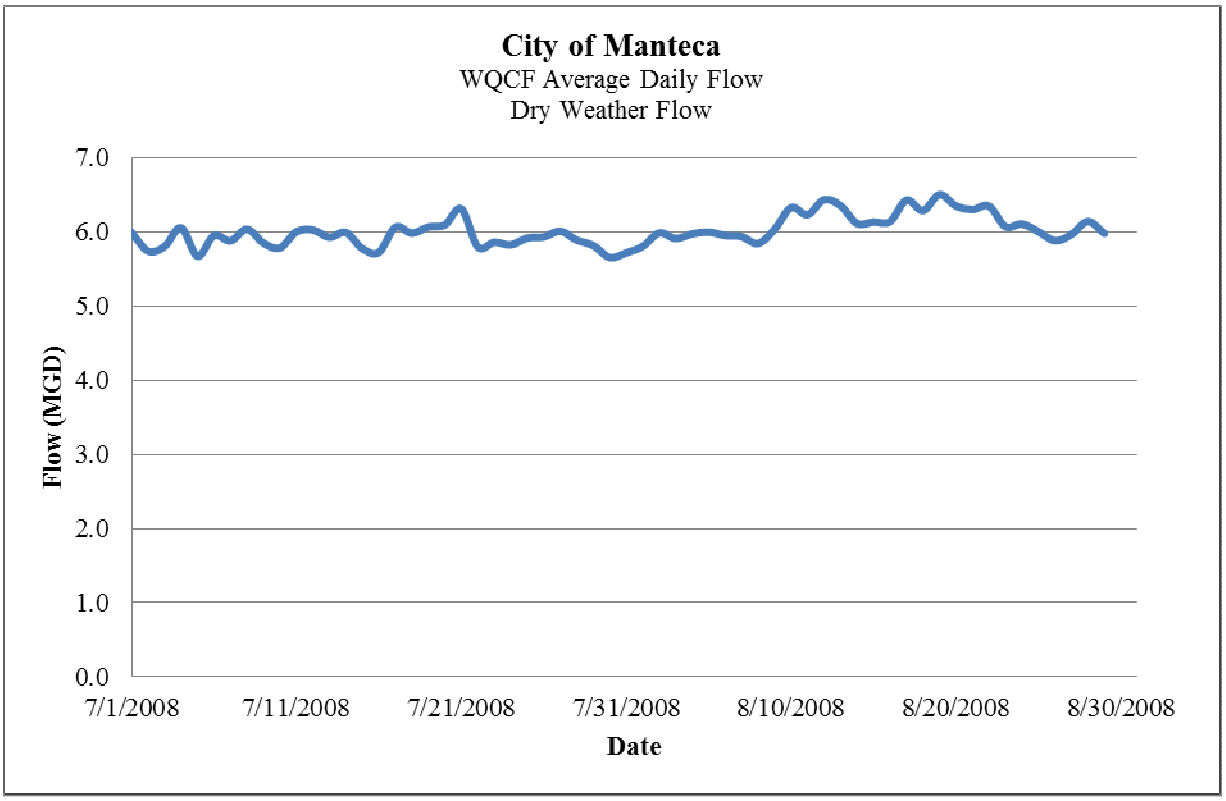

Figure 3-2 WQCF Average Daily Flow for July-August 2008

The peak hour flow from the wet weather data provided was 12.15 mgd and occurred on January 4, 2008 at 15:00 hrs. The City weather station recorded approximately 1 inch of rainfall on January 4, 2008. The ratio of peak hour flow and ADWF was 2.05. This ratio is the basis for the limit which the PF curve approaches in Figure 3-1.

3.5 Rationale for Estimating Projected Flows

The trunk sewers are sized to accommodate the projected flows along the route. The following method was used to estimate wastewater flow:

1. Establish sewer shed boundaries to assign areas which will contribute flow to the trunk sewer.

2. Obtain land use information for each shed from the General Plan land use diagram.

3. Multiply land use areas within each shed by the corresponding WGF to obtain the projected ADWF for each shed.

4. Estimate PWWF by multiplying the projected ADWF with the PF, considering the relationship between PF and ADWF in Figure 3-1. PWWF is the flow used to size trunk sewers, pump/lift stations, and force mains.

3.6 Pump/Lift Stations

Construction of pump or lift stations are anticipated for some connections to the proposed trunk sewers. The pump/lift station should meet the following criteria:

1. Duplex pump/lift stations are preferred and will be used for PWWF up to 2 mgd. When necessary, triplex stations will be used if a single pump capable of meeting the anticipated range of flows is not available. For planning purposes, triplex pump stations should be assumed for PWWFs greater than 2 mgd.

2. Pump and impeller sizes will be selected with operating points within 60-115 percent of the pump's best efficiency point.

3. Each pump in a duplex pump station will be designed to meet 100 percent of PWWF.

4. Triplex pump stations are designed to meet 100 percent of PWWF with two pumps operating.

5. Variable frequency drives will be provided to allow for pumps to meet the anticipated range of flows.

6. Wet well inverts are approximated by assuming 8 foot (ft) minimum cover for upstream gravity sewers and an average slope of 0.0042 from the furthest point within a sewer shed. This average slope is based on a review of record drawings for developments within the City.

7. Static lift is calculated as the difference between the wet well invert and the upstream springline of the trunk sewer immediately downstream of the lift station.

Preliminary design criteria developed with City staff for pump and lift stations are summarized below:

1. Pump and lift stations will be furnished with submersible pumps and are to include the redundancy of one stand-by pump.

2. Pump station lot to be sized to fit all lift station equipment and a vactor truck.

3. Vaults to be provided to house valving, bypass capability, and flowmeters.

4. Provide traffic rated wet well and vault hatches.
5. Provide utility stubs and concrete pads for chemical addition and biofilters in triplex stations.
6. Include a generator receptacle for connection to a portable emergency generator.
7. Provide ability to bypass the pump station with piping for portable pump.
8. On-site drainage will be routed to wet well.
9. Provide an on-site pump retrieval system such as a hoist.
10. Include sufficient area for pump washdown.
11. All wet wells will be lined.
12. Provide site lighting and water for washdown purposes.
13. Provide concrete masonry unit or ornamental site fencing for security and aesthetics.

Preliminary layouts for submersible pump/lift stations are presented in Figures 3-3 through 3-6. Figures 3-3 and 3-4 illustrate plan and section views of a typical submersible pump station with a circular wet well. Figures 3-5 and 3-6 illustrate plan and section views of a typical submersible pump station with a rectangular wet well. Circular wet wells will be used for duplex pumps which can be accommodated within a 7 ft diameter reinforced concrete section. Rectangular wet wells will be used for triplex pump stations.

Pump stations and lift stations will be similar to each other. However, the pump station will discharge to a force main and the lift station will discharge to a gravity sewer.

Figure 3-3 Typical Pump Station Site Plan for Circular Wet Well

Figure 3-4 Typical Section for Circular Wet Well

Figure 3-5 Typical Pump Station Site Plan for Rectangular Wet Well

Figure 3-6 Typical Section for Rectangular Wet Well

3.7 Gravity Pipelines and Force Mains

The use of gravity sewers for the collection system is the preferred method of conveyance. Although initially more expensive due to larger size and depth of installation, gravity sewers tend to have lower operation and maintenance costs and a reduced risk of failure. Pump stations, lift stations, and force mains will be selected for conditions where the topography is relatively flat or adverse for the use of gravity sewers.

The following criteria are used in the design of the gravity sewers:

1. The minimum depth of cover is 8 ft.

2. The maximum depth of cover is 30 ft.

3. Manholes are assumed every 400 ft for pipe diameters ranging from 8 to 18 inch, every 500 ft for pipe diameters ranging from 21 to 30 inch, and every 600 ft for pipe diameters larger than 30-inch; manholes are also assumed at every junction or change in pipe diameter.

4. Gravity sewer lines will be sized to flow 70-80 percent full.

5. Pipe velocities will range from 2-6 feet per second (ft/sec).

The following design criteria will be used for force mains:

1. Minimum cover of 3 ft.

2. Velocities will range from 2-6 ft/sec.

3. Plug valves will be installed every 1,000 ft and at major crossings.

4. Tracer wire will be provided.

5. Force mains will be constructed of PVC, AWWA C900/C905.

6. A redundant 18-inch force main will be constructed between Woodbridge and Chadwick pump stations.

4 Recommended Collection System Strategy

This chapter summarizes the recommended sewer collection system strategy for the City. Specifically, the following topics are included: 1) flow projections; 2) sizing and invert elevations; and 3) exhibits illustrating proposed alignments, sizing, and sheds for the NMCS, SMCS, and CMCS.

4.1 Sewer Collection System Strategy

The overall trunk sewer strategy will consist of a combination trunk sewer gravity collection system with pump or lift stations located along the alignment to convey wastewater to an influent pump station located at the WQCF. Interim pump stations will be constructed as needed and gradually phased out as the collection system is completed. The boundaries of these three major sections (also referred to as sheds) are shown in Figure 4-1. The NMCS and SMCS will collect flow from areas where future growth is expected. The CMCS will connect the existing collection system to the NMCS.

Wastewater flow from specific sections of the City will be directed to either a pump station, lift station, or the trunk sewer. The use of pump stations and lift stations provide the following benefits:

1. Reduce the number of interim pump stations to be constructed.

2. Reduce the depth of the trunk sewers.

3. Reduce restrictions on the depth of the gravity sewers within a particular shed.

However, pump stations, lift stations, and force mains also tend to have higher operation and maintenance costs and an increased risk for failure. Measures such as parallel force mains and pumping redundancy are included to mitigate these risks. For reference, two permanent pump stations and two permanent lift stations will be included in the NMCS. Three permanent pump stations and four permanent lift stations will be included in the SMCS. Woodward Park Pump Station, Tara Park Pump Station, Bella Vista Lift Station, and Antigua Way Lift Station will be decommissioned and their influent sewers redirected to the trunk gravity alignment along Woodward Avenue following construction of Links 1-5. The proposed routing for these trunk sewers and preliminary locations for pump stations and lift stations are depicted in Plate 4-A. The numbering of trunk sewer links generally matches the link numbering presented in previous documents. Additional pump and lift stations will be constructed as needed for developments to connect to the proposed trunk sewers.

Figure 4-1 Major Trunk Sewer Sheds

4.2 Projected Flows

The trunk sewers are sized to accommodate the projected flows along the route. Shed boundaries, shown in Plates 4-B through 4-H, were identified and assigned to a corresponding trunk sewer link, pump station, or lift station. The outer limits of the sheds were established to include all parcels with designated land uses in the General Plan. Once the shed boundaries were delineated, the method described in Section 3.5 was used to estimate PWWF for each link. ADWF projections for the City were based on the land uses presented in the General Plan. PWWF for the pump or lift stations and downstream sewer may differ based on the use of a different PF, as the PF varies as a function of flow. Cumulative flows estimates for each link are included in Appendix B.

4.3 Vertical Design Constraints

The following vertical constraints were considered in establishing the inverts for the NMCS:

1. As-built information for Link 51A constructed under the WQCF Phase III Expansion Project, Schedule B. Link 51A was assumed to have an invert elevation of -3.87 ft per record documents.

2. City approved designs for Links 66, 66S1, 67, 68, 69, and 70 located within the Union Ranch Development. As-built information was not available for these links.

3. A 12-inch sewer from the Villa Ticino No. 1 subdivision with an assumed invert elevation of 3.36 ft based on as-built drawings at the intersection of Geneva Way and Airport Way connecting to the NMCS at the upstream end of Link 56.

4. Matching springlines at downstream end of Link 54 and upstream end of Link 91, to avoid potential backwater effect from the 60-inch diameter Link 91 to the 18-inch diameter Link 54. Crowns could not be matched due to the required upstream invert for Link 56 as described above.

5. Matching crowns of trunk sewer links and connections, where feasible.

6. Minimum 8 ft of cover.

The preliminary design for the SMCS reflected the following vertical constraints:

1. As-built information for Link 1A constructed under the WQCF Phase III Expansion Project, Schedule B. Link 1A was assumed to have an invert elevation of -3.92 ft per record documents.

2. City as-built information dated 2/3/07 for Links 34A and 34B constructed as part of the Dutra Estates development.

3. Survey information from September 2008 for Link 6 conducted by Nolte Associates, Inc. indicating an upstream invert of -1.23 ft and downstream invert of -2.31 ft.

4. A 15-inch sewer from Daniels Street with an assumed invert elevation of 0.47 ft connecting to the SMCS at the upstream end of Link 3. This connection will allow for decommissioning of the Westbrook Pump Station.

5. Survey information from May 2002 for previously constructed Links 16-18.

6. As-built information for previously constructed Links 14-15.

7. City approved designs for Links 19-21 and Links 30-32.

8. Matching crowns of trunk sewer links and connections, where feasible.

9. Minimum 8 ft of cover.

The CMCS will eliminate the need for the Union Road Pump Station and will connect the existing collection system to the NMCS at the upstream end of Link 91. Design of the CMCS reflects the following vertical constraints:

1. Upstream invert elevation of 11.00 ft (corresponds to the bottom elevation of the Union Road Pump Station wet well).

2. Upstream invert elevation of 17.18 ft for Link 93S1 (corresponds to the bottom elevation of sewer leading to Fishback Pump Station).

4.4 Description of Proposed Trunk Sewer

Each trunk sewer is described below.

a. <u>North Manteca Collection Strategy</u>

The NMCS will follow the alignment illustrated in Figure 4-2 including proposed "spines" (Links 66S2, 66S3, 66S4, 69S1, and 69S2) serving the northern areas of the City. The NMCS will include the existing Woodbridge Pump Station, a new pump station near Chadwick Square, a new lift station on the east side of SR-99, and a new lift station on Louise Avenue at the upstream end of Link 81. The existing Chadwick Unit 5 Pump Station will be decommissioned and replaced with a pump station capable of serving a larger area. The new lift station on the east side of SR-99 will reduce the depth of the sewer crossing at SR-99 to the connection with

existing Link 70. The new Louise Avenue Lift Station upstream of Link 81 will facilitate service to the eastern extents of the City. Table 4-1 summarizes the hydraulic parameters for the NMCS.

Figure 4-2 Proposed North Manteca Trunk Sewer Alignment and Sizing

TABLE 4-1
CITY OF MANTECA
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NORTH MANTECA TRUNK SEWER PRELIMINARY DESIGN DATA

Link	Diameter (in)	Length (ft)	Slope	Sanitary Flow (cfs)[a]	Invert Elevation (ft)		d/D	Velocity (ft/sec)
					Upstream	Downstream		
51A	60	560	0.0005	31.16	-3.87	-4.13	0.53	2.93
51	54	911	0.0003	31.16	-3.10	-3.37	0.76	2.42
52	54	648	0.0003	30.93	-2.91	-3.10	0.75	2.40
53	54	1,083	0.0003	30.74	-2.59	-2.91	0.75	2.41
54	18	2,646	0.0012	1.52	2.54	-0.64	0.45	1.97
56	12	184	0.0017	1.04	3.36	3.04	0.62	2.05
66	48	503	0.0035	10.17	3.77	2.00	0.23	4.56
66S1	30	500	0.0006	2.69	5.56	5.26	0.35	1.73
66S2	18	2,711	0.0014	2.35	10.40	6.56	0.55	2.33
66S3	18	2,693	0.0014	0.88	14.21	10.40	0.32	1.80
66S4	18	1,075	0.0012	0.00	15.50	14.21	0.40	1.49
67	42	2,706	0.0005	7.63	5.21	3.87	0.40	2.11
68	42	3,070	0.0005	7.10	6.78	5.21	0.38	2.09
69	30	706	0.0018	1.39	9.08	7.78	0.19	2.14
69S1	18	5,317	0.0016	0.72	18.50	10.08	0.28	1.77
69S2	18	3,085	0.0010	0.00	21.50	18.50	0.48	1.50
70	36	2,710	0.0005	5.81	8.15	6.78	0.43	1.99
71	24	930	0.0032	5.38	26.94	24.00	0.45	3.88
72	24	2,400	0.0006	5.38	28.38	26.94	0.79	2.01
72A	24	870	0.0007	4.88	29.00	28.38	0.68	2.14
73B	18	280	0.0024	4.88	13.23	12.55	0.77	3.33
73	18	1,400	0.0023	4.88	16.41	13.23	0.80	3.23
74	18	909	0.0023	4.50	18.48	16.41	0.74	3.21
75	18	1,767	0.0016	4.07	21.32	18.48	0.79	2.71
76	18	1,328	0.0012	3.41	22.92	21.32	0.77	2.34
77	18	1,300	0.0012	3.09	24.48	22.92	0.71	2.31
79	18	3,996	0.0012	2.51	29.27	24.48	0.61	2.22
80	18	1,236	0.0012	2.51	30.76	29.27	0.61	2.22
81	18	3,954	0.0012	2.51	35.50	30.76	0.61	2.22
90	54	853	0.0003	30.63	-2.34	-2.59	0.75	2.40
91	54	652	0.0003	30.63	-2.14	-2.34	0.73	2.45

[a] CFS = cubic feet per second, PWWF

For the crossing from SR-99 to the connection with the upstream end of existing Link 70, three alternatives were considered: 1) a lift station and shallow gravity sewer; 2) a pump station with single force main; and 3) a pump station with a dual force main. Table 4-2 summarizes each of the alternatives. More detailed calculations are provided in Appendix C. Based on a review of the Preliminary Trunk Sewer Design drawings, prepared by Nolte Associates, Inc. in November 2002 [8], there does not appear to be any critical utility crossings for the alignments which would require the sewer or force main to be placed at a deep elevation.

TABLE 4-2
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SR-99 CROSSING ALTERNATIVES

Alternative	Lift Station	Pump Station with Single Force Main	Pump Station with Dual Force Main
Pipe diameter	24-inch	18-inch	(2) 12-inch
Pipe depth	Min. 4 ft cover	Min. 4 ft cover	Min. 4 ft cover
TDH[a] required, ft	31.1	31.5	38.0
Design flow per pump, gpm[b]	1,014	1,014	1,014
Projected pump efficiency, %	74.9	72.7	74.9
Pump station configuration	Triplex	Triplex	Triplex
Approximate motor size, hp[c]	15	15	15

[a] TDH = total dynamic head

[b] gpm = gallons per minute

[c] hp = horsepower

The lift station alternative is recommended because:

1. The pumping requirements for the lift station and pump station alternatives are very similar because there is an approximate 5 ft drop in ground elevation from SR-99/Lathrop Road to the connections with the existing trunk sewer. Therefore, because the headloss in the force main is equivalent to the ground elevation drop, the head required for the two scenarios is approximately equal.

2. If the pump station alternative is selected, a "headmaker" would most likely be needed at the connection with the existing trunk sewer to maintain a full line.

3. Transitioning from a lift station to a force main appears to be relatively straightforward and will not necessarily require a change in pumping requirements.

For the NMCS, the desired design criteria could not be met at the following locations:

1. Link 54 has a projected velocity less than 2 ft/sec and flows less than 70 percent full due to vertical design constraints.

2. Links 51A, 66, 66S1, 67, 68, 69, and 70 have projected velocities less than 2 ft/sec and flow less than 70 percent full due to reduced WGFs for new development. These links are constructed.

3. Links 66S3, 66S4, 69S1, and 69S2 have projected velocities less than 2 ft/sec and flow less than 70 percent full.

4. Links 56, 66S2, and 71 flow less than 70 percent full due to reduced WGFs for residential development and/or vertical design constraints.

The agricultural land uses attributed to Links 66S1, 66S2, 66S3, 66S4, 69S1, and 69S2 may be developed as residential beyond the General Plan timeline. Therefore, the projected flows into these links may increase beyond current estimates. To avoid future disruptions associated with additional sewer construction within existing streets, no change in pipe sizing to meet design criteria is recommended.

b. South Manteca Collection Strategy

The SMCS has changed significantly since the 2008 Addendum. The City has decided to route the SMTS along Woodward Avenue. A Woodward Avenue alignment better accommodates near-term growth in South Manteca and does not require obtaining additional right-of-way. Construction of a deep sewer along Woodward Avenue was selected by the City to allow for future abandonment of Woodward Park Pump Station following construction of Links 1-5 and Link 22. The following revised SMCS Strategy is recommended:

1. Three permanent pump stations and four permanent lift stations, as listed below.

    a. Yosemite Square Pump Station

    b. Austin Business Park Pump Station

    c. South Main Lift Station

    d. South Union Lift Station

    e. South Airport Lift Station

    f. Trails of Manteca Lift Station

g. Oakwood Shores Pump Station

2. Three force mains, as listed below:

   a. Force main 36 from Yosemite Square Pump Station to the existing gravity sewer along Woodward Avenue, upstream of Woodward Park Pump Station (Link 19). Force mains 36 and 27N converge in Force main 28.

   b. Force main 27N from Austin Business Park Pump Station to the existing gravity sewer along Woodward Avenue, upstream of Woodward Park Pump Station (Link 19). Force mains 36 and 27N converge in Force main 28.

   c. Force main 27S from Austin Business Park Pump Station to route flow to a proposed gravity sewer flowing to South Main Lift Station. This force main is recommended because the existing gravity sewer alignment upstream of Woodward Park Pump Station (Links 16 through 21) does not have sufficient capacity to accommodate flow from all of the area served by Austin Business Park Pump Station.

   d. The Oakwood Shores force main (OSFM) from Oakwood Shores Pump Station to the gravity sewer immediately downstream of Trails of Manteca Lift Station (Link 33).

The proposed SMCS is shown in Figure 4-3. Table 4-3 summarizes the hydraulic parameters for the SMCS. To accommodate development while minimizing construction of infrastructure in South Manteca, phasing of the recommended SMCS was considered and is described further in Chapter 5.

Figure 4-3 Proposed South Manteca Trunk Sewer Alignment and Sizing

TABLE 4-3
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SOUTH MANTECA TRUNK SEWER PRELIMINARY DESIGN DATA

Link	Diameter (in)	Length (ft)	Slope	Sanitary Flow (cfs)[a]	Invert Elevation (ft)		d/D	Velocity (ft/sec)
					Upstream	Downstream		
1A	60	480	0.0005	27.07	-3.92	-4.14	0.49	2.82
1	54	1,000	0.0002	27.07	-3.70	-3.92	0.76	2.08
2	48	686	0.0004	26.89	-3.44	-3.70	0.79	2.53
3	48	1,325	0.0004	26.89	-2.95	-3.44	0.80	2.50
4	48	808	0.0004	26.25	-2.67	-2.95	0.80	2.43
5	48	1,056	0.0003	25.94	-2.31	-2.67	0.80	2.41
6	60	2,637	0.0004	25.94	-1.23	-2.31	0.54	2.40
7	36	1,553	0.0009	20.73	1.73	0.37	0.88	3.19
8	36	1,620	0.0009	19.87	3.16	1.73	0.83	3.22
8S	12	4,835	0.0024	0.61	16.80	5.16	0.41	2.03
9	36	2,602	0.0009	19.18	5.44	3.16	0.80	3.20
9S	12	3,808	0.0020	1.27	18.01	10.39	0.67	2.25
10	36	2,660	0.0009	18.03	7.78	5.44	0.75	3.18
10S	12	4,887	0.0020	1.53	23.87	14.09	0.79	2.31
14A	36	50	0.0008	10.21	12.43	12.39	0.52	2.72
22A	36	1,200	0.0009	16.90	8.83	7.78	0.71	3.14
22	36	4,050	0.0009	16.59	12.39	8.83	0.70	3.13
22S	24	5,300	0.0008	4.61	32.00	28.00	0.64	2.17
22S2	18	1,500	0.0021	4.61	12.00	8.90	0.79	3.08
22S1	18	6,500	0.0020	4.09	25.00	12.00	0.72	2.99
25	12	2,650	0.0020	1.48	25.00	19.70	0.76	2.30
33	18	2,975	0.0014	3.76	5.50	1.45	0.79	2.50
34A	30	1,095	0.0026	0.75	4.25	1.45	0.13	2.00
34B	30	649	0.0036	4.99	1.45	-1.23	0.49	3.55

[a] PWWF

The desired design criteria could not be met at the following locations:

1. As-built information for Links 7, 8, 9, 10, and 22A is not presently available. A constant slope was assumed for these links.

2. Links 1A, 6, 14A, 34A, and 34B will flow less than 70 percent full. These links are constructed.

3. Links 8S, 9S, and 22S will flow less than 70 percent full due to vertical design constraints and/or maintaining a minimum pipe diameter of 12-inches.

c. Central Manteca Collection Strategy

The City provided the preliminary alignment for the CMCS which is shown in Figure 4-4. The cumulative PWWF within this trunk is estimated at 11.3 mgd. The CMCS will consist of a 36-inch diameter trunk sewer at an average slope of 0.0007. "Spines" will convey flow to the CMTS from the area currently served by Fishback Pump Station and anticipated future flows from developable lands in the area bound by Airport Way, Fishback Road, Yosemite Avenue, and SR-120. Table 4-4 summarizes the hydraulic parameters for the CMCS. The desired design criteria were met at all locations along the CMCS except for Link 93S1. Link 93S1 is the 12-inch diameter pipe for conveying flows from the Fishback Pump Station area to the CMTS and is limited by an upstream vertical design constraint.

Figure 4-4 Proposed Central Manteca Trunk Sewer Alignment and Sizing

TABLE 4-4
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CENTRAL MANTECA TRUNK SEWER PRELIMINARY DESIGN

Link	Diameter (in)	Length (ft)	Slope	Sanitary Flow (cfs)[a]	Invert Elevation (ft)		d/D	Velocity (ft/sec)
					Upstream	Downstream		
92	36	902	0.0008	17.50	7.92	7.20	0.76	3.03
93	36	464	0.0007	17.50	8.26	7.92	0.79	2.91
93S1	12	1,088	0.0020	1.06	17.18	15.00	0.60	2.17
94	36	465	0.0007	16.86	8.59	8.26	0.78	2.86
95	36	450	0.0007	16.86	8.92	8.59	0.77	2.90
96	36	627	0.0007	16.86	9.38	8.92	0.77	2.90
97	36	499	0.0007	16.86	9.74	9.38	0.77	2.88
98	36	545	0.0007	16.86	10.14	9.74	0.77	2.90
99	36	542	0.0007	16.86	10.54	10.14	0.76	2.91
100	36	624	0.0007	16.86	11.00	10.54	0.76	2.91

[a] PWWF

5 Recommended System Improvements

This chapter presents recommended system improvements for completion of the proposed sewer collection system strategy for the City.

5.1 Recommended Collection System Strategy

As described in Chapter 4, the recommended collection system strategy for the City will expand the existing collection system. The NMCS and SMCS will serve areas of future growth in the north and south. The Union Road Pump Station will be eliminated and the existing collection system will connect to the NMCS via the CMCS. The following sections summarize the system improvements needed for completion of this collection system strategy. The estimated numbers of manholes were based on the City standard for maximum spacing (every 400 ft for pipe diameters ranging from 8 to 18-inch; every 500 ft for pipe diameters ranging from 21 to 30-inch; and every 600 ft for pipe diameters larger than 30-inch). Manholes are also assumed at changes in direction and/or pipe size.

a. North Manteca Collection Strategy

The majority of the NMCS is in the preliminary design phase. Links 66, 66S1, 67, 68, 69, and 70 have been constructed for the Union Ranch subdivision. Link 51A was constructed as part of the WQCF Phase III Expansion Project, Schedule B. Table 5-1 summarizes the pipe diameters and lengths required to construct the remaining segments of the NMCS. Table 5-1 also includes an estimate of the required number of manholes. Table 5-2 summarizes the estimated pump and lift station capacity requirements for the remaining elements of the NMCS.

TABLE 5-1
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
NORTH MANTECA COLLECTION STRATEGY SUMMARY

Link	Diameter (in)	Average Estimated Depth of Cover (ft)	Average Estimated Excavation Depth (ft)	Length (ft)	Number of Manholes
Gravity					
51	54	22.2	25-30	911	2
52	54	21.5	25-30	648	2
53	54	21.3	25-30	1,083	2
54	18	22.6	20-25	2,646	7
56	12	18.3	10-20	184	1
66S2	18	13.0	10-20	2,711	7
66S3	18	9.2	10-20	2,693	7
66S4	18	7.1	0-10	1,075	3
69S1	18	11.2	10-20	5,317	14
69S2	18	7.0	0-10	3,085	8
71	24	5.0	0-10	930	2
72	24	5.3	0-10	2,400	5
72A	24	4.3	0-10	870	2
73B	18	20.6	20-25	280	1
73	18	18.7	20-25	1,400	4
74	18	16.1	10-20	909	3
75	18	14.6	10-20	1,767	5
76	18	14.9	10-20	1,328	4
77	18	17.3	10-20	1,300	4
79	18	16.6	10-20	3,996	10
80	18	13.5	10-20	1,236	4
81	18	10.4	10-20	3,954	10
90	54	22.0	25-30	853	2
91	54	22.7	25-30	652	2
Force Main					
FMN-01	18	4.0	0-10	3,900	N/A

TABLE 5-2
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
NORTH MANTECA PUMP AND LIFT STATION SUMMARY

Pump/Lift Station	ADWF (mgd)	PWWF (mgd)	Estimated TDH (ft)	Estimated Wet Well Elevation (ft)	Approximate Ground Elevation (ft)
Chadwick Pump Station	618,054	1,626,116	67.0	-1.0	23.0
Louise Avenue Lift Station	615,120	1,620,499	30.0	22.0	52.0
SR-99 Lift Station	1,462,381	3,154,874	32.3	8.6	35.0

b. Overview of South Manteca Collection Strategy

Several sections of the SMCS have been constructed or designed in preparation for construction, as described in Chapter 4. Table 5-3 summarizes the components of the remaining segments of the SMCS. Table 5-4 summarizes the estimated pump and lift station requirements for the SMCS.

TABLE 5-3
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SOUTH MANTECA COLLECTION STRATEGY SUMMARY

Link	Diameter (in)	Average Estimated Depth of Cover (ft)	Average Estimated Excavation Depth (ft)	Length (ft)	Number of Manholes
Gravity					
1	54	20.6	25-30	1,000	2
2	48	22.1	25-30	686	2
3	48	21.7	25-30	1,325	3
4	48	18.8	20-25	808	2
5	48	18.5	20-25	1,056	2
8S	12	11.8	10-20	4,835	13
9S	12	10.8	10-20	3,808	10
10S	12	12.0	10-20	4,887	13
14A	36	21.5	20-25	50	1
22	36	19.2	20-25	4,050	7
22S	24	4.9	0-10	5,300	11
22S2	18	25.6	25-30	1,500	4
22S1	18	16.0	10-20	6,500	17
25	12	16.2	10-20	2,650	7
33	18	12.0	10-20	2,975	8
Force Main					
27N	8	4	0-10	6,250	N/A
27S	12	4	0-10	3,000	N/A
28	15	4	0-10	4,100	N/A
36	12	4	0-10	5,000	N/A
OSFM	8	4.0	0-10	6,550	N/A

TABLE 5-4
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SOUTH MANTECA PUMP AND LIFT STATION SUMMARY

Pump/Lift Station	ADWF (mgd)	PWWF (mgd)	Estimated TDH (ft)	Estimated Wet Well Elevation (ft)	Approximate Ground Elevation (ft)
Trails of Manteca Lift Station	990,274	2,303,365	21.8	-4.8	17.0
Oakwood Shores Pump Station	373,988	1,120,710	50.0	-20.0	10.0
Yosemite Square Pump Station	1,398,661	3,037,816	45.0	15.0	40.0
Austin Business Pump Station	997,286	2,315,842	45.2	19.8	45.0
South Main Lift Station	1,364,910	2,976,135	25.0	9.0	34.0
South Union Lift Station	318,584	990,025	25.0	7.0	32.0
South Airport Lift Station	107,894	395,087	25.0	-1.0	24.0

c. Phasing of SMCS Improvements

Phased construction of the SMCS network will occur as development progresses. Until all components in the recommended SMCS are constructed, an interim strategy for conveying flow from South Manteca will be employed to reduce initial capital costs. The interim strategy will include the following:

1. Continued use of the 12-inch and 18-inch Woodward Force Main (WFM) which extends from Woodward Park Pump Station to the WQCF. WFM use will continue to be used until Links 1-5 are constructed.

2. Tara Park Pump Station and Airport-Daniel Lift Station will remain connected to WFM until the trunk sewer network to the WQCF is completed.

3. Antigua Way Lift Station and Bella Vista Lift Station will be connected to nearby gravity links (currently under construction) concurrent with the first upgrade to Woodward Park Pump Station pumps. Flow from these stations will re-pumped by Tarra Park Pump Station to the WFM.

4. Utilization of a temporary pump station to transfer flows from Link 7 to Tarra Park Pump Station.

5. Connection of proposed developments near Links 8, 9, 10, and 22 to the corresponding link. Flow from these links will be pumped by the temporary pump station at Link 7 and Tarra Park Pump Station.

Most SMCS components (links, force mains, pump stations, and lift stations) will be constructed as needed to serve their respective service areas. However, construction of certain components of the SMCS will be required as development progresses and increases wastewater flow in the collection system. Projects that are required based on specific flow criteria are described in Table 5-5. Additional information regarding pump station upgrades is presented in Table 5-6.

TABLE 5-5
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SOUTH MANTECA COLLECTION STRATEGY
PHASED IMPROVEMENT PROJECTS

Project Description	Project Type
Construct Links 1 - 5	Gravity Sewer
Upgrade Woodward Park Pump Station Pumps, Stage 1	Pump Upgrade
Upgrade Tarra Park Pump Station Pumps, Stage 1	Pump Upgrade
Upgrade Tarra Park Pump Station Pumps, Stage 2	Pump Upgrade
Construct Link 25	Gravity Sewer
Construct Austin Business Park Pump Station	Pump Station
Construct Link 27S	Force Main
Construct South Main Lift Station	Lift Station
Construct Links 22S1, 22S2, and 22S	Gravity Sewer

TABLE 5-6
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SOUTH MANTECA COLLECTION STRATEGY
SUMMARY OF PUMPING SCENARIOS FOR ESTABLISHING PUMP UPGRADE TRIGGER FLOWS

Project Description	Assumed "Existing" Scenario	Trigger Component[a,b]	Required Power[c]	Trigger Flow		
				PWWF (gpm)	PWWF (gpd)	ADWF (gpd)
Upgrade Woodward Park Pump Station Pumps, Stage 1 (upgrade pumps, duplex configuration)	Existing pumps, duplex configurations at both Woodward Park Pump Station and Tarra Park Pump Station	Woodward Park Pump Station (Curve D-1)	200 HP	590	849,000	262,000
Upgrade Tarra Park Pump Station Pumps, Stage 1 (upgrade pumps, duplex configuration)	Existing pumps, duplex configurations at both Woodward Park Pump Station and Tarra Park Pump Station	Tarra Park Pump Station (Curve D-3)	90 HP	1,250	1,800,000	710,000
Upgrade Tarra Park Pump Station Pumps, Stage 2 (upgrade to triplex configuration)	Upgraded Stage 1 pumps, duplex configuration at Tarra Park Pump Station; triplex configuration at Woodward Park Pump Station	Tarra Park Pump Station (Curve D-4)	200 HP	3,080	4,435,000	2,134,000

[a] Assumes flows from Antigua Way Lift Station and Bella Vista Lift Station pump to the gravity sewer along Woodward Avenue and re-pump at Tarra Park Pump Station

[b] Curve numbers correspond to Appendix D page numbers

[c] Assumes 75% pump efficiency and 75% motor efficiency

The SMCS improvement projects listed above will be required when projected wastewater flows from anticipated developments exceed a certain threshold or "trigger flow." The trigger flow for the Woodward Park Pump Station Stage 1 Upgrade was determined by comparing the system head curve for the existing WFM against the existing Woodward Park Pump Station pump curve. Similarly, trigger flows for Tarra Park Pump Station pump upgrades were determined by comparing the system head curve for the existing 18-inch portion of WFM against existing and proposed (upgraded) Tarra Park Pump Station pump curves. These curves are provided in Appendix D. A summary of the pumping scenarios used to determine Woodward Park Pump Station and Tarra Park Pump Station pump upgrade requirements is presented in Table 5-6. If actual pumping scenarios differ than the assumed scenarios presented, the system head curves in Appendix D may be used to refine trigger flow estimates.

Antigua Way Lift Station, Bella Vista Lift Station, and Airport-Daniel Lift Station currently connect to the WFM and are considered in total flow estimates. The existing pumps installed at

Antigua Way Lift Station and Bella Vista Lift Station may be unable to pump against the pressure generated by peak flows from Woodward Park Pump Station. The SMCS assumes that these pump stations will connect to the gravity sewer along Woodward Avenue and be re-pumped at Tarra Park Pump Station to the WQCF following the Stage 1 upgrade to Woodward Park Pump Station.

Trigger flows for the construction of Links 27S, 22S1, 22S2, 22S and South Main Lift Station were determined by capacity limitations in the existing trunk sewers on Woodward Avenue. Appendix E includes a summary of the existing Links, estimated PWWF, corresponding ADWF capacities, and projected remaining capacity for flow from SMCS sheds. Sheds located north of SR-99 were assigned priority for being routed through the existing links in Woodward Avenue because of the option available for sheds located south of SR-99 to flow to Link 22S1. If development occurs slowly within Sheds 36N and 36S, capacity in existing Links 16 – 21 along Woodward Avenue could potentially be used on an interim basis by Sheds 25 and 27S.

The 12-inch section of the WFM is not sufficient to convey buildout flows from the sheds upstream of Woodward Park Pump Station with a maximum pressure at or below 100 psi. As shown by Curve D-2 (Appendix D), the maximum PWWF through the existing 12-inch WFM is approximately 1,900 gpm, corresponding to an ADWF of 1.23 mgd. Once this flow is achieved at Woodward Park Pump Station, it is recommended that Links 1-5 be constructed and Woodward Park Pump Station abandoned. Alternatively, Links 1-5 will require construction when velocity in the 18-inch section of the WFM (downstream of Tarra Park Pump Station) exceeds 8 ft/sec or flow to Tarra Park Pump Station exceeds the 4,350 gpm capacity of the Stage 2 Tarra Park Pump Station Upgrade.

Trigger flows, as ADWF and PWWF, have been calculated for each project component and are listed in Table 5-7. The ADWF values serve as a guide for determining when projects are needed as development occurs. ADWF is calculated based on proposed land uses and established WGFs. The PWWF values are a measure of the available (for constructed) or required (for proposed) capacity of each component. Flows listed are the total estimated flow in each trigger component.

TABLE 5-7
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SOUTH MANTECA COLLECTION STRATEGY
TRIGGER FLOWS FOR PHASED IMPROVEMENT PROJECTS

Phase	Project Description	Trigger Component	Trigger Event	Trigger Flow (gpd)	
				ADWF	PWWF
1	Upgrade Woodward Park Pump Station Pumps, Stage 1 (upgrade pumps, duplex configuration)	Woodward Park Pump Station	Flow from Woodward Park Pump Station exceeds existing pump capacity under PWWF conditions with one pump running; assumes existing duplex Tarra Park Pump Station	262,000	849,000
	Upgrade Tarra Park Pump Station Pumps, Stage 1 (upgrade pumps, duplex configuration)	Tarra Park Pump Station	Flow to Tarra Park Pump Station exceeds existing pump capacity under PWWF conditions with one pump running; assumes existing duplex Woodward Park Pump Station	710,000	1,800,000
2[a]	Upgrade Tarra Park Pump Station Pumps, Stage 2 (upgrade to triplex configuration)[a]	Tarra Park Pump Station	Flow to Tarra Park Pump Station exceeds upgraded pump capacity under PWWF conditions with one pump running	2,134,000	4,435,000
3	Construct Links 1-5; existing 12-inch WFM (pressure) limiting component	12-inch WFM	Required pressure at Woodward Park Pump Station exceeds 100 psi in the existing 12-inch WFM under PWWF conditions	1,232,000	2,736,000
	Construct Links 1-5; existing 18-inch WFM (velocity) limiting component	18-inch WFM	Velocity in the 18-inch WFM exceeds 8 ft/sec under PWWF conditions	4,455,000	9,136,000
4	Construct Link 27S (force main)	Austin Business Park Pump Station	Flow from Austin Business Park Pump Station causes Link 18 to exceed 80% full flow under PWWF conditions	394,000	1,166,000
	Construct South Main Lift Station, Link 22S1, Link 22S2, and Link 22S	Austin Business Park Pump Station	Construction of Link 27S; flow from Austin Business Park Pump Station causes Link 18 to exceed 80% full flow under PWWF conditions	394,000	1,166,000

[a] Stage 2 Tarra Park Pump Station pump upgrade is not required if Links 1-5 are constructed before trigger flow is reached

Figure 5-1 presents a summary of the recommended projects and phasing. A summary of remaining ADWF capacity in each project component prior to improvement project implementation is provided in Table 5-8. Supporting calculations for remaining ADWF capacity

estimates are provided in Appendix F. Appendix B includes background data used to calculate ADWF for SMCS sheds and links.

The phasing plan presented in this 2012 Master Plan provides direction for the City regarding timing requirements, in terms of flow, for construction of critical SMCS components, as well as interim upgrades at Woodward Park Pump Station and Tarra Park Pump Station. Final recommendations of these improvements will depend on future development patterns within South Manteca.

TABLE 5-8
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SOUTH MANTECA COLLECTION STRATEGY
REMAINING ADWF CAPACITY OF PROJECT COMPONENTS

Phase	Project Description	Trigger Component	Available ADWF Capacity (gpd)[a]
1	Upgrade Woodward Park Pump Station Pumps, Stage 1 (upgrade pumps, duplex configuration)	Woodward Park Pump Station	(581,148)
	Upgrade Tarra Park Pump Station Pumps, Stage 1 (upgrade pumps, duplex configuration)	Tarra Park Pump Station	(248,406)
2[b]	Upgrade Tarra Park Pump Station Pumps, Stage 2 (upgrade to triplex configuration)	Tarra Park Pump Station	1,113,064
3	Construct Links 1-5; Existing 12-inch WFM (pressure) limiting component	12-inch WFM	388,852
	Construct Links 1-5; Existing 18-inch WFM (velocity) limiting component	18-inch WFM	1,135,057
4	Construct Link 27S (force main)	Austin Business Park Pump Station	394,000
	Construct South Main Lift Station, Link 22S1, Link 22S2, and Link 22S	Austin Business Park Pump Station	394,000

[a] See Appendix F for detailed calculations; when flow is greater than the available ADWF capacity, project is recommended

[b] Stage 2 Tarra Park Pump Station Pump Upgrade is not required if Links 1-5 are constructed before trigger flow is reached

Figure 5-1 South Manteca Collection Strategy Phasing

d. Central Manteca Collection Strategy

The proposed alignment for the CMTS may change depending on plans for future development along the route. Table 5-9 summarizes the projected pipe diameters, lengths, and number of manholes required for completion of the CMCS. Additional improvements associated with the CMCS will include demolition of the Union Road Pump Station and connection of existing sewers.

TABLE 5-9
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CENTRAL MANTECA COLLECTION STRATEGY SUMMARY

Link	Diameter (in)	Average Estimated Depth of Cover (ft)	Average Estimated Excavation Depth (ft)	Length (ft)	Number of Manholes
Gravity					
92	36	14.4	10-20	902	2
93	36	13.9	10-20	464	1
93S1	12	8.9	0-10	1,088	3
94	36	13.6	10-20	465	1
95	36	13.2	10-20	450	1
96	36	12.9	10-20	627	2
97	36	12.4	10-20	499	1
98	36	12.1	10-20	545	1
99	36	11.7	10-20	542	1
100	36	11.2	10-20	624	2

6 Probable Construction Costs

The 2012 Master Plan unit costs were developed for sewers, manholes, isolation gates, and other elements identified as recommended improvements. The basis for the piping and manhole unit costs is described below. Piping costs were developed for pipe installed within four different depth categories: 1) 0-10 ft; 2) 10-20 ft; 3) 20-25 ft; and 4) 25-30 ft. Manhole costs were developed for 48-inch and 60-inch diameter manholes placed within two depth categories: 1) 10-20 ft; and 2) 20-30 ft.

6.1 Unit Costs for Pipe

Unit costs for pipe reflect installation, including dewatering, and assumes conventional pipe installation by means of open cut, unless otherwise noted. Capital costs may be higher if trenchless technology construction methods are employed. Vitrified clay pipe (VCP) was assumed for sewers from 10-inches to 33-inches in diameter. T-lock reinforced concrete pipe (RCP) was assumed for sewers 36-inches in diameter and larger. The following RCP pipe classes were assumed: Class II for depth 0-10 ft, Class III for depth 10-20 ft, and Class IV for depth 20-30 ft.

Costs for conventional open cut construction include five components. Unit costs assumed for each of these components are presented in Table 6-1.

TABLE 6-1
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
UNIT CONSTRUCTION COSTS FOR EXCAVATION WORK

Description	Unit Cost ($)	Unit[a]
Excavation	2.00	cy
Backfill	2.00	cy
Compaction	2.00	cy
Dewatering[b]	31.50	vlf
Pavement removal and replacement	5.00	cy

[a] cy = cubic yard, vlf = vertical lineal foot

[b] Groundwater table is assumed at 15 ft below ground level

Unit costs for excavation work are based on a review of recent bid results, including Caltrans projects and other pipeline installation work, and published Caltrans Contract Cost Data [9]. For shallow excavations (depths less than 10 ft), costs for shoring are assumed to be included with excavation costs. For excavations at depths greater than 10 ft, additional costs for shoring are assumed to be included with dewatering costs. All costs are indexed to the October 2012 Engineering News Record (ENR) San Francisco Construction Cost Index of 10367.34 [10].

The excavation costs were multiplied by the appropriate units based on probable trench dimensions. The assumptions used for the width and depth for a conventional open cut trench are shown in Table 6-2 and are depicted in Figures 6-1, 6-2, 6-3, and 6-4.

TABLE 6-2
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
ASSUMED OPEN TRENCH DIMENSIONS

Description	Trench Dimension (ft)			
	0-10 ft Depth	**10-20 ft Depth**	**20-25 ft Depth**	**25-30 ft Depth**
Trench width - added to pipe diameter	2	3	6	6
Depth for which trench width applies	Entire depth	Entire depth	5-30 ft below surface	5-30 ft below surface
Trench surface width - added to pipe diameter[a]	4	5	8	8
Depth for which trench surface width applies	At surface	At surface	0-5 ft below surface	0-5 ft below surface
Depth[b]	10.5	20.5	25.5	30.5

[a] Trench surface width used to estimate pavement removal and replacement

[b] Depth includes an additional 6-inches for bedding

Figure 6-1 Assumed Open Trench Dimensions 0-10 ft depth

Figure 6-2 Assumed Open Trench Dimensions 10-20 ft depth

Figure 6-3 Assumed Open Trench Dimensions 20-25 ft depth

Figure 6-4 Assumed Open Trench Dimensions 25-30 ft depth

Unit costs for piping materials are summarized in Tables 6-3 and 6-4. Unit costs reflect quotations from local vendors in September 2010 (modified to October 2012 costs by utilizing the ENR cost factor) for VCP and T-lock lined RCP and include freight and shipping. For developing the total installed cost per foot of pipe installation, a contingency of 50 percent was applied to piping material costs as follows:

a. Taxes: 10 percent
b. Installation (labor, equipment, and traffic control): 25 percent
c. Contractor Overhead and Profit: 15 percent

TABLE 6-3
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
VITRIFIED CLAY PIPE COSTS

Pipe Diameter (in)	Cost per lf[a,b] ($)
6	8
8	11
10	17
12	23
15	36
18	50
21	65
24	87
27	104
30	126
33	152

[a] lf = lineal foot

[b] Cost includes 50 percent contingency for taxes, installation (labor, equipment, traffic control), and contractor overhead and profit

TABLE 6-4
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
T-LOCK LINED REINFORCED CONCRETE PIPE COSTS

Pipe Diameter, in	Cost per lf[a] ($)		
	Class II	Class III	Class IV
36	410	410	425
42	441	441	441
48	449	449	449
54	473	473	473
60	503	512	543

[a] Cost includes 50 percent contingency for taxes, installation (labor, equipment, traffic control), and contractor overhead and profit.

6.2 Unit Costs for Manholes

A manhole diameter of 48-inches was assumed for pipes up to 24-inches in diameter. A manhole diameter of 60-inches was assumed for pipes 27-inches and larger. Material costs for the manhole sections and cones reflect quotations from Central Precast Concrete in September 2010 2010 (modified to October 2012 costs by utilizing the ENR cost factor) and are presented in Table 6-5. For pipes up to 24-inches in diameter, a manhole base composed of 7.3 cy of concrete was assumed (corresponds to outer dimensions of 7 ft x 7 ft x 4 ft). For pipes up to 60-inches in diameter, a manhole base composed of 9.5 cy of concrete was assumed (corresponds to outer dimensions of 8 ft x 8 ft x 4 ft).

TABLE 6-5
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
UNIT COSTS FOR MANHOLE COMPONENTS

Description	Unit Cost ($)	Unit
48-inch x 24-inch x 36-inch PVC lined cone	835[a]	ea[b]
48-inch vertical section, PVC lined	235[a]	vlf
48-inch manhole base	6,800[c]	ea
60-inch x 24-inch x 48-inch PVC lined cone	1,020[a]	ea
60-inch vertical section, PVC lined	330[a]	vlf
60-inch manhole base	8,800[c]	ea

[a] Includes 50 percent contingency for taxes, installation (labor, equipment, traffic control), and contractor overhead and profit

[b] ea = each

[c] Assumes a unit price of $745/cy of concrete plus 25 percent contingency for installation

6.3 Total Pipe and Manhole Costs

Using the unit costs for the components associated with the installation of piping and manholes described previously, total costs for piping and manhole construction were developed. These final costs are summarized in Tables 6-6, 6-7, 6-8, 6-9, and 6-10. A complete breakdown of pipe costs is presented in Appendix G.

TABLE 6-6
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
UNIT PIPE COSTS, 0-10 FT TRENCH DEPTH

Pipe Diameter (in)	Pipe Material	Cost per lf ($)				
		Earthwork[a]	Dewatering	Pavement Replacement	Piping and Installation[b]	Total
6	VCP	6	0	23	8	37
8	VCP	7	0	24	11	42
10	VCP	7	0	25	17	49
12	VCP	7	0	25	23	55
15	VCP	8	0	27	36	71
18	VCP	8	0	28	50	86
21	VCP	9	0	29	65	103
24	VCP	9	0	30	87	126
27	VCP	10	0	32	104	146
30	VCP	10	0	33	126	169
33	VCP	11	0	34	152	197
36	RCP II	11	0	35	410	456
42	RCP II	12	0	38	441	491
48	RCP II	13	0	40	449	502
54	RCP II	13	0	43	473	529
60	RCP II	14	0	45	503	562

[a] Includes costs for excavation, backfill, compaction

[b] Includes 50 percent contingency for taxes, installation (labor, equipment, traffic control), and contractor overhead and profit

TABLE 6-7
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
UNIT PIPE COSTS, 10-20 FT TRENCH DEPTH

Pipe Diameter (in)	Pipe Material	Cost per lf ($)				
		Earthwork[a]	Dewatering	Pavement Replacement	Piping and Installation[b]	Total
6	VCP	16	174	28	8	226
8	VCP	17	174	29	11	231
10	VCP	18	174	30	17	239
12	VCP	19	174	30	23	246
15	VCP	20	174	32	36	262
18	VCP	21	174	33	50	278
21	VCP	22	174	34	65	295
24	VCP	23	174	35	87	319
27	VCP	24	174	37	104	339
30	VCP	25	174	38	126	363
33	VCP	26	174	39	152	391
36	RCP III	27	174	40	410	651
42	RCP III	29	174	43	441	687
48	RCP III	31	174	45	449	699
54	RCP III	32	174	48	473	727
60	RCP III	34	174	50	512	770

[a] Includes costs for excavation, backfill, compaction

[b] Includes 50 percent contingency for taxes, installation (labor, equipment, traffic control), and contractor overhead and profit

TABLE 6-8
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
UNIT PIPE COSTS, 20-25 FT TRENCH DEPTH

Pipe Diameter (in)	Pipe Material	Cost per lf ($)				
		Earthwork[a]	Dewatering	Pavement Replacement	Piping and Installation[b]	Total
12	VCP	42	331	45	23	441
15	VCP	44	331	47	36	458
18	VCP	45	331	48	50	474
21	VCP	46	331	49	65	491
24	VCP	48	331	50	87	516
27	VCP	49	331	52	104	536
30	VCP	50	331	53	126	560
33	VCP	51	331	54	152	588
36	RCP IV	53	331	55	425	864
42	RCP IV	55	331	58	441	885
48	RCP IV	58	331	60	449	898
54	RCP IV	60	331	63	473	927
60	RCP IV	62	331	65	543	1,001

[a] Includes costs for excavation, backfill, compaction

[b] Includes 50 percent contingency for taxes, installation (labor, equipment, traffic control), and contractor overhead and profit

TABLE 6-9
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
UNIT PIPE COSTS, 25-30 FT TRENCH DEPTH

Pipe Diameter (in)	Pipe Material	Cost per lf ($)				
		Earthwork[a]	Dewatering	Pavement Replacement	Piping and Installation[b]	Total
18	VCP	53	489	48	50	640
21	VCP	55	489	49	65	658
24	VCP	56	489	50	87	682
27	VCP	58	489	52	104	703
30	VCP	60	489	53	126	728
33	VCP	61	489	54	152	756
36	RCP IV	63	489	55	425	1,032
42	RCP IV	66	489	58	441	1,054
48	RCP IV	69	489	60	449	1,067
54	RCP IV	72	489	63	473	1,097
60	RCP IV	74	489	65	543	1,171

[a] Includes costs for excavation, backfill, compaction, and dewatering

[b] Includes 50 percent contingency for taxes, installation (labor, equipment, traffic control), and contractor overhead and profit

TABLE 6-10
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
UNIT COSTS FOR MANHOLES

Item	Unit Cost ($/ea)
48-inch PVC lined manhole cost (10-20 ft depth)[a]	12,000
48-inch PVC lined manhole cost (20-30 ft depth)[b]	14,000
60-inch PVC lined manhole cost (10-20 ft depth)[a]	16,000
60-inch PVC lined manhole cost (20-30 ft depth)[b]	19,000

[a] Assumes a depth of 20 ft

[b] Assumes a depth of 30 ft

6.4 Pump and Lift Station Costs

Probable construction costs for the pump and lift stations were developed based on similar projects and the design criteria presented in Chapter 3. Pump and lift station costs were developed for two ranges of flow: 1) less than 2 mgd, and 2) between 2-4 mgd. These flow ranges were selected based on the projected design flows for the pump and lift stations and the anticipated types of wet wells required for the design flows. The probable construction costs for these two ranges of flows are presented in Tables 6-11 and 6-12. Detailed information regarding the cost estimates is presented in Appendix H.

TABLE 6-11
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PROBABLE CONSTRUCTION COST
FOR PUMP AND LIFT STATIONS LESS THAN 2 MGD

Item	Total ($)
Mobilization and demobilization	80,000
Grading, excavation, and site preparation	100,000
Construct wet well	109,000
Furnish and install pumps and motors	63,000
Site electrical, control systems, and lighting	195,000
Install site piping and appurtenances	105,000
Install manholes and ancillary facilities	85,000
Aggregate base (Class 2)	3,000
Asphalt concrete paving	6,000
Gates and fencing	13,000
All sheeting, shoring, and bracing	22,000
Total (rounded)	**780,000**

TABLE 6-12
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PROBABLE CONSTRUCTION COST
FOR PUMP AND LIFT STATIONS BETWEEN 2-4 MGD

Item	Total ($)
Mobilization and demobilization	115,000
Grading, excavation, and site preparation	100,000
Construct wet well	186,000
Furnish and install pumps and motors	126,000
Site electrical, control systems, and lighting	287,000
Install site piping and appurtenances	108,000
Install manholes and ancillary facilities	120,000
Aggregate base (Class 2)	3,000
Asphalt concrete paving	6,000
Gates and fencing	14,000
All sheeting, shoring, and bracing	82,000
Total (rounded)	**1,145,000**

6.5 Force Main Costs

Several force mains are included in the collection strategy for the City. Unit costs presented in Table 6-6 were used to estimate force main costs as summarized in Table 6-13. Costs are rounded to the nearest $1,000.

TABLE 6-13
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PROBABLE CONSTRUCTION COST FOR FORCE MAINS

Force Main	Diameter (in)	Length (ft)	Unit Cost ($/lf)	Cost ($ rounded)
FMN-01	18	3,900	86	336,000
OSFM	8	6,550	42	276,000
27N	8	6,250	42	263,000
27S	12	3,000	55	165,000
28	15	4,100	71	292,000
36[a]	12	5,000	55	1,565,000
Total, Force Mains				**2,897,000**

[a] Cost includes $1,290,000 for bore and jack crossing beneath SR-120 and UPRR

6.6 Probable Construction Costs for Recommended Improvements

Probable construction costs for the revised City collection system strategy are presented in the following sections. Costs are rounded to the nearest $1,000. A contingency for unforeseen conditions is not included in the total costs. Contingencies (25 percent) are included in the subsequent calculations of impact fees in the PFIP. Costs for improvements to the existing collection system are also excluded.

a. North Manteca Collection Strategy

The total probable construction cost for the NMCS is summarized in Table 6-14. Costs for links 51A, 66, 66S1, 67, 68, 69, and 70 are not included as these sections are currently completed.

TABLE 6-14
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
NORTH MANTECA COLLECTION STRATEGY
SUMMARY OF PROBABLE CONSTRUCTION COSTS

Link, Pump Station, or Lift Station	Probable Construction Cost ($)				
	Pipe	Manhole	Pump or Lift Station	Force Main	Total
51	1,000,000	38,000			1,038,000
52	711,000	38,000			749,000
53	1,189,000	38,000			1,227,000
54	1,255,000	98,000			1,353,000
56	46,000	12,000			58,000
Chadwick Pump Station			780,000		780,000
FMN-01				336,000	336,000
66S2	754,000	84,000			838,000
66S3	749,000	84,000			833,000
66S4	93,000	36,000			129,000
69S1	1,479,000	168,000			1,647,000
69S2	266,000	96,000			362,000
71	118,000	24,000			142,000
72	303,000	60,000			363,000
72A[a]	110,000	24,000			1,774,000
SR-99 Lift Station			1,145,000		1,145,000
73B	133,000	14,000			147,000
73	664,000	56,000			720,000
74	253,000	36,000			289,000
75	492,000	60,000			552,000
76	370,000	48,000			418,000
77	362,000	48,000			410,000
79	1,111,000	120,000			1,231,000
80	344,000	48,000			392,000
81	1,100,000	120,000			1,220,000
Louise Avenue Lift Station			780,000		780,000
90[b]	936,000	38,000			1,464,000
91	716,000	38,000			754,000
Total, North Manteca Collection Strategy					**21,151,000**

[a] Total cost includes $1,640,000 for bore and jack crossing beneath SR-99

[b] Total cost includes $490,000 for bore and jack under Yosemite Avenue

b. South Manteca Collection Strategy

The total probable construction cost for the SMCS is summarized in Table 6-15. Costs for Links 6, 7, 8, 9, 10, 22A, 34A, and 34B are not included in the table because those sections have been constructed.

TABLE 6-15
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SOUTH MANTECA COLLECTION STRATEGY
SUMMARY OF PROBABLE CONSTRUCTION COSTS

Link, Pump Station, or Lift Station	Probable Construction Cost ($)				
	Pipe	Manhole	Pump or Lift Station	Force Main	Total
1	1,097,000	38,000			1,135,000
2	732,000	38,000			770,000
3	1,414,000	57,000			1,471,000
4	726,000	38,000			764,000
5[a]	949,000	38,000			2,987,000
8S	1,190,000	156,000			1,346,000
9S	937,000	120,000			1,057,000
10S	1,203,000	156,000			1,359,000
14A	44,000	19,000			63,000
22	3,500,000	133,000			3,633,000
22S	668,000	132,000			800,000
22S1	1,807,000	204,000			2,011,000
22S2	960,000	56,000			1,016,000
25	652,000	84,000			736,000
33	828,000	96,000			924,000
Trails of Manteca Lift Station			1,145,000		1,145,000
South Main Lift Station			1,145,000		1,145,000
South Union Lift Station			780,000		780,000
South Airport Lift Station			780,000		780,000
Austin Business Pump Station			1,145,000		1,145,000
27N				263,000	263,000
27S				165,000	165,000
Yosemite Square Pump Station			1,145,000		1,145,000
28				292,000	292,000
36[b]				275,000	1,565,000
Oakwood Shores Pump Station			780,000		780,000
OSFM				276,000	276,000
Woodward Park, Stage 1 Upgrade			100,000		100,000
Tara Park, Stage 1 Upgrade			100,000		100,000
Tara Park, Stage 2 Upgrade			100,000		100,000
Total, South Manteca Collection Strategy					**29,853,000**

[a] Total cost includes $2,000,000 for bore and jack crossing beneath SR-120

[b] Total cost includes $1,290,000 for bore and jack crossing beneath SR-120 and UPRR

c. Central Manteca Collection Strategy

The total probable construction cost for the CMCS is summarized in Table 6-16.

TABLE 6-16
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CENTRAL MANTECA COLLECTION STRATEGY
SUMMARY OF PROBABLE CONSTRUCTION COSTS

Link, Pump Station, or Lift Station	Probable Construction Cost ($)		
	Pipe	Manhole	Total
92	588,000	32,000	620,000
93	303,000	16,000	319,000
93S1	268,000	36,000	304,000
94	303,000	16,000	319,000
95	293,000	16,000	309,000
96	409,000	32,000	441,000
97	325,000	16,000	341,000
98	355,000	16,000	371,000
99	353,000	16,000	369,000
100[a]	407,000	32,000	539,000
Total, South Manteca Collection Strategy			**3,932,000**

[a] Total cost includes $100,000 for Union Road Pump Station abandonment

7 Capital Improvement Plan

This chapter summarizes potential CIP projects for future implementation.

7.1 Projects

Cost for construction of the NMCS, SMCS, and CMCS are presented for the City to use when developing PFIP fees and capital improvement projects. The construction costs were divided by fee zone for each link or element, where applicable. Costs for the zones contributing to each link were calculated based on ADWF. Acreage and land use information of developable land within the Central Trunk sewer shed were provided by the City and used to determine the project fee for Zone 21. The construction cost attributable to the portion of flow from existing development within the Central Trunk sewer shed is approximately $5,939,000. Table 7-1 summarizes all of the facilities included in the NMCS, SMCS, CMSCS and the division of construction costs among the fee zones. For reference, Plate 7-A presents the three collection strategies and the fee zones established under the PFIP.

TABLE 7-1
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PFIP SEWER PROJECTS AND
PROJECTED COSTS BY ZONE

Link, Force Main, Pump Station, or Lift Station	Project Cost ($)	City Cost ($)	PFIP Costs ($)				
			Zone 21	Zone 22	Zone 24	Zone 25	Zone 26
Link 1	1,135,000	-	-	-	964,750	124,850	45,400
Link 2	770,000	-	-	-	654,500	84,700	30,800
Link 3	1,471,000	-	-	-	1,250,350	161,810	58,840
Link 4	764,000	-	-	-	649,400	84,040	30,560
Link 5	2,987,000	-	-	-	2,538,950	328,570	119,480
Link 8S	1,346,000	-	-	-	1,346,000	-	-
Link 9S	1,057,000	-	-	-	1,057,000	-	-
Link 10S	1,359,000	-	-	-	1,359,000	-	-
Link 14A	63,000	-	-	-	63,000	-	-
Link 22	3,633,000	-	-	-	3,633,000	-	-
Link 22S	800,000	-	-	-	800,000	-	-
Link 22S1	2,011,000	-	-	-	2,011,000	-	-
Link 22S2	1,016,000	-	-	-	1,016,000	-	-
Link 25	736,000	-	-	-	736,000	-	-
Link 33	924,000	-	-	-	-	674,520	249,480
Link 51	1,038,000	508,620	301,747	227,633	-	-	-
Link 52	749,000	374,500	213,465	161,035	-	-	-
Link 53	1,227,000	613,500	349,695	263,805	-	-	-
Link 54	1,353,000	-	-	1,353,000	-	-	-
Link 56	58,000	-	-	58,000	-	-	-
Link 66S2	838,000	-	-	838,000	-	-	-
Link 66S3	833,000	-	-	833,000	-	-	-
Link 66S4	129,000	-	-	129,000	-	-	-
Link 69S1	1,647,000	-	-	1,647,000	-	-	-
Link 69S2	362,000	-	-	362,000	-	-	-
Link 71	142,000	-	-	142,000	-	-	-
Link 72	363,000	-	-	363,000	-	-	-
Link 72A	1,774,000	-	-	1,774,000	-	-	-
Link 73B	147,000	-	-	147,000	-	-	-
Link 73	720,000	-	-	720,000	-	-	-
Link 74	289,000	-	-	289,000	-	-	-

TABLE 7-1 (CONTINUED)
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PFIP SEWER PROJECTS AND
PROJECTED COSTS BY ZONE

Link, Force Main, Pump Station, or Lift Station	Project Cost ($)	City Cost ($)	PFIP Costs ($)				
			Zone 21	Zone 22	Zone 24	Zone 25	Zone 26
Link 75	552,000	-	-	552,000	-	-	-
Link 76	418,000	-	-	418,000	-	-	-
Link 77	410,000	-	-	410,000	-	-	-
Link 79	1,231,000	-	-	1,231,000	-	-	-
Link 80	392,000	-	-	392,000	-	-	-
Link 81	1,220,000	-	-	1,220,000	-	-	-
Link 90	1,464,000	732,000	417,240	314,760	-	-	-
Link 91	754,000	377,000	214,890	162,110	-	-	-
Link 92	620,000	545,600	74,400	-	-	-	-
Link 93	319,000	280,720	38,280	-	-	-	-
Link 93S1	304,000	97,280	206,720	-	-	-	-
Link 94	319,000	287,100	31,900	-	-	-	-
Link 95	309,000	278,100	30,900	-	-	-	-
Link 96	441,000	396,900	44,100	-	-	-	-
Link 97	341,000	306,900	34,100	-	-	-	-
Link 98	371,000	333,900	37,100	-	-	-	-
Link 99	369,000	332,100	36,900	-	-	-	-
Link 100	539,000	485,100	53,900	-	-	-	-
Force Main 27N	263,000	-	-	-	263,000	-	-
Force Main 27S	165,000	-	-	-	165,000	-	-
Force Main 28	292,000	-	-	-	292,000	-	-
Force Main 36	1,565,000	-	-	-	1,565,000	-	-
Force Main FMN-01	336,000	-	-	336,000	-	-	-
Force Main OSFM	276,000	-	-	-	-	-	276,000
Austin Business Pump Station	1,145,000	-	-	-	1,145,000	-	-
Chadwick Pump Station	780,000	-	-	780,000	-	-	-
Louise Avenue Lift Station	780,000	-	-	780,000	-	-	-

TABLE 7-1 (CONTINUED)
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PFIP SEWER PROJECTS AND
PROJECTED COSTS BY ZONE

Link, Force Main, Pump Station, or Lift Station	Project Cost ($)	City Cost ($)	PFIP Costs ($)				
			Zone 21	Zone 22	Zone 24	Zone 25	Zone 26
Oakwood Shores Pump Station	780,000	-	-	-	-	-	780,000
South Airport Lift Station	780,000	-	-	-	780,000	-	-
South Main Lift Station	1,145,000	-	-	-	1,145,000	-	-
South Union Lift Station	780,000	-	-	-	780,000	-	-
SR-99 Lift Station	1,145,000	-	-	1,145,000	-	-	-
Trails of Manteca Lift Station	1,145,000	-	-	-	-	1,145,000	-
Yosemite Square Pump Station	1,145,000	-	-	-	1,145,000	-	-
Woodward Park, Stage 1 Upgrade	100,000	-	-	-	100,000	-	-
Tara Park, Stage 1 Upgrade	100,000	-	-	-	72,000	20,000	8,000
Tara Park, Stage 2 Upgrade	100,000	-	-	-	72,000	20,000	8,000
Total, All Projects	**54,936,000**	**5,949,320**	**2,085,337**	**17,048,343**	**25,602,950**	**2,643,490**	**1,606,560**

Projects are further summarized for each PFIP zone in Tables 7-2 through 7-6.

TABLE 7-2
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
ZONE 21 PROJECT TOTALS

Project Description	Total Project Cost ($)	Zone 21 Cost ($)
Sanitary Sewer Gravity Pipe		
Link 51	1,038,000	301,747
Link 52	749,000	213,465
Link 53	1,227,000	349,695
Link 90	1,464,000	417,240
Link 91	754,000	214,890
Link 92	620,000	74,400
Link 93	319,000	38,280
Link 93S1	304,000	206,720
Link 94	319,000	31,900
Link 95	309,000	30,900
Link 96	441,000	44,100
Link 97	341,000	34,100
Link 98	371,000	37,100
Link 99	369,000	36,900
Link 100	539,000	53,900
Total, Zone 21	**9,164,000**	**2,085,337**

TABLE 7-3
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
ZONE 22 PROJECT TOTALS

Project Description	Total Project Cost ($)	Zone 22 Cost ($)
Sanitary Sewer Gravity Pipe		
Link 51	1,038,000	227,633
Link 52	749,000	161,035
Link 53	1,227,000	263,805
Link 54	1,353,000	1,353,000
Link 56	58,000	58,000
Link 66S2	838,000	838,000
Link 66S3	833,000	833,000
Link 66S4	129,000	129,000
Link 69S1	1,647,000	1,647,000
Link 69S2	362,000	362,000
Link 71	142,000	142,000
Link 72	363,000	363,000
Link 72A	1,774,000	1,774,000
Link 73B	147,000	147,000
Link 73	720,000	720,000
Link 74	289,000	289,000
Link 75	552,000	552,000
Link 76	418,000	418,000
Link 77	410,000	410,000
Link 79	1,231,000	1,231,000
Link 80	392,000	392,000
Link 81	1,220,000	1,220,000
Link 90	1,464,000	314,760
Link 91	754,000	162,110
Sanitary Sewer Force Mains		
Force Main FMN-01	336,000	336,000
Sanitary Sewer Lift Stations		
Louise Avenue Lift Station	780,000	780,000
SR-99 Lift Station	1,145,000	1,145,000
Sanitary Sewer Pump Stations		
Chadwick Pump Station	780,000	780,000
Total, Zone 22	**21,151,000**	**17,048,343**

TABLE 7-4
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
ZONE 24 PROJECT TOTALS

Project Description	Total Project Cost ($)	Zone 24 Cost ($)
Sanitary Sewer Gravity Pipe		
Link 1	1,135,000	964,750
Link 2	770,000	654,500
Link 3	1,471,000	1,250,350
Link 4	764,000	649,400
Link 5	2,987,000	2,538,950
Link 8S	1,346,000	1,346,000
Link 9S	1,057,000	1,057,000
Link 10S	1,359,000	1,359,000
Link 14A	63,000	63,000
Link 22	3,633,000	3,633,000
Link 22S	800,000	800,000
Link 22S1	2,011,000	2,011,000
Link 22S2	1,016,000	1,016,000
Link 25	736,000	736,000
Sanitary Sewer Force Mains		
Force Main 27N	263,000	263,000
Force Main 27S	165,000	165,000
Force Main 28	292,000	292,000
Force Main 36	1,565,000	1,565,000
Sanitary Sewer Lift Stations		
South Airport Lift Station	780,000	780,000
South Main Lift Station	1,145,000	1,145,000
South Union Lift Station	780,000	780,000
Sanitary Sewer Pump Stations		
Austin Business Pump Station	1,145,000	1,145,000
Yosemite Square Pump Station	1,145,000	1,145,000
Woodward Park, Stage 1 Upgrade	100,000	100,000
Tara Park, Stage 1 Upgrade	100,000	72,000
Tara Park, Stage 2 Upgrade	100,000	72,000
Total, Zone 24	**26,728,000**	**25,602,950**

TABLE 7-5
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
ZONE 25 PROJECT TOTALS

Project Description	Total Project Cost ($)	Zone 25 Cost ($)
Sanitary Sewer Gravity Pipe		
Link 1	1,135,000	124,850
Link 2	770,000	84,700
Link 3	1,471,000	161,810
Link 4	764,000	84,040
Link 5	2,987,000	328,570
Link 33	924,000	674,520
Sanitary Sewer Lift Stations		
Trails of Manteca Lift Station	1,145,000	1,145,000
Sanitary Sewer Pump Stations		
Tara Park, Stage 1 Upgrade	100,000	20,000
Tara Park, Stage 2 Upgrade	100,000	20,000
Total, Zone 25	**9,396,000**	**2,643,490**

TABLE 7-6
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
ZONE 26 PROJECT TOTALS

Project Description	Total Project Cost ($)	Zone 26 Cost ($)
Sanitary Sewer Gravity Pipe		
Link 1	1,135,000	45,400
Link 2	770,000	30,800
Link 3	1,471,000	58,840
Link 4	764,000	30,560
Link 5	2,987,000	119,480
Link 33	924,000	249,480
Sanitary Sewer Force Mains		
Force Main OSFM	276,000	276,000
Sanitary Sewer Lift Stations		
Oakwood Shores Pump Station	780,000	780,000
Sanitary Sewer Pump Stations		
Tara Park, Stage 1 Upgrade	100,000	8,000
Tara Park, Stage 2 Upgrade	100,000	8,000
Total, Zone 26	**9,307,000**	**1,606,560**

8 References

[1] *City of Manteca General Plan 2023 Policy Document*, adopted October 6, 2003.

[2] *City of Manteca General Plan Housing Element*, adopted June 15, 2010.

[3] *City of Manteca Wastewater Collection System Master Plan Update*, prepared by Nolte Associates, Inc., December 2006.

[4] *City of Manteca Addendum to 2006 Wastewater Collection System Master Plan Update*, prepared by Nolte Associates, Inc., November 2008.

[5] *Sewer Master Plan for City of Manteca Public Facilities Implementation Plan*, Nolte Associates, Inc., December 1993.

[6] *City of Manteca Wastewater Collection System Master Plan, Wastewater Generation Factors, Technical Memorandum*, Nolte Associates, Inc., February 2004.

[7] *City of Manteca Wastewater Collection System 2011 Master Plan Update, Wastewater Generation Factors, Technical Memorandum – Draft*, Nolte Associates, Inc., November 2010.

[8] *City of Manteca Preliminary Trunk Sewer Design, North Manteca Trunk Sewer, South Manteca Trunk Sewer, Union Road Outfall*, Nolte Associates, Inc., November 2002.

[9] *2009 Contract Cost Data*, prepared by State of California Department of Transportation, 2010. http://www.dot.ca.gov/hq/esc/oe/awards/2009CCDB/2009ccdb.pdf

[10] *ENR Cost Indexes in San Francisco*, Engineering News Record, October 2012. http://enr.construction.com