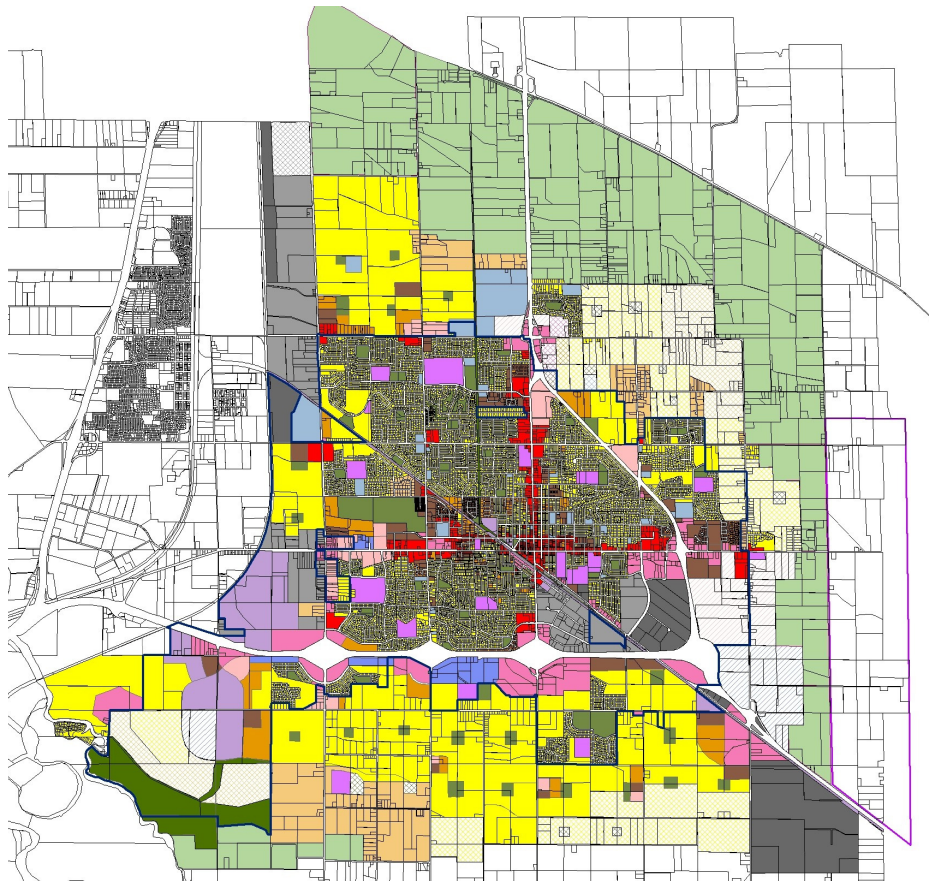


**CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM
MASTER PLAN UPDATE**



January 2013



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2012 WASTEWATER COLLECTION SYSTEM
MASTER PLAN UPDATE

January 2013



2.14.13



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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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LIST OF ABBREVIATIONS

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

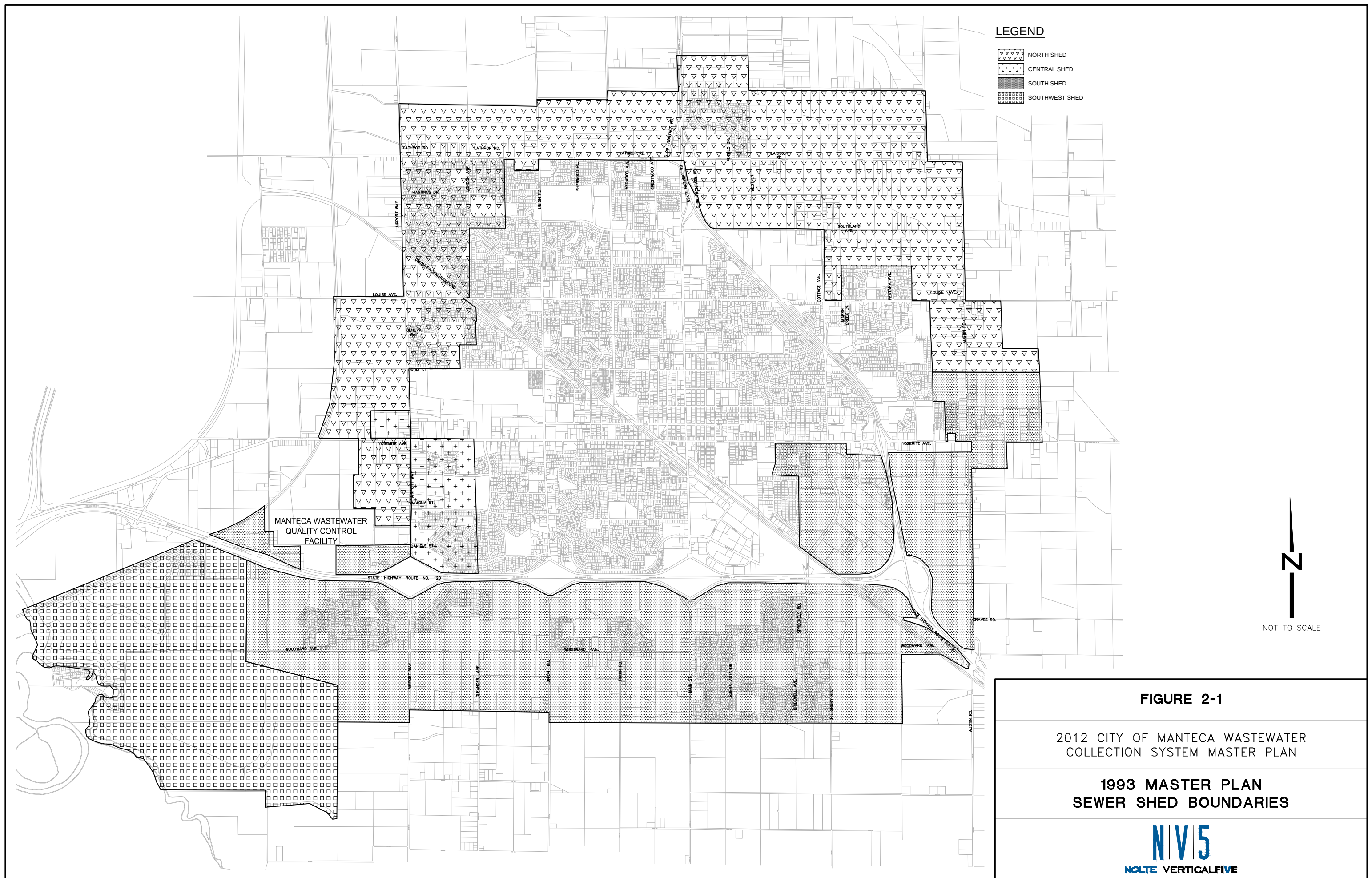
This 2012 Master Plan was developed based on information provided in previous sewer master plans. The two preceding sewer master plans and a subsequent addendum are summarized in the following chapter.

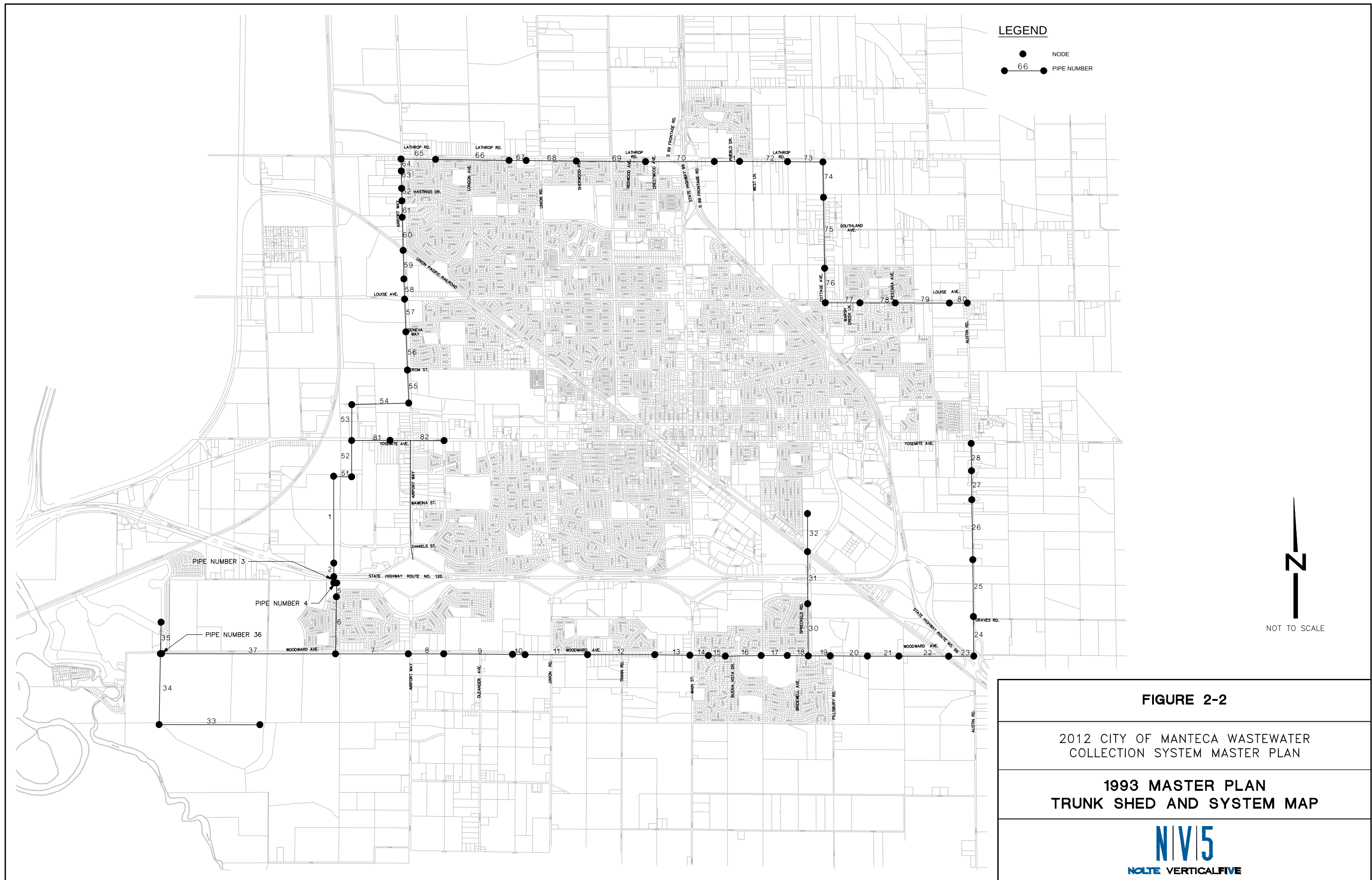
2.1 1993 Sewer System Master Plan

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.





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
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
WASTEWATER GENERATION FACTORS

Land Use	Designation	Density ^a (edu/ac)	Wastewater Generation Factor ^b (gpd/ac)
<u>Residential – Existing Development</u>			
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
<u>Residential – New Development</u>			
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
<u>Other – Existing and New Development</u>			
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.

Recommended Peaking Factor Curve

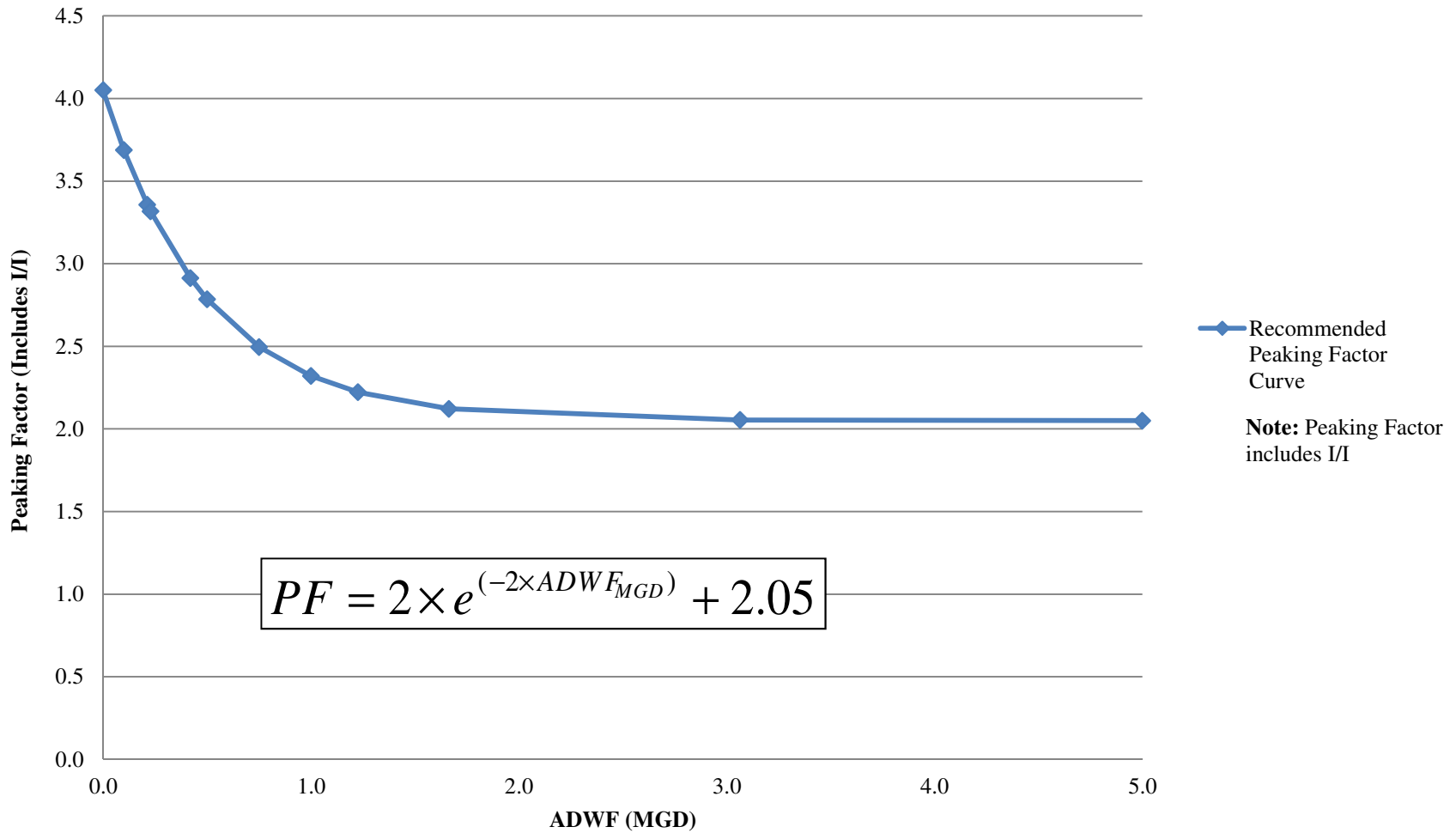


FIGURE 3-1

**2012 CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN**

PEAKING FACTOR CURVE

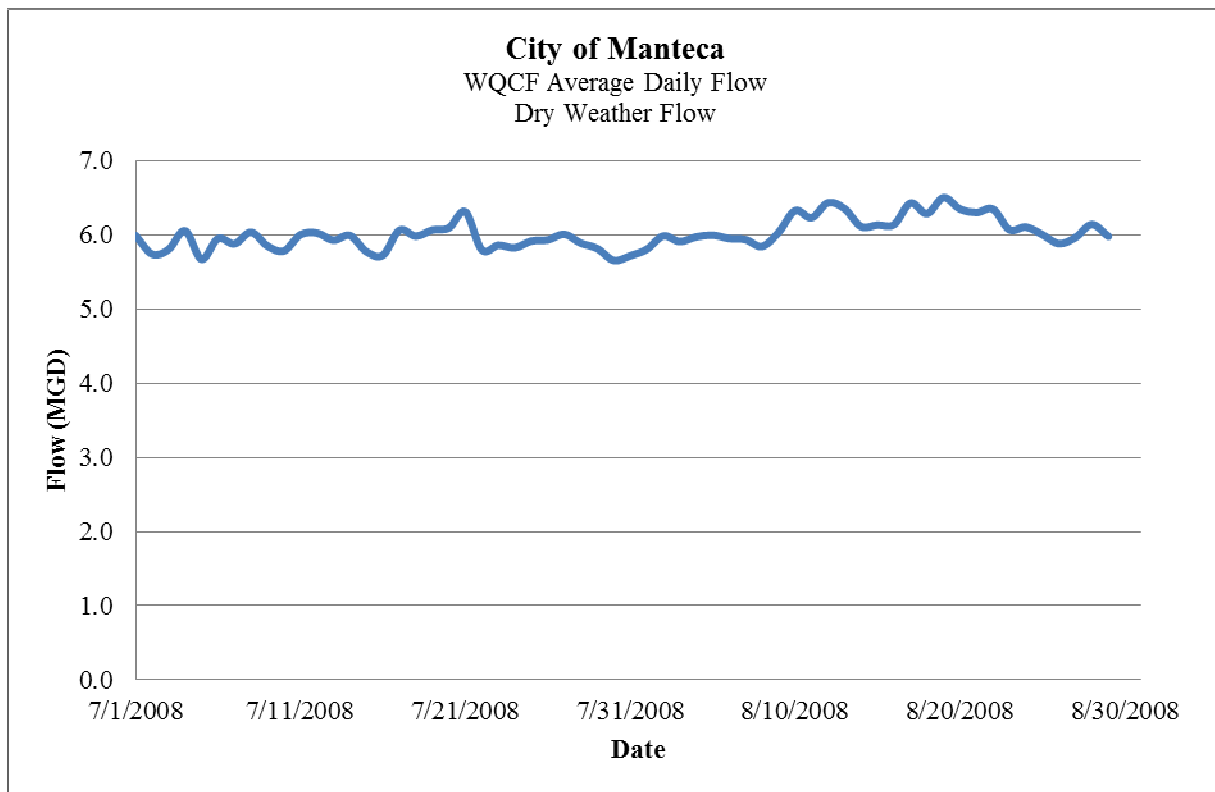


Figure 3-2 WQCF Average Daily Flow for July-August 2008

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 vector 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.

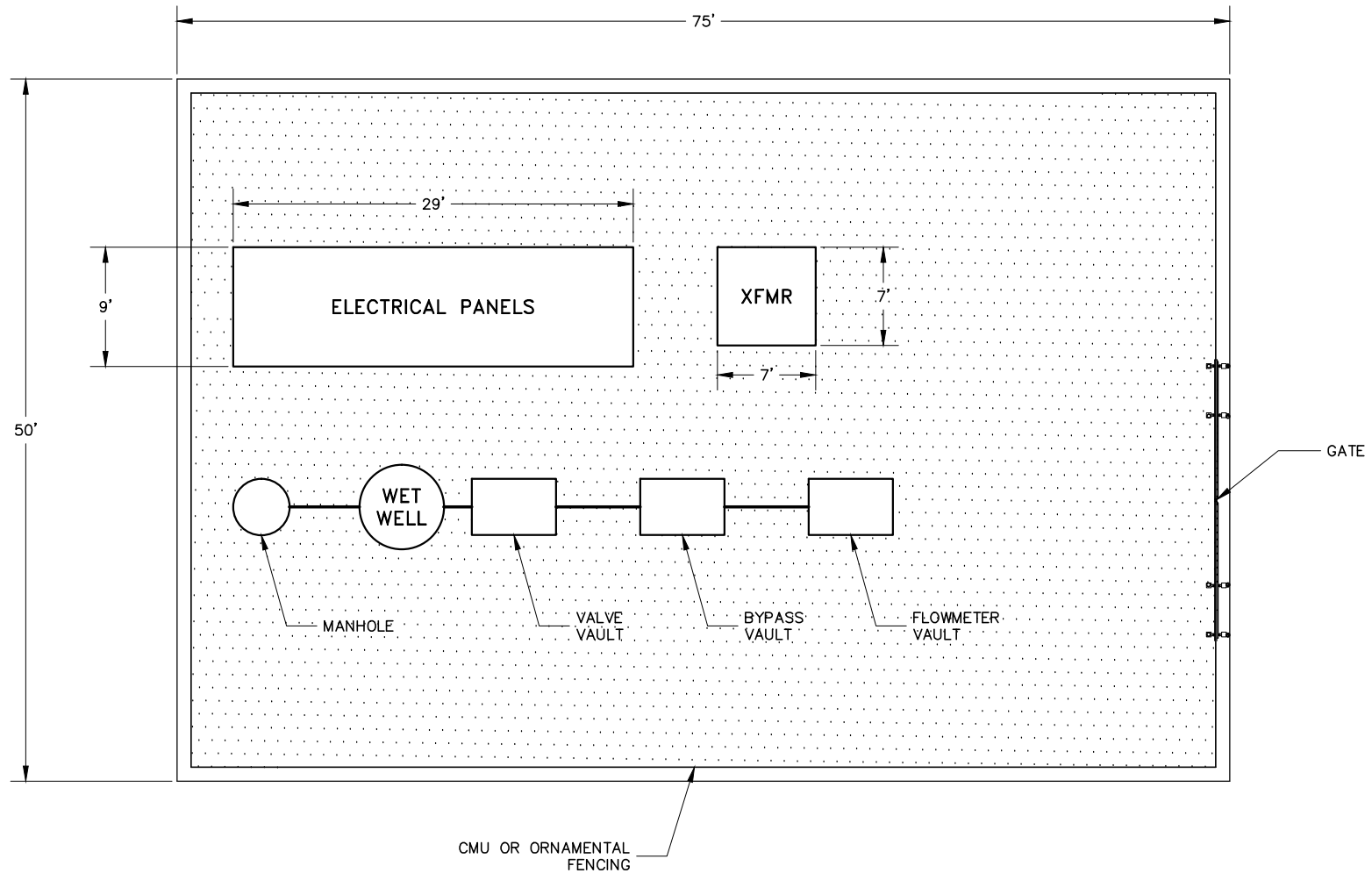


FIGURE 3-3

2012 CITY OF MANTECA WASTEWATER
COLLECTION SYSTEM MASTER PLAN

**TYPICAL PUMP STATION SITE PLAN
FOR CIRCULAR WET WELL**

N|V|5
NOLTE VERTICAL FIVE

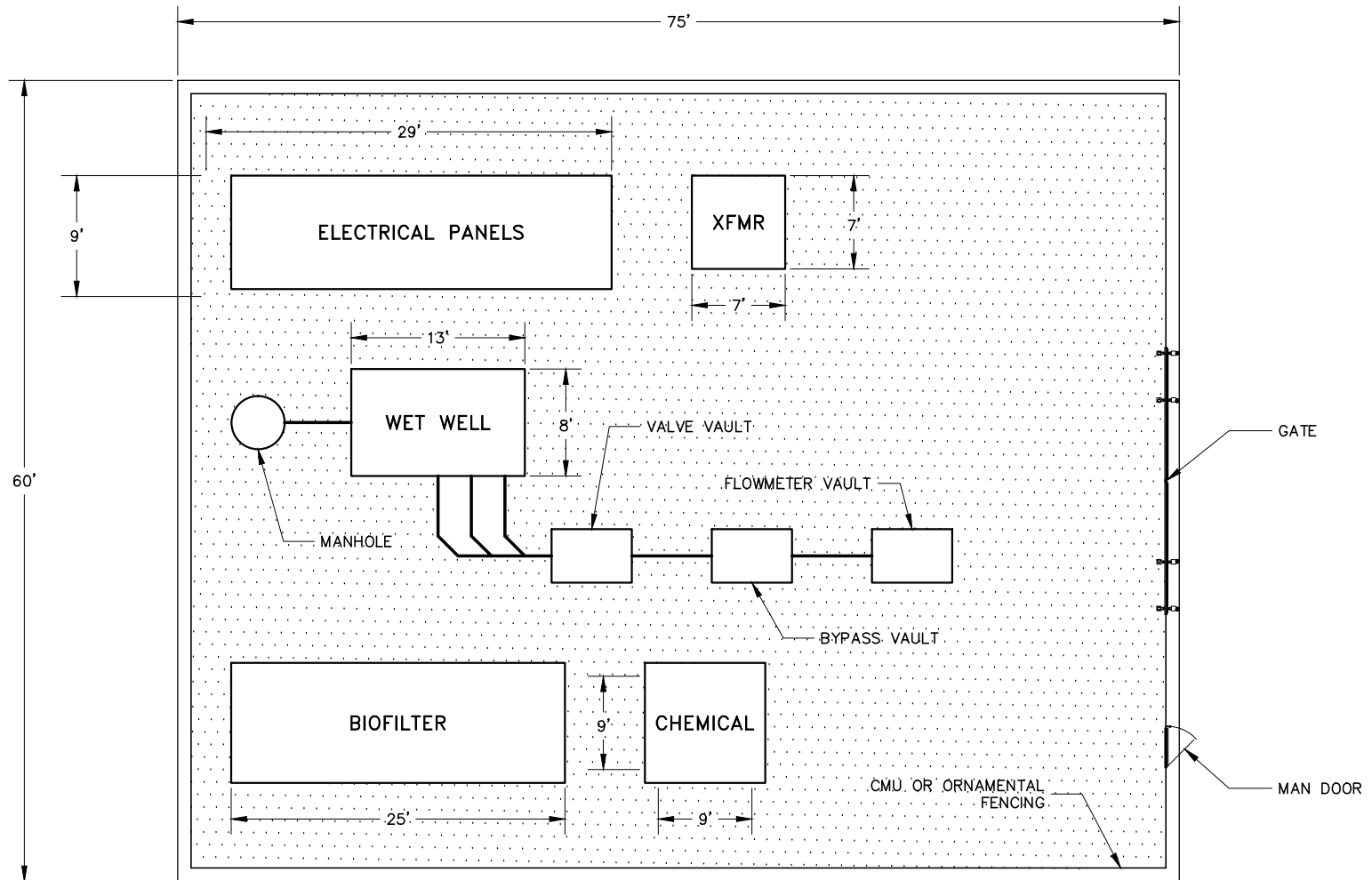


FIGURE 3-5

2012 CITY OF MANTECA WASTEWATER
COLLECTION SYSTEM MASTER PLAN

**TYPICAL PUMP STATION SITE PLAN
FOR RECTANGULAR WET WELL**

N|V|5
NOLTE VERTICAL FIVE

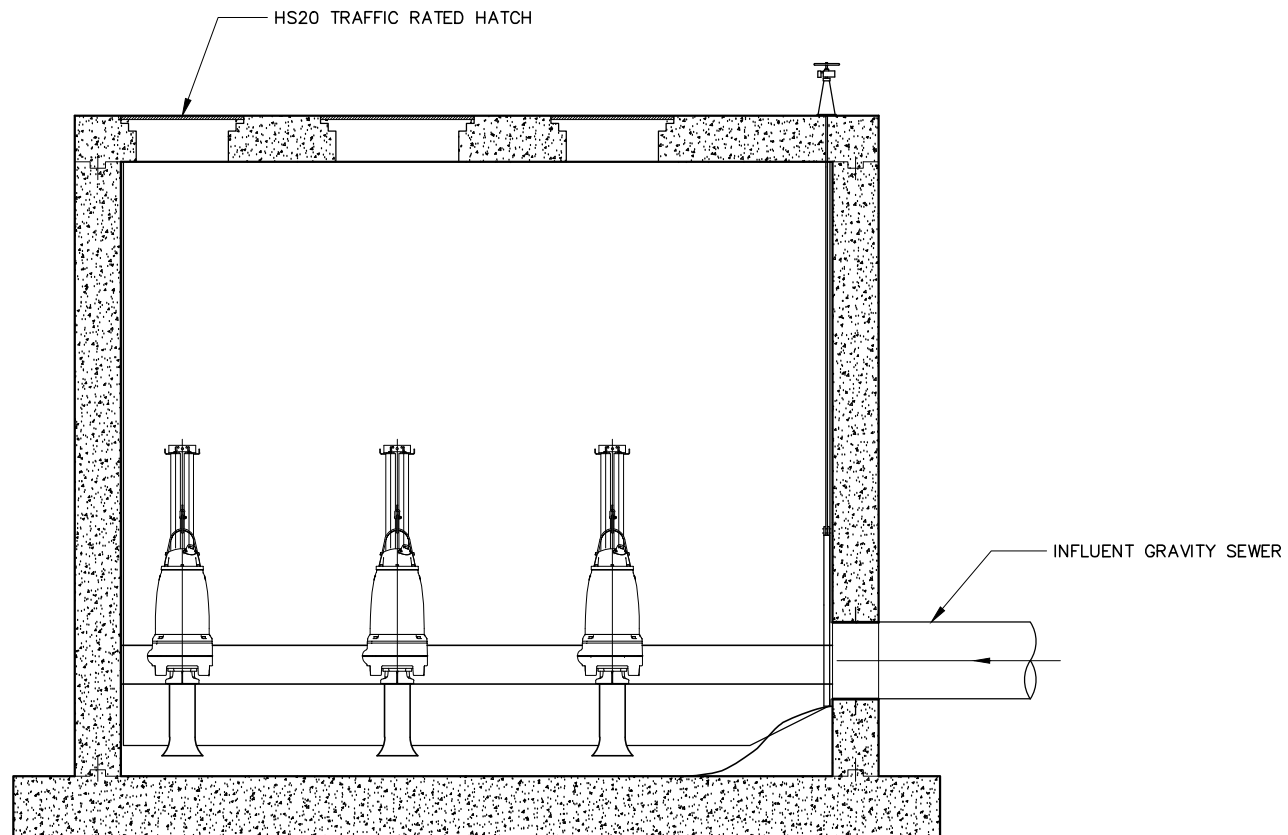


FIGURE 3-6

2012 CITY OF MANTECA WASTEWATER
COLLECTION SYSTEM MASTER PLAN

**TYPICAL SECTION FOR
RECTANGULAR WET WELL**

N|V|5
NOLTE VERTICAL FIVE

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.

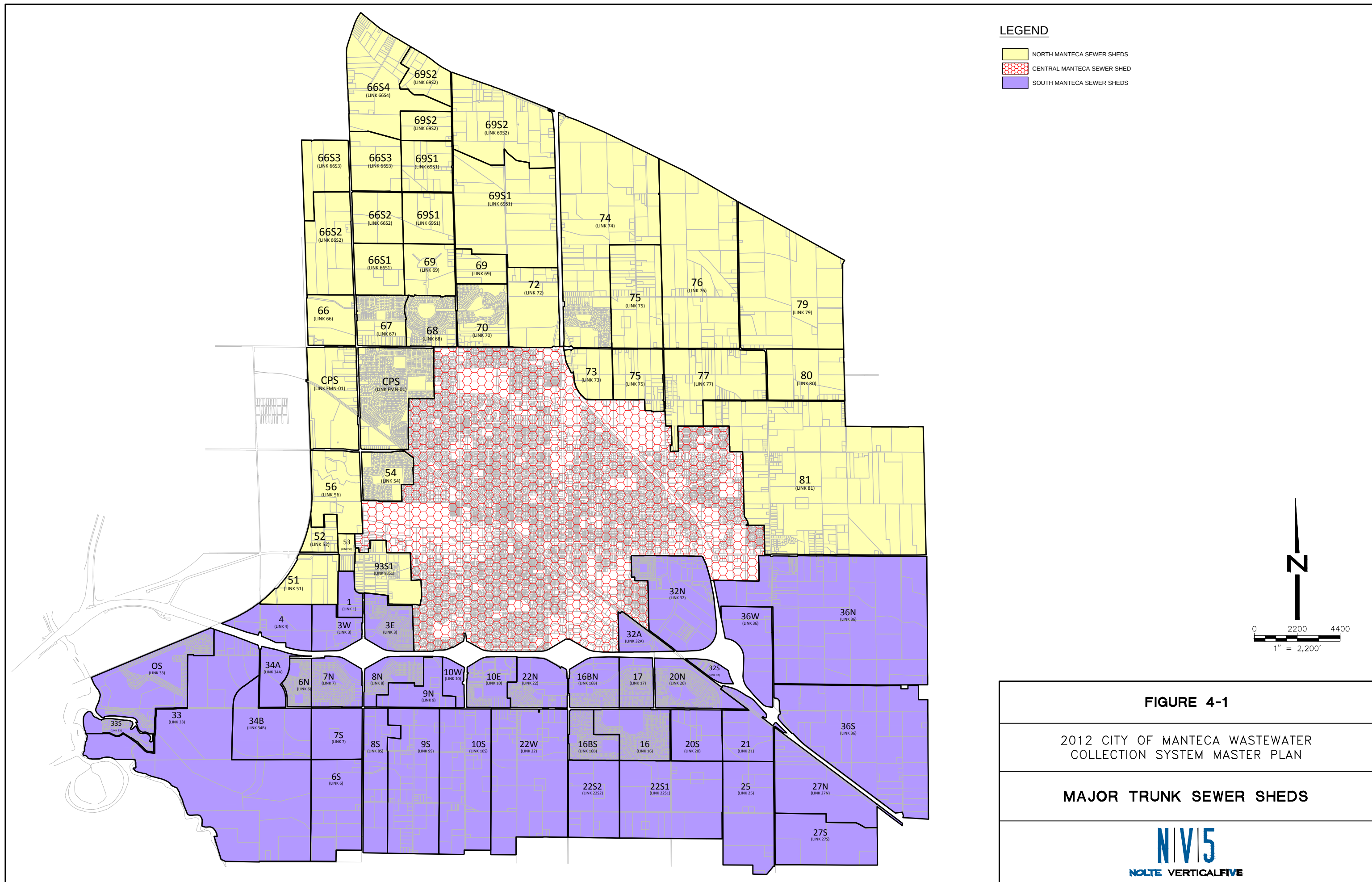
4.1 Sewer Collection System Strategy

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.



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).

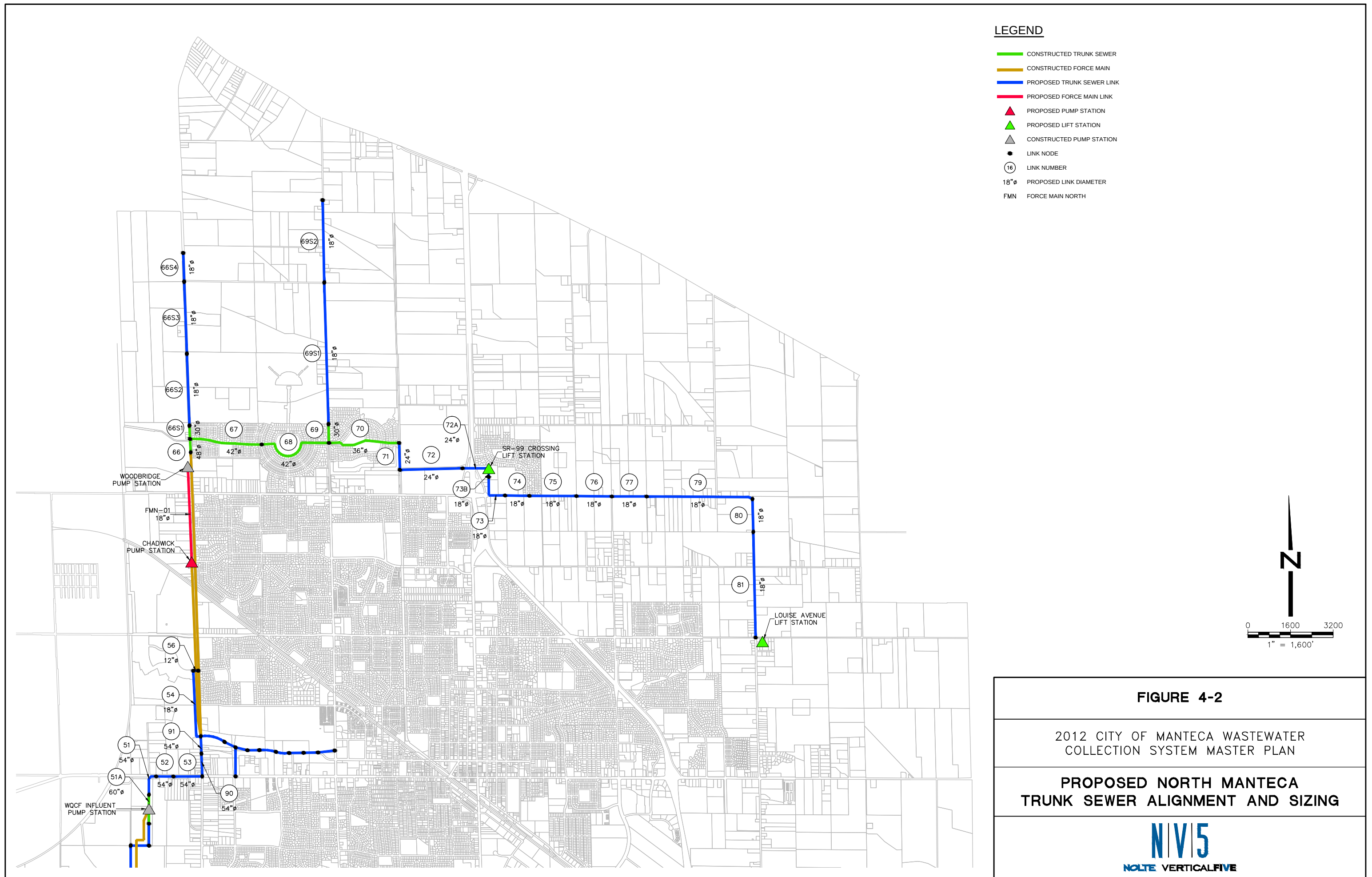
4.4 Description of Proposed Trunk Sewer

Each trunk sewer is described below.

a. North Manteca Collection Strategy

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.



City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 4: Recommended Collection System Strategy

TABLE 4-1
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
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.

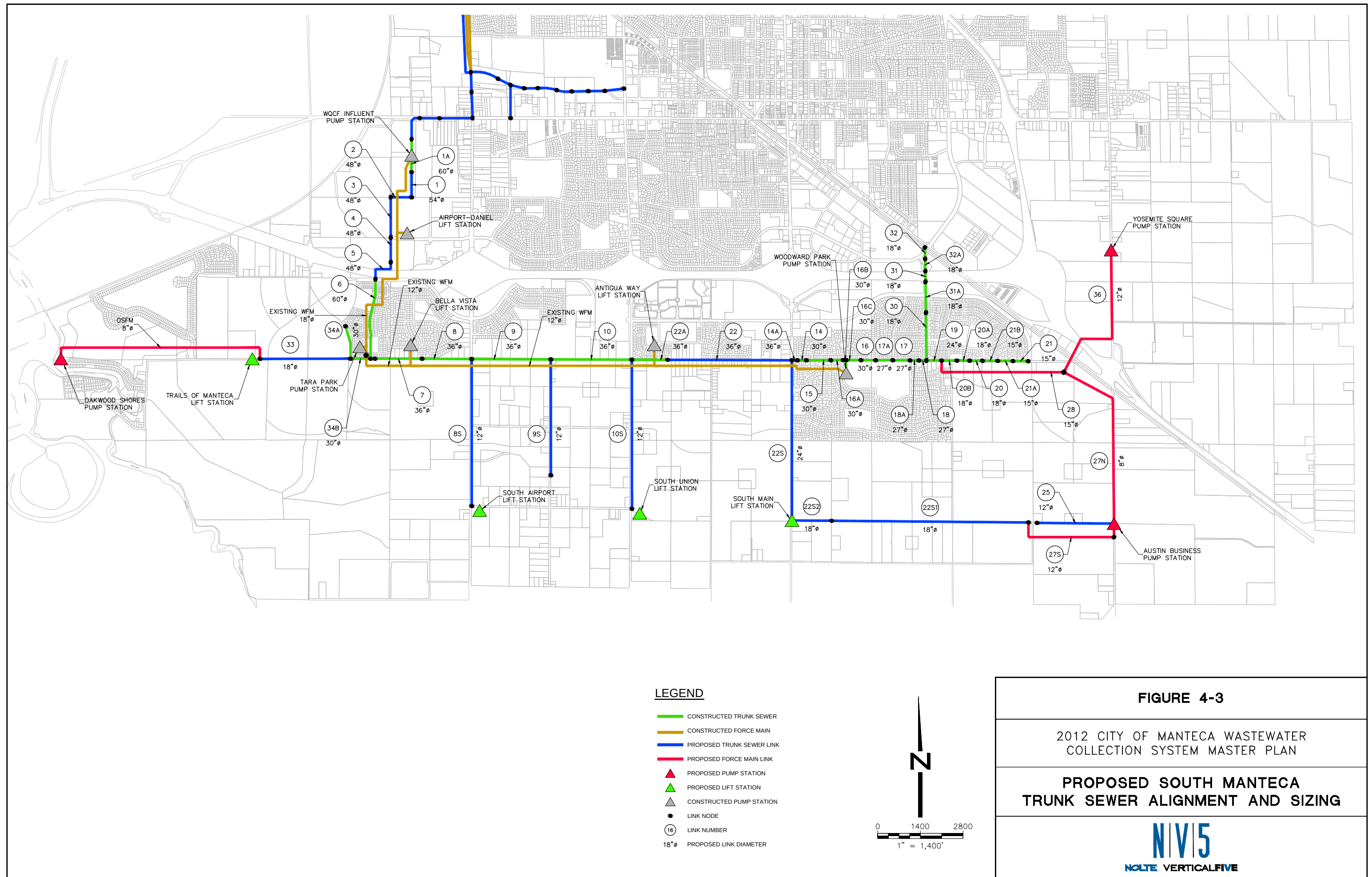
b. South Manteca Collection Strategy

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.



City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 4: Recommended Collection System Strategy

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.

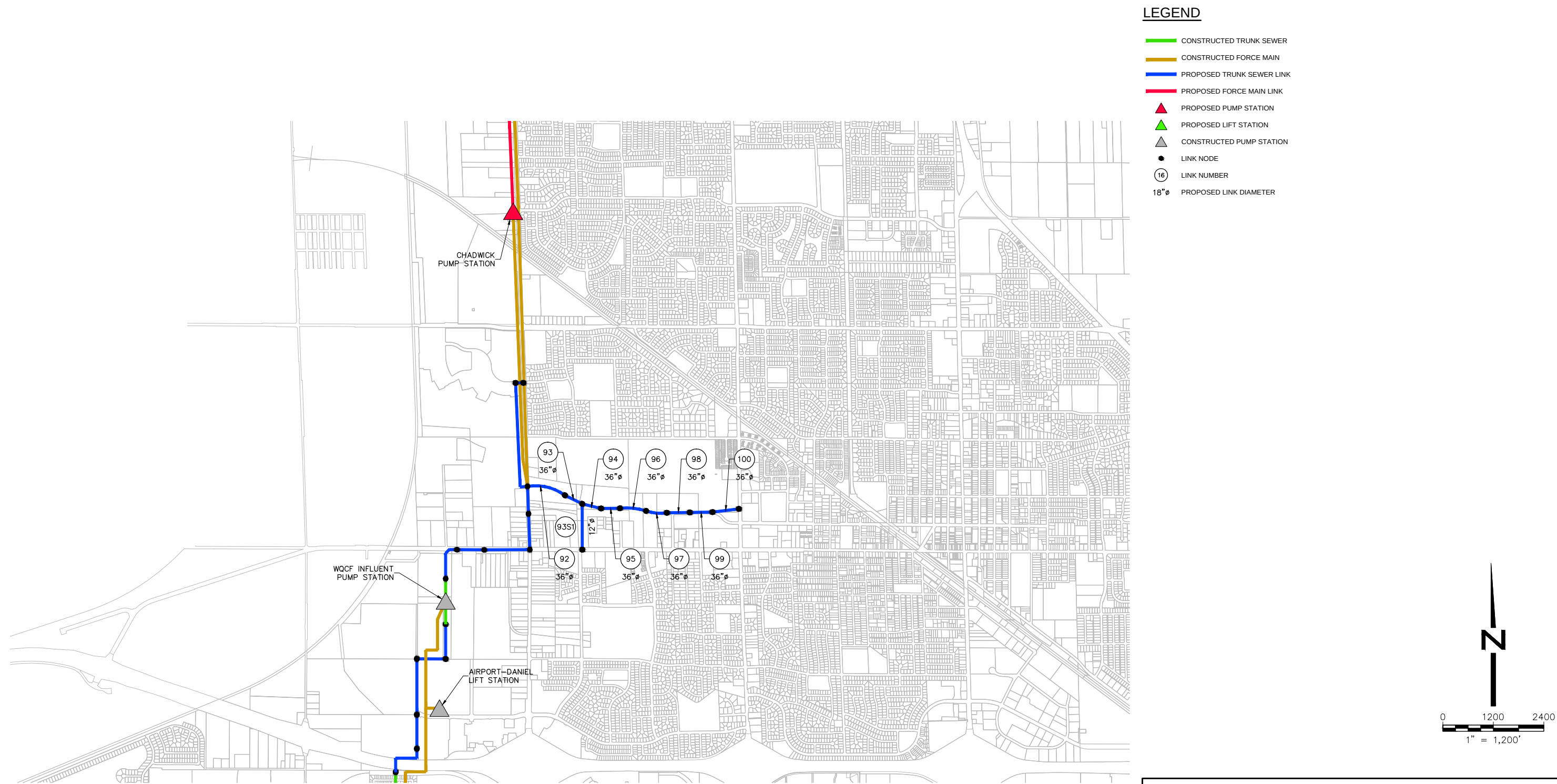


TABLE 4-4
CITY OF MANTECA
2012 WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CENTRAL MANTECA TRUNK SEWER PRELIMINARY DESIGN

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.

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 5: Recommended System Improvements

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.

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 5: Recommended System Improvements

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.

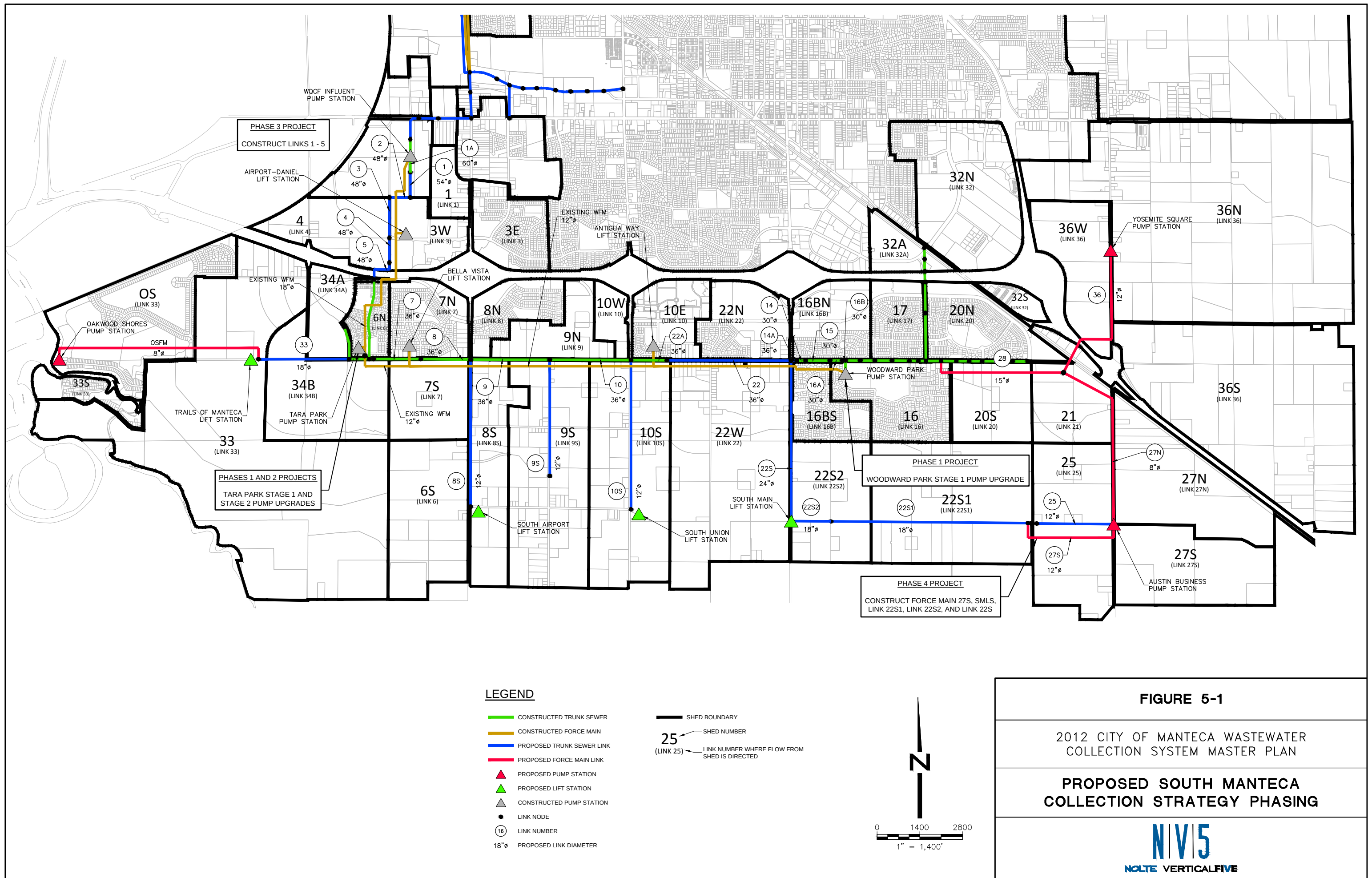
The phasing plan presented in this 2012 Master Plan provides direction for the City regarding timing requirements, in terms of flow, for construction of critical SMCS components, as well as interim upgrades at Woodward Park Pump Station and Tarra Park Pump Station. Final recommendations of these improvements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



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].

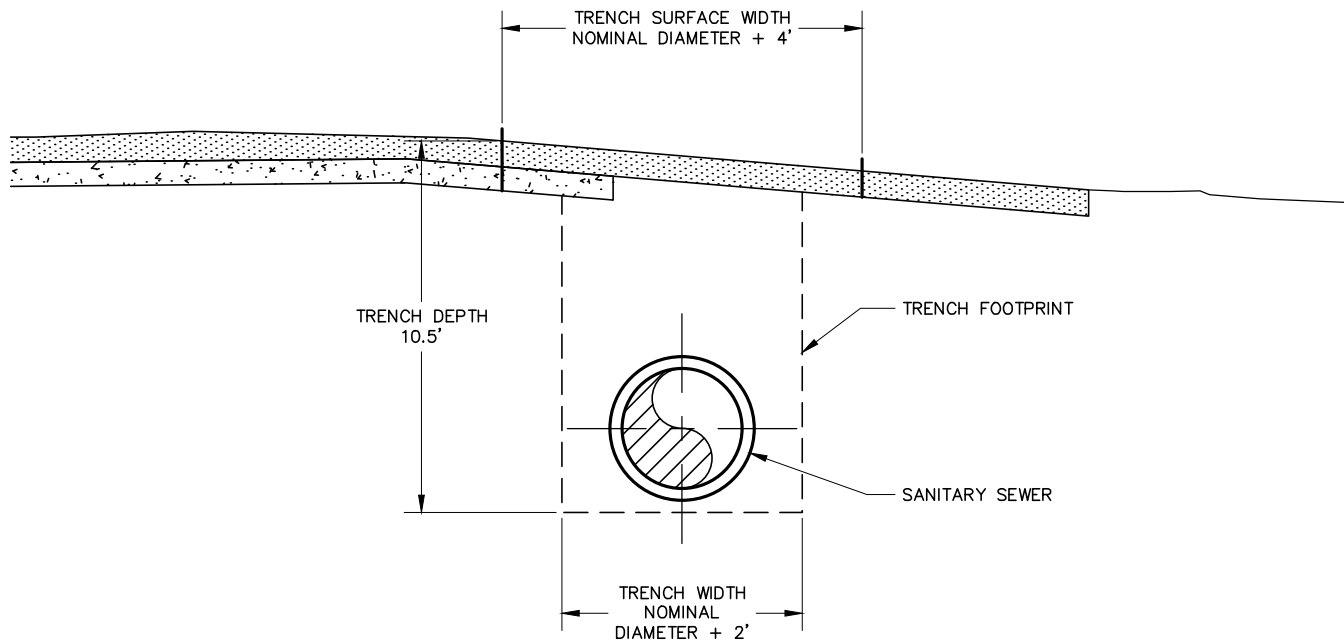
The excavation costs were multiplied by the appropriate units based on probable trench dimensions. The assumptions used for the width and depth for a conventional open cut trench are shown in Table 6-2 and are depicted in Figures 6-1, 6-2, 6-3, and 6-4.

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



0-10 FT DEPTH
TRENCH SECTION

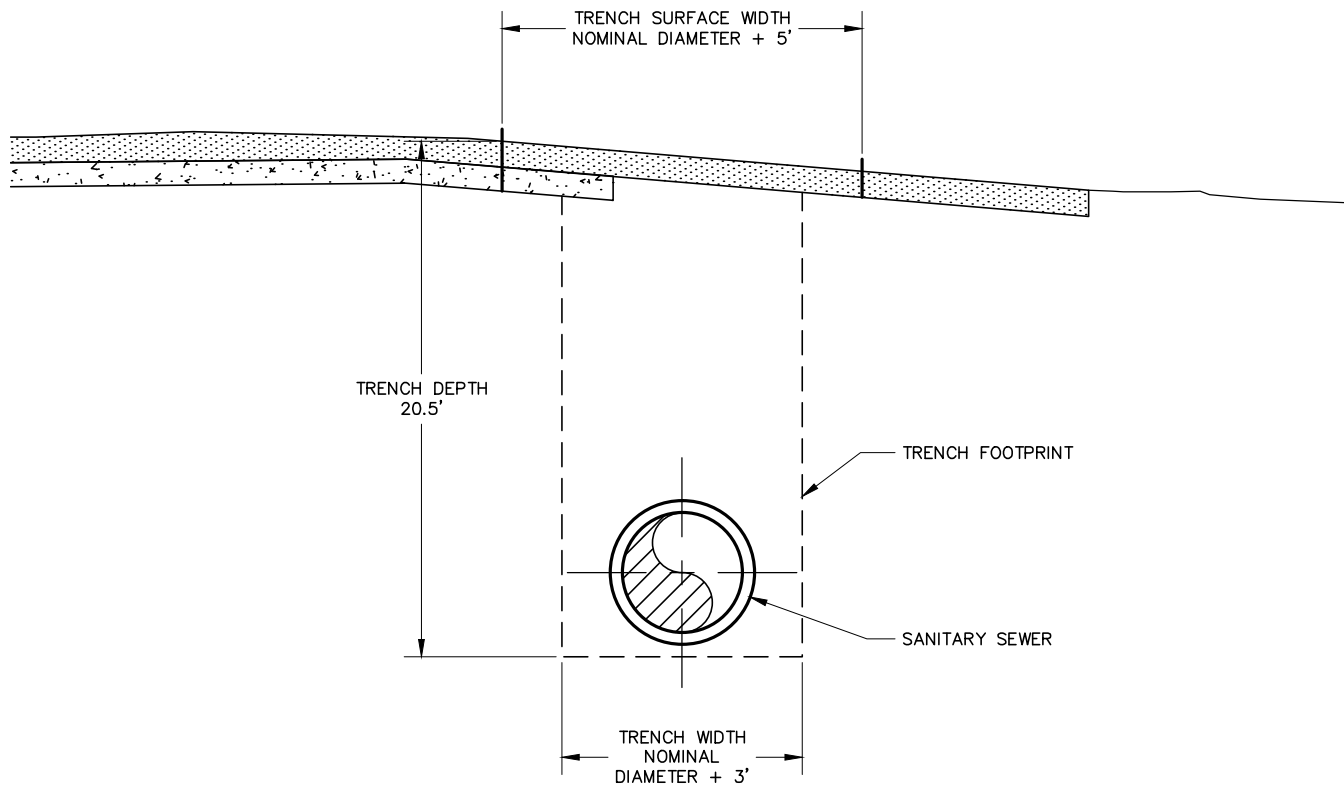
NOT TO SCALE

FIGURE 6-1

2012 CITY OF MANTECA WASTEWATER
COLLECTION SYSTEM MASTER PLAN

**ASSUMED OPEN TRENCH DIMENSIONS
0-10 FT DEPTH**

N|V|5
NOLTE VERTICALFIVE



10-20 FT DEPTH
TRENCH SECTION

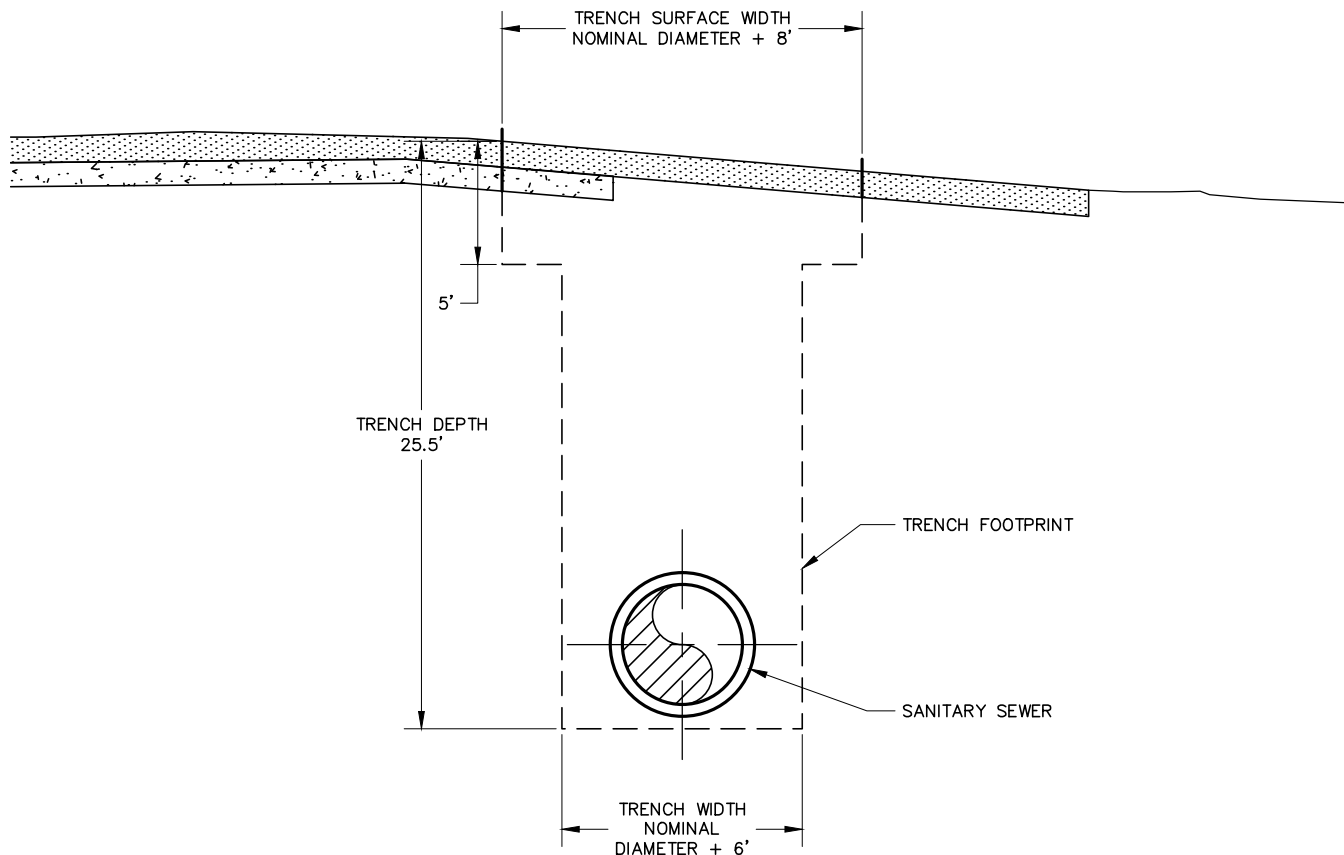
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FIGURE 6-2

2012 CITY OF MANTECA WASTEWATER
COLLECTION SYSTEM MASTER PLAN

**ASSUMED OPEN TRENCH DIMENSIONS
10-20 FT DEPTH**

N|V|5
NOLTE VERTICAL FIVE



20-25 FT DEPTH TRENCH SECTION

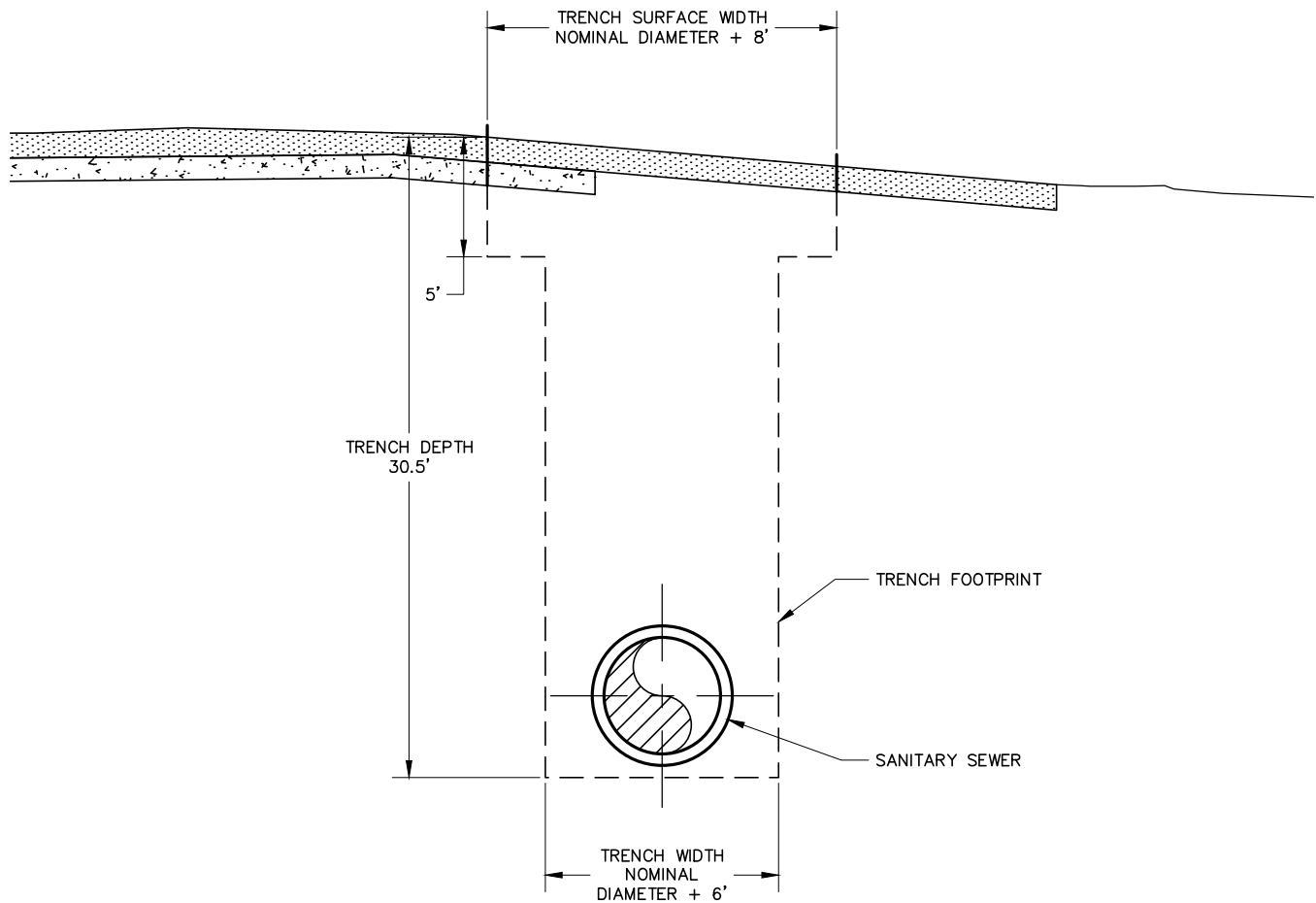
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FIGURE 6-3

2012 CITY OF MANTECA WASTEWATER
COLLECTION SYSTEM MASTER PLAN

ASSUMED OPEN TRENCH DIMENSIONS
20-25 FT DEPTH





25-30 FT DEPTH
TRENCH SECTION

NOT TO SCALE

FIGURE 6-4

2012 CITY OF MANTECA WASTEWATER
COLLECTION SYSTEM MASTER PLAN

**ASSUMED OPEN TRENCH DIMENSIONS
25-30 FT DEPTH**

N|V|5
NOLTE VERTICAL FIVE

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 (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.

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 6: Probable Construction Costs

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 (\$)				Total
		Earthwork ^a	Dewatering	Pavement Replacement	Piping and Installation ^b	
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

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 6: Probable Construction Costs

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 (\$)				Total
		Earthwork ^a	Dewatering	Pavement Replacement	Piping and Installation ^b	
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

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 6: Probable Construction Costs

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 (\$)				Total
		Earthwork ^a	Dewatering	Pavement Replacement	Piping and Installation ^b	
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

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 6: Probable Construction Costs

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 (\$)				Total
		Earthwork ^a	Dewatering	Pavement Replacement	Piping and Installation ^b	
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.

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 6: Probable Construction Costs

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 (\$)				Total
	Pipe	Manhole	Pump or Lift Station	Force Main	
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.

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 6: Probable Construction Costs

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 (\$)				Total
	Pipe	Manhole	Pump or Lift Station	Force Main	
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.

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 7: Capital Improvement Plan

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	-	-	-

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 7: Capital Improvement Plan

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	-	-	-

City of Manteca
2012 Wastewater Collection System Master Plan Update
Chapter 7: Capital Improvement Plan

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

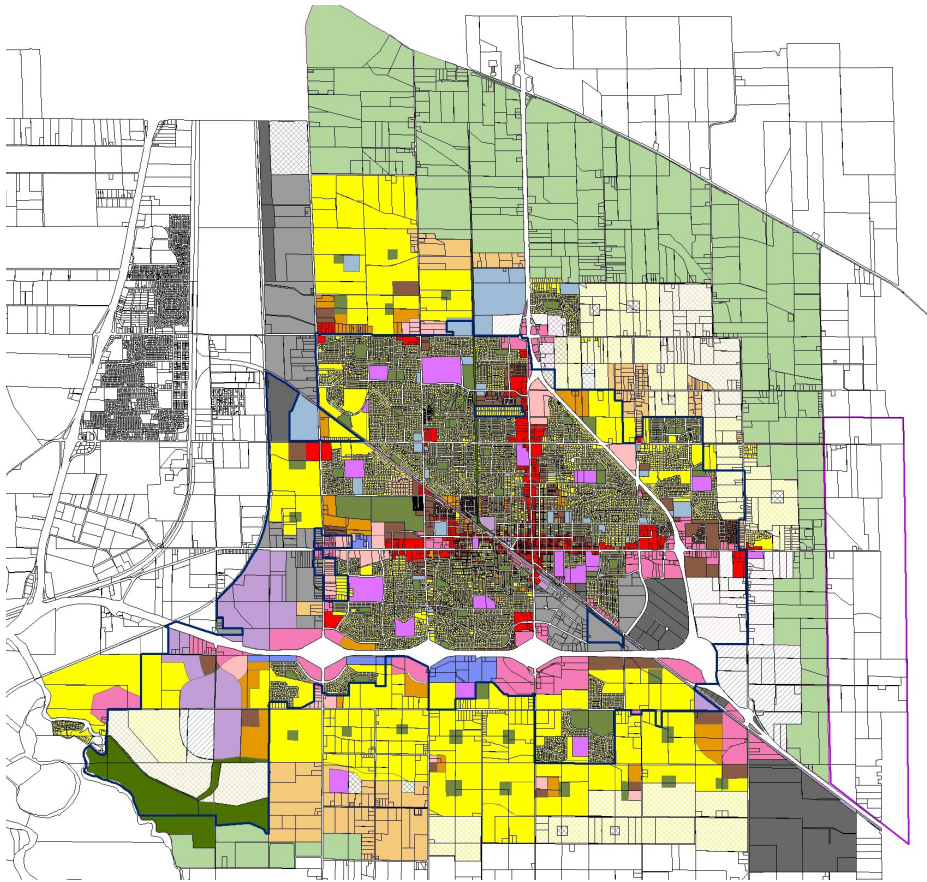
- [1] *City of Manteca General Plan 2023 Policy Document*, adopted October 6, 2003.
- [2] *City of Manteca General Plan Housing Element*, adopted June 15, 2010.
- [3] *City of Manteca Wastewater Collection System Master Plan Update*, prepared by Nolte Associates, Inc., December 2006.
- [4] *City of Manteca 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>

APPENDIX A

WASTEWATER GENERATION FACTORS TECHNICAL MEMORANDUM

**CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM
2010 MASTER PLAN UPDATE**

**WASTEWATER GENERATION FACTORS
TECHNICAL MEMORANDUM**



DRAFT

November 2010

NOLTE
BEYOND ENGINEERING

CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM
2010 MASTER PLAN UPDATE
WASTEWATER GENERATION FACTORS
TECHNICAL MEMORANDUM
DRAFT

November 2010



Submitted to:

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

Prepared by:

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1215 West Center Street, Suite 201
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**CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM
2010 MASTER PLAN UPDATE
WASTEWATER GENERATION FACTORS**

**TECHNICAL MEMORANDUM
DRAFT**

November 2010

A 2010 update (2010 Master Plan) to the 2006 City of Manteca (City) Wastewater Collection System Master Plan Update (2006 Master Plan Update) [1] is under preparation. Consistent with previous documents, the 2010 Master Plan will propose the construction of three large diameter trunk sewers and a series of lift stations/pump stations 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).

The 2010 Master Plan will include modified wastewater generation factors for residential, commercial, and industrial land uses based on upcoming water conservation legislation for residential development and historical water use data from local businesses. The local business parks evaluated in this technical memorandum include Big League Dreams (BLD) commercial properties and Spreckels Park located in Manteca.

Previous Generation Factors

Current wastewater generation factors (WGFs) for residential and industrial land uses as presented in the 2006 Master Plan Update are provided in Table 1. The current WGFs for residential land use range from 530 gallons per day per acre (gpd/acre) for very low density residential to 3,789 gpd/acre for high density residential. These residential WGFs equate to an individual water use rate of approximately 70 gallons per capita per day (gpcd) and were based on an analysis of flows at the WQCF in 2002-2003. The current WGF for both heavy and light industrial land uses is 2,010 gpd/acre.

TABLE 1
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PREVIOUS WASTEWATER GENERATION FACTORS

Land Use	Designation	Population Density ^a , persons/edu ^b	Density ^c , edu/acre	Wastewater Generation Factor		
				gpcd	gpd/edu ^a	gpd/acre ^d
Very low density residential	VLDR	3.68	Less than 2	72.0	265	530 ^e
Low density residential	LDR	3.68	2.1-8	72.0	265	1,338 ^f
Medium density residential	MDR	2.68	8.1-15	70.5	189	2,183 ^g
High density residential	HDR	2.68	15.1-25	70.5	189	3,789 ^h
General commercial	GC	--	--	--	--	1,120
Heavy industrial	HI	--	--	--	--	2,010
Light industrial	LI	--	--	--	--	2,010

^a Based on February 2004 Wastewater Generation Factor TM [2]

^b edu = equivalent dwelling unit

^c Based on the adopted 2003 General Plan [3]

^d Nonresidential generation factors based on the 1993 Master Plan [4]

^e Generation factor based on 265 gpd/edu [2] and density of 2.00 dwelling units per acre

^f Generation factor based on 265 gpd/edu [2] and density of 5.05 dwelling units per acre

^g Generation factor based on 189 gpd/edu [2] and density of 11.55 dwelling units per acre

^h Generation factor based on 189 gpd/edu [2] and density of 20.05 dwelling units per acre

Methodology for Updated Generation Factors

The methodology to determine adjustments in WGFs for residential, commercial, and industrial land uses is provided below.

Residential

California recently approved the 2010 California Green Building Standards Code (CALGreen 2010) which requires new buildings in California to become more efficient by mandating new construction to meet minimum standards. CALGreen 2010 requires compliance effective January 1, 2011, as Part 11 of California Code of Regulations (CCR) Title 24.

When addressing residential water use, CALGreen 2010 requires a 20 percent reduction in indoor water use from the 2008 Title 24 baseline, through either prescriptive or performance methods. The prescriptive method requires installation of ultra low fixtures for showerheads, bathroom and kitchen faucets, and toilets. The performance method requires a demonstrated 20 percent reduction in baseline water use, with options for compliance left to the builder. Historical flow rates of water fixtures and clothes washers over time are presented in Table 2.

TABLE 2
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
REQUIRED FLOW RATES OF FIXTURES AND APPLIANCES OVER TIME ^a

Fixture/Appliance	Year				
	1975	1980	1992	2008	2011 ^d
Shower (gpm ^b)	3.5	2.5	2.5	2.5	2.0
Toilets (gpf ^c)	5.0	3.6	1.6	1.6	1.28
Faucets (gpm)	2.5	2.5	2.5	2.2	1.8
Clothes washers (gal/cu. ft.)	15.0	15.0	15.0	8.5	6.0 ^e

^a *Water Use in the California Residential Home*, January 2010 [5]

^b gpm = gallons per minute

^c gpf = gallons per foot

^d CALGreen 2010 fixture rates for prescriptive method of compliance, effective January 2011

^e Regulated by CCR Title 20, Div 2, Ch 4, Article 4, Section 1605.3

Other legislation and water conservation programs include the 20x2020 Water Conservation Plan, LEED, Senate Bill (SB) 407, and EPA WaterSense[®] Program, each of which have similar goals in water use reduction and efficiency to CALGreen.

The 20x2020 Water Conservation Plan (SB7 legislation) requires a statewide 20 percent per capita reduction in urban water demands by 2020 while LEED has a prerequisite to reduce indoor water usage 20 percent beyond 1992 standards. SB407 mandates retrofit of non-compliant plumbing fixtures in pre-1994 homes. Beginning in January 2014, all building alterations or improvements to single-family, multi-family, and commercial properties will require non-compliant fixtures to be replaced for final permit approval by local building departments. Starting in January 2017, a seller or transferor of a property must disclose to the purchaser the requirement for replacing plumbing fixtures. Furthermore, beginning in January 2019, all non-compliant plumbing fixtures in multi-family and commercial properties must be replaced. The EPA WaterSense[®] program also requires a 20 percent reduction in water use. New homes may be labeled as EPA WaterSense[®] if specific criteria are met and the home is built by a WaterSense[®] building partner.

With the new CALGreen legislation and other water conservation programs, indoor water use (and wastewater flows) is expected to decrease significantly for new residential development. Reduced indoor water use estimated from new water conservation legislation and programs is provided in Table 3.

TABLE 3
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
WATER USE CONSIDERING NEW WATER CONSERVATION LEGISLATION AND PROGRAMS

Legislation/Program	Expected Indoor Water Use, gpcd
CALGreen 2010	40.0 ^a
EPA WaterSense® Program	39.5 ^b
American Water Works Association	43.5 ^c

^a *Water Use in the California Residential Home*, January 2010 [5]

^b *Water-Efficient Single Family New Home Specification Supporting Statement*, May 2008 [6]

^c *Water Conservation Measurement Metrics Guidance Report*, January 2010 [7]

Adjusted residential WGFs based on the high-end of the range for projected water use are presented in Table 4. The updated WGF for residential land uses ranges from 320 gpd/acre for very low density residential to 2,337 gpd/acre for high density residential.

TABLE 4
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PROPOSED FUTURE RESIDENTIAL WASTEWATER GENERATION FACTORS

Land Use	Designation	Population Density^a, persons/edu	Density^b, edu/acre	Wastewater Generation Factor		
				gpcd^c	gpd/edu	gpd/acre
Very low density residential	VLDR	3.68	2.00	43.5	160	320
Low density residential	LDR	3.68	5.05	43.5	160	808
Medium density residential	MDR	2.68	11.55	43.5	117	1,346
High density residential	HDR	2.68	20.05	43.5	117	2,337

^a Based on February 2004 Wastewater Generation Factor TM [2]

^b See Table 1

^c *Water Conservation Measurement Metrics Guidance Report*, January 2010 [7]

These adjusted residential WGFs will be used for proposed residential areas. The previous residential WGFs from the 2006 Master Plan Update will continue to be used for existing residential areas. Although water use will begin to decrease for existing homes with the SB407 legislation beginning in 2014, the timing and magnitude of long-term reductions are unknown.

Commercial

WGFs for general commercial land uses presented in the 2006 Master Plan Update (Table 1) were based on the 1993 Sewer System Master Plan (1993 Master Plan). These factors were updated after reviewing historical water usage data from existing commercial developments at Spreckels Park and BLD.

The BLD commercial properties are located northwest and adjacent to the intersection of State Route (SR) 120 and Airport Way. Water usage was available for approximately 43.3 acres of commercial businesses in BLD. Spreckels Park is comprised of approximately 313 acres of commercial and industrial businesses located adjacent to and northwest of the SR 99 and SR 120 interchange. Water usage data were available for approximately 48.3 acres of industrial businesses in Spreckels Park. Average wintertime (December to March) water usage for BLD and Spreckels Park commercial properties over recent years is presented in Table 5. A detailed analysis is available in Appendix A. Water usage data for the months of April to November were excluded in the analysis to avoid including landscape irrigation in the WGF. Water usage data varies greatly depending on the type of business. Retail and department stores tend to have low water usage of 50 to 220 gpd/acre. Restaurants, grocery stores, and gas stations have significantly greater water usage of 810 to 9,810 gpd/acre. The average WGF for commercial land use in BLD and Spreckels Park combined is 750 gpd/acre. This WGF includes building and parking areas and is representative of a gross WGF for general commercial land use.

TABLE 5
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
BIG LEAGUE DREAMS AND SPRECKELS PARK COMMERCIAL PROPERTIES
WATER USE AND WASTEWATER GENERATION FACTOR

Item	Value
Range of average wastewater generation factor, gpd/acre ^a	50 – 9,810
Average wastewater generation factor, gpd/acre ^a	750

^a Average water use from December to March

The average WGF value for the two commercial developments validates reduction of the general commercial WGF. Consistent with the historical BLD and Spreckels Park water use data, a general commercial WGF of 750 gpd/acre is recommended.

Industrial

WGFs for heavy and light industrial land uses presented in the 2006 Master Plan Update (Table 1) were based on the City 1993 Master Plan. These factors were updated after reviewing historical water usage data from existing industrial developments.

Water usage data were available for approximately 193 acres of industrial businesses in Spreckels Park. Average wintertime (December to March) water usage for Spreckels Park over recent years for industrial businesses is presented in Table 6. A detailed analysis of the water usage data is available in Appendix B. Water usage data for the months of April to November were excluded in the analysis to avoid including landscape irrigation in the WGF. The average WGF for industrial land use in Spreckels Park is 193 gpd/acre. The 90th percentile WGF is 600 gpd/acre.

TABLE 6
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SPRECKELS PARK INDUSTRIAL WATER USE AND WASTEWATER GENERATION FACTOR

Item	Value
Total average water use, gal/month ^a	1,054,000
Total average water use, gpd	34,700
Spreckels service area, acres	180
Average wastewater generation factor, gpd/acre	193
90 th Percentile wastewater generation factor, gpd/acre	600

^a Average water use from December to March

The estimated 90th percentile WGF value for the industrial developments in Spreckels Park validates reduction of the light and heavy industrial WGFs. Consistent with the historical Spreckels Park water use data, light and heavy industrial WGFs of 600 gpd/acre are recommended.

Summary of Recommended Wastewater Generation Factors

Updated WGFs for residential and industrial land types are recommended for use in the 2010 Master Plan. The recommended WGFs and a comparison with the previous 2006 Master Plan Update WGFs are presented in Table 7.

TABLE 7
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SUMMARY OF PROPOSED WASTEWATER GENERATION FACTORS

Land Use	Wastewater Generation Factor, gpd/acre	
	2006 Master Plan Update	Proposed for 2010 Master Plan Update
Existing Development		
Very low density residential	530	530
Low density residential	1,338	1,338
Medium density residential	2,183	2,183
High density residential	3,789	3,789
General commercial	1,120	750
Heavy industrial	2,010	600
Light industrial	2,010	600
New Development		
Very low density residential	530	320
Low density residential	1,338	808
Medium density residential	2,183	1,346
High density residential	3,789	2,337
General commercial	1,120	750
Heavy industrial	2,010	600
Light industrial	2,010	600

REFERENCES

- [1] *City of Manteca Wastewater Collection System Master Plan Update*, prepared by Nolte Associates, December 2006.
- [2] *City of Manteca Wastewater Collection System Master Plan Wastewater Generation Factor Technical Memorandum*, prepared by Nolte Associates, February 2004.
- [3] *City of Manteca General Plan 2023 Policy Document*, adopted October 6, 2003.
- [4] *Sewer Master Plan for City of Manteca Public Facilities Implementation Plan*, prepared by Nolte Associates, December 1993.
- [5] *Water Use in the California Residential Home*, prepared by ConSol, January 2010.
- [6] *Water-Efficient Single Family New Home Specification Supporting Statement*, United States Environmental Protection Agency – Water Sense, May 2008.
http://www.epa.gov/WaterSense/docs/home_suppstat508.pdf

- [7] *Water Conservation Measurement Metrics Guidance Report*, American Water Works Association – Water Conservation Division, January 2010.
<http://www.awwa.org/files/Publications/Streamlines/2010/030210/AWWA%20Metrics%20Guidance%20Report%20Jan-22-2010%20Final%20_3_.pdf>

APPENDIX A

Big League Dreams and Spreckels Park Commercial Properties Water Use and Wastewater Generation Factors

TABLE A-1
CITY OF MANTECA WASTEWATER COLLECTION SYSTEM
2010 MASTER PLAN UPDATE
BIG LEAGUE DREAMS AND SPRECKELS PARK COMMERCIAL WATER USE AND WASTEWATER GENERATION FACTORS

APN	Business	Address	Land Use	Land Use Description	Acreage	Water Use ^a (cu ft/month)				Water Use ^a (gal/month)				Average Water Use (gal/month)	Average Water Use (gpd)	WGF (gpd/acre)
						Dec	Jan	Feb	Mar	Dec	Jan	Feb	Mar			
--	Big League Dreams Properties	2120 - 2420 DANIELS ST	GC	GENERAL COMMERCIAL	43.30	90,833	98,645	87,638	88,460	679,427	737,865	655,533	661,678	684,000	22,488	520
22120036	Food 4 Less	131 SPRECKELS AV	GC	GENERAL COMMERCIAL	5.31	26,419	23,801	22,688	21,564	197,615	178,031	169,708	161,296	176,662	5,808	1,090
22120027	Target	280 SPRECKELS AV	GC	GENERAL COMMERCIAL	11.75	9,155	8,567	8,245	7,932	68,479	64,079	61,673	59,329	63,390	2,084	180
22120069	Bank of the West	150 COMMERCE AV	GC	GENERAL COMMERCIAL	0.63	283	227	230	200	2,119	1,695	1,720	1,496	1,758	58	90
22120051	Holiday Inn Express	179 COMMERCE AV	GC	GENERAL COMMERCIAL	1.78	17,738	16,956	15,989	18,127	132,683	126,829	119,595	135,591	128,674	4,230	2,380
22120030	Staples	249 COMMERCE AV	GC	GENERAL COMMERCIAL	2.54	709	437	698	376	5,302	3,266	5,219	2,809	4,149	136	50
22120031	The Home Depot	250 COMMERCE AV	GC	GENERAL COMMERCIAL	12.78	8,977	11,135	13,389	11,401	67,148	83,290	100,150	85,279	83,967	2,761	220
22120057	TJ Maxx	277 COMMERCE AV	GC	GENERAL COMMERCIAL	4.79	1,548	1,362	1,270	1,230	11,579	10,188	9,500	9,200	10,117	333	70
22120032	IHOP	1150 E YOSEMITE AV	GC	GENERAL COMMERCIAL	0.86	12,786	12,900	12,779	11,124	95,636	96,492	95,587	83,208	92,731	3,049	3,540
22120016	Chevron	1234 E YOSEMITE AV	GC	GENERAL COMMERCIAL	1.06	29,663	28,911	28,202	26,089	221,882	216,255	210,951	195,146	211,058	6,939	6,550
22120043	AppleBees	1272 E YOSEMITE AV	GC	GENERAL COMMERCIAL	1.30	23,419	23,676	25,612	21,982	175,173	177,093	191,579	164,427	177,068	5,821	4,480
22120041	Jack in the Box	1310 E YOSEMITE AV	GC	GENERAL COMMERCIAL	0.86	6,903	5,221	6,176	6,390	51,633	39,056	46,194	47,797	46,170	1,518	1,770
22120053	Gas Depot	1330 E YOSEMITE AV	GC	GENERAL COMMERCIAL	1.11	3,385	3,362	7,528	6,793	25,320	25,145	56,312	50,814	39,398	1,295	1,170
22120067	Mimosa Spa and Salon	1360 E YOSEMITE AV	GC	GENERAL COMMERCIAL	0.71	7,057	6,007	4,767	4,650	52,784	44,930	35,655	34,782	42,038	1,382	1,940
22120063	In-N-Out	1490 E YOSEMITE AV	GC	GENERAL COMMERCIAL	0.99	14,010	16,006	14,128	12,496	104,795	119,725	105,677	93,470	105,917	3,482	3,500
22120061	Panda Express	1467 HULSEY WY	GC	GENERAL COMMERCIAL	0.67	34,142	24,950	24,308	23,934	255,382	186,626	181,824	179,026	200,715	6,599	9,810
22120060	Carl's Jr	1489 HULSEY WY	GC	GENERAL COMMERCIAL	<u>1.15</u>	3,238	4,364	3,916	3,566	24,220	32,643	29,292	26,674	<u>28,207</u>	<u>927</u>	810
					91.59									2,097,000	69,000	

^a Average water usage ranging from 1999 to 2010 for Spreckels Park businesses and from 2005 to 2010 for Big League Dreams businesses.

Average Wastewater Generation Factor	750	gpd/acre
Range of Wastewater Generation Factors	50 - 9810	gpd/acre
Median Wastewater Generation Factor	1,470	gpd/acre
<u>Percentiles</u>		
Wastewater Generation Factor, 80 Percentile	3,540	gpd/acre
Wastewater Generation Factor, 90 Percentile	5,515	gpd/acre
Wastewater Generation Factor, 95 Percentile	7,365	gpd/acre

APPENDIX B

Spreckels Park Industrial Water Use and Wastewater Generation Factors

TABLE B-1
CITY OF MANTECA WASTEWATER COLLECTION SYSTEM
2010 MASTER PLAN UPDATE
SPRECKELS PARK INDUSTRIAL WATER USE AND WASTEWATER GENERATION FACTORS

APN	Business	Address	Land Use	Land Use Description	Acreage (acres)	Water Use ^a (cu ft/month)				Water Use ^a (gal/month)				Average Water Use (gal/month)	Average Water Use (gpd)	WGF (gpd/acre)
						Dec	Jan	Feb	Mar	Dec	Jan	Feb	Mar			
22125020	Sexton Chevrolet	321 SPRECKELS AV	LI	LIGHT INDUSTRIAL	6.96	0	160	300	110	0	1,197	2,244	823	1,066	35	5
22125005	Terrell Transportation	600 SPRECKELS AV	HI	HEAVY INDUSTRIAL	27.84	23,995	26,741	17,555	16,277	179,483	200,023	131,311	121,752	158,142	5,199	187
22121017	Millard Refrigerated Services	730 SPRECKELS AV	HI	HEAVY INDUSTRIAL	17.45	34,517	36,257	41,827	35,895	258,185	271,200	312,863	268,495	277,686	9,129	523
22125011	American Modular Systems	787 SPRECKELS AV	LI	LIGHT INDUSTRIAL	30.00	2,575	2,538	3,546	3,504	19,261	18,981	26,526	26,208	22,744	748	25
22121014	Global HVAC Distributors	900 SPRECKELS AV	HI	HEAVY INDUSTRIAL	13.54	3,614	1,100	3,264	10,103	27,035	8,228	24,417	75,569	33,812	1,112	82
22121002	Frito Lay	1190 SPRECKELS AV	HI	HEAVY INDUSTRIAL	7.54	1,161	1,330	1,423	978	8,684	9,948	10,647	7,318	9,149	301	40
22121027	Dance and Cheer Stars	1240 DUPONT CT	HI	HEAVY INDUSTRIAL	0.91	293	265	318	260	2,188	1,982	2,375	1,945	2,122	70	77
22121024	Rose Glass and Aluminum	1252 DUPONT CT	HI	HEAVY INDUSTRIAL	0.54	1,915	2,305	745	35	14,324	17,241	5,573	262	9,350	307	570
22121023	Fun and Game Rentals	1258 DUPONT CT	HI	HEAVY INDUSTRIAL	0.59	208	210	233	245	1,552	1,571	1,739	1,833	1,674	55	93
22121022	Unknown	1262 DUPONT CT	HI	HEAVY INDUSTRIAL	0.58	3,050	1,040	815	775	22,814	7,779	6,096	5,797	10,622	349	601
22121033	JA Clark Construction	1270 DUPONT CT	HI	HEAVY INDUSTRIAL	0.41	50	75	50	82	374	561	374	613	481	16	39
22121032	Elite Roofing	1274 DUPONT CT	HI	HEAVY INDUSTRIAL	0.34	93	78	90	73	692	580	673	542	622	20	58
22121031	Newberry Whell & Tires	1278 DUPONT CT	HI	HEAVY INDUSTRIAL	0.39	1,590	1,410	20	0	11,893	10,547	150	0	5,647	186	481
22121030	EMT Electric	1282 DUPONT CT	HI	HEAVY INDUSTRIAL	0.47	730	247	270	287	5,460	1,845	2,020	2,144	2,867	94	198
-	Cool Roofing Systems	1286 DUPONT CT	HI	HEAVY INDUSTRIAL	0.47	523	660	493	605	3,915	4,937	3,684	4,525	4,265	140	295
22121028	E-M Manufacturing	1290 DUPONT CT	HI	HEAVY INDUSTRIAL	0.58	360	395	363	353	2,693	2,955	2,712	2,637	2,749	90	155
-	Creative Design Interiors	1300 DUPONT CT	HI	HEAVY INDUSTRIAL	5.00	8,778	9,353	13,463	15,733	65,656	69,957	100,700	117,679	88,498	2,910	582
22121019	Dreyer's Grand Ice Cream	1351 DUPONT CT	HI	HEAVY INDUSTRIAL	12.03	56,108	21,962	21,564	22,912	419,688	164,276	161,299	171,382	229,161	7,534	626
22125017	Platt Electric Supply	550 COMMERCE CT	HI	HEAVY INDUSTRIAL	1.08	235	223	168	543	1,758	1,664	1,253	4,058	2,183	72	67
22126001	Multiple Small Businesses	560 COMMERCE CT	HI	HEAVY INDUSTRIAL	3.92	11,762	13,068	12,118	9,280	87,980	97,749	90,643	69,414	86,446	2,842	725
22125031	Ford Motor Co. Sacramento Parts Depot	1260 PHOENIX DR	HI	HEAVY INDUSTRIAL	31.59	3,590	3,096	3,056	3,080	26,853	23,160	22,861	23,038	23,978	788	25
22121005	L S Expeditors, Revchem Plastics Inc	1205 MOFFAT BL	HI	HEAVY INDUSTRIAL	14.24	6,890	3,761	3,278	9,270	51,537	28,134	24,516	69,340	43,382	1,426	100
-	Dr's Offices	1140 NORMAN DR	LI	LIGHT INDUSTRIAL	3.22	4,600	5,073	5,350	4,483	34,408	37,949	40,018	33,535	36,477	1,199	373
					180									1,054,000	34,700	

^a Average water usage ranging from 1999 to 2010.

Average Wastewater Generation Factor	193	gpd/acre
Range of Wastewater Generation Factors	5 - 725	gpd/acre

Percentiles

Wastewater Generation Factor, 80 Percentile	550	gpd/acre
Wastewater Generation Factor, 90 Percentile	600	gpd/acre
Wastewater Generation Factor, 95 Percentile	620	gpd/acre

APPENDIX B

CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
SOUTH MANTECA TRUNK SEWER								
33	AG-U	33	191.43	0	0			
33	BIP-U	33	27.33	1,200	32,791			
33	CMU-U	33	98.81	2,473	244,356			
33	GC-D	OS	1.71	750	1,285			
33	GC-U	33, OS	79.27	750	59,452			
33	HDR-U	33	18.72	2,337	43,753			
33	LDR-D	33S, OS	61.54	1,338	82,340			
33	LDR-U	33, OS	661.99	808	534,890			
33	OS-U	33	415.02	0	0			
33	VLDR-U	33	186.62	320	59,720			
TOTAL FLOW, LINK 33						1,058,587	2.29	2,424,950
34A	BIP-U	34A	44.66	1,200	53,592			
34A	CMU-U	34A	23.41	2,473	57,882			
34A	GC-U	34A	24.42	750	18,318			
34A	HDR-U	34A	2.13	2,337	4,977			
TOTAL FLOW, LINK 34A						134,768	3.58	482,129
34B	BIP-U	34B	178.00	1,200	213,601			
34B	LDR-U	34B	28.62	808	23,127			
34B	MDR-U	34B	48.99	1,346	65,944			
34B	OS-U	34B	13.93	0	0			
34B	VLDR-U	34B	9.39	320	3,003			
Flow from Link 33					1,058,587			
Flow from Link 34A					134,768			
TOTAL FLOW, LINK 34B						1,499,031	2.15	3,222,567
32	BIP-D	32S	1.51	1,200	1,810			
32	GC-D	32N, 32S	88.14	750	66,103			
32	GC-U	32N	1.28	750	959			
32	HI-D	32N	148.96	1,000	148,962			
32	HI-U	32N	26.07	1,000	26,065			
32	LDR-D	32N	22.65	1,338	30,310			
32	LI-D	32N, 32S	56.95	1,000	56,951			
32	LI-U	32N, 32S	23.32	1,000	23,319			
32	P-D	32N	4.42	400	1,767			
TOTAL FLOW, LINK 32						356,247	3.03	1,079,727

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
32A	LI-D	32A	1.00	1,000	1,000			
32A	LI-U	32A	56.17	1,000	56,166			
32A	P-D	32A	2.25	400	901			
32A	PQP-D	32A	8.97	425	3,812			
<i>Flow from Link 32</i>					356,247			
TOTAL FLOW, LINK 32A						418,126	2.92	1,219,533
21	GC-U	21	6.27	750	4,704			
21	HDR-U	21	25.70	2,337	60,061			
21	HI-U	21	11.99	1,000	11,994			
21	LDR-U	21	77.50	808	62,620			
21	LI-U	21	2.14	1,000	2,139			
21	MDR-U	21	41.20	1,346	55,455			
21	PQP-U	21	7.68	425	3,263			
21	P-U	21	1.70	400	680			
TOTAL FLOW, LINK 21						200,916	3.39	680,741
20	CMU-U	20S	5.01	2,473	12,401			
20	HDR-U	20N	15.33	2,337	35,832			
20	LDR-D	20N	42.17	1,338	56,427			
20	LDR-U	20N, 20S	185.69	808	150,039			
20	MDR-U	20N	14.91	1,346	20,068			
20	P-D	20N	9.51	400	3,803			
20	PQP-D	20N	7.38	425	3,138			
20	PQP-U	20N	8.01	425	3,402			
20	P-U	20S	10.24	400	4,097			
<i>Flow from Link 21</i>					200,916			
TOTAL FLOW, LINK 20						490,125	2.80	1,372,562
27N	CMU-U	27N	42.60	2,473	105,350			
27N	GC-U	27N	108.20	750	81,150			
27N	HI-D	27N	0.00	1,000	0			
27N	HI-U	27N	28.50	1,000	28,500			
27N	PQP-D	27N	20.15	425	8,563			
TOTAL FLOW, LINK 27N						223,563	3.33	744,224
36	AG-U	36N, 36S	472.65	0	0			
36	BIP-U	36W	373.02	1,200	447,624			
36	CMU-U	36N, 36W	185.59	2,473	458,967			
36	HDR-U	36N	15.50	2,337	36,224			
36	HI-U	36S	2.43	1,000	2,433			
36	LDR-U	36W	61.90	808	50,015			
36	MDR-U	36N	9.40	1,346	12,652			
36	NC-U	36N	7.51	1,120	8,409			
36	PQP-U	36N	6.79	425	2,884			
36	P-U	36N	7.00	400	2,800			
36	UR-U	36N, 36S	1,130.55	320	361,775			
36	VLDR-U	36N	46.49	320	14,877			
TOTAL FLOW, LINK 36						1,398,661	2.17	3,037,816

APPENDIX B
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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
17	HDR-D	17	17.31	3,789	65,586			
17	LDR-D	17	61.28	1,338	81,986			
				<i>Flow from Link 36</i>	1,398,661			
				<i>Flow from Link 32A</i>	418,126			
				<i>Flow from Link 27N</i>	223,563			
				<i>Flow from Link 20</i>	490,125			
				TOTAL FLOW, LINK 17		2,678,047	2.06	5,515,273
16	LDR-D	16	109.25	1,338	146,170			
16	NC-U	16	2.33	1,120	2,612			
16	P-D	16	50.62	400	20,248			
				<i>Flow from Link 17</i>	2,678,047			
				TOTAL FLOW, LINK 16		2,847,077	2.06	5,855,673
16B	CMU-U	16BN	88.65	2,473	219,230			
16B	LDR-D	16BN, 16BS	104.62	1,338	139,986			
16B	LDR-U	16BN	10.26	808	8,294			
16B	PQP-D	16BS	13.23	425	5,622			
				<i>Flow from Link 16</i>	2,847,077			
				TOTAL FLOW, LINK 16B		3,220,210	2.05	6,611,707
25	HDR-U	25	20.30	2,337	47,441			
25	LDR-D	25	0.00	1,338	0			
25	LDR-U	25	276.30	808	223,250			
25	MDR-U	25	19.90	1,346	26,785			
25	P-U	25	17.80	400	7,120			
				TOTAL FLOW, LINK 25		304,597	3.14	955,697
27S	BIP-U	27S	65.10	1,200	78,120			
27S	CMU-U	27S	41.40	2,473	102,382			
27S	HI-U	27S	273.02	1,000	273,025			
27S	OS-U	27S	7.60	0	0			
27S	PQP-U	27S	8.00	425	3,400			
27S	P-U	27S	30.50	400	12,200			
				<i>Flow from Link 25</i>	304,597			
				TOTAL FLOW, LINK 27S		773,724	2.48	1,915,416
22S1	CMU-U	22S1	7.10	2,473	17,559			
22S1	HDR-U	22S1	6.44	2,337	15,043			
22S1	LDR-D	22S1	2.12	1,338	2,840			
22S1	LDR-U	22S1	426.09	808	344,278			
22S1	MDR-U	22S1	12.96	1,346	17,444			
22S1	P-U	22S1	20.10	400	8,040			
				<i>Flow from Link 27S</i>	773,724			
				TOTAL FLOW, LINK 22S1		1,178,927	2.24	2,639,907
22S2	LDR-U	22S2	224.13	808	181,094			
22S2	P-U	22S2	12.22	400	4,890			
				<i>Flow from Link 22S1</i>	1,178,927			
				TOTAL FLOW, LINK 22S2		1,364,910	2.18	2,976,135

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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
22	CMU-U	22N	19.58	2,473	48,420			
22	GC-D	22N	3.56	750	2,671			
22	GC-U	22N	64.90	750	48,678			
22	LDR-D	22N, 22W	77.06	1,338	103,107			
22	LDR-U	22N, 22W	518.63	808	419,050			
22	P-U	22W	27.42	400	10,970			
22	VLDR-D	22W	3.00	530	1,588			
22	VLDR-U	22W	35.65	320	11,408			
				<i>Flow from Link 16B</i>	3,220,210			
				<i>Flow from Link 22S2</i>	1,364,910			
				TOTAL FLOW, LINK 22		5,231,012	2.05	10,723,874
22A	GC-D	22A	66.29	750	49,718			
22A	LDR-D	22A	27.69	1,338	37,052			
22A	P-D	22A	5.07	400	2,029			
22A	PQP-D	22A	18.02	425	7,659			
				<i>Flow from Link 22</i>	5,231,012			
				TOTAL FLOW, LINK 22A		5,327,470	2.05	10,921,564
10S	CMU-D	10S	1.92	2,473	4,747			
10S	CMU-U	10S	1.44	2,473	3,570			
10S	HDR-U	10S	4.07	2,337	9,509			
10S	LDR-D	10S	20.59	1,338	27,550			
10S	LDR-U	10S	267.52	808	216,155			
10S	MDR-D	10S	1.06	2,183	2,314			
10S	MDR-U	10S	7.21	1,346	9,709			
10S	P-U	10S	23.88	400	9,554			
10S	VLDR-D	10S	5.89	530	3,120			
10S	VLDR-U	10S	101.12	320	32,358			
				TOTAL FLOW, LINK 10S		318,584	3.11	990,024
10	GC-U	10N	50.68	750	38,007			
				<i>Flow from Link 22A</i>	5,327,470			
				<i>Flow from Link 10S</i>	318,584			
				TOTAL FLOW, LINK 10		5,684,061	2.05	11,652,456
9S	AG-U	9S	19.56	0	0			
9S	LDR-D	9S	28.78	1,338	38,509			
9S	LDR-U	9S	159.14	808	128,585			
9S	P-U	9S	17.21	400	6,885			
9S	VLDR-D	9S	64.01	530	33,923			
9S	VLDR-U	9S	135.70	320	43,423			
				TOTAL FLOW, LINK 9S		251,325	3.26	819,283

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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
9	GC-U	9N	2.43	750	1,822			
9	LDR-D	9N	11.42	1,338	15,285			
9	LDR-U	9N	91.03	808	73,553			
9	MDR-U	9N	11.40	1,346	15,346			
9	P-U	9N	9.90	400	3,961			
				<i>Flow from Link 10</i>	5,684,061			
				<i>Flow from Link 9S</i>	251,325			
				TOTAL FLOW, LINK 9		6,045,354	2.05	12,393,044
8S	AG-U	8S	37.04	0	0			
8S	LDR-D	8S	5.00	1,338	6,690			
8S	LDR-U	8S	77.29	808	62,453			
8S	PQP-U	8S	25.44	425	10,811			
8S	P-U	8S	4.78	400	1,914			
8S	VLDR-D	8S	18.10	530	9,594			
8S	VLDR-U	8S	51.35	320	16,432			
				TOTAL FLOW, LINK 8S		107,894	3.66	395,088
8	CMU-U	8N	8.96	2,473	22,159			
8	GC-U	8N	29.95	750	22,466			
8	LDR-D	8N	47.45	1,338	63,492			
8	LDR-U	8N	0.39	808	314			
8	P-D	8N	6.91	400	2,764			
				<i>Flow from Link 9</i>	6,045,354			
				<i>Flow from Link 8S</i>	107,894			
				TOTAL FLOW, LINK 8		6,264,442	2.05	12,842,152
7	CMU-D	7N	10.08	2,473	24,925			
7	GC-D	7N	3.45	750	2,587			
7	GC-U	7N	23.45	750	17,591			
7	LDR-D	7N	70.26	1,338	94,009			
7	LDR-U	7S	152.09	808	122,890			
7	NC-D	7N	1.35	1,120	1,510			
7	P-D	7N	9.24	400	3,695			
7	P-U	7S	5.66	400	2,263			
				<i>Flow from Link 8</i>	6,264,442			
				TOTAL FLOW, LINK 7		6,533,911	2.05	13,394,545
6	AG-D	6S	4.99	0	0			
6	AG-U	6S	54.88	0	0			
6	LDR-D	6N	31.11	1,338	41,630			
6	LDR-U	6N	1.64	808	1,323			
6	MDR-D	6N	0.11	2,183	230			
6	MDR-U	6N	17.41	1,346	23,431			
6	P-D	6N	5.27	400	2,107			
6	VLDR-U	6S	236.59	320	75,709			
				<i>Flow from Link 34B</i>	1,499,031			
				<i>Flow from Link 7</i>	6,533,911			
				TOTAL FLOW, LINK 6		8,177,371	2.05	16,763,613
4	LI-D	4	3.75	1,000	3,750			
4	LI-U	4	46.10	1,000	46,104			
4	PQP-D	4	112.44	425	47,788			
				<i>Flow from Link 6</i>	8,177,371			
				TOTAL FLOW, LINK 4		8,275,013	2.05	16,963,778

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Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
3	CMU-U	3E	3.24	2,473	8,011			
3	GC-D	3W	47.05	750	35,285			
3	GC-U	3E, 3W	30.70	750	23,025			
3	LDR-D	3E	54.35	1,338	72,723			
3	MDR-D	3E	10.47	2,183	22,866			
3	NC-U	3E	10.68	1,120	11,967			
3	P-D	3E	5.07	400	2,028			
3	PQP-U	3W	51.60	425	21,929			
3	VLDR-D	3E	7.22	530	3,826			
<i>Flow from Link 4</i>					8,275,013			
TOTAL FLOW, LINK 3						8,476,673	2.05	17,377,181
1	LI-D	1	4.27	1,000	4,270			
1	LI-U	1	54.44	1,000	54,436			
<i>Flow from Link 3</i>					8,476,673			
TOTAL FLOW, LINK 1						8,535,379	2.05	17,497,528
TOTAL ADWF, South Manteca Trunk Sewer (gpd)						8,535,379	2.05	17,497,528

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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
CENTRAL MANTECA TRUNK SEWER								
100	BIP-D	100	13.14	1,200	15,764			
100	BIP-U	100	1.00	1,200	1,200			
100	CMU-D	100	148.68	2,473	367,692			
100	CMU-U	100	76.18	2,473	188,403			
100	GC-D	100	158.60	750	118,947			
100	GC-U	100	36.36	750	27,274			
100	HDR-D	100	229.06	3,789	867,919			
100	HDR-U	100	34.90	2,337	81,555			
100	HI-D	100	8.77	1,000	8,771			
100	LDR-D	100	1,876.28	1,338	2,510,460			
100	LDR-U	100	155.29	808	125,473			
100	LI-D	100	120.54	1,000	120,540			
100	LI-U	100	7.91	1,000	7,911			
100	MDR-D	100	164.88	2,183	359,923			
100	MDR-U	100	55.91	1,346	75,261			
100	NC-D	100	133.36	1,120	149,365			
100	NC-U	100	13.09	1,120	14,663			
100	P-D	100	271.44	400	108,576			
100	PQP-D	100	335.67	425	142,659			
100	P-U	100	8.61	400	3,443			
100	VLDR-D	100	32.06	530	16,992			
100	VLDR-U	100	6.76	320	2,165			
TOTAL FLOW, LINK 100						5,314,955	2.05	10,895,915
93S1	CMU-U	93S1	50.46	2,473	124,780			
93S1	GC-D	93S1	4.84	750	3,631			
93S1	GC-U	93S1	10.06	750	7,542			
93S1	LDR-D	93S1	14.40	1,338	19,262			
93S1	LDR-U	93S1	6.81	808	5,504			
93S1	LI-D	93S1	15.08	1,000	15,082			
93S1	P-D	93S1	3.56	400	1,423			
93S1	PQP-D	93S1	46.21	425	19,640			
93S1	VLDR-D	93S1	10.98	530	5,819			
TOTAL FLOW, LINK 93S1						202,681	3.38	685,767
53	LI-D	53	0.63	1,000	634			
53	LI-U	53	34.60	1,000	34,601			
Flow from Link 100					5,314,955			
Flow from Link 93S1					202,681			
Flow from Link 66					3,206,509			
Flow from Link 54					314,518			
Flow from CPS					618,054			
TOTAL FLOW, LINK 53						9,691,952	2.05	19,868,502
TOTAL ADWF, Central Manteca Trunk Sewer (gpd)^a						5,552,871	2.05	11,383,553

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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
NORTH MANTECA TRUNK SEWER								
81	AG-D	81	46.73	0	0			
81	AG-U	81	414.53	0	0			
81	GC-D	81	1.45	750	1,088			
81	GC-U	81	1.75	750	1,310			
81	LDR-D	81	86.74	1,338	116,058			
81	LDR-U	81	330.66	808	267,173			
81	NA-D	81	0.01	0	0			
81	UR-D	81	14.95	530	7,922			
81	UR-U	81	578.54	320	185,131			
81	P-U	81	8.79	400	3,515			
81	VLDR-D	81	25.44	530	13,485			
81	VLDR-U	81	60.74	320	19,436			
TOTAL FLOW, LINK 81						615,120	2.63	1,620,499
80	AG-D	80	12.54	0	0			
80	AG-U	80	225.41	0	0			
Flow from Link 81					615,120			
TOTAL FLOW, LINK 80						615,120	2.63	1,620,499
79	AG-D	79	51.96	0	0			
79	AG-U	79	688.39	0	0			
Flow from Link 80					615,120			
TOTAL FLOW, LINK 79						615,120	2.63	1,620,499
77	LDR-D	77	2.59	1,338	3,467			
77	LDR-U	77	137.21	808	110,869			
77	P-U	77	6.74	400	2,697			
77	VLDR-D	77	55.30	530	29,311			
77	VLDR-U	77	174.27	320	55,767			
Flow from Link 79					615,120			
TOTAL FLOW, LINK 77						817,230	2.44	1,994,135

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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
76	AG-D	76	22.45	0	0			
76	AG-U	76	522.39	0	0			
76	LDR-D	76	1.37	1,338	1,833			
76	LDR-U	76	73.49	808	59,380			
76	P-U	76	4.28	400	1,712			
76	VLDR-D	76	23.90	530	12,669			
76	VLDR-U	76	130.90	320	41,887			
<i>Flow from Link 77</i>					817,230			
TOTAL FLOW, LINK 76						934,711	2.36	2,204,446
75	AG-D	75_North	28.83	0	0			
75	AG-U	75_North	128.34	0	0			
75	LDR-D	75_North, 75_South	5.24	1,338	7,017			
75	LDR-U	75_North, 75_South	239.86	808	193,807			
75	PQP-U	75_South	11.65	425	4,952			
75	P-U	75_North, 75_South	17.75	400	7,099			
75	VLDR-D	75_South	39.35	530	20,856			
75	VLDR-U	75_South	8.88	320	2,841			
<i>Flow from Link 76</i>					934,711			
TOTAL FLOW, LINK 75						1,171,283	2.24	2,626,206
74	AG-D	74	15.94	0	0			
74	AG-U	74	775.23	0	0			
74	CMU-U	74	9.50	2,473	23,487			
74	GC-D	74	2.60	750	1,952			
74	GC-U	74	28.44	750	21,331			
74	LDR-D	74	74.80	1,338	100,087			
74	P-D	74	6.63	400	2,652			
74	PQP-D	74	11.56	425	4,911			
<i>Flow from Link 75</i>					1,171,283			
TOTAL FLOW, LINK 74						1,325,703	2.19	2,904,752

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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
73	GC-D	73	14.16	750	10,620			
73	GC-U	73	18.65	750	13,989			
73	HDR-D	73	9.91	3,789	37,555			
73	LDR-U	73	59.34	808	47,948			
73	MDR-U	73	19.74	1,346	26,565			
<i>Flow from Link 74</i>					1,325,703			
TOTAL FLOW, LINK 73						1,462,380	2.16	3,154,874
72	CMU-U	72	33.56	2,473	82,994			
72	GC-D	72	5.10	750	3,822			
72	PQP-D	72	13.40	425	5,696			
72	PQP-U	72	141.61	425	60,184			
72	P-U	72	5.43	400	2,173			
72	VLDR-D	72	31.68	530	16,792			
72	VLDR-U	72	10.75	320	3,439			
<i>Flow from Link 73</i>					1,462,380			
TOTAL FLOW, LINK 72						1,637,480	2.13	3,480,688
70	CMU-D	70	7.00	2,473	17,302			
70	CMU-U	70	12.72	2,473	31,460			
70	LDR-D	70	9.44	1,338	12,626			
70	LDR-U	70	90.16	808	72,853			
70	OS-D	70	3.34	0	0			
70	OS-U	70	13.15	0	0			
70	P-D	70	10.74	400	4,294			
70	PQP-D	70	24.68	425	10,491			
70	P-U	70	1.00	400	399			
<i>Flow from Link 72</i>					1,637,480			
TOTAL FLOW, LINK 70						1,786,905	2.11	3,763,397
69S2	AG-D	69S2_East	93.82	0	0			
69S2	AG-U	69S2_East	534.47	0	0			
TOTAL FLOW, LINK 69S2						0	4.05	0
69S1	AG-D	69S1_East	20.98	0	0			
69S1	AG-U	69S1_East	741.60	0	0			
69S1	LDR-D	69S1_Southwest	4.77	1,338	6,389			
69S1	LDR-U	69S1_Southwest	152.82	808	123,482			
<i>Flow from Link 69S2</i>					0			
TOTAL FLOW, LINK 69S1						129,871	3.59	466,563
69	LDR-U	69_West	135.50	808	109,482			
69	P-U	69_East, 69_West	15.36	400	6,143			
69	VLDR-D	69_West	9.98	530	5,289			
69	VLDR-U	69_East	95.04	320	30,413			
<i>Flow from Link 69S1</i>					129,871			
TOTAL FLOW, LINK 69						281,199	3.19	896,935

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
68	CMU-D	68	3.05	2,473	7,543			
68	CMU-U	68	16.58	2,473	41,003			
68	LDR-D	68	54.71	1,338	73,196			
68	LDR-U	68	19.93	808	16,105			
68	MDR-D	68	2.18	2,183	4,763			
68	OS-D	68	9.15	0	0			
68	OS-U	68	2.13	0	0			
68	P-D	68	14.23	400	5,691			
				<i>Flow from Link 70</i>	1,786,905			
				<i>Flow from Link 69</i>	281,199			
				TOTAL FLOW, LINK 68		2,216,404	2.07	4,596,295
67	HDR-U	67	15.19	2,337	35,491			
67	LDR-D	67	21.95	1,338	29,362			
67	LDR-U	67	44.55	808	36,000			
67	MDR-D	67	18.58	2,183	40,571			
67	MDR-U	67	6.39	1,346	8,600			
67	NC-D	67	11.31	1,120	12,672			
67	OS-D	67	2.83	0	0			
67	P-D	67	5.59	400	2,235			
67	P-U	67	4.20	400	1,681			
				<i>Flow from Link 68</i>	2,216,404			
				TOTAL FLOW, LINK 67		2,383,018	2.07	4,925,765
66S4	AG-D	66S4	47.49	0	0			
66S4	AG-U	66S4	344.95	0	0			
				TOTAL FLOW, LINK 66S4		0	4.05	0
66S3	AG-D	66S3_East	12.10	0	0			
66S3	AG-U	66S3_East	162.67	0	0			
66S3	HI-U	66S3_West	48.47	1,000	48,466			
66S3	LI-U	66S3_West	114.45	1,000	114,449			
				<i>Flow from Link 66S4</i>	0			
				TOTAL FLOW, LINK 66S3		162,915	3.49	569,201
66S2	HI-U	66S2_West	47.06	1,000	47,061			
66S2	LDR-U	66S2_East	154.93	808	125,185			
66S2	LI-U	66S2_West	225.26	1,000	225,261			
				<i>Flow from Link 66S3</i>	162,915			
				TOTAL FLOW, LINK 66S2		560,422	2.70	1,514,265
66S1	LDR-U	66S1	135.53	808	109,506			
66S1	PQP-U	66S1	14.73	425	6,262			
66S1	P-U	66S1	4.83	400	1,932			
				<i>Flow from Link 66S2</i>	560,422			
				TOTAL FLOW, LINK 66S1		678,122	2.57	1,739,554

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
66	LI-D	66	7.44	1,000	7,441			
66	LI-U	66	137.93	1,000	137,928			
				<i>Flow from Link 67</i>	2,383,018			
				<i>Flow from Link 66S1</i>	678,122			
				TOTAL FLOW, LINK 66		3,206,509	2.05	6,583,861
CPS	GC-U	CPS_East	0.89	750	671			
CPS	HI-D	CPS_West	6.84	1,000	6,838			
CPS	HI-U	CPS_West	79.60	1,000	79,600			
CPS	LDR-D	CPS_East	224.10	1,338	299,845			
CPS	LDR-U	CPS_East	21.33	808	17,239			
CPS	LI-D	CPS_West	4.27	1,000	4,270			
CPS	LI-U	CPS_West	139.40	1,000	139,400			
CPS	MDR-U	CPS_East	12.71	1,346	17,105			
CPS	NC-U	CPS_East	3.09	1,120	3,457			
CPS	P-D	CPS_East	20.40	400	8,158			
CPS	PQP-D	CPS_East, CPS_West	97.58	425	41,472			
				TOTAL FLOW, CPS		618,054	2.63	1,626,116
56	HDR-U	56	10.48	2,337	24,491			
56	LDR-D	56	2.74	1,338	3,663			
56	LDR-U	56	174.00	808	140,588			
56	NA-D	56	0.72	0	0			
56	NC-U	56	19.46	1,120	21,794			
56	PQP-D	56	5.54	425	2,353			
56	PQP-U	56	0.83	425	354			
56	P-U	56	14.21	400	5,685			
				TOTAL FLOW, LINK 56		198,928	3.39	675,066
54	GC-U	54	9.46	750	7,096			
54	LDR-D	54	70.07	1,338	93,748			
54	P-D	54	5.59	400	2,237			
54	PQP-D	54	29.43	425	12,509			
				<i>Flow from Link 56</i>	198,928			
				TOTAL FLOW, LINK 54		314,518	3.12	980,104
52	LDR-U	52	10.80	808	8,723			
52	LI-D	52	23.75	1,000	23,751			
52	LI-U	52	25.25	1,000	25,251			
				<i>Flow from Link 53</i>	9,691,952			
				TOTAL FLOW, LINK 52		9,749,677	2.05	19,986,838
51	LI-D	51	4.08	1,000	4,084			
51	PQP-D	51	163.28	425	69,394			
				<i>Flow from Link 52</i>	9,749,677			
				TOTAL FLOW, LINK 51		9,823,155	2.05	20,137,468
TOTAL ADWF, North Manteca Trunk Sewer (gpd)^b						4,270,284	2.05	8,755,750
TOTAL EXISTING AREA (ac)			25,185.96	TOTAL ADWF (gpd)	18,358,534	2.05	37,634,995	

^a Excludes flow from NMCS Sheds 66, 54, and CPS

^b Excludes flow from CMCS Sheds 53, 93S1, and 100

APPENDIX C

SR-99 HYDRAULIC DESIGN OF LIFT STATION AND PUMP STATION ALTERNATIVES

Appendix C
SR-99 Hydraulic Design of Lift Station and Pump Station Alternatives

Lift Station and Pump Station Alternatives

Force Main Parameter	Lift Station Alternative	Pump Station Alternative	
		Single Force Main	Dual Force Main
Length (ft)	5	4,120	4,120
Diameter (in)	18	18	12
C _{HW} Value	130	130	130
From Inv.	8.92	8.92	8.92
To Inv.	29.50	24.50	24.50
Flow (gpm)	2,029	2,029	1,014
Velocity (ft/s)	2.6	2.6	2.9
h_Z, Elevation Head (ft)	20.58	15.58	15.58
h_V, Velocity Head (ft)	0.10	0.10	0.13
h_F, Friction Head (ft)	0.01	5.34	10.67

Discharge Piping Friction Loss

Discharge Piping Parameter	Lift Station Alternative	Pump Station Alternative	
		Single Force Main	Dual Force Main
Length (ft)	55	55	55
Diameter (in)	10	10	10
Flow (gpm)	1,014	1,014	1,014
Velocity (ft/s)	4.1	4.1	4.1
C _{HW} Value	130	130	130
h_F, Discharge Piping (ft)	0.35	0.35	0.35

Local Losses (Discharge Piping)

Fitting	Quantity	K-Value	Local Head Loss (ft)		
			Lift Station	Single Force Main	Dual Force Main
Inlet	1	5.00	1.47	1.47	1.47
10" 90-deg Ell	1	0.25	0.07	0.07	0.07
10" Check Valve	1	2.20	0.64	0.64	0.64
10" Plug Valve	1	0.30	0.09	0.09	0.09
10" Tee, Inline	0	2.00	0.00	0.00	0.00
10" Tee, Branch	2	2.00	1.17	1.17	1.17
Reducer	1	5.00	1.47	1.47	1.47
Total Local Head Loss at Fittings			4.91	4.91	4.91
Total Friction Loss at Discharge Piping (Hazen-Williams)			0.35	0.35	0.35
h_L, Discharge Piping Loss (ft)			5.26	5.26	5.26

Total Head Loss Summary

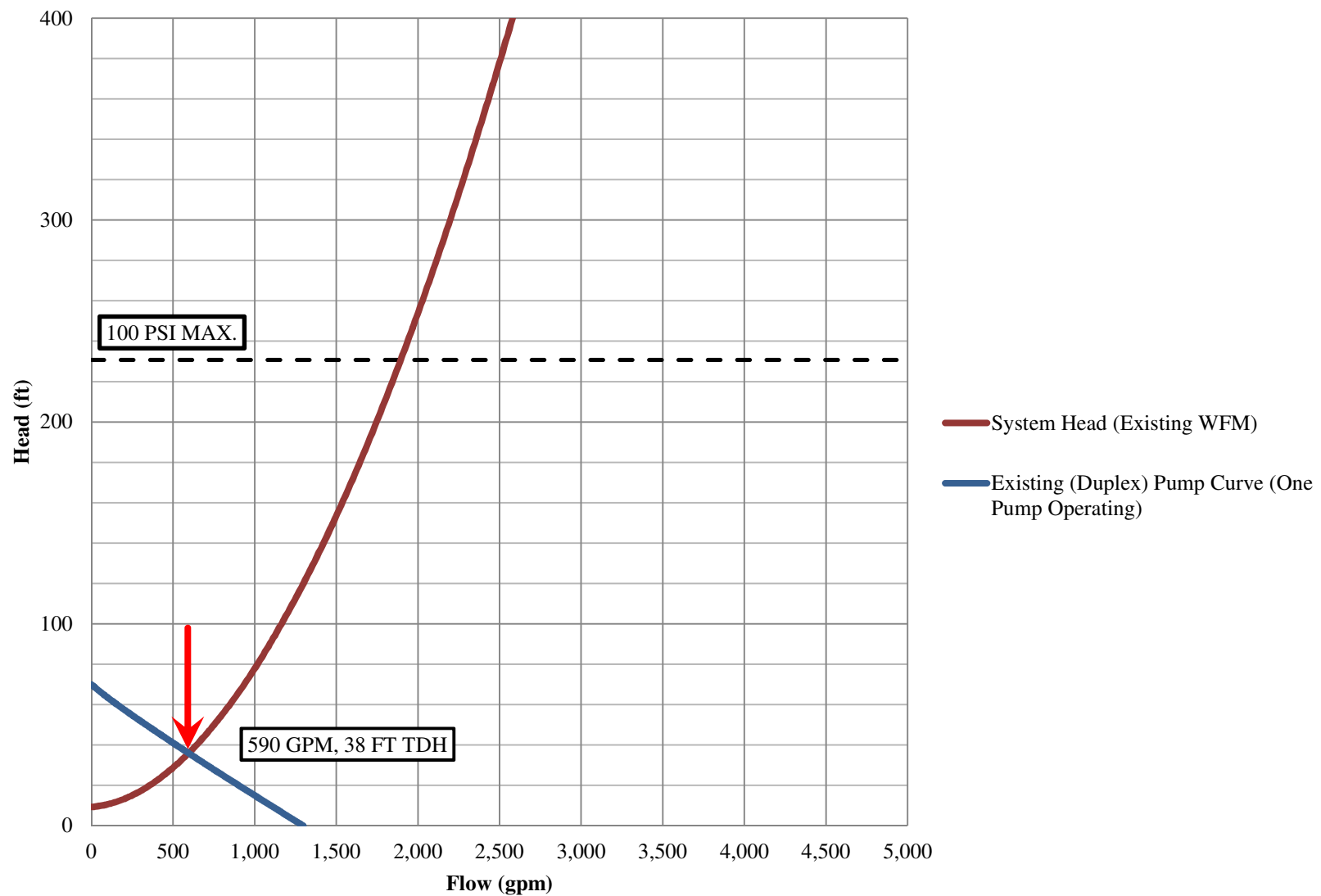
Head Loss (ft)	Lift Station Alternative	Pump Station Alternative (Single Force Main)	Pump Station Alternative (Dual Force Main)
h _Z , Elevation Head	20.58	15.58	15.58
h _V , Velocity Head	0.10	0.10	0.13
h _F , Friction Head	0.01	5.34	10.67
h _L , Discharge Piping Loss	5.26	5.26	5.26
Contingency	20%	20%	20%
Total Dynamic Head (TDH)	31.1	31.5	38.0
Station Configuration	Triplex	Triplex	Triplex
Pump Design Flow (gpm)	1,014	1,014	1,014

APPENDIX D

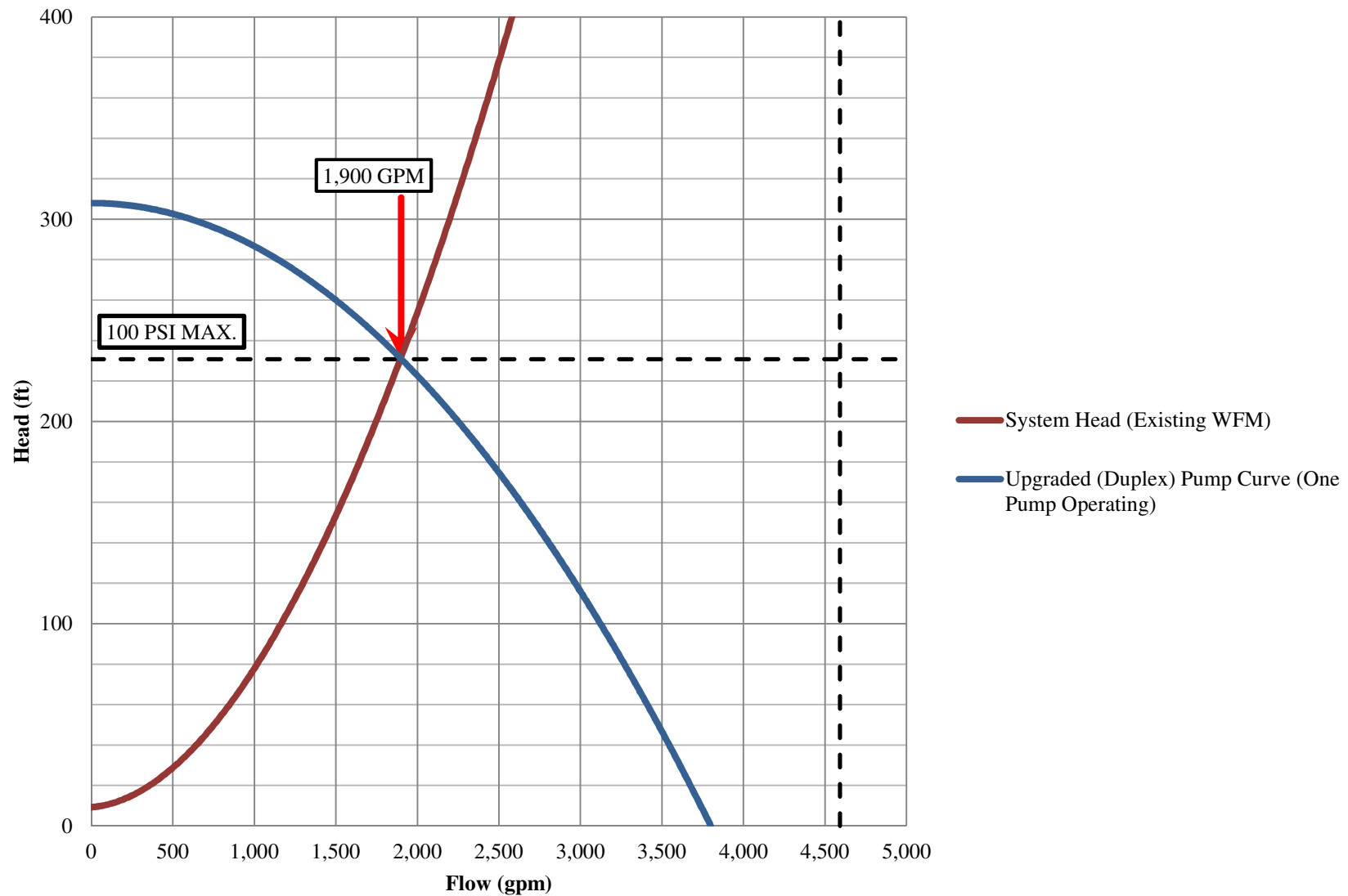
WOODWARD FORCE MAIN SYSTEM HEAD CURVES

Woodward Force Main (Woodward Park) System Curves

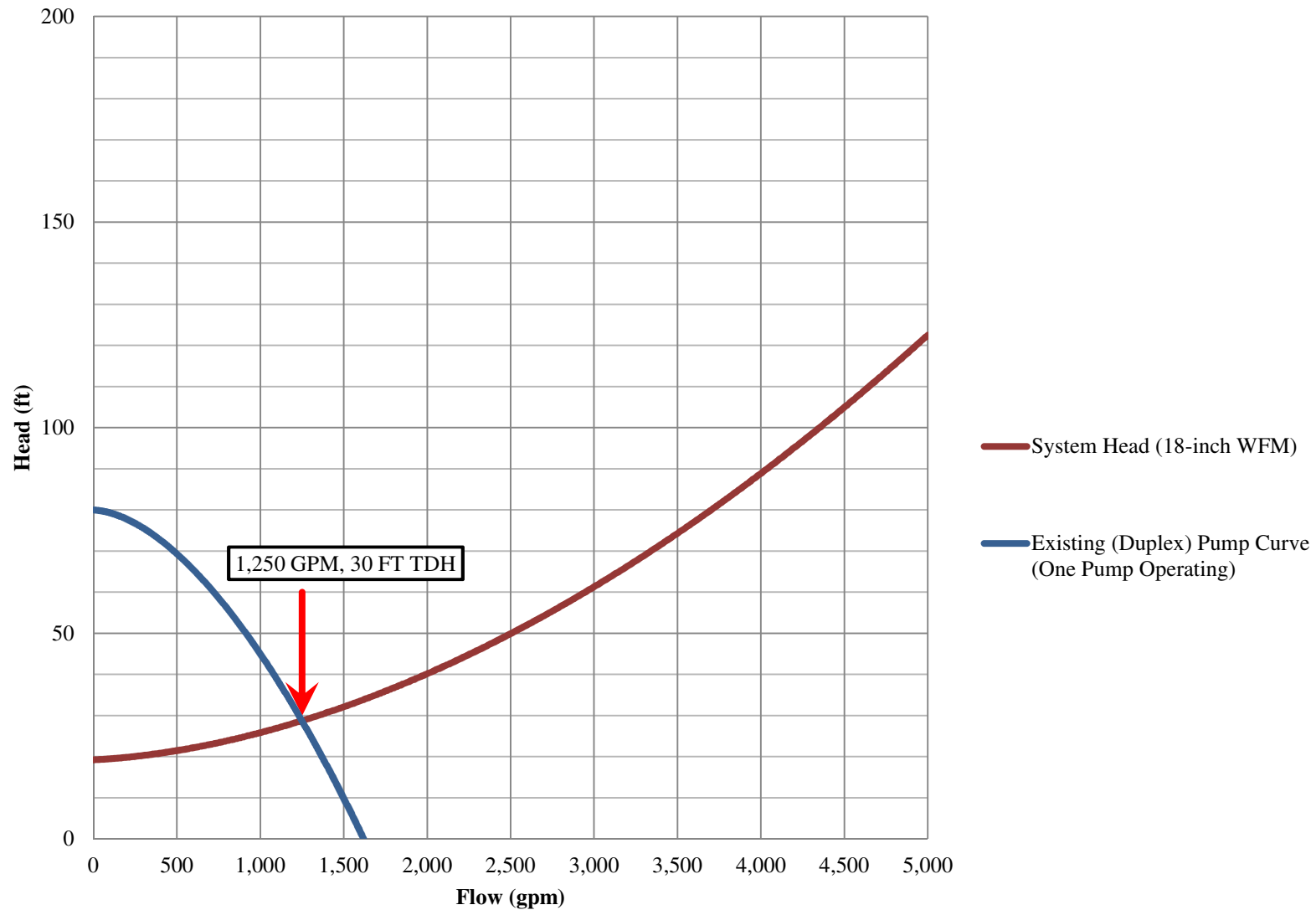
Existing WPPS (Duplex) vs System Head (Exsiting WFM)



Woodward Force Main (Woodward Park) System Curves
Upgraded WPPS (Duplex) vs System Head (Existing WFM); Peak Flows at 100 psi

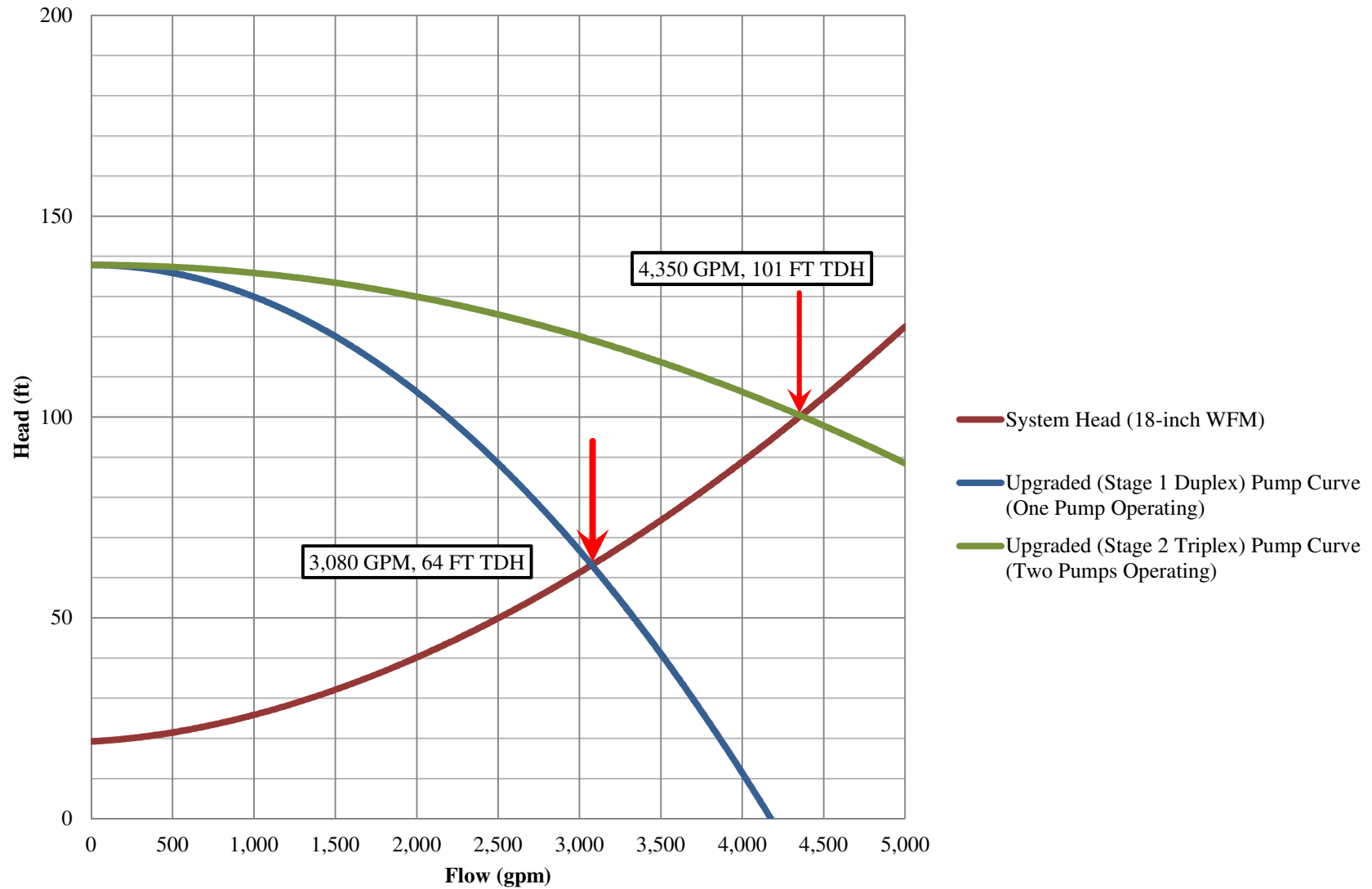


Woodward Force Main (Tara Park) System Curves
Existing TPPS (Duplex) vs System Head (18-inch Force Main)



Woodward Force Main (Tara Park) System Curves

Upgraded TPPS (Stage 1 Duplex and Stage 2 Triplex) vs System Head (18-inch Force Main)



APPENDIX E

SOUTH MANTECA COLLECTION STRATEGY PHASED IMPROVEMENTS EXISTING FLOW AND AVAILABLE CAPACITY FOR ADWF AND PWWF LOADING

APPENDIX E
FLOW ESTIMATES FOR SOUTH MANTECA COLLECTION SYSTEM GRAVITY LINKS
EXISTING FLOW AND AVAILABLE CAPACITY FOR ADWF AND PWWF LOADING

Link	Status	Length (ft)	Diameter (in)	Upstream Invert	Downstream Invert	Slope	PWWF Capacity ^a	Peaking Factor ^b	ADWF Capacity ^c	Cumulative ADWF (gpd)	
										Existing	Available Capacity
1A	Constructed	480	60	-3.92	-4.14	0.0005	35,223,022	2.05	17,181,962	1,704,650	15,477,312
1	Proposed	1,000	54	-3.70	-3.92	0.0002	18,425,839	2.05	8,988,214	1,704,650	7,283,563
2	Proposed	686	48	-3.44	-3.70	0.0004	17,665,820	2.05	8,617,473	1,700,381	6,917,092
3	Proposed	1,325	48	-2.95	-3.44	0.0004	17,450,155	2.05	8,512,270	1,700,381	6,811,890
4	Proposed	808	48	-2.67	-2.95	0.0004	16,892,057	2.05	8,240,027	1,563,653	6,676,374
5	Proposed	1,056	48	-2.31	-2.67	0.0003	16,754,385	2.05	8,172,870	1,512,115	6,660,755
6	Constructed	2,637	60	-1.23	-2.31	0.0004	28,856,576	2.05	14,076,379	1,512,115	12,564,263
7	Constructed	1,553	36	1.73	0.37	0.0009	12,424,826	2.05	6,060,858	1,384,524	4,676,334
8	Constructed	1,620	36	3.16	1.73	0.0009	12,430,577	2.05	6,063,664	1,257,799	4,805,865
8S	Proposed	4,835	12	16.80	5.16	0.0024	1,104,318	3.01	366,852	16,284	350,568
9	Constructed	2,602	36	5.44	3.16	0.0009	12,368,349	2.05	6,033,307	1,175,259	4,858,048
9S	Proposed	3,808	12	18.01	10.39	0.0020	1,006,804	3.09	325,507	72,432	253,075
10	Constructed	2,660	36	7.78	5.44	0.0009	12,424,826	2.05	6,060,858	1,087,542	4,973,316
10S	Proposed	4,887	12	23.87	14.09	0.0020	1,006,849	3.09	325,525	37,731	287,795
14A	Proposed	50	36	12.43	12.39	0.0008	11,917,474	2.05	5,813,351	(N/A)	5,813,351
16C	Constructed	507	30	14.31	14.01	0.0006	6,302,979	2.05	3,068,150	697,540	2,370,610
16	Constructed	475	30	14.37	14.31	0.0001	2,912,179	2.19	1,329,789	697,540	632,249
17A	Constructed	568	27	15.00	14.62	0.0007	5,060,424	2.06	2,450,721	531,122	1,919,599
17	Constructed	566	27	15.66	15.00	0.0012	6,680,870	2.05	3,254,228	531,122	2,723,106
18A	Constructed	296	27	15.95	15.66	0.0010	6,123,820	2.06	2,979,725	383,549	2,596,176
18	Constructed	243	27	16.07	15.95	0.0005	4,347,672	2.08	2,089,603	383,549	1,706,054
19	Constructed	500	24	16.90	16.31	0.0012	4,909,119	2.07	2,374,634	71,932	2,302,702
20B	Constructed	501	18	17.90	16.90	0.0020	2,964,652	2.18	1,358,614	63,369	1,295,245
20A	Constructed	417	18	18.75	17.90	0.0020	2,995,946	2.18	1,375,764	63,369	1,312,394
20	Constructed	420	18	19.59	18.75	0.0020	2,967,615	2.18	1,360,239	63,369	1,296,870
21B	Constructed	501	15	21.09	19.59	0.0030	2,232,900	2.35	950,685	0	950,685
21A	Constructed	498	15	22.59	21.09	0.0030	2,239,616	2.35	954,457	0	954,457
21	Constructed	503	15	24.09	22.59	0.0030	2,228,457	2.35	948,190	0	948,190
22A	Constructed	1,200	36	8.83	7.78	0.0009	12,463,593	2.05	6,079,770	1,049,812	5,029,959
22	Proposed	4,050	36	12.39	8.83	0.0009	12,492,136	2.05	6,093,695	953,354	5,140,341
22S	Proposed	5,300	24	32.00	28.00	0.0008	3,926,039	2.10	1,871,926	2,840	1,869,087
22S1	Proposed	6,500	18	25.00	12.00	0.0020	2,967,615	2.18	1,360,239	2,840	1,357,399
22S2	Proposed	1,500	18	12.00	8.90	0.0021	3,016,670	2.17	1,387,104	2,840	1,384,264
25	Proposed	2,650	12	25.00	19.70	0.0020	1,006,540	3.09	325,397	0	325,397
30	Constructed	1,576	18	19.18	17.28	0.0012	2,304,047	2.33	990,657	311,617	679,041
31A	Constructed	1,014	18	20.41	19.18	0.0012	2,311,139	2.32	994,643	311,617	683,027
31	Constructed	350	18	20.83	20.41	0.0012	2,298,705	2.33	987,655	311,617	676,038
32A	Constructed	399	18	21.31	20.83	0.0012	2,301,584	2.33	989,273	311,617	677,656
32	Constructed	376	18	21.76	21.31	0.0012	2,295,646	2.33	985,936	305,904	680,033
33	Proposed	2,975	18	5.50	1.45	0.0014	2,448,367	2.28	1,071,732	83,625	988,107

^a PWWF Capacity based on d/D = 0.80

^b Peaking Factor corresponding to PWWF Capacity

^c ADWF Capacity = PWWF / Peaking Factor

APPENDIX F

SOUTH MANTECA COLLECTION STRATEGY PHASED IMPROVEMENTS TRIGGER FLOW CALCULATIONS

APPENDIX F
SOUTH MANTECA COLLECTION STRATEGY - PHASED IMPROVEMENTS
TRIGGER FLOW CALCULATIONS

PROJECT: Upgrade WPPS Pumps, Stage 1 Upgrade

Description	WPPS Inflow
Trigger Flow (PWWF)	849,000 gpd
Trigger Flow (ADWF)	262,000 gpd
Existing ADWF to WPPS	843,148 gpd
Remaing ADWF Capacity to Trigger Flow	(581,148) gpd <i>Available Flow to WPPS</i>

PROJECT: Upgrade TPPS Pumps, Stage 1 Upgrade

Description	TPPS Inflow
Trigger Flow (PWWF)	1,800,000 gpd
Trigger Flow (ADWF)	710,000 gpd
Existing Flow (ADWF) from Pump Stations along 12" Force Main (see Appendix D)	289,439 gpd
Existing ADWF to TPPS	668,968 gpd
Remaing ADWF Capacity to Trigger Flow	(248,406) gpd <i>Available Flow to TPPS</i>

PROJECT: Upgrade TPPS Pumps, Stage 2 Upgrade

Description	TPPS Inflow
Trigger Flow (PWWF)	4,435,000 gpd
Trigger Flow (ADWF)	2,134,000 gpd
Buildout Flow (ADWF) from Pump Stations along 12" Force Main (see Appendix D)	351,968 gpd
Existing ADWF to TPPS	668,968 gpd
Remaing ADWF Capacity to Trigger Flow	1,113,064 gpd <i>Available Flow to TPPS</i>

PROJECT: Construct Links 1 - 5; Existing 12-inch WFM limiting component (pressure)

Description	WPPS Inflow
Trigger Flow (PWWF)	2,736,000 gpd
Trigger Flow (ADWF)	1,232,000 gpd
Existing Flow (ADWF) to WPPS	843,148 gpd
Remaing ADWF Capacity to Trigger Flow	388,852 gpd <i>Available Flow to WPPS / 12-inch WFM</i>

APPENDIX F
SOUTH MANTECA COLLECTION STRATEGY - PHASED IMPROVEMENTS
TRIGGER FLOW CALCULATIONS

PROJECT: Construct Links 1 - 5; Existing 18-inch WFM limiting component (velocity)

Description	TPPS Inflow	
Trigger Flow (PWWF)	9,136,000 gpd	
Trigger Flow (ADWF)	4,455,000 gpd	
Maximum Flow in 12-inch WFM (ADWF)	1,941,000 gpd	<i>12-inch WFM Trigger Flow</i>
Buildout Flow for 12-inch WFM Lift Stations (ADWF)	351,968 gpd	
Buildout Flow for Sheds 1, 3, and 4 (ADWF)	358,008 gpd	
Existing Flow (ADWF) to TPPS	668,968 gpd	
Remaing ADWF Capacity to Trigger Flow	1,135,057 gpd	<i>Available Flow to TPPS / 18-inch WFM^a</i>

^a Assumed that Sheds 1, 3, and 4 have reached buildout

PROJECT: Construct Link 27S (Force Main); Construct SMLS, Link 22S1, Link 22S2, and Link 22S

Description	Link 18	
80% Full Flow Capacity of Link 18 (PWWF)	5,563,000 gpd	
Corresponding ADWF Capacity of Link 18	2,701,796 gpd	
Buildout ADWF in Link 18, Excluding Sheds Tributary to ABPS	2,306,911 gpd	
Remaing ADWF Capacity to Trigger Flow	394,000 gpd	<i>Available Flow to Link 18</i>

APPENDIX G

DEVELOPMENT OF UNIT PIPE INSTALLATION COSTS

APPENDIX G
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM 2012 MASTER PLAN UPDATE
DEVELOPMENT OF UNIT PIPE INSTALLATION COSTS

Description (Diameter and Depth)	Material	Assumed Trench Depth (ft)	Trench Width (ft)	Surface Width (ft)	Depth for which Surface Width Applies (ft)	Excavation Quantities (per unit length)				Water Depth (vlf)	Earthwork, Dewatering and Pavement Cost					Piping and Installation Cost					TOTAL (rounded)					
						Excavation (cy)	Backfill (cy)	Compaction (cy)	Pavement Removal & Replacement (sf)		Earthwork			Dewatering (\$/lf)	Pavement Removal & Replacement (\$/lf)	Pipe Base Cost (\$/lf)	10% Taxes (\$/lf)	25% Install. (\$/lf)	15% Contractor OH&P (\$/lf)	PIPING AND INSTALLATION SUBTOTAL (\$/lf)	Earthwork (\$/lf)	Dewatering (\$/lf)	Pavement Removal & Replacement (\$/lf)	Piping and Installation (\$/lf)	Total Cost (\$/lf)	
											Excavation (\$/lf)	Backfill (\$/lf)	Compaction (\$/lf)													EARTHWORk SUBTOTAL (\$/lf)
6-inch; 0-10 ft	VCP	10.50	2.50	4.50	0.00	0.97	0.96	0.96	4.50	0	1.94	1.93	1.93	5.80	0.00	22.50	4.82	0.48	1.21	0.72	7.23	6	0	23	8	37
6-inch; 10-20 ft	VCP	20.50	3.50	5.50	0.00	2.66	2.65	2.65	5.50	5.5	5.31	5.30	5.30	15.92	173.25	27.50	4.82	0.48	1.21	0.72	7.23	16	174	28	8	226
6-inch; 20-25 ft	VCP	25.50	6.50	8.50	0.00	6.14	6.13	6.13	8.50	10.5	12.28	12.26	12.26	36.80	330.75	42.50	4.82	0.48	1.21	0.72	7.23	37	331	43	8	419
8-inch; 0-10 ft	VCP	10.50	2.67	4.67	0.00	1.04	1.02	1.02	4.67	0	2.07	2.05	2.05	6.17	0.00	23.33	6.70	0.67	1.68	1.01	10.06	7	0	24	11	42
8-inch; 10-20 ft	VCP	20.50	3.67	5.67	0.00	2.78	2.77	2.77	5.67	5.5	5.57	5.54	5.54	16.65	173.25	28.33	6.70	0.67	1.68	1.01	10.06	17	174	29	11	231
10-inch; 0-10 ft	VCP	10.50	2.83	4.83	0.00	1.10	1.08	1.08	4.83	0	2.20	2.16	2.16	6.53	0.00	24.17	11.02	1.10	2.75	1.65	16.53	7	0	25	17	49
10-inch; 10-20 ft	VCP	20.50	3.83	5.83	0.00	2.91	2.89	2.89	5.83	5.5	5.82	5.78	5.78	17.38	173.25	29.17	11.02	1.10	2.75	1.65	16.53	18	174	30	17	239
12-inch; 0-10 ft	VCP	10.50	3.00	5.00	0.00	1.17	1.14	1.14	5.00	0	2.33	2.28	2.28	6.88	0.00	25.00	14.76	1.48	3.69	2.21	22.14	7	0	25	23	55
12-inch; 10-20 ft	VCP	20.50	4.00	6.00	0.00	3.04	3.01	3.01	6.00	5.5	6.07	6.02	6.02	18.11	173.25	30.00	14.76	1.48	3.69	2.21	22.14	19	174	30	23	246
12-inch; 20-25 ft	VCP	25.50	7.00	9.00	5.00	6.98	6.95	6.95	9.00	10.5	13.96	13.90	13.90	41.77	330.75	45.00	14.76	1.48	3.69	2.21	22.14	42	331	45	23	441
15-inch; 0-10 ft	VCP	10.50	3.25	5.25	0.00	1.26	1.22	1.22	5.25	0	2.53	2.44	2.44	7.40	0.00	26.25	23.37	2.34	5.84	3.51	35.06	8	0	27	36	71
15-inch; 10-20 ft	VCP	20.50	4.25	6.25	0.00	3.23	3.18	3.18	6.25	5.5	6.45	6.36	6.36	19.18	173.25	31.25	23.37	2.34	5.84	3.51	35.06	20	174	32	36	262
15-inch; 20-25 ft	VCP	25.50	7.25	9.25	5.00	7.22	7.17	7.17	9.25	10.5	14.44	14.34	14.34	43.12	330.75	46.25	23.37	2.34	5.84	3.51	35.06	44	331	47	36	458
18-inch; 0-10 ft	VCP	10.50	3.50	5.50	0.00	1.36	1.30	1.30	5.50	0	2.72	2.59	2.59	7.90	0.00	27.50	32.83	3.28	8.21	4.92	49.24	8	0	28	50	86
18-inch; 10-20 ft	VCP	20.50	4.50	6.50	0.00	3.42	3.35	3.35	6.50	5.5	6.83	6.70	6.70	20.24	173.25	32.50	32.83	3.28	8.21	4.92	49.24	21	174	33	50	278
18-inch; 20-25 ft	VCP	25.50	7.50	9.50	5.00	7.45	7.39	7.39	9.50	10.5	14.91	14.78	14.78	44.46	330.75	47.50	32.83	3.28	8.21	4.92	49.24	45	331	48	50	474
18-inch; 25-30 ft	VCP	30.50	7.50	9.50	5.00	8.84	8.78	8.78	9.50	15.5	17.69	17.55	17.55	52.79	488.25	47.50	32.83	3.28	8.21	4.92	49.24	53	489	48	50	640
21-inch; 0-10 ft	VCP	10.50	3.75	5.75	0.00	1.46	1.37	1.37	5.75	0	2.92	2.74	2.74	8.39	0.00	28.75	43.18	4.32	10.79	6.48	64.76	9	0	29	65	103
21-inch; 10-20 ft	VCP	20.50	4.75	6.75	0.00	3.61	3.52	3.52	6.75	5.5	7.21	7.03	7.03	21.28	173.25	33.75	43.18	4.32	10.79	6.48	64.76	22	174	34	65	295
21-inch; 20-25 ft	VCP	25.50	7.75	9.75	5.00	7.69	7.60	7.60	9.75	10.5	15.38	15.20	15.20	45.78	330.75	48.75	43.18	4.32	10.79	6.48	64.76	46	331	49	65	491
21-inch; 25-30 ft	VCP	30.50	7.75	9.75	5.00	9.13	9.04	9.04	9.75	15.5	18.25	18.07	18.07	54.39	488.25	48.75	43.18	4.32	10.79	6.48	64.76	55	489	49	65	658
24-inch; 0-10 ft	VCP	10.50	4.00	6.00	0.00	1.56	1.44	1.44	6.00	0	3.11	2.88	2.88	8.87	0.00	30.00	57.34	5.73	14.34	8.60	86.01	9	0	30	87	126
24-inch; 10-20 ft	VCP	20.50	5.00	7.00	0.00	3.80	3.68	3.68	7.00	5.5	7.59	7.36	7.36	22.31	173.25	35.00	57.34	5.73	14.34	8.60	86.01	23	174	35	87	319
24-inch; 20-25 ft	VCP	25.50	8.00	10.00	5.00	7.93	7.81	7.81	10.00	10.5	15.85	15.62	15.62	47.09	330.75	50.00	57.34	5.73	14.34	8.60	86.01	48	331	50	87	516
24-inch; 25-30 ft	VCP	30.50	8.00	10.00	5.00	9.41	9.29	9.29	10.00	15.5	18.81	18.58	18.58	55.98	488.25	50.00	57.34	5.73	14.34	8.60	86.01	56	489	50	87	682
27-inch; 0-10 ft	VCP	10.50	4.25	6.25	0.00	1.65	1.51	1.51	6.25	0	3.31	3.01	3.01	9.33	0.00	31.25	68.97	6.90	17.24	10.35	103.45	10	0	32	104	146
27-inch; 10-20 ft	VCP	20.50	5.25	7.25	0.00	3.99	3.84	3.84	7.25	5.5	7.97	7.68	7.68	23.33	173.25	36.25	68.97	6.90	17.24	10.35	103.45	24	174	37	104	339
27-inch; 20-25 ft	VCP	25.50	8.25	10.25	5.00	8.16	8.01	8.01	10.25	10.5	16.32	16.03	16.03	48.38	330.75	51.25	68.97	6.90	17.24	10.35	103.45	49	331	52	104	536
27-inch; 25-30 ft	VCP	30.50	8.25	10.25	5.00	9.69	9.54	9.54	10.25	15.5	19.38	19.09	19.09	57.55	488.25	51.25	68.97	6.90	17.24	10.35	103.45	58	489	52	104	703
30-inch; 0-10 ft	VCP	10.50	4.50	6.50	0.00	1.75	1.57	1.57	6.50	0	3.50	3.14	3.14	9.77	0.00	32.50	83.66	8.37	20.92	12.55	125.50	10	0	33	126	169
30-inch; 10-20 ft	VCP	20.50	5.50	7.50	0.00	4.18	3.99	3.99	7.50	5.5	8.35	7.99	7.99	24.33	173.25	37.50	83.66	8.37	20.92	12.55	125.50	25	174	38	126	363
30-inch; 20-25 ft	VCP	25.50	8.50																							

APPENDIX H

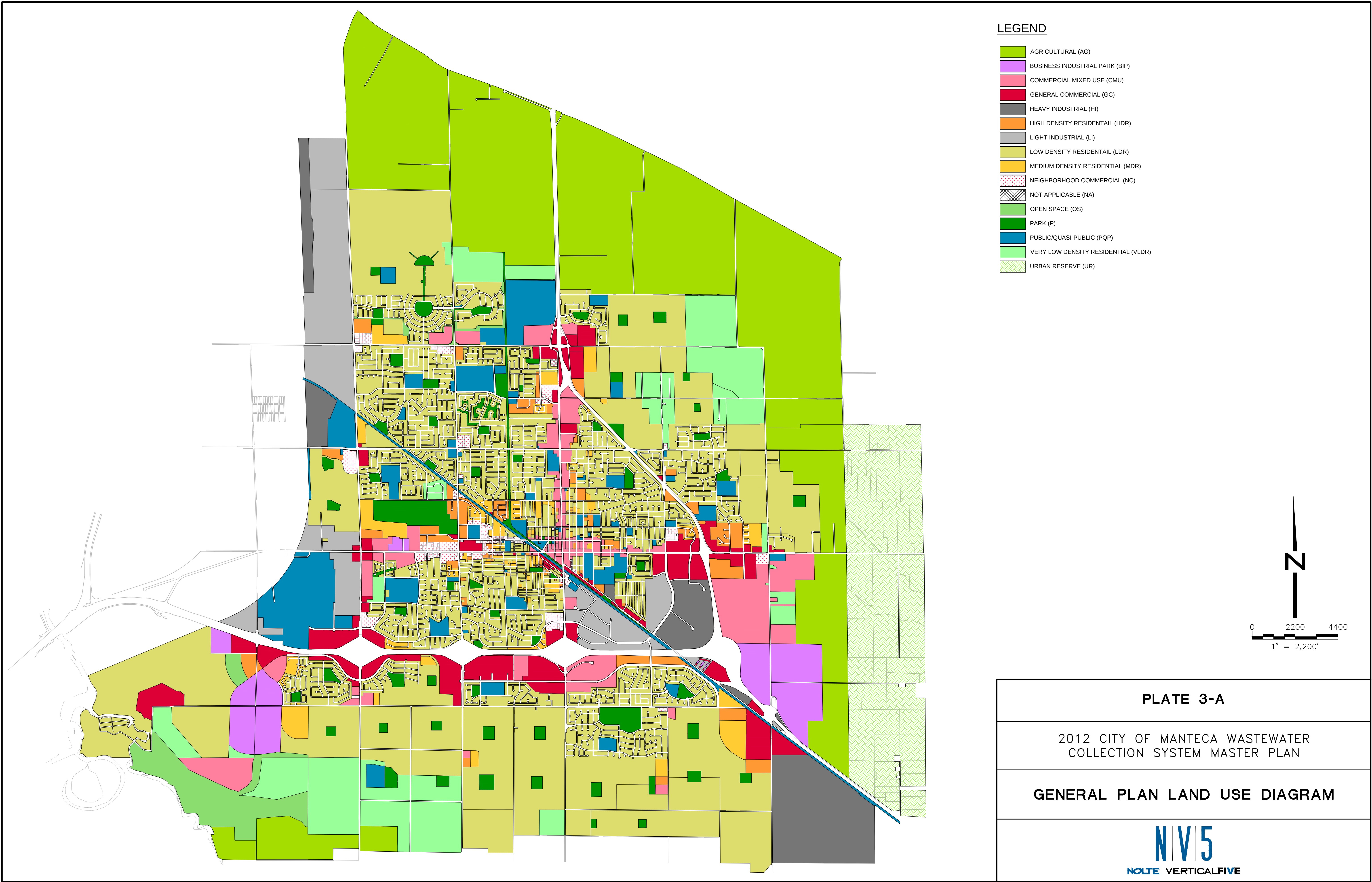
**PUMP AND LIFT STATION
CONSTRUCTION COST ESTIMATES**

APPENDIX H
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
1.5 MGD PUMP STATION COST ESTIMATE

ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE (\$)	ITEM TOTAL (rounded) (\$)
Mobilization and Demobilization	LS	1	\$80,000	<u>\$80,000</u>
<i>Subtotal-Mobilization</i>				\$80,000
Grading, Excavation and Site Preparation				
<i>Subtotal-Grading, Site Preparation</i>				\$100,000
Construct Wet Well				
Excavation	CY	290	\$35	\$10,141
Backfill	CY	17	\$30	\$513
Wet well foundation and cover	CY	13	\$785	\$10,236
Wet well (84" RCP)	LF	34	\$795	\$27,030
Wet well access hatch	EA	2	\$4,405	\$8,810
Waterproofing/Lining	LS	1	\$52,500	<u>\$52,500</u>
<i>Subtotal - Wet Well</i>				\$109,231
Furnish and Install Pumps and Motors				
Pump	EA	2	\$31,500	<u>\$63,000</u>
<i>Subtotal - Pumps</i>				\$63,000
Site Electrical, Control Systems, and Lighting	LS	1	\$195,000	<u>\$195,000</u>
<i>Subtotal - Site Electrical and Controls</i>				\$195,000
Install Site Piping and Appurtenances				
Force main	LF	100	\$105	\$10,500
Sewer (24" @ 20-30' depth)	LF	25	\$875	\$21,875
10" Check valves	EA	2	\$3,700	\$7,400
10" Gate valve	EA	4	\$2,600	\$10,400
10" Magnetic flowmeter	EA	1	\$7,900	\$7,900
4" Check valve	EA	1	\$525	\$525
4" Drain pipe (PVC)	LF	100	\$50	\$5,000
2" Foul air pipe (DIP)	LF	10	\$35	\$350
4" Foul air pipe (DIP)	LF	50	\$50	\$2,500
1" Drain pipe (PVC)	LF	10	\$50	\$500
Pipe fittings and supports	LS	1	\$10,500	\$10,500
2" Comb air valve	EA	1	\$2,900	\$2,900
Vault ladders	LF	24	\$155	\$3,720
Miscellaneous pipe fittings	LS	1	\$21,000	<u>\$21,000</u>
<i>Subtotal - Site Piping</i>				\$105,070
Install Manholes and Ancillary Facilities				
Manhole (48")	EA	1	\$5,700	\$5,700
Traffic bollards	EA	6	\$420	\$2,520
Concrete pads	CY	17	\$525	\$9,042
Valve vault and 8' x 8' hatch	EA	1	\$36,400	\$36,400
Flowmeter vault and 4' 6"x 6' hatch	EA	1	\$15,750	\$15,750
Bypass vault and 4' 6" x 6' hatch	EA	1	\$15,750	<u>\$15,750</u>
<i>Subtotal - Manholes and Ancillary Facilities</i>				\$85,162
Aggregate Base (Class 2)	CY	150	\$20	\$3,000
Asphalt Concrete Paving	TON	62	\$95	\$5,890
Gates and Fencing				
Fencing	LF	250	\$35	\$8,750
20-foot rolling gate	EA	1	\$4,200	<u>\$4,200</u>
<i>Subtotal - Gates and Fencing</i>			\$52	\$12,950
All Sheeting, Shoring and Bracing				
Pump Station	SF	748	\$30	<u>\$22,431</u>
<i>Subtotal - Sheeting and Shoring</i>				\$22,431
TOTAL (rounded)				\$780,000

APPENDIX H
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
2.0-4.0 MGD PUMP STATION COST ESTIMATE

ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE (\$)	ITEM TOTAL (rounded) (\$)
Mobilization and Demobilization	LS	1	\$115,000	<u>\$115,000</u>
<i>Subtotal-Mobilization</i>				\$115,000
Grading, Excavation and Site Preparation				
<i>Subtotal-Grading, Site Preparation</i>				\$100,000
Construct Wet Well				
Excavation	CY	415	\$35	\$14,508
Backfill	CY	26	\$30	\$780
Wet well foundation and cover	CY	31	\$785	\$24,715
Wet well	CY	103	\$785	\$80,593
Wet well access hatch	EA	3	\$4,405	\$13,215
Waterproofing/Lining	LS	1	\$52,500	<u>\$52,500</u>
<i>Subtotal - Wet Well</i>				\$186,312
Furnish and Install Pumps and Motors				
Pump	EA	3	\$42,000	<u>\$126,000</u>
<i>Subtotal - Pumps</i>				\$126,000
Site Electrical, Control Systems, and Lighting	LS	1	\$286,538	<u>\$286,538</u>
<i>Subtotal - Site Electrical and Controls</i>				\$286,538
Install Site Piping and Appurtenances				
Force main	LF	100	\$105	\$10,500
Sewer (24" @ 20-30' depth)	LF	25	\$875	\$21,875
10" Check valves	EA	2	\$3,700	\$7,400
10" Gate valve	EA	4	\$2,600	\$10,400
12" Magnetic flowmeter	EA	1	\$10,500	\$10,500
4" Check valve	EA	1	\$525	\$525
4" Drain pipe (PVC)	LF	100	\$50	\$5,000
2" Foul air pipe (DIP)	LF	10	\$35	\$350
4" Foul air pipe (DIP)	LF	50	\$50	\$2,500
1" Drain pipe (PVC)	LF	10	\$50	\$500
Pipe fittings and supports	LS	1	\$10,500	\$10,500
2" Comb air valve	EA	1	\$2,900	\$2,900
Vault ladders	LF	24	\$155	\$3,720
Miscellaneous pipe fittings	LS	1	\$21,000	<u>\$21,000</u>
<i>Subtotal - Site Piping</i>				\$107,670
Install Manholes and Ancillary Facilities				
Manhole (48")	EA	1	\$5,700	\$5,700
Traffic bollards	EA	6	\$420	\$2,520
Concrete pads	CY	34	\$525	\$17,967
Biofilter	EA	1	\$26,200	\$26,200
Valve vault and 8' x 8' hatch	EA	1	\$36,400	\$36,400
Flowmeter vault and 4' 6"x 6' hatch	EA	1	\$15,700	\$15,700
Bypass vault and 4' 6" x 6' hatch	EA	1	\$15,700	<u>\$15,700</u>
<i>Subtotal - Manholes and Ancillary Facilities</i>				\$120,187
Aggregate Base (Class 2)	CY	135	\$20	\$2,700
Asphalt Concrete Paving	TON	68	\$95	\$6,460
Gates and Fencing				
Fencing	LF	270	\$35	\$9,450
20-foot rolling gate	EA	1	\$4,200	<u>\$4,200</u>
<i>Subtotal - Gates and Fencing</i>			\$51	\$13,650
All Sheeting, Shoring and Bracing				
Pump Station	SF	2,728	\$30	<u>\$81,840</u>
<i>Subtotal - Sheeting and Shoring</i>				\$81,840
TOTAL (rounded)				\$1,145,000





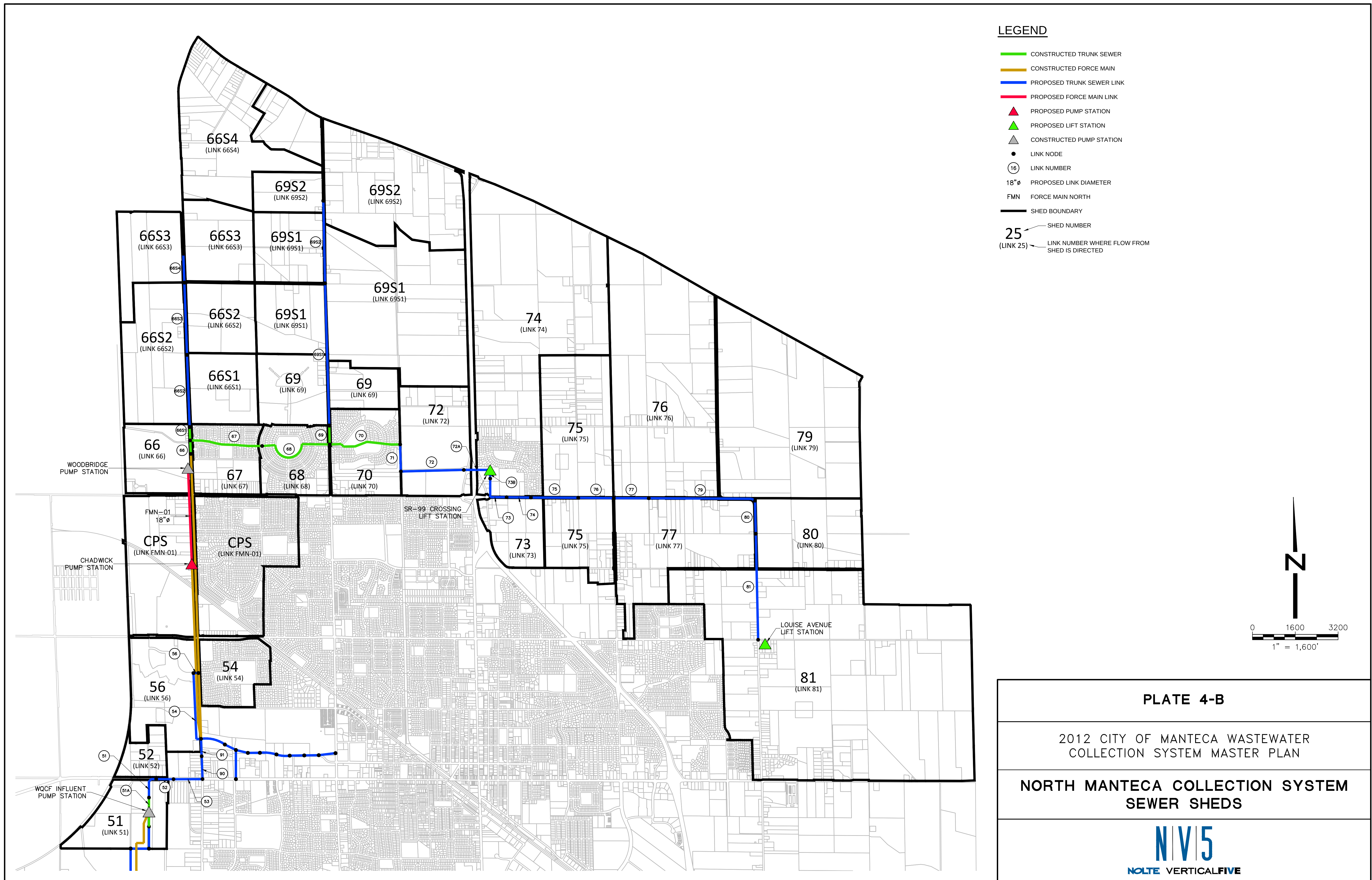


PLATE 4-B

2012 CITY OF MANTECA WASTEWATER
COLLECTION SYSTEM MASTER PLAN

NORTH MANTECA COLLECTION SYSTEM
SEWER SHEDS



