Sewer Master Plan

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TABLE OF CONTENTS

SECTION 1 - INTRODUCTION 1-1

SECTION 2 - SERVICE BOUNDRIES AND LAND USE 2-1

STUDY AREA BOUNDARIES AND COMPOSITION 2-1

Retail Service Area 2-1

Sewer Service Areas 2-1

PROJECTED LAND USE ANALYSIS 2-3

SECTION 3 - ANALYSIS CRITERIA 3-1

PROJECTED WASTEWATER FLOW CRITERIA 3-1

Wastewater Generation Factors 3-1

Infiltration/Inflow 3-3

Wet Weather Flow 3-3

Wastewater Peak Factors 3-4

Large Point Sources 3-4

FACILITY DESIGN 3-4

Conveyance Facilities 3-4

Wastewater Treatment Facilities 3-7

SECTION 4 - EXISTING SYSTEM ANALYSIS 4-1

EXISTING TRIBUTARY AREAS 4-1

SUMMARY OF EXISTING FACILITIES 4-1

Sewer Collection / Trunk Line Systems 4-1

Pressure Systems – Sewer Lift Stations and Force Mains 4-3

Wastewater Treatment Plants 4-5

EXISTING HYDRAULIC MODEL 4-6

Model Input 4-6

Model Analysis 4-8

ANALYSIS RESULTS 4-8

SECTION 5 - PROPOSED SYSTEM ANALYSIS 5-1

FUTURE TRIBUTARY AREAS 5-1

PROPOSED FACILITIES AND BENEFIT AREAS 5-1

Proposed Sewer Facilities 5-1

Proposed Benefit Areas 5-2

ULTIMATE FLOW PROJECTIONS 5-3

Flow Calculations 5-3

Flow Summary 5-3

FUTURE HYDRAULIC MODEL 5-5

Model Input 5-5

Model Analysis 5-6

ANALYSIS RESULTS 5-6
West System Analysis Results 5-6
East System Analysis Results 5-7
SECTION 6 - FUTURE FACILITIES AND IMPROVEMENTS 6-1
GROWTH RATE PROJECTIONS 6-1
WEST SYSTEM FUTURE FACILITIES AND IMPROVEMENTS 6-2
Future Trunk Lines 6-2
Future Lift Stations 6-2
Trunk Line Improvements 6-2
Lift Station Improvements 6-2
EAST SYSTEM FUTURE FACILITIES AND IMPROVEMENTS 6-3
Future Lift Stations 6-3
Future Trunk Lines 6-3
Trunk Line Improvements 6-4
Lift Station Improvements 6-4
SECTION 7 - COST ESTIMATES 7-1
COST BASIS 7-1
FACILITY COSTS 7-1

LIST OF TABLES

Table 2-1 - WMWD Sewer Service Area Land Use Summary 2-3
Table 3-1 – Existing Domestic Wastewater Generation Factors 3-2
Table 3-2 - Summary of Wastewater Generation Factors 3-3
Table 3-3 – Maximum Depth of Flow to Pipeline Diameter Rates 3-5
Table 3-4 – Minimum and Maximum Slope Criteria 3-5
Table 3-5 – Minimum Manhole Diameter Summary 3-6
Table 4-1 - Summary of Existing Sewage Lift Stations 4-3
Table 4-2 – Summary of Existing West Sewer System Avg. Daily Flows 4-7
Table 4-3 – Summary of Existing East Sewer System Avg. Daily Flows 4-7
Table 5-1 – Summary of Ultimate West Sewer System Avg. Daily Flows 5-4
Table 5-2 – Summary of Ultimate East Sewer System Avg. Daily Flows 5-4
Table 6-1 - WMWD Growth Projection 6-1
Table 7-1 – Costs for Facilities to be constructed 7-2
Table 7-2 – Facilities for Benefit Area 1 7-2
Table 7-2 – Facilities for Benefit Area 2 7-2
Table 7-3 – Facilities for Benefit Area 3 7-3

LIST OF PLATES

Water Retail and Sewer Service Area Boundries _____ Plate 1
West Sewer Service Area Boundries _____ Plate 1A
East Sewer Service Area Boundries _____ Plate 1B
West RCIP Landuse _____ Plate 2A
East RCIP Landuse _____ Plate 2B
Existing West Sewer System and Tributary Areas _____ Plate 3A
Existing East Sewer System and Tributary Areas _____ Plate 3B
Existing West Trunk Systems _____ Plate 4A
Existing East Trunk Systems _____ Plate 4B
Ultimate West Sewer System and Tributary Areas _____ Plate 5A
Ultimate East Sewer System and Tributary Areas _____ Plate 5B
West System Benefit Areas _____ Plate 6A
East System Benefit Areas _____ Plate 6B
West System Analysis Results _____ Plate 7A
East System Analysis Results _____ Plate 7B
West System Fee Facilities _____ Plate 8A
East System Fee Facilities _____ Plate 8B

LIST OF APPENDICES

Reference Reports _____ Appendix A
Cooperative Agreement For Sewer Service _____ Appendix B
Flow Monitoring Data _____ Appendix C
Standard Peaking Factor Data _____ Appendix D
Existing System Average Daily Flow Summaries _____ Appendix E
Ultimate System Average Daily Flow Summaries _____ Appendix F
Unit Costs _____ Appendix G

SECTION 1 - INTRODUCTION

The following document is a Sewer Master Plan for Western Municipal Water District (District or Western) which is located in Western Riverside County. The District provides water resource management, water supply, wastewater disposal, and reclaimed water services to a service area of approximately 510 square miles[1].

The District plans to provide wastewater services to approximately 11,500 acres within its retail service area (**Plate 1**). The District's wastewater jurisdiction includes developments such as Lake Hills and Victoria Grove, which contribute wastewater flows to the Western Riverside County Regional Wastewater Authority (WRCRWA). The District also provides wastewater services to developments such as Mission Ranch, Boulder Springs, and developments within the March Joint Powers Authority (March JPA). These areas contribute wastewater flows to the Western Water Recycling Facility (WWRF).

Various developments have been proposed, or are currently under construction, within the District's wastewater jurisdiction. In particular, the area pertaining to the March JPA is projected to undergo significant development within the next several years. Developments such as the Meridian Business Center and Ben Clark Training Center will add significant flows to the District's wastewater system. Future residential developments will also contribute added flows to the conveyance system.

Purpose

The purpose of the Sewer Master Plan is to provide the District with a planning document that will outline the potential service area boundaries, available capacity of existing facilities, location and sizing of future sewer conveyance facilities, and the costs and potential connection fees for capital cost recovery.

SCOPE OF REPORT

To accomplish the objectives of this report, the scope of the study includes the following:

1. Research and data collection
2. Review of existing and projected study area characteristics
3. Definition of design criteria
4. Hydraulic evaluation of existing sewer system
5. Hydraulic evaluation of ultimate sewer system
6. Sizing and design of future facilities and improvements
7. Evaluation of projected project costs

[1] "East Area Wastewater Capital Cost recovery Program of 2006"

SECTION 2 - SERVICE BOUNDRIES AND LAND USE

The purpose of this section is to provide descriptions of the sewer service boundaries within Western Municipal Water District, and the projected land use within those boundaries.

STUDY AREA BOUNDARIES AND COMPOSITION

Retail Service Area

While the majority of Western's customers are wholesale customers, those within the Retail Service Area receive water and sewer services as retail customers. The Retail Service Area is generally bounded by the City of Riverside to the north, the City of Moreno Valley to the east, the City of Lake Elsinore to the south, and the City of Corona to the west. The extent of the Retail Service Area is shown on **Plate 1**, with the exception of a smaller retail service area in Murrieta that is not shown. This report deals more specifically with those areas within the Retail Service Area that receive sewer service from the District. These sewer service areas are explained in greater detail below.

Sewer Service Areas

The District plans to provide wastewater services to approximately 11,500 acres within its retail service area. Various planning and design reports were compiled and reviewed in the preparation of this report, in order to garner a full understanding of Western's sewer service area. Many of these reports were provided by the District, while some are being prepared concurrently with this report. A reference list of these reports is provided in **Appendix A**.

The reports referenced in **Appendix A** not only aided in the composition of existing sewer service area boundaries, but also provided information on future development and potential future development areas. The sewer service areas described herein consist of both existing areas tributary to the current sewer system, as well as future areas that can be served by the District upon expansion of the existing system. These sewer service areas are divided into the following general categories:

- East Sewer Service Area
- West Sewer Service Area

West Sewer Service Area

The West Sewer Service Area is shown on **Plate 1A** and includes the developments of Victoria Grove and Lake Hills, as well as future development areas to the east of Victoria Grove. All sewer flows from the West Sewer Service Area flow to the WRCRWA treatment plant. Much of the area is already built out. However, the portion of the service area east of McAllister St. remains largely undeveloped, with some developments currently in planning stages. Some of the areas within the West Sewer Service Area receive sewer service from the District, but do not receive water service. These two areas are Home Garden, and an area along La Sierra Ave North of Victoria Grove as shown on **Plate 1A**.

East Sewer Service Area

The East Sewer Service Area is shown on **Plate 1B**, and encompasses the developments of Mission Ranch, Boulder Springs, the March JPA, and the March Air Reserve Base. All sewer flows from the East Sewer Service Area flow to the WWRF, with the exception of the Global Port development which is currently served by Eastern through an agreement. Some of the areas within the Boulder Springs and Mission Ranch developments are already built out, with other residential areas currently in planning stages. Numerous commercial and industrial developments are in various stages of planning and construction, such as the Meridian Business Center and Ben Clark Training Center.

Van Buren Sewer Service Agreement

Particular attention is given to the sewer service boundary line between Western and the City of Riverside along Van Buren Blvd. A "Cooperative Agreement for Sewer Service" was executed in 2003 which helped define the sewer service boundary line along Van Buren Blvd between Washington St. and I-215. A copy of this agreement has been provided in **Appendix B**. In a report prepared for the Gamble Lift Station, modifications were made to the boundary outlined in the agreement, incorporating more businesses into Western's sewer service area along Van Buren. This boundary line is shown in **Plate 1B.** Areas generally north of the boundary line will receive sewer service from the City of Riverside, and areas generally south of the boundary line will receive sewer service from the District. The District has agreed not to provide sewer service to the areas shown in purple in **Plate 1B**.

Non-Sewage Producing Areas

Several areas were not included in the sewer retail service area and were considered non-sewage producing areas. These areas are shown in yellow in **Plate 1B**. The non-sewage producing areas include the Riverside National Cemetery, portions of the Ben Clark Training Center, and the March ARB tarmac. The area directly west of the March JPA is also considered a non-sewage producing area for the purposes of this report, given the fact that there are no approved plans to develop this environmental area. If development occurs in this area, a separate study would be needed to determine the required sewer facilities.

Gateway Project

Some consideration should be given to the area north east of the intersection of I-215 and Highway 60, referred to as the Gateway Project. This area is shown on **Plate 1**. This area falls within the District's water retail service area; however, due to the natural grade of the area it cannot be connected by gravity to the District's sewer system. If the District were to provide sewer service to this area it would most likely be through a metered connection to the City of Riverside. No agreements have been made concerning sewer service in this area. For the purposes of this report, the Gateway Project was not considered a part of the District's sewer retail service area.

PROJECTED LAND USE ANALYSIS

Plate 2A and **Plate 2B** depict the various land use types within the west and east sewer service areas respectively. These land use types are based on the RCIP General Plan land use designations. Ultimate wastewater flows within the service areas were calculated based on these land use types.

It is noted that some of the planning reports used to develop the future sewer service boundaries propose land uses that are different than the RCIP designations. In these situations, projected EDU's and flows were based on the planning reports and not on the RCIP land use designations. This is explained in greater detail in Section 5 of this report.

A summary of the RCIP land use designations within the District's sewer service area is given below in **Table 2-1**.

Table 2-1 - WMWD Sewer Service Area Land Use Summary

Land Use Characteristics	West Sewer Service Area (Acres)	East Sewer Service Area (Acres)
Residential		
Rural Res. (Less then 0.2 -1 DU per AC	433	25
Very Low Density (1 - 2 DU per AC)	688	1679
Low Density (2 DU per AC)	1383	988
Medium Density (2 - 5 DU per AC)	1075	679
Med. to High Density (5 to 8 DU per AC)	187	155
High Density (8 to 14 DU per AC)	17	0
Commercial (mixed)	17	773
Industrial (mixed)	0	978
Public Facilities	36	957
Open Space (non-wastewater generating)	384	938
Totals:	**4,220**	**7,172**

SECTION 3 - ANALYSIS CRITERIA

The following section discusses criteria used to evaluate the District's wastewater system. Analysis criteria are divided into the following categories:

- Projected Wastewater Flow Criteria
- Facility Design Criteria

PROJECTED WASTEWATER FLOW CRITERIA

This section describes the criteria used to project the quantity of wastewater flow to the District's facilities. This flow quantity will determine the size of the sewer gravity mains, lift stations, and treatment capacity. The following elements of wastewater flow are examined:

- Wastewater Generation Factors
- Infiltration/inflow
- Wet Weather Flows
- Peak Flow Factors
- Large Point Sources

Wastewater Generation Factors

Domestic Sewage

The District's standard domestic wastewater generation factor for sizing of new conveyance facilities has been 330 gpd/EDU. For estimation of sewer treatment capacity the District standard has been 280 gpd/EDU[1]. For the purposes of this report, the domestic wastewater generation factors were re-evaluated based on actual flows experienced in the existing sewer service areas.

Flow data was provided for each of the District's metering locations and lift stations. This information is provided in **Appendix C**. These wastewater flow readings were evaluated in conjunction with the number of equivalent dwelling units (EDU's) tributary to each meter or lift station. This analysis is summarized in **Table 3-1**. From this analysis it was determined that the existing system averaged approximately 184 gpd/EDU. This average does not include the flows metered at the Markham Lift Station, which had a lower wastewater generation factor than the other metering stations and was therefore a statistical outlier.

Based on the analysis described above and through discussions with the District, this report will adopt the following domestic wastewater generation factors as recommended by District staff:

- 200 gpd/EDU for sizing of new sewer conveyance facilities
- 200 gpd/EDU for estimating treatment capacity

[1] From Western's Developer Handbook, updated June 12, 2007.

Table 3-1 – Existing Domestic Wastewater Generation Factors

Existing Meters and Lift Stations	Avg. Metered Flow (gpd)	Tributary Residential EDU's	Wastewater Generation Factor (gpd/EDU)
Arizona	311,000	1,613	193
Buchanan	130,000	782	166
Fillmore	148,000	895	165
McKinley	213,000	1,053	202
Cajalco	60,000	317	189
Dauchy	100,000	540	185
Markham[1]	177,000	1,350	131
Average (not including Markham)			**184**

1 Statistical Outlier – Excluded from Average

Commercial/Industrial Sewage

Most of the commercial and industrial sewer flow is generated in the East Sewer Service Area, primarily from developments within the area that previously belonged to the March Air Force Base. Establishing accurate wastewater generation rates for commercial and industrial flows based on existing flow data was difficult, given the lack of existing sewer account data within the old March AFB area. Existing EDU data in this area is inconsistent at best. Wastewater generation factors were therefore based on factors used by other local agencies. The commercial and industrial wastewater generation factors are as follows:

- 1,700 gpd/acre for commercial flows
- 2,000 gpd/acre for industrial flows

These wastewater generation factors are considered conservative, in order to account for the ambiguity of the existing account data, as discussed above. These same generation rates have also been used in planning reports for developments in this area, such as the Meridian Business Center and Ben Clark Training Center.

Public Facilities and School Sewage

Due to the variety of public facilities, such as post offices, fire stations, parks, etc., this report assumes a wastewater generation of 1,000 gpd/acre for public uses. This value is consistent with previous planning reports within the East Sewer Service Area. It is also consistent with other local agencies which use the same value.

In determining wastewater generation factors for schools, data from "Wastewater Engineering Treatment and Reuse" 4th edition, 2002, by Metcalf & Eddy, Inc. was used. This book recommends different wastewater generation factors dependent upon the grade level of schools. These factors were adopted for this report and are as follows:

- 10 gpd/student for elementary schools
- 15 gpd/student for middle schools
- 25 gpd/student for high schools

Wastewater Generation Factors Summary

A summary of the wastewater generation factors utilized in the report is provided in **Table 3-2**.

Table 3-2 - Summary of Wastewater Generation Factors

Land Use	Wastewater Generation Factors
Residential	
Single & Multi-Family (treatment capacity)	200 gpd/EDU
Single & Multi-Family (pipeline/lift station sizing)	200 gpd/EDU
Commercial	1,700 gpd/acre
Industrial	2,000 gpd/acre
Public Uses (excluding schools)	1,000 gpd/acre
Elementary Schools	10 gpd/student
Middle Schools	15 gpd/student
High Schools	25 gpd/student

Infiltration/Inflow

To design pipeline improvements, it is necessary to establish values for the peak flows, which also entails an allowance for infiltration/inflow (I/I). A starting point in developing this allowance for a sewer agency normally begins with a review of recorded data. Review of District flow records for WRCRWA and the WWRF are provided in **Appendix C**. During the first several months of 2008 the District experienced inclement weather. It was observed that there was an increase in flow of 0.149 MGD at the WWRF.

The district has confirmed that most of the I/I is occurring in the older pipelines within the March JPA area previously pertaining to the March AFB. For other areas of the sewer system where newer pipes are in place, no analysis has been performed to confirm the amount of I/I that may be occurring. The District currently has no adopted standard to account for I/I during analysis. For the purposes of this report it is assumed that I/I is covered by the peaking factor discussed later in this section.

Wet Weather Flow

Since most of the sewers in the study area will lie above the groundwater table, infiltration during dry weather periods is assumed to be negligible. However, wet weather infiltration plus direct storm inflow must be added to dry weather flows to obtain the total wet weather flow. Wet weather flows govern the hydraulic capacity of pipelines and other facilities such as lift stations and inlet and outlet structures.

Direct storm inflow is distinguished from wet weather infiltration by the rapidity with which inflow begins and ends after a period of rainfall. Infiltration, on the other hand, may persist for an extended period after the cessation of rainfall. This study uses the peak flow factors described later in this section to determine the total wet weather flow.

Wastewater Peak Factors

The flow used for the design capacity for sewers and sewage lift stations is the "computed peak flow," or facility "design flow," which is determined on the basis of projected land use area, the unit wastewater generation factor assigned to the particular land use designation, and a peak factor to account for the diurnal flow rate variations.

The District's standard peaking curve, shown in **Appendix D**, was used to calculate peak flows in this report. A review was conducted to compare the District's peaking factor with those used by other local agencies (**Appendix D**). Peak factors were similar for flows greater than 0.1 mgd. For flows smaller than 0.1 mgd the District's peak factor appears to be higher than those used by other local agencies. It is also noted that the District's curve ends at 1 mgd which is less than the projected future flows in some areas.

Large Point Sources

This section would normally identify large wastewater sources and/or sources which have extra-ordinary flow or peaking factors. Interviews with District staff have indicated there are currently two large point sources of wastewater in the District. The first is Home Gardens which ties into the main trunk line along Samson Rd. near the intersection of Radio Rd. This source generated an average of 0.46 MGD of wastewater between May 2006-2007. The second area is a portion of Norco which is metered by the Norco/Coda meter. This source generated an average of 1.45 MGD between May 2007-2008 (see **Appendix C**). These sources tie into the District's sewer system as wholesale customers, and the flows are generally residential. It is beyond the scope of this report to evaluate these areas; however, point loads were added to the model for the analysis of the sewer system.

FACILITY DESIGN

Facility design criteria basically fall into one of the following wastewater facility components:

- Conveyance Facilities
- Wastewater Treatment Facilities

The following discusses each of these components. It should be noted that the majority of the following criteria are summarized from Western's Developer Handbook.

Conveyance Facilities

Collection Sewers

Collection sewers in this report are considered to be pipes less than 12 inches in diameter. These pipes should be designed under peak conditions to be flowing at one-half full. Collection sewers are typically designed to flow one-half full for maintenance purposes and since collection pipelines serve smaller areas, they can experience high peak factors. Collection sewer diameters are determined by means of Manning's formula, using a roughness coefficient (n) of 0.013. Polyvinyl chloride (PVC) pipe material, unless otherwise indicated, is assumed to be used in future construction of sewer pipes that are 12 inches in diameter and smaller.

Trunk and Interceptor Sewers

Trunk sewers in this report are considered to be pipes 12 inches and larger in diameter. Sewer diameters are determined by means of Manning's formula, using a roughness coefficient (n) of 0.013. The capacity to be provided in each section of a trunk sewer is based on the peak rate of flow calculated for the area tributary to that section. Vitrified clay pipe (VCP) material is assumed to be used in future construction of trunk lines greater than 12 inches in diameter.

Sewer Flow Ratio Criteria

A summary of flow ratio criteria is given below in **Table 3-3**.

Table 3-3 – Maximum Depth of Flow to Pipeline Diameter Rates

Pipe Dia. (in)	Flow Ratio (depth/dia.)
8 - 12	0.50
15 and greater	0.75

Sewer Slope Criteria

Given that low velocities in the sewers will cause deposition of solids and result in sulfide problems, minimum slopes should be set to maintain a flow velocity of not less than 2 feet per second. **Table 3-4** provides a summary of the minimum and maximum slope criteria.

Table 3-4 – Minimum and Maximum Slope Criteria

Pipe Dia. (in)	Preferred Min. Slope (V = 3 fps)	Min. Slope (V = 2 fps)	Extreme Min. Slope (V = 1.5 fps)
8	0.0076	0.0034	0.0019
10	0.0058	0.0026	0.0014
12	0.0044	0.002	0.0011
15	0.0033	0.0015	0.00081
18	0.0025	0.00113	0.00066
21	0.0021	0.00092	0.00052
24	0.00175	0.00076	0.00044
27	0.00146	0.00064	0.00036
30	0.0013	0.00056	0.00031
33	0.00106	0.0005	0.00029

When possible, the pipelines should be designed to flow by gravity. Sewage lift stations should be installed only when existing topography prevents gravity flow or to avoid excessive trench depths. Extreme minimum slopes are the exception, not the norm, and are reserved to special cases approved by District staff.

Manhole Criteria

Manholes shall be located at all junctions, all changes in grade, all changes in direction, all changes in pipe size, at street intersections, at connections with laterals 6 inch and larger in diameter, and at the beginning of sewer runs such as a cul-de-sac. Where the distance between manholes exceeds 450 feet for 8 inch sewer or 500 feet for 12 inch and larger, good judgment should be used in placing intermediate manholes at points of probable sewer intersections, or lacking other criteria, at approximately equal intervals. A 400 foot maximum interval between manholes for sewer with slopes 5% or greater should be observed.

Manhole diameters are determined based upon the depth of the sewer as shown on **Table 3-5**.

Table 3-5 – Minimum Manhole Diameter Summary

Manhole Depth	Minimum Manhole Diameter
12 ft or less	48"
12 ft or more	60"

In addition to the above mentioned manhole design criteria, the following design parameters shall also be used in the final design process.

- Manholes will be constructed of precast reinforced concrete rises and top sections in compliance with ASTM C478. Additionally, there may exist the possibility of using watertight manhole covers.
- Manholes in pipelines where hydrogen sulfide may be problematic should be lined with PVC lining to minimize chemical deterioration. Manhole bases should be lined with PVC lining or a special protective coating.
- All manholes deeper than 25 feet may require safety platforms installed.
- Where future sewer lines will likely be connected into the trunk sewer manholes, an appropriately sized stub will be installed.

Inverted Siphons

The purpose of an inverted siphon is to carry the flow under an obstruction such as a stream or depressed highway and to regain as much elevation as possible after the obstruction has been passed. Self-cleaning velocities (2 to 3 fps) should be obtained at least once a day, even during the early years of operation. To insure adequate minimum velocities, it may be necessary to use multiple diameter pipelines. Flow in these lines can be regulated by control structures such as overflow weirs. Inverted siphons may require cleaning more often than gravity sewers.

A conservative Hazen-Williams roughness coefficient (C) of 100 (equivalent to Manning's n of between 0.014 and 0.018) is recommended to calculate head loss in inverted siphons. Material that would be considered for siphons includes VCP and PVC pipe. Final selection of pipe materials would be made during the detailed design phase. Inverted siphons should be avoided in future designs whenever possible.

Force Mains

Force mains are designed to flow full with minimum velocities required to prevent deposition of suspended solids. Velocities normally fall within a range of from 3 to 5 fps. A velocity of 2 fps is considered to be sufficient to prevent settling of solids, but velocities of between 2.5 and 3 fps are required to re-suspend those which already have accumulated in the force main. If flushing velocities are attained once or twice a day, excessive deposits are not likely to occur.

Material that would be considered for force mains is primarily polyvinyl chloride (PVC) pipe. Final selection of pipe materials would be made during the detailed design phase. Diameters are calculated using the Hazen-Williams formula with a roughness coefficient (C) of 110.

Sewage Lift Stations

Small sewage lift stations should have two pumping units, with each unit sized to pump the peak design flow. One pumping unit operates during each pumping cycle with the other acting as standby. Typically, the pumping units are a submersible design with the units placed in a manhole or vault structure.

Intermediate sized sewage pump stations should be planned to have three units of usually equal size. One or two units can operate during a pumping cycle with the third unit acting as a standby in case one of the primary units fails. Two pumping units operating at the same time should be sized to handle the peak design flow. Intermediate sized sewage lift stations can have submersible pumping units or be of a wet well/dry well design, based on Hydraulic Institute standards.

Large sewage pump stations should be designed so ready expansion can occur when necessary. Thus, mechanical equipment may be installed at various stages of development. Large sewage pump stations typically provide for complete separation of wet and dry wells with easy access to both.

In all cases, standby drives or power units should be provided in cases where bypassing cannot be allowed around the sewage pump station.

Wastewater Treatment Facilities

The primary considerations in the design of a wastewater treatment plant are the required capacity and the degree of treatment. Plant capacity is usually expressed in terms of average dry weather flow. Degree of treatment is based on requirements established in the waste discharge permit issued by the California Regional Water Quality Control Board. Plants are designed with sufficient capacity to handle peak organic, as well as peak hydraulic loads and are planned for enlargement to handle future increases.

SECTION 4 - EXISTING SYSTEM ANALYSIS

This Section discusses the analysis of the existing east and west sewer systems under current flow conditions. Detailed analysis of the existing system consisted of the following:

- Development of Existing Tributary Areas
- Summary of Existing Facilities
- Development and analysis of existing hydraulic model
- Analysis Results

EXISTING TRIBUTARY AREAS

The existing sewer service areas were divided up into smaller tributary areas. The existing tributary areas for the West and East Sewer Service Areas are shown in **Plate 3A** and **Plate 3B** respectively. These tributary areas were developed based on the layout of the existing collection system. All sewer lines within each tributary area drain to the same manhole or lift station. Sewer account information within each tributary area was used to simulate existing flows. Existing tributary areas were not created in areas where the District did not have current sewer account data.

Information on the existing sewer system was provided by the District. This information was provided in the form of electronic sewer as-built plans and GIS data bases of all existing sewer facilities. These existing facilities are summarized in the following section.

SUMMARY OF EXISTING FACILITIES

Sewer Collection / Trunk Line Systems

The District's existing sewer collection system is divided into several main trunk systems. These trunk systems are summarized below.

West Trunk Systems (**Plate 4A**):

- McKinley Trunk System
- Buchanan Trunk System
- Fillmore Trunk System
- Arizona Trunk System

East Trunk Systems (**Plate 4B**):

- Cajalco Trunk System
- Dauchy Trunk System
- Cole Trunk System
- MARB Trunk Systems

The west trunk systems all flow to the Sampson trunk line. This trunk line traverses west along Sterling Ave. and Sampson Ave. and carries all flows to the South Regional Lift Station. The South Regional Lift Station lifts the flows to the WRCRWA. The east trunk systems flow to the Western Water Recycling Facility.

McKinley Trunk System
Wastewater generated in the Home Gardens area and the west side of Lake Hills is conveyed through the McKinley trunk system to the Sampson trunk line. The McKinley Trunk system consists of 8 to 15 inch diameter pipes as well as a three barrel inverted siphon under a flood control channel that runs south of Sampson Avenue. The McKinley trunk system traverses along McKinley Street and weaves though multiple streets in the Home Gardens and Lake Hills area as shown on **Plate 4A**. Flow from the McKinley trunk system is monitored at the McKinley monitoring station before it is deposited into the Sampson trunk line.

Buchanan Trunk System
Much of the wastewater generated in the Lake Hills area is conveyed through the Buchanan trunk system. The Buchanan trunk system consists of 8 to 12 inch diameter pipelines along Buchanan Street and Lake Pointe Drive as shown on **Plate 4A**. Flow from the Buchanan trunk system is monitored at the Buchanan monitoring station.

Fillmore Trunk System
The Fillmore trunk system serves the east portion of the Lake Hills area and neighboring residential tracts west of La Sierra Avenue. Wastewater is conveyed to the Sampson trunk line through a series of pipes ranging from 8 to 12 inches in diameter. The Fillmore trunk system traverses along Fillmore Avenue and other streets through the Lake Hills area as shown on **Plate 4A**. Flow from the Fillmore trunk system is monitored at the Fillmore monitoring station.

Arizona Trunk System
Victoria Grove and the Beazer Area are served by the Arizona trunk system. The Arizona trunk system consists of pipes between 8 to 18 inches in diameter. The anticipated future flows for the west sewer service area will flow into the Arizona trunk system. The majority of the trunk system is within La Sierra Avenue as shown on **Plate 4A**. Flows from this trunk system are metered at the Arizona metering station.

Cajalco Trunk System
The Cajalco trunk system transfers sewer flows from the Boulder Springs area and conveys the wastewater to the Markham Sewer Lift Station. Pipes in this system range in size from 12 to 18 inches in diameter. This trunk system is in is in the East Sewer System and is shown in **Plate 4B**. Future developments within the Boulder Springs area will be collected by the Cajalco trunk system. Flows from this trunk system are metered at the Cajalco lift station.

Dauchy Trunk System
The Dauchy trunk system collects sewer flows on the East side of the Mission Ranch development and conveys them to the west side of the development. Pipes in this system range in size from 8 to 12 inches in diameter. This trunk system is in is in the East Sewer System and is shown in **Plate 4B**. Flows from this trunk system are metered at the Dauchy lift station.

Cole Trunk System
The Cole trunk system collects sewer flows on the West side of the Mission Ranch development to a trunk line on Cole Avenue, which carries the flows to the Markham lift station. Pipes in this system range in size from 12 to 18 inches in diameter. This trunk system is in is in the East Sewer System and is shown in **Plate 4B**. Flows from this trunk system are metered at the Markham lift station, together with the flows from the Dauchy and Cajalco lift stations.

MARB Trunk Systems

The MARB trunk systems include all other trunk systems shown in **Plate 4B** that were previously owned and operated by the March Air Force Base. These areas include the following:

- *Ben Clark Training Center* – Metered at the MARB Building 3412 lift station
- *Air Force Village West* – Metered at the AFVW lift station
- *Meridian* – Metered at the Van Buren lift station
- *The East MARB area* – Metered at the MARB Building 1269 lift station

The District had very little sewer account information for the EDU's in these areas; therefore, existing tributary areas were not created. Existing flows in these areas were accounted for using point loads at the lift stations where flows were metered, based on flow information from the District.

Pressure Systems – Sewer Lift Stations and Force Mains

The majority of the District's sewage is collected and transmitted by gravity flow. For situations where gravity flow was not possible, pressure systems were utilized. There are various lift stations and force mains within the District's existing sewer system. For the purposes of this report, only those lift station owned by the District will be discussed. **Table 4-1** summarizes these lift stations:

Table 4-1 - Summary of Existing Sewage Lift Stations

Sewer Lift Station Name	No. of Pumps	Pump HP	Force Main Dia. (inches)	TDH (ft)	Pump Curve Flow (gpm)
MARB Bldg.1269	3	15, 40 & 100	10	54	870
Beazer #1	2	6.2	3	94	80
Beazer #2	2	6.2	3	79	98
Beazer #3	2	10.7	3	142	85
Cajalco	2	150	12	237	1000
Dauchy	2	75	8	180	750
MARB Bldg. 2240	Information not Provided				
MARB Bldg. 2313	Information not Provided				
MARB Bldg. 429	Information not Provided				
MARB Bldg 2307	2	7.5	4	23	250
MARB Bldg. 3412	2	7.5	4	82	200
MARB Fire Station	1	5	4	20	100
MARB Philips Bldg.	2	30	4	172	175
Markham	2	150	12	237	1,250
Sky Ridge	2	40	4	110	120
South Regional	Information not Provided				
Spring Canyon	2	15	4	95	120
Van Buren	2	7.5	8	25	740
Victoria Grove	2	25	6	110	260

1269 Lift Station

The 1269 Lift Station is located on March Air Reserve Base near the south east end of the runway (**Plate 4B**). The lift station is a collection point for wastewater generated in the north east portion of the base. Wastewater collected at the lift station is pumped to the WWRF through a 10 inch diameter force main that traverses around the south end of the runway.

Beazer Lift Stations

There are three lift stations located just north of the Victoria Grove development that are used as collection points for a few wastewater accounts that were not able to flow by gravity to the main trunk line. These lift stations pump in series, Beazer #3 pumps to Beazer #2, Beazer #2 pumps to Beazer #1, and Beazer #1 pumps to a gravity collector line which drains to the Arizona Trunk line. Each lift station pumps through separate 3 inch diameter force mains. It is not anticipated that any additional flow will be added to these stations in the near future.

Cajalco

The Cajalco Lift Station is located near the intersection of Cajalco Road and Wood Road. A 12 inch diameter force main connects the lift station to a gravity line in Wood Road that drains to the Markham Lift Station. The Cajalco Lift Station is designed to service all of the Boulder Springs area.

Dauchy

The Dauchy Lift Station is near the corner of Dauchy Avenue and Ardenwood Lane. The east half of the Mission Ranch development is tributary to the Dauchy Lift Station. Wastewater from the lift station is pumped to a trunk line in Cole Ave. which carries the flow to the Markham lift station.

MARB Bldg. 3412

This lift station services the Ben Clark Training Center, in the south west portion of the former March Air Force Base. Wastewater is pumped east through a 6 inch diameter force main to a gravity line that is tributary to the WWRF.

MARB Cantonment Area Lift Stations

The MARB Lift stations include MARB building 2240, 2313, 429, 2307, and the MARB Fire Station. These lift stations are all within the MARB cantonment area or current March Air Reserve Base. These are small lift stations that service only the buildings they are named after. Flow from these lift stations is pumped to the 1269 Lift Station, which lifts the flows to the WWRF.

Markham

Both the Mission Ranch and Boulder Springs developments are tributary to the Markham Lift Station. The Markham Lift Station can pump wastewater to the WWRF at a rate of 1,250 gpm through a 12 inch diameter force main. Markham Lift Station was designed to be expandable to handle flow up to 2,350 gpm with an additional force main.

Sky Ridge

The Sky Ridge lift station is the collection point for the wastewater generated by approximately 125 homes in the Lake Hills area just south of the Home Gardens area. Wastewater is pumped through a 4 inch force main to the McKinley Trunk.

South Regional

Located at the end of the Sampson trunk line is the South Regional Lift Station. This lift station is the collection point for all wastewater generated in the West Sewer System and is the largest of Western's lift stations. The South Regional lift station discharges into the WRCWRA on the north side of the Santa Ana River. The force main is a 20 inch diameter pipe approximately 3 miles long.

Spring Canyon

Approximately 125 homes are tributary to the Spring Canyon Lift station located on Spring Canyon Place. It is not anticipated that this lift station will ever be expanded.

Van Buren

The Van Buren Lift Station is located within the March JPA, just to the west of I-215. All sewage flows from the north western portion of the March JPA flow to the Van Buren lift station, which then pumps the flows to the main trunk line feeding the WWRF. It is anticipated that this lift station shall be abandoned with the development of the Meridian Business Center. Flows are limited by downstream capacity limitations.

Victoria Grove

The eastern portion of the Victoria Grove area is serviced by the Victoria Grove Lift Station. Current flows are pumped through a six inch force main westward to the Arizona trunk system. The lift station also has a back up force main which flows to the east and contributes to the same Arizona trunk system.

Wastewater Treatment Plants

Sewer flow from the District flows to two separate wastewater treatment plants, the Western Riverside County Regional Wastewater Authority (WRCRWA) and the Western Water Recycling Facility (WWRF).

WRCRWA

The plant was brought on line in 1998 and is capable of treating 8 million gallons per day (mgd) of wastewater, with expansion capability up to 32 mgd. Western currently owns 1.93 mgd of this capacity. The plant has tertiary treatment and meets Title 22 requirements for recycled water.

WWRF

The WWRF was originally constructed in 1941 and had major modifications made in 2007. The plant consists of preliminary, primary, and secondary treatment processes. The plant uses activated sludge with nitrification and de-nitrification capabilities. Currently the plant is capable of treating an average daily wastewater flow of 3.0 mgd. The treated effluent BOD and suspended solids range from 9 to 15 mg/l. Treated recycled water is used for the General Old Golf Course and the Riverside National Cemetery.

EXISTING HYDRAULIC MODEL

Based on the existing tributary drainage areas shown in **Plate 3A** and **Plate 3B**, a hydraulic model was developed to determine the adequacy of the existing trunk sewer lines to convey wastewater under current flow conditions. The sewer system was modeled by utilizing the computer software SewerCAD® version 5.6 by Bentley Systems, Inc. This software has the capability to analyze the system as a whole and to provide an efficient means of calculating the complex hydraulics attributed to sewer systems of this magnitude.

The program also calculates the depth of flow and the hydraulic grade line by using the standard step energy balance, an iterative procedure based on the Bernoulli equation. The ratio of the depth of flow to the diameter of the pipe can also indicate if the pipe is flowing above its capacity. Pipelines that convey flows exceeding their capacity are identified by the software.

Model Input

The SewerCAD® software requires various types of input data. Input data can be broken down into the following categories:

- Sewer Facility Input
- Load Input
- Design Criteria Input

Sewer Facility Input

Sewer facility input consists of the following:

- *Pipeline Data* – including diameter, length, slope, and Manning's roughness coefficients "n"
- *Manhole Data* – including rim and sump elevations
- *Wet well Data* – including diameter, depth, initial levels and alarms
- *Pump Data* – including capacity, head, and elevations

This information was obtained from the District's GIS database and electronic as-built plans. The data was imported into the hydraulic model to create the existing system layouts shown in **Plate 3A** and **Plate 3B**. It should be noted that only the main trunk lines or significant collector lines were modeled. In **Plate 3A** and **Plate 3B**, modeled pipelines are shown in blue, while those pipelines that were not modeled are shown in green.

Load Input

Existing loads were based on EDU information provided by the District. The District provided current sewer account information for all existing sewer accounts within the sewer service area. These accounts were grouped into their corresponding tributary areas as shown in **Plate 3A** and **Plate 3B**. The total number of EDU's within each tributary area were summed up and applied to the corresponding manholes in the model. Flows were then calculated based on a unit wastewater generation factor of 200 gpd/EDU, as discussed in Section 3.

A summary of existing sewer flows is provided in the following tables. The west sewer system average daily flows are provided in **Table 4-2** and the east sewer system average daily flows are provided in **Table 4-3**. For a more detailed summary of existing sewer flows for each individual tributary area, see **Appendix E**.

Table 4-2 – Summary of Existing West Sewer System Avg. Daily Flows

Tributary Sewer Trunk System [1]	Total Area (ac)	From Active Accounts in 2007[2]			Total Flow[3] gpd
		Residential edu's	Com. / Ind. edu's	School edu's	
Arizona	1,506	1,613	0	34	324,300
Buchanan	297	782	0	0	156,442
Fillmore	454	895	0	0	179,000
McKinley	284	1,053	0	0	210,600
Point Source Flow					
Norco Coda					1,450,000
Home Garden					450,000
Totals:	**2,541**	**4,343**		**34**	**2,770,342**

1 Tributary trunk systems correspond to those shown in Plate 4A.
2 EDU amounts are based on existing sewer account information provided by the District.
3 Residential flows were calculated based on an existing wastewater generation factor of 200 gpd/EDU. Commercial/Industrial and School flows are estimated based on developed acreage.

Table 4-3 – Summary of Existing East Sewer System Avg. Daily Flows

Tributary Sewer Trunk System [1]	Total Area (ac)	From Active Accounts in 2007[2]			Total Flow[3] gpd
		Residential edu's	Com. / Ind. edu's	School edu's	
Cajalco	341	317	0	0	63,400
Dauchy	213	540	0	0	108,000
Cole	229	493	31	268	113,550
Markham Sub-Total	**783**	**1,350**	**31**	**268**	**284,950**
March Air Reserve Base					
AFVW[4]					65,000
MARB Bldg. 3412					10,000
MARB Bldg. 1269					240,000
Meridian		14	118		8,700
Totals:	**783**	**1,364**	**149**	**268**	**608,650**

1 Tributary trunk systems correspond to those shown in Plate 4B.
2 EDU amounts are based on existing sewer account information provided by the District.
3 Residential flows were calculated based on an existing wastewater generation factor of 200 gpd/EDU. Commercial/Industrial and School flows are estimated based on developed acreage.
4 AFVW Lift Station is not owned by Western.

Design Criteria Input

Design criteria input tell the program how to analyze the data. These criteria include the following:

- Flow peaking factors
- Minimum and maximum slope criteria
- Minimum and maximum velocity criteria
- Minimum and maximum depth criteria
- Pipe design capacity criteria (d/D)

This input data was based on the design criteria discussed in Section 3, and the details of the design criteria can be found in that section.

Model Analysis

The SewerCAD® sewer modeling software is able to analyze sewer systems using two distinct modules, the Analysis module and the Design module. Each module is described below:

- *Analysis module* - The Analysis module allows the user to convey flow through a system with given parameters while maintaining the system's current attributes. This allows the user to review data such as flow, velocity, excess flow, hydraulic deficiencies, etc. as a result of passing a specified flow through the system. This module is best utilized for analysis of an "existing" sewer system and how it interacts when passing certain amounts of flow through the system. This module only provides the results of the interactions between flow and the existing system and does not "change" any system settings such as pipe diameters.

- *Design module* - The Design module provides for changes in the system settings. This module searches for hydraulic deficiencies, as defined by the user, within the system and changes certain parameters within that system such as pipe diameters to meet the deficiencies. In essence, this module calculates the pipe diameter required to pass the specified flow without any deficiencies. This module is best utilized for the development of the "design" sewer system to pass flows of a certain magnitude without deficiencies such as manhole surcharging.

The existing system was analyzed using the Analysis module. It was not necessary to use the Design module to change any of the attributes of the existing system. The purpose was to simulate existing flows through the system and observe any resulting problems in the current capacity of the existing facilities. The Design module was used for sizing future facilities, as will be discussed in Section 5.

ANALYSIS RESULTS

Based on the existing flows detailed in **Appendix E** and summarized in **Table 4-2** and **Table 4-3**, no capacity problems were observed in the existing system under current flow conditions. Both the east and the west sewer systems seem to have sufficient capacity. This is most likely a result of the fact that the existing facilities were designed based on a residential unit wastewater generation rate that is much higher than what is used in this report (330 gpd/EDU compared to 200 gpd/EDU). Such conservative design standards have resulted in excess capacity within the existing system, allowing capacity for future development.

SECTION 5 - PROPOSED SYSTEM ANALYSIS

This Section discusses the analysis of the proposed east and west sewer systems under ultimate flow conditions. Detailed analysis of the proposed system consisted of the following:

- Development of Future Tributary Areas
- Proposed Facilities and Benefit Areas
- Ultimate Flow Projections
- Development and analysis of future hydraulic model
- Analysis Results

FUTURE TRIBUTARY AREAS

Future sewer development areas were based on current planning reports as well as communication with the District concerning areas of possible development. These future sewer service areas were divided up into smaller tributary areas. The future tributary areas for the West and East Sewer Service Areas are shown in **Plate 5A** and **Plate 5B** respectively.

Where current planning reports did not provide specific tributary boundaries, future tributary areas were based on watershed boundaries. Watershed boundaries were determined from a digital elevated contour GIS layer provided by Riverside County Flood Control. Wastewater was assumed to flow based on the natural drainage patterns of the existing topography and tentative tract information provided in various planning studies. The exact drainage boundaries may vary when future engineering plans are developed. Within tributary watersheds, boundary lines were delineated to exclude a significant portion of mountainous area because of the improbable likelihood of development. It was assumed that areas with a slope greater than 25% would not be developed.

PROPOSED FACILITIES AND BENEFIT AREAS

Proposed Sewer Facilities

Proposed sewer collection lines were laid out based on current planning reports provided by the district. Where no reports were available, lines were placed in proposed public rights of way. Proposed sewer facilities within the West sewer service area are shown in **Plate 5A**, and proposed sewer facilities within the East sewer service area are shown in **Plate 5B**. It should be noted that although many of the proposed lines are based on current planning reports, the location of the lines remains preliminary. All proposed line locations are for planning purposes and are subject to change upon further engineering analysis.

Only major sewer trunk line facilities were proposed for the ultimate sewer system, as shown in **Plate 5A** and **Plate 5B**. Given the preliminary nature of the proposed sewer system, it was not necessary to layout the locations of all possible collector lines. Gravity mains were used wherever possible, and lift station were only proposed in locations where flows could not be conveyed by gravity.

Proposed Benefit Areas

The District's ultimate sewer collection system is divided into eight benefit areas. These benefit areas are shown on Plate 6A and Plate 6B, and are described below.

Benefit Area 1

This benefit area constitutes the whole of the west sewer system, including all future development in the Victoria Grove and McAllister Hills area. It is anticipated that the same sewer connection fee will be used throughout this area.

Benefit Area 2

This benefit area consists of all areas tributary to the Gamble Lift Station. This area includes the Frank Miller Middle School that is currently under construction, as well as the proposed Bridge Walk development. This area also includes existing housing currently on septic tanks that will have the option to connect to the new sewer system.

Benefit Area 3

Benefit Area 3 includes the developments of Mission Ranch and Boulder Springs, and all future expansion within these developments. All flows within this benefit area flow to the Markham Lift Station.

Benefit Area 4

This benefit area is referred to as Meridian, and consists primarily of the Meridian Business Park development. Sewer flows are generally industrial in this area and all flow to the main trunk line which parallels I-215. This trunk line carries the flows to the WWRF.

Benefit Area 5

Benefit Area 5 consists of all development pertaining to the Ben Clark Training Center. Flows from this benefit area are collected at the MARB Building 3412 lift station, which lifts the flows to the WWRF.

Benefit Area 6

Benefit Area 6 constitutes the development of Air Force Village West (AFVW) and the General Old Golf Course. Flows from AFVW are collected at the AFVW lift station, and flows from the golf course flow by gravity to the WWRF. The AFVW lift station is not owned by Western.

Benefit Area 7

This benefit area consists of the eastern portion of the March JPA, as well as the existing March Air Reserve Base, referred to as the MARB Cantonment Area. Flows from this area are collected at the MARB 1269 lift station, which lifts the flows around the runway to the WWRF.

Benefit Area 8

This benefit area is referred to as the Global Port. Current flows from this area flow to the EMWD sewer system by agreement; however, this report assumes ultimate flows will go to the WWRF. Flows will be lifted by the proposed South JPA lift station to the MARB 1269 lift station.

ULTIMATE FLOW PROJECTIONS

Flow Calculations

Ultimate wastewater flows are generated from both existing and future tributary areas, and are broken down into the flow categories shown below. Special considerations were taken for each of these flow categories.

- Projected flows from future tributary areas
- Projected flows from continued development within existing tributary areas
- Point Source Flows

Flows from Future Tributary Areas

Many developments within future tributary areas are currently in planning or construction stages. Future flow projections have been estimated for these developments, and are given in the corresponding planning reports (**Appendix A**). These flow projections are based on specific planning data and are therefore more accurate than merely projecting flows based on RCIP land use designations. For these future tributary areas, planning report flow projections were used in place of any RCIP land use estimates. For all other future tributary areas not associated with planning reports, ultimate flows were estimated using the RCIP land use designations shown in **Plate 2A** and **Plate 2B**. Detailed calculations for each tributary area are found in **Appendix F**.

Flows from Continued Development within Existing Tributary Areas

Most of the existing tributary areas were made up of primarily residential land uses. Ultimate EDU counts were calculated for these tributary areas based on RCIP land use. For some of the tributary areas, the calculated ultimate EDU's were lower than the existing EDU's. For others the calculated EDU's were higher than existing EDU's even though no continued development was expected. In each of these cases the areas were considered built out; and ultimate EDU's were set to equal existing EDU's. Appropriate wastewater generation factors, developed in Section 3, were then applied within each tributary area in order to calculate ultimate flows. These flow calculations are also found in **Appendix F.**

Point Source Flows

As discussed in Section 3, the District currently receives sewer flows from two large point sources, Home Gardens and Norco. While existing flows from these sources is known, it is beyond the scope of this report to attempt to project what future flows may be from these sources. Therefore, any large future increase in flow from these sources is not accounted for in this report.

Flow Summary

A summary of ultimate sewer flows is provided in the following tables. Ultimate west sewer system average daily flows are provided in **Table 5-1**, and ultimate east sewer system average daily flows are provided in **Table 5-2**. The tables are summarized by benefit area. For a more detailed summary of ultimate sewer flows for each individual tributary area, see **Appendix F**.

Table 5-1 – Summary of Ultimate West Sewer System Avg. Daily Flows

Benefit Area[1]	Total Area (ac)	Residential		Non-Residential		Total Flow[6] gpd
		Flows[2] (gpd)	Domestic EDU's[3]	Flows[4] (gpd)	Equivalent EDU's[5]	
Benefit Area 1	4,221	1,409,742	7,049	63,887	319	1,473,629
Point Source Flow						
Norco Coda						1,450,000
Home Garden						450,000
Totals:	**4,221**	**1,409,742**	**7,049**	**63,887**	**319**	**3,373,629**

1 Benefit Areas are shown in Plate 6A.
2 Residential flows were calculated based on a unit wastewater generation factor of 200 gpd/edu.
3 Residential EDU's are calculated based on RCIP land use densities, amount of future development, and existing EDU's
4 Non-residential flows were calculated based on the generation factors described in Section 3.
5 Non-residential equivalent EDU's were calculated by dividing non-residential flows by 200 gpd/edu.
6 Total flows were the sum of residential and non-residential flows.

Table 5-2 – Summary of Ultimate East Sewer System Avg. Daily Flows

Benefit Area[1]	Total Area (ac)	Residential		Non-Residential		Total Flow[6] (gpd)
		Flows[2] (gpd)	Domestic EDU's[3]	Flows[4] (gpd)	Equivalent EDU's[5]	
Benefit Area 2	519	141,600	708	83,043	415	224,643
Benefit Area 3	3,283	1,173,600	5,868	112,461	562	1,286,061
Benefit Area 4	1,351	1,400	7	1,961,044	9,805	1,962,444
Benefit Area 5	236	0	0	71,000	355	71,000
Benefit Area 6	473	96,800	484	35,139	176	131,939
Benefit Area 7	1,070	59,600	298	1,388,106	6,941	1,447,706
Benefit Area 8	180	0	0	281,705	1,409	281,705
Totals:	**7,112**	**1,473,000**	**7,365**	**3,932,498**	**19,663**	**5,405,498**

1 Benefit Areas are shown in Plate 6B.
2 Residential flows were calculated based on a unit wastewater generation factor of 200 gpd/edu.
3 Residential EDU's are calculated based on RCIP land use densities, amount of future development, and existing EDU's
4 Non-residential flows were calculated based on the generation factors described in Section 3.
5 Non-residential equivalent EDU's were calculated by dividing non-residential flows by 200 gpd/edu.
6 Total flows were the sum of residential and non-residential flows.

FUTURE HYDRAULIC MODEL

As was done with the existing sewer system, an electronic model of the future sewer system was created. The future system was also modeled using SewerCAD® version 5.6 by Bentley Systems, Inc. Beginning with the existing sewer model, future sewer facilities were added to the model, as well as all future flows. This was done in order to size the future sewer facilities as well as determine the adequacy of the existing system to convey future flows. Details concerning the implication of the future sewer model are described in this section.

Model Input

The same type of input data required for the existing sewer model was required for the future model. Input data is once again broken down into the following categories:

- Sewer Facility Input
- Load Input
- Design Criteria Input

Sewer Facility Input

Existing facilities remained in the model, and future facilities were added to the model. The location and layout of future facilities was based primarily on the current planning reports provided by the district (**Appendix A**). Where planning reports were not available, future facilities were placed in proposed public right-of-way. Only the main trunk lines or significant collector lines were proposed.

Slopes for future trunk lines were also based on current planning reports. If planning reports did not contain slope data, sewer slopes were then based on the existing topography of the area. Lift stations were only proposed in locations where the sewage could not be conveyed by gravity. Several proposed lift stations were based on current planning reports and a few are currently under construction.

Load Input

Load input for the future sewer model consisted of the ultimate flow projections discussed previously in this section. Detailed calculation of ultimate sewer flows is provided in **Appendix F**, and summarized in **Table 5-1** and **Table 5-2**. Ultimate sewer flows were summed within each existing and future tributary area and applied to the corresponding manholes in the model.

Design Criteria Input

The design criteria input for the future model was the same as the design criteria for the existing model. This input data was based on the design criteria discussed in Section 3, and the details of the design criteria can be found in that section. Flows were peaked in the model using the District's peak flow criteria. All future sewer facilities were designed in the model to carry the ultimate peak sewer flows while maintaining the design criteria given in Section 3.

Model Analysis

Analysis of the future sewer model can be broken down into the following two categories:

- Sizing and design of future sewer facilities
- Analysis of capacity of existing facilities

Sizing and Design of Future Facilities

Sizing and design of future facilities was done in the model using the Design Module as described previously in Section 4. The Design Module takes into account all the input design criteria and assigns the minimum required pipe diameter to each proposed sewer pipe. All future sewer facilities were designed to carry the peak sewer flows while staying within the given design criteria.

Analysis of Capacity of Existing Facilities

In section 4, the capacity of the existing sewer system was analyzed under current peak flow conditions. Now in this section, the capacity of the existing system is analyzed under ultimate peak flow conditions in order to determine which facilities may need to be upgraded in the future. This was done in the model using the Analysis module as described previously in Section 4. The Analysis module does not change the parameters of the existing pipes, and those sections of pipe that that do not have sufficient capacity are identified by the model. This was done in order to determine the adequacy of the existing system to carry ultimate peak sewer flows.

ANALYSIS RESULTS

West System Analysis Results

Analysis results for the west sewer system are shown in **Plate 7A**. Only a few capacity problems exist in the west sewer system under ultimate sewer flows. These capacity problems are a result of increased sewer flows from future development in the McAllister Hills area east of Victoria Grove.

The following sections of pipe are projected to flow above design capacity under ultimate flow conditions.

1. Orchard View Lane between Citrus Glen Circle and La Sierra Avenue (Approx. 175 LF) This section of 8-inch pipe is projected to flow at approximately 51 percent full.
2. Willow Dr. between Poinsetta Dr. and Orangeblossom Lane. (Approx. 330 LF) This section of 8-inch pipe is projected to flow at approximately 56 percent full.
3. Willow Dr. and Avocado Way between Bougainvillea Way and Aloe Lane. (Approx. 520 LF) This section of 8-inch pipe is projected to flow at approximately 56 percent full.

These sections of pipe are shown in red in **Plate 7A** with the corresponding number as given above. Proposed improvements addressing these capacity issues are laid out in Section 6.

East System Analysis Results

Analysis results for the east sewer system are shown in **Plate 7B**. More capacity problems are experienced in the east system under ultimate flows than in the west system. The majority of these capacity problems are a result of the large amount of industrial development occurring in the Meridian area. These large industrial flows push some of the existing pipes well beyond design capacity. Other smaller capacity problems occur as a result of increased flows in the Mission Ranch development and the Ben Clark Training Center.

The following sections of pipe are projected to flow above design capacity under ultimate flow conditions.

1. Ardenwood Lane between Grangehill Dr. and Dauchy Ave. (Approx. 450 LF) This section of 8-inch pipe is projected to flow at approximately 51 percent full.
2. Grangehill Dr. between Mooreland Ct. and Hawksbury Dr.. (Approx. 430 LF) This section of 8-inch pipe is projected to flow at approximately 51 percent full.
3. Krameria Avenue from the end of the Dauchy force main to Cole Ave. (Approx. 680 LF) This section of 12-inch pipe is projected to flow at approximately 60 percent full.
4. Undeveloped dirt road from the end of the MARB Building 3412 force main to Clark St. (Approx. 380 LF) This section of 6-inch pipe is projected to flow at approximately 56 percent full.
5. Undeveloped dirt road in undeveloped area east of Clark St. (Approx. 400 LF) This section of 6-inch pipe is projected to flow at approximately 54 percent full.
6. Meridian interceptor line paralleling I-215 between Van Buren Blvd. and the WWRF. (Approx. 8300 LF) This Section of pipe ranges from 15 to 21 inches in diameter. The 15 and 18 inch sections are projected to flow beyond full capacity, and the 21-inch section is projected to flow at approximately 90 percent full.

The following lift stations are projected to flow above design capacity under ultimate flow conditions.

- Markham Lift Station – The current capacity of this lift station is 1250 gpm. Based on the model, ultimate flows at the lift station are projected to be approximately 1950 gpm. This lift station will therefore need to be expanded.

The sections of pipe projected to flow above capacity are shown in red in **Plate 7B** with the corresponding number as given above. The lift stations projected to flow above capacity are also shown in red. Proposed improvements addressing these capacity issues are laid out in Section 6.

SECTION 6 - FUTURE FACILITIES AND IMPROVEMENTS

This Section discusses the projected rate of growth and the proposed facilities and sewer improvements that will be required for the ultimate flows discussed in this report. The proposed facilities and sewer improvements are divided into the following categories:

- West System Future Facilities and Improvements
- East System Future Facilities and Improvements

GROWTH RATE PROJECTIONS

The total population for the District's sewer service area is unknown, however the total domestic equivalent dwelling units (EDU) according to the District's current account records is 5,707 EDU. For estimating purposes the County's General Plan utilizes a factor of 3.01 people/EDU for Western Riverside County, which yields an estimated 17,178 people (5,707 EDU x 3.01 people/du).

According to the Southern California Association of Governments (SCAG), the population within the Riverside County is expected to increase from 1,850,231 to 3,142,468 from the years 2005 to 2030. This represents an annual increase of 2.1%. The unincorporated areas are expected to increase in population from 508,538 to 1,018,061 during the same time, which represents an annual increase of 2.8%. For purposes of this report, an annual increase of 2.5% is estimated within the District's sewer service area.

Table 6-1 represents the estimated EDU growth within the sewer service area based on an annual increase of 2.5%. This was developed to assist the District in predicting the need for future expansions/upgrades of existing sewer facilities.

Table 6-1 - WMWD Growth Projection
(at 2.5% annual increase)

Year	Total Domestic EDU's
2008	5,707
2010	6,000
2015	6,800
2020	7,700
2025	8,700
2030	9,800
2035	11,100
±2045	±14,400 Build out

WEST SYSTEM FUTURE FACILITIES AND IMPROVEMENTS

Future Trunk Lines

The locations and sizes of all proposed future trunk lines in the west sewer system are shown in **Plate 7A**. These locations and sizes are preliminary, and are subject to change upon further engineering analysis and design. It is recommended that the District conduct a feasibility study for each proposed development so that sewer lines are sized accurately. The timetable for the construction of these future trunk lines will depend on when the area is developed.

Future Lift Stations

No future lift station are proposed for the west sewer system. Depending upon the staging of development, some lift stations funded solely by an individual developer may be required if right-of-way is not available and downstream facilities are not yet constructed.

Trunk Line Improvements

Based on the analysis results discussed in Section 5, relatively few capacity problems occur in the west sewer system. The sections of pipe that experience capacity problems are shown in red in **Plate 7A**. All of these capacity problems occur in eight inch pipelines that are projected to flow only slightly higher than design capacity (51 – 56 percent full). For the purposes of this report, these flows are considered acceptable and capacity improvements are not required. However, it is suggested that the District continue to monitor these sections of pipeline.

Lift Station Improvements

None of the lift stations in the west system are expected to experience capacity problems, based on the analysis results discussed in Section 5 and shown in **Plate 7A**. All the lift stations in the west system, with the exception of the South Regional lift station, are small lift stations that are not expected to receive large increases in flow. Based on discussions with the District, the South Regional lift station is expected to have sufficient capacity for the ultimate flows projected in this report.

EAST SYSTEM FUTURE FACILITIES AND IMPROVEMENTS

Future Lift Stations

Several future lift stations are proposed for the west sewer system. These lift stations are shown in **Plate 7B** and are described below. The timetable for construction of these lift stations will depend on when the area is developed.

Bridge Walk Lift Station

This lift station is located at the east end of the proposed Bridge Walk development[1]. Flows from this development will be lifted from the Bridge Walk lift station to the Gamble lift station through a 2 mile force main. Peak discharge from the lift station is projected to be approximately 125 gpm with a total head of 270 feet.

Gamble Lift Station

This lift station is currently under construction. The Gamble Lift Station is located at the intersection of Gamble and Van Buren Blvd. This lift station collects flows from the western portion of the Mission Ranch development, including the Frank Miller Middle school and some commercial areas that front Van Buren Blvd. Flows are lifted to the Dauchy lift station. Peak discharge from the lift station is projected to be approximately 350 gpm with a total head of 140 feet.

Unit 2 Lift Station

This lift station is proposed as part of the Meridian Business Park development[2], and lifts flows from the northern end of the development to a gravity main south of Cactus Ave. Peak discharge from the lift station is projected to be approximately 160 gpm with a total head of 40 feet.

D-3 Lift Station

This lift station is required for the development area north of Cactus Ave. between I-215 and the frontage road. Flows from this area will be lifted to the west side of I-215 and into the gravity mains pertaining to the Meridian Business Park. Peak discharge from the lift station is projected to be approximately 120 gpm with a total head of 40 feet.

South JPA Lift Station

The south JPA lift station is located in the Global Port area. Although current sewer flows form this area flow to EMWD by agreement, this report assumes that ultimate flows will go to Western. This lift station is required to lift the sewer flows from the Global Port area to the MARB 1269 lift station. Peak discharge from the lift station is projected to be approximately 180 gpm with a total head of 40 feet.

Future Trunk Lines

The locations and sizes of all proposed future trunk lines in the east sewer system are shown in **Plate 7B**. Some of these future trunk lines are currently in stages of design and construction, such

[1] Reference #7 – Appendix A
[2] Reference #24 – Appendix A

as the proposed sewer lines within the Meridian Business Park. For those trunk lines that are not in current design or construction stages, the locations and sizes are preliminary and are subject to change upon further engineering analysis. It is recommended that the District conduct a feasibility study for each proposed development so that sewer lines are sized accurately. The timetable for the construction of these future trunk lines will depend on when each area is developed.

Trunk Line Improvements

Capacity problems occurring in the east sewer system were discussed in Section 5. The sections of pipe that experience capacity problems are shown in red in **Plate 7B**. Most of these capacity problems occur in six to eight inch pipelines that are projected to flow only slightly higher than design capacity (51 – 56 percent full). For these sections of pipe, no capacity improvements are proposed. However, other sections of sewer line are projected to flow well above the design capacity, and improvements for these sections of pipe are described below.

Krameria Avenue

This sewer line extends from the end of the Dauchy lift station force main along Krameria Avenue to the 15-inch trunk line in Cole Avenue. As discussed in Section 5, this 12-inch line is projected to flow at 60 percent full (#3 on **Plate 7B**) as a result of additional projected flows from the west. It is proposed that this section be upgraded to a 15-inch line. The approximate length of this section of sewer line is 680 feet. It is suggested that the District monitor the flows in this section of pipe and upgrade the line when the flows begin to reach design capacity.

Meridian Interceptor

This sewer line parallels I-215 from Van Buren Blvd. to the WWRF. All flows from the Meridian Business Park will be transferred through this line. As discussed in Section 5, the majority of this line is projected to flow above full capacity (#6 on **Plate 7B**). It is proposed that this section be upgraded to a 24-inch line. The approximate length of this section of sewer line is 8300 feet. Replacement of this sewer line is already part of the ultimate development plan for the Meridian Business Park.

Lift Station Improvements

Markham Lift Station

It is proposed that this lift station be expanded to sustain the projected ultimate flow of 1950 gpm, as discussed in Section 5. This expansion represents an increase of 700 gpm to the current capacity of the lift station. This lift station was designed to be expandable, with the intended addition of a second 12-inch force main upon expansion. Based on the model analysis it is determined that the current 12-inch force main will be sufficient to sustain ultimate flows. However, the District may consider installing the second force main as a backup due to the critical nature of the Markham lift station and the high volume of flows that it receives.

SECTION 7 - COST ESTIMATES

This section discusses the sewer facility costs that will be reimbursed through sewer connection fees. Only costs associated with connection fees are discussed in this section. Any developer funded facilities and improvements are not included in this section.

COST BASIS

All future facility costs estimates are based on the following criteria:

- *Sewer Line Construction Costs* – Sewer line construction cost estimates are based on the unit costs[1] provided in **Appendix G.** These costs include pipeline material and installation costs, manhole costs, and excavation costs. Pavement repair costs are separate. Existing sewer line costs were provided by the District.
- *Lift Station Construction Costs* – Lift station construction cost estimates are based on current planning level estimates. These costs include all material and installation costs associated with the pumps, wet wells, and excavation costs. Costs for force mains are separate. Existing lift station costs were provided by the District.
- *Project Costs* – Project costs were calculated as 140 percent of construction costs. These costs include construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and basic environmental documentation.

FACILITY COSTS

All costs are divided up into the benefit areas. As discussed previously, only the facilities whose costs are reimbursed through sewer connection fees are accounted for in this section. These facilities are shown in **Plate 8**A and **Plate 8B**. Costs to for facilities to be constructed are given in **Table 7-1**. The facilities are labeled according to the ID numbers given in the following tables. These sewer facilities fall into the following three categories:

- *Existing Sewer Facilities* – This includes existing trunk lines and lift stations reimbursable through sewer connection fees.
- *Future Sewer Facilities* – This includes future trunk lines and lift stations funded by the District and reimbursable through sewer connection fees.
- *Treatment Capacity* – Treatment capacity costs are a component of the sewer connection fee and are generally constructed so asset values are known. It is beyond the scope of this report list treatment capacity costs due to additional financing costs to be added to the original asset values

[1] Unit costs are taken from cost estimates for sewer lines from the East Sewer Cost Study for WMWD. Costs were adjusted using the current ENR for Los Angeles.

Table 7-1 – Costs for Facilities to be constructed

ID	Description	Units	Qty	Unit Cost[2]	Construction Cost[3]	Project Cost[4]
5	McAllister Trunk Line including pavement	L.F.	1,100	$133	$146,300	$204,820
7	Future 12-in Trunk Line	L.S.	4,250	$100	$425,000	$595,000
13a	Markham 12-inch Force Main	L.F.	16,900	$68	$1,149,200	$1,608,880
14	Markham Lift Station Upgrade	GPM	700	n/a	$600,000	$840,000
25	Future Pavement Repair	L.F.	16,900	$33	$557,700	$780,780
			Total Costs		$2,878,200	$4,294,480

1 Domestic and Non-residential EDU's from Tables 5-1 and 5-2.
2 Calculated in Appendix G
3 Unit Cost times Quantity
4 1.4 times Const. Cost.

Benefit Area 1 Assets

Fee facilities for Benefit Area 1 include all treatment costs for the WRCRWA, and any major trunk line facilities whose over sizing costs were funded by the District. These fee facilities for Benefit Area 1 are shown in **Plate 8A**. These facilities are summarized below in **Table 7-2**. The only future facility that will be funded by the District is the 12-inch line extending from the end of the McAllister trunk line as shown in the plate.

Table 7-2 – Facilities for Benefit Area 1

ID	Description	Units	Qty
4	La Sierra Trunk Line	L.F.	16,500
5	McAllister Trunk Line	L.F.	8,700
6	Regional Conveyance Facilities	L.F.	49,000
7	12-inch Trunk Line	L.F.	4,250

1 Domestic and Non-residential EDU's from Tables 5-1 and 5-2.

Benefit Area 2 Assets

Fee facilities for Benefit Area 2 include lift station, force main, and major trunk line costs just for this benefit area. The fee facilities for Benefit Area 2 are shown in **Plate 8B**. These facilities are summarized below in **Table 7-3**.

Table 7-3 – Facilities for Benefit Area 2

ID	Description	Units	Qty
8	Gamble Lift Station	L.S.	1
9	Gamble 8-inch Force Main	L.F.	2,892
10	Van Buren Blvd. 10-inch Trunk Line	L.F.	1,950
9/10	Pavement Repair	L.F.	4,842

1 Domestic and Non-residential EDU's from Tables 5-1 and 5-2.

Benefit Area 3 Assets

Fee Facilities for Benefit Area 3 include lift station, force main, and major trunk line costs. Future facility costs in this area include the upsizing of the Markham Lift Station and an additional Markham 12-inch force main. The fee facilities for Benefit Area 3 are shown in **Plate 8B**. These facilities are summarized below in **Table 7-4**.

Table 7-4 – Facilities for Benefit Area 3

ID	Description	Units	Qty
2b	Treatment Capacity for Benefit Area 3	EDU[1]	6,430
11	Nandina Trunk Sewer	L.F.	5,500
12	Markham Lift Station	L.S.	1
13	Markham 12-inch Force Main	L.F.	16,900
13a	2nd Markham 12-inch Force Main	L.F.	16,900
14	Markham Lift Station Upgrade	GPM	700
15	Wood Rd. 12-inch Trunk Line	L.F.	3,000
16	Wood Rd. 12-inch Force Main	L.F.	5,611
17	Cajalco Lift Station	L.S.	1
18	Hawkhill Ave. 10-inch Trunk Line	L.F.	4,000
19	Cajalco Rd. 15-inch Trunk Line	L.F.	4,000
20	Parson Rd. 18-inch Trunk Line	L.F.	6,500
21	Cole Ave. 15-inch Trunk Line	L.F.	3,960
22	Lurin Ave. 8-inch gravity main	L.F.	3,660
23	Krameria Ave 8-inch gravity main	L.F.	2,640
24	Krameria Ave 12-inch Trunk Line	L.F.	680
25	Krameria Ave. 15-inch Upgrade	L.F.	680
26	Dauchy 8-inch Force Main	L.F.	6,300
27	Dauchy Lift Station	L.S.	1
28	Dauchy 8-inch gravity main	L.F.	1,200
29	15-inch Trunk Line	L.F.	1,560
20-29	Previous Pavement Repair	L.F.	6,520
25	Future Pavement Repair	L.F.	16,900

1 Domestic and Non-residential EDU's from Tables 5-1 and 5-2.
2 Calculated in Appendix G (n/a for existing facilities)
3 Unit Cost times Quantity (n/a for existing facilities and treatment costs)
4 For treatment - Unit Cost times Quantity; For existing facilities - cost provided by the District; For future facilities - 1.4 times Const. Cost.

Benefit Areas 4 through 8 Assets

Fee Facilities for Benefit Areas 4 through 8 include only treatment capacity. All costs for future conveyance facilities are to be funded by the developer. The upgrade of the Meridian trunk line from Van Buren Blvd. to the WWRF is also funded by the developer, so the cost of this upgrade is not included here.

Appendix A

Reference Reports

WMWD Sewer Master Plan
Reference Reports

Ref. #	Area	Report Title	Date of Report	Engineering Company	Author
1	Lake Hills	Sewer Master Plan Lake Hills, Riverside Tract Nos. 28815 & 28816	September 7, 2001	Hunsaker & Associates Inc.	James H. Smith, PE
2	Lake Hills	Lake Hills Correspondence Sewer Design Issues			
3	Lake Hills	Lake Hills Correspondence Water & Sewer 2002-2003			
4	Cajalco Sub-Area	Cajalco Sub-Area Water and Sewer Facilities Report	June 7, 2000 (Amended November 14, 2000)	Albert A. Webb Associates	
5	Cajalco Sub-Area Lift Station	Draft Cajalco Sub-Area Cajalaco Road Lift Station & Force Main Design Report	April 2, 2001	K & A Engineering, Inc. and Dexter Wilson Engineering, Inc.	
6	Cajalco Sub-Area Lift Station	Cajalco Sub-Area Cajalaco Road Lift Station & Force Main Design Report	July 23, 2001	K & A Engineering, Inc. and Dexter Wilson Engineering, Inc.	
7	Bridgewalk	Facilities Report for Tract 32477 - Bridgewalk Sewer Lift Station	August 23, 2006	Hunsaker & Associates Inc.	James D. Maeding, PE
8	Victoria Grove	Addendum No. 1 to the Amended Facilities Report Victoria Grove Community Facilities District CFD No. 7	October, 2005	Hunsaker & Associates Inc.	John Gass, PE
9	Victoria Grove	Amended Facilities Report Victoria Grove Community facilities District CFD No. 7	May, 2001	Canty Engineering Group, Inc	John W. Canty
10	Victoria Grove	Amended Facilities Report Victoria Grove Community facilities District CFD No. 7	November 2000	Canty Engineering Group, Inc	John W. Canty
11	Victoria Grove	Facilities Report for Victoria Grove Community Facilities District CFD No. 7	January 1999 (Amended August 2, 1999)	Albert A. Webb Associates	Bruce A. Davis, PE
12	Woodcrest Area	Sitting Analysis for the Proposed Woodcrest area Wastewater Treatment Plant	May 1998	Albert A. Webb Associates	
13	East Area	East Area Wastewater Capital Cost Recovery Program of 2006 (Draft)	Dec. 30, 2007		
14	-	Cooperative Agreement for Sewer Service (Bonding w/ City of Riverside & WMWD)	April 15, 2003		
15	Markham Lift Station	Markham Lift Station Expansion Study (& Comments)	January 16, 2004	Krieger & Stewart	Jon P. MacPeek
16	Val Verde Unified School District	Exhibit A Community Facilities District No. 2002-1 (Boulder Springs) of the Val Verde Unified school District			
17	East Area	East Sewer Cost Study	April 20, 2004	Albert A. Webb Associates	Bradley A. Sackett, PE
18	East AFC	Draft East AFC Analysis	September 24, 2003	Albert A. Webb Associates	Brad Sackett, PE
19	Sheffield Property	Report for Sewer Service Plan for the Sheffield Property	February, 2003 (Revised March, 2003)	Albert A. Webb Associates	
20	Woodcrest Sub-Area (Mission Ranch)	Initial Study Mitigated Negative Declaration for the Western Municipal Water District Woodcrest Sub-Area Wastewater Conveyance System and Water Master Plan Facilities (Mission Ranch)	December, 2003	Albert A. Webb Associates	Autumn Miller
21	Woodcrest & Alta Cresta Ranch	Supplemental Report for Wastewater service Plan for the Woodcrest Area Including Alta Cresta Ranch Specific Plan	May, 2001	Albert A. Webb Associates	
22	Markham Lift Station	Technical Specifications for Markham Lift Station	January, 2003	Dexter Wilson Eng.	Michael J. Filecia
23	Ben Clark Public Saftey Training Center	Master Plan & EIR Number 438 - SCH Number 2002011088 - Ben Clark Public Saftey Training Center	2001	Albert A. Webb Associates	
24	March Business Center	March Business Center Sewer Master Plan	May, 2003	Kimley - Horn	
25	MARB	MARB Water Master Plan	2008	Albert A. Webb Associates	
26	Eastern	Letter to Consumer	November 21, 2007	Albert A. Webb Associates	
27	Mission CFD	East Sewer Cost Study Update	2005	Albert A. Webb Associates	
28	Ben Clark Training Center	Ben Clark Training Center - Specific Plan	2008	Albert A. Webb Associates	
29	March JPA	March Lifecare Village - Specific Plan	2008	Albert A. Webb Associates	
30	March JPA	March ARB Sewer Master Plan	March, 2001	Kennedy / Jenks Consultants	
31	McAllister Hills	Lake Mathews Golf and Country Club - Approved Specific Plan 325	-	-	County of Riverside

Appendix B

Cooperative Agreement for Sewer Service

COOPERATIVE AGREEMENT FOR SEWER SERVICE

AGREEMENT made this 15th day of April, 2003 between the City of Riverside ("Riverside") and Western Municipal Water District of Riverside County ("Western").

RECITALS

WHEREAS, Riverside owns and operates a sewer collection and treatment system that discharges a portion of the treated effluent to the Santa Ana River and also uses a portion of the treated effluent as a non-potable source of water supply for certain customers; and

WHEREAS, annexations to Riverside have resulted in the southerly extension of Riverside's sewer collection system as far as Van Buren Boulevard in order to service the Mission Grove/Orangecrest area; and

WHEREAS, Riverside is currently completing a Master Plan for a city-wide recycled water system, in order to increase Riverside's reclamation and reuse of its treated effluent as a source of non-potable irrigation water, to be used for irrigation of park sites, landscape median, reverse frontage areas, agricultural lands and for sale to other non-potable customers and to reduce the current and future increased demand on other sources of water; and

WHEREAS, Western owns and operates a sewer collection, treatment and reclaimed water distribution system that serves areas now outside of Riverside, and provides a non-potable source of water supply to the Riverside National Cemetery and

other non-potable users such as the General Olds Golf Course, parks schools, citrus orchards and greenbelts; and

WHEREAS, Western is currently expanding the capacity of its treatment plant and is constructing gravity sewers, sewer lift stations and force mains capable of providing sewer service both east and west of Wood Road, from Van Buren Boulevard, southerly to beyond Cajalco Road. A purpose of such plant expansion and collection system construction is to increase the supply of non-potable irrigation water to the cemetery and others, and thereby reduce the current and future increased demand for imported water from the Colorado River, and

WHEREAS, Riverside and Western both encourage the reclamation and reuse of municipal treated effluent, and support the concept that the effluent generated from development southerly of the commercial properties along Van Buren should be reclaimed and reused within that general area rather than discharged to the Santa Ana River; and

WHEREAS, for Riverside to provide sewer service to areas currently in the County south of Van Buren Boulevard would require extensive upsizing and replacement or modifications of many miles of existing sewer lines; and

WHEREAS, as part of its approval on February 27, 2003 of Riverside Annexations 93 and 94, the Riverside County LAFCO endorsed the concept of reclamation and reuse of the treated effluent from these annexations, and future

annexations south of Van Buren, and indicated that Riverside and Western should agree upon a sewer service plan prior to LAFCO's consideration of Riverside Annexation 96; and

WHEREAS, the purpose of this agreement is to establish an understanding regarding those properties that will be provided sewer service by Riverside with the treated effluent either being discharged to the Santa Ana River or for reclamation and reuse by Riverside, and those lands that will be serviced by Western for reclamation and reuse within the local area.

AGREEMENT

1. Riverside will continue to provide sewer service to all properties currently served or capable of being served within the City of Riverside, and will also provide sewer service in the future to all properties that front on Van Buren Boulevard (both sides of the boulevard) and all properties north of Van Buren Boulevard, except for land formerly part of March Air Reserve Base, all as shown on the map attached as Exhibit A.

2. Western Municipal Water District will provide sewer service to all properties not currently serviced by Riverside that are south of properties that front on Van Buren Boulevard, and to all properties that were formerly a part of March Air Reserve Base, as shown on Exhibit A, with the treated effluent used for reclamation and reuse within the local area.

3. Minor revisions to the service area boundaries described above may be made with the approval of the Riverside City Council and Western's Board of Directors.

4. Nothing in this agreement shall be construed to prevent Riverside from the reclamation and reuse of treated effluent from its sewer collection and treatment system for sale to non-potable or other customers.

5. Amendments. This Agreement may be amended or supplemented only by written documents signed by both parties.

6. Termination. This Agreement may be terminated only by mutual agreement of the parties hereto.

7. Venue. Any action at law or in equity brought by either of the parties hereto for the purpose of enforcing a right or rights provided for by this Agreement shall be tried in a court of competent jurisdiction in the County of Riverside, State of California, and the parties hereby waive all provisions of law providing for a change of venue in such proceedings to any other county.

8. Successors and Assigns. It is mutually understood and agreed that this Agreement shall be binding upon Riverside and Western and their respective successors. Neither this Agreement or any part hereof may be assigned by either party without the prior consent of the other party.

9. Severability. Each provision, term, condition, covenant and/or restriction, in whole and in part, in this Agreement shall be considered severable. In the

event any provision, term, condition, covenant and/or restriction, in whole and/or in part, in this Agreement is declared invalid, unconstitutional, or void for any reason, such provision or part thereof shall be severed from this Agreement and shall not affect any other provision, term, condition, covenant and/or restriction of this Agreement and the remainder of the Agreement shall continue in full force and effect.

10. Authority. The individuals executing this Agreement and the instruments referenced herein on behalf of their respective parties each represent and warrant that they have the legal power, right and actual authority to bind their respective party to the terms and conditions hereof and thereof.

11. Entire Agreement. This Agreement constitutes the final, complete, and exclusive statement of the terms of the agreement between the parties pertaining to the subject matter of this Agreement, and supersedes all prior and contemporaneous understandings or agreements of the parties. Neither party has been induced to enter into this Agreement by, and neither party is relying on, any representation or warranty outside those expressly set forth in this Agreement.

[signatures on following page]

APPROVED AS TO FORM
CITY ATTORNEY'S OFFICE
BY Susan Wilson
Deputy City Attorney

CITY OF RIVERSIDE

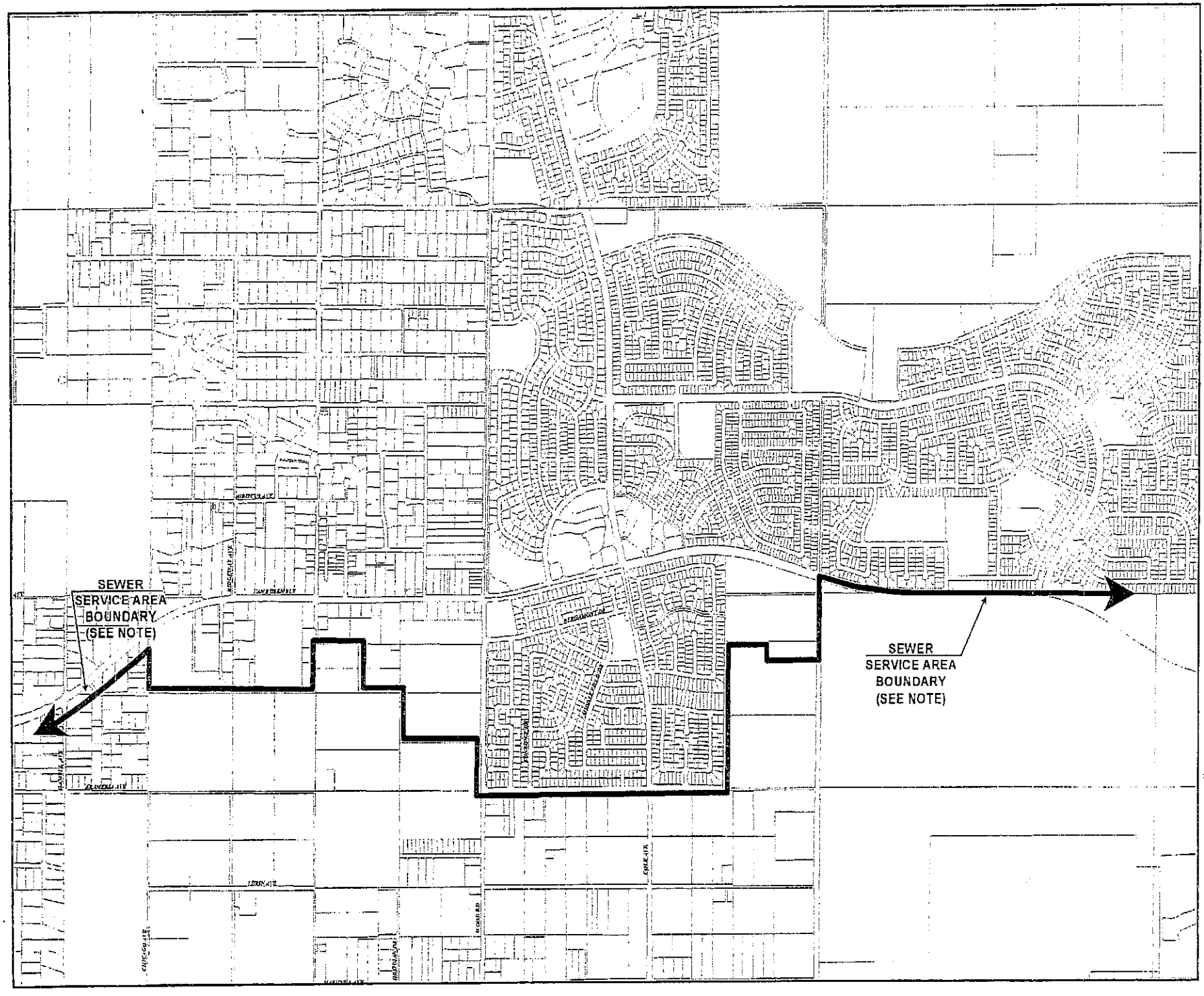
By: _____
George A. Caravalho
City Manager

Attest: _____
City Clerk

WESTERN MUNICIPAL WATER DISTRICT

By: _____

SEWER SERVICE BOUNDARY



NOTE:

SEWER SERVICE IN THE AREA NORTH OF THE "SEWER SERVICE AREA BOUNDARY" WILL BE PROVIDED BY THE CITY OF RIVERSIDE. TREATMENT WILL OCCUR AT VAN BUREN REGIONAL WASTEWATER TREATMENT PLANT.

SEWER SERVICE IN THE AREA SOUTH OF THE "SEWER SERVICE AREA BOUNDARY" WILL BE PROVIDED BY WESTERN MUNICIPAL WATER DISTRICT WITH EFFLUENT TO BE RECLAIMED AND REUSED IN SERVICE AREA.

500 0 500 1000 Feet

ALBERT A WEBB ASSOCIATES
ENGINEERING CONSULTANTS

G:\2002\02-0366\GIS\sewer_service_area_bnd\sewer service area

Appendix C

Flow Monitoring Data

Western Municipal Water District

Wastewater Treatment Plant Reclamation Facility

		WASTEWATER FLOWS												WEST NEW LIFT STATIONS					
		WWTP			LS 1269			AFVW			EGETS			MARKHAM			LS 3412		
			Avg. Daily	Totals		Avg. Daily	Totals		Avg. Daily	Totals		Avg. Daily	Totals		Avg. Daily	Totals		Avg. Daily	Totals
Year	Month	MR	MGD	Mgals	MR	MGD	Mgals	MR	MGD	Mgals	MR	MGD	Mgals	MR	MGD	Mgals	MR	MGD	Mgals
2004	December	483551	0.379	11.754	470194	0.190	5.900	268567	0.061	1.9006	24217098		0	178233	0.088	2.726			
2006	January	496130	0.406	12.579	474446	0.137	4.252	288642	0.065	2.0075	24217098		0	207157	0.093	2.8924			
	February	512805	0.575	16.675	483035	0.296	8.589	306644	0.062	1.8002	24630192	0.142	4.1309	236809	0.102	2.9652			
	March	526758	0.450	13.953	488418	0.174	5.383	327162	0.066	2.0518	24676749	0.015	0.466	256974	0.065	2.0165			
	April	545104	0.612	18.346	498165	0.325	9.747	345755	0.062	1.8593	25124707	0.149	4.4796	294234	0.124	3.726	30		
	May	565678	0.664	20.574	510514	0.398	12.349	357583	0.065	2.015	25776587	0.210	6.5188	345357	0.165	5.1123	412	0.012	0.382
	June	584929	0.642	19.251	521069	0.352	10.555	383745	0.087	2.6162	26303930	0.176	5.2734	389357	0.147	4.4	820	0.014	0.408
	July	603364	0.595	18.435	531301	0.330	10.232	405211	0.069	2.1466	26771529	0.151	4.6760	421390	0.103	3.2033	1184	0.012	0.364
	August	622957	0.632	19.593	541844	0.340	10.543	425663	0.066	2.045	27236224	0.150	4.6470	464462	0.139	4.3072	2432	0.040	1.248
	September	*	0.653	19.575	552682	0.361	10.838	444737	0.064	1.9074	27608668	0.124	3.7244	498168	0.112	3.3706	2887	0.015	0.455
	October	17330	0.531	16.466	560261	0.244	7.579	466396	0.070	2.1659	27696072	0.028	0.874	548552	0.163	5.0384	3211	0.010	0.324
	November	31506	0.473	14.176	566975	0.224	6.714	485836	0.065	1.944	27696072		0	597802	0.164	4.925	3429	0.007	0.218
	December	46506	0.484	15.000	573840	0.167	5.172	504681	0.061	1.8845	27696072		0	99551	0.128	3.9771	3724	0.010	0.295
2007	January	61527	0.485	15.021	579507	0.183	5.667	523392	0.060	1.8711	27696072		0	105149	0.181	5.598	**4030**	0.010	**0.306**
	February	73411	0.410	11.884	583687	0.144	4.180	540990	0.061	1.7598	27696072		0	110195	0.174	5.046	**4199**	0.006	**0.169**
	March	89218	0.510	15.807	590903	0.233	7.216	561939	0.068	2.0949	27925875	0.074	2.298	115986	0.187	5.791	**4460**	0.008	**0.261**
	April	10568	0.549	16.466	no/pow	0.250	7.500	580814	0.063	1.8875	no/pow	0.083	2.487	121608	0.187	5.622	4746	0.010	**0.286**
	May	122284	0.535	16.600	no/pow	0.280	8.680	600009	0.062	1.9195	no/pow	0.076	2.350	127305	0.184	5.697	5086	0.011	0.340
	June	139675	0.580	17.391	599758	0.280	8.400	621089	0.070	2.108	no/pow	0.063	1.876	133007	0.190	5.702	5302	0.007	0.216
	July	159136	0.628	19.461	608690	0.288	8.932	643192	0.071	2.2103	no/pow	0.069	2.145	4192	0.136	4.218	5571	0.009	0.269
	August																		
	September																		
	October																		
	November																		
	December																		

		Average	Total		Average	Total		Average	Total		Average	Total		Average	Total		Average	Total
2006		0.560	204.623		0.279	101.953		0.067	24.443		0.127	34.790		0.125	45.934		0.015	3.694
2007		0.528	112.630		0.237	50.575		0.065	13.851		0.073	11.156		0.177	37.674		0.009	1.847

Note: AFVW flows were average for May, 2006 because power was off at meter for two weeks.

*September 19, 2006 WWTP flows were split between two effluent. Old plant treated 15.028 Mgals. And new plant treated 4.547 Mgals.

Note: Flows from old effluent was 3.683 million gallons, and the flows from the new effluent was 12.783 million gallons.

Note: Markham lift station totalizer was reset, and multiplier changed to 1000 on 12/27/06.

Note: Lift Station # 1269 and EGETS power to meter is down for the Month of 4/2007.

Norco/Cota W-03A	Daily Flow Average (MGD)		
Jun-05	1.489		
Jul-05	1.519		
Aug-05	1.404		
Sep-05	1.393		
Oct-05	1.496		
Nov-05	1.219		
Dec-05	1.420		
Jan-06	1.458		
Feb-06	1.421		
Mar-06	1.417		
Apr-06	1.454		
May-06	1.451		
Jun-06	1.460	17.141	**2006 Total**
Jul-06	1.459	1.428	**Average**
Aug-06	1.456		
Sep-06	1.555		
Oct-06	1.541		
Nov-06	1.497		
Dec-06	1.436		
Jan-07	1.431		
Feb-07	1.356		
Mar-07	1.553		
Apr-07	1.423		
May-07	1.280		
Jun-07	1.363	17.447	**2007 Total**
		1.454	**Average**

McKinley W-04	Daily Flow Average (MGD)		
Jun-05	0.222		
Jul-05	0.220		
Aug-05	0.214		
Sep-05	0.217		
Oct-05	0.219		
Nov-05	0.203		
Dec-05	0.200		
Jan-06	0.199		
Feb-06	0.197		
Mar-06	0.216		
Apr-06	0.221		
May-06	0.218		
Jun-06	0.197	2.546	**2006 Total**
Jul-06	0.204	0.212	**Average**
Aug-06	0.204		
Sep-06	0.217		
Oct-06	0.219		
Nov-06	0.208		
Dec-06	0.215		
Jan-07	0.211		
Feb-07	0.212		
Mar-07	0.209		
Apr-07	0.229		
May-07	0.233		
Jun-07	0.215	2.557	**2007 Total**
		0.213	**Average**

Filmore W-05	Daily Flow Average (MGD)		
Jun-05	0.262		
Jul-05	0.189		
Aug-05	0.256		
Sep-05	0.238		
Oct-05	0.230		
Nov-05	0.421		
Dec-05	0.233		
Jan-06	0.182		
Feb-06	0.177		
Mar-06	0.178		
Apr-06	0.114		
May-06	0.175		
Jun-06	0.176	2.654	**2006 Total**
Jul-06	0.147	0.221	**Average**
Aug-06	0.146		
Sep-06	0.153		
Oct-06	0.151		
Nov-06	0.148		
Dec-06	0.150		
Jan-07	0.146		
Feb-07	0.139		
Mar-07	0.137		
Apr-07	0.142		
May-07	0.144		
Jun-07	0.148	1.779	**2007 Total**
		0.148	**Average**

Buchanan W-06	Daily Flow Average (MGD)		
Jun-05	0.100		
Jul-05	0.108		
Aug-05	0.115		
Sep-05	0.101		
Oct-05	0.109		
Nov-05	0.113		
Dec-05	0.118		
Jan-06	0.127		
Feb-06	0.131		
Mar-06	0.133		
Apr-06	0.174		
May-06	0.118		
Jun-06	0.115	1.449	**2006 Total**
Jul-06	0.152	0.121	**Average**
Aug-06	0.112		
Sep-06	0.116		
Oct-06	0.112		
Nov-06	0.160		
Dec-06	0.122		
Jan-07	0.138		
Feb-07	0.137		
Mar-07	0.137		
Apr-07	0.134		
May-07	0.127		
Jun-07	0.118	1.562	**2007 Total**
		0.130	**Average**

Home Gardens W-07	Daily Flow Average (MGD)		
Jun-05	0.416		
Jul-05	0.426		
Aug-05	0.444		
Sep-05	0.459		
Oct-05	0.457		
Nov-05	0.443		
Dec-05	0.411		
Jan-06	0.417		
Feb-06	0.470		
Mar-06	0.475		
Apr-06	0.457		
May-06	0.471		
Jun-06	0.489	5.346	**2006 Total**
Jul-06	0.487	0.445	**Average**
Aug-06	0.493		
Sep-06	0.527		
Oct-06	0.500		
Nov-06	0.451		
Dec-06	0.445		
Jan-07	0.452		
Feb-07	0.441		
Mar-07	0.360		
Apr-07	0.434		
May-07	0.441		
Jun-07	0.447	5.520	**2007 Total**
		0.460	**Average**

Arizona W-08	Daily Flow Average (MGD)		
Jun-05	0.268		
Jul-05	0.280		
Aug-05	0.271		
Sep-05	0.280		
Oct-05	0.287		
Nov-05	0.289		
Dec-05	0.307		
Jan-06	0.301		
Feb-06	0.296		
Mar-06	0.302		
Apr-06	0.294		
May-06	0.299		
Jun-06	0.298	3.474	**2006 Total**
Jul-06	0.320	0.289	**Average**
Aug-06	0.349		
Sep-06	0.304		
Oct-06	0.293		
Nov-06	0.307		
Dec-06	0.329		
Jan-07	0.328		
Feb-07	0.371		
Mar-07	0.215		
Apr-07	0.227		
May-07	0.387		
Jun-07	0.425	3.728	**2007 Total**
		0.311	**Average**

Norco 2nd St.	W-03B	Daily Flow Average (MGD)		
	Jun-05	0.089		
	Jul-05	0.167		
	Aug-05	0.133		
	Sep-05	0.137		
	Oct-05	0.140		
	Nov-05	0.139		
	Dec-05	0.139		
	Jan-06	0.130		
	Feb-06	0.142		
	Mar-06	0.143		
	Apr-06	0.139		
	May-06	0.140		
	Jun-06	0.139	1.640	**2006 Total**
	Jul-06	0.137	0.137	**Average**
	Aug-06	0.139		
	Sep-06	0.147		
	Oct-06	0.133		
	Nov-06	0.062		
	Dec-06	0.047		
	Jan-07	0.085		
	Feb-07	0.137		
	Mar-07	0.137		
	Apr-07	0.137		
	May-07	0.134		
	Jun-07	0.133	1.434	**2007 Total**
			0.120	**Average**

Norco Corydon

W-03C	Daily Flow Average (MGD)		
Jun-05	0.331		
Jul-05	0.328		
Aug-05	0.326		
Sep-05	0.330		
Oct-05	0.338		
Nov-05	0.337		
Dec-05	0.341		
Jan-06	0.346		
Feb-06	0.401		
Mar-06	0.499		
Apr-06	0.582		
May-06	0.592		
Jun-06	0.370	4.750	**2006 Total**
Jul-06	0.619	0.396	**Average**
Aug-06	0.329		
Sep-06	0.348		
Oct-06	0.337		
Nov-06	0.302		
Dec-06	0.263		
Jan-07	0.332		
Feb-07	0.334		
Mar-07	0.335		
Apr-07	0.336		
May-07	0.335		
Jun-07	0.330	4.239	**2007 Total**
		0.353	**Average**

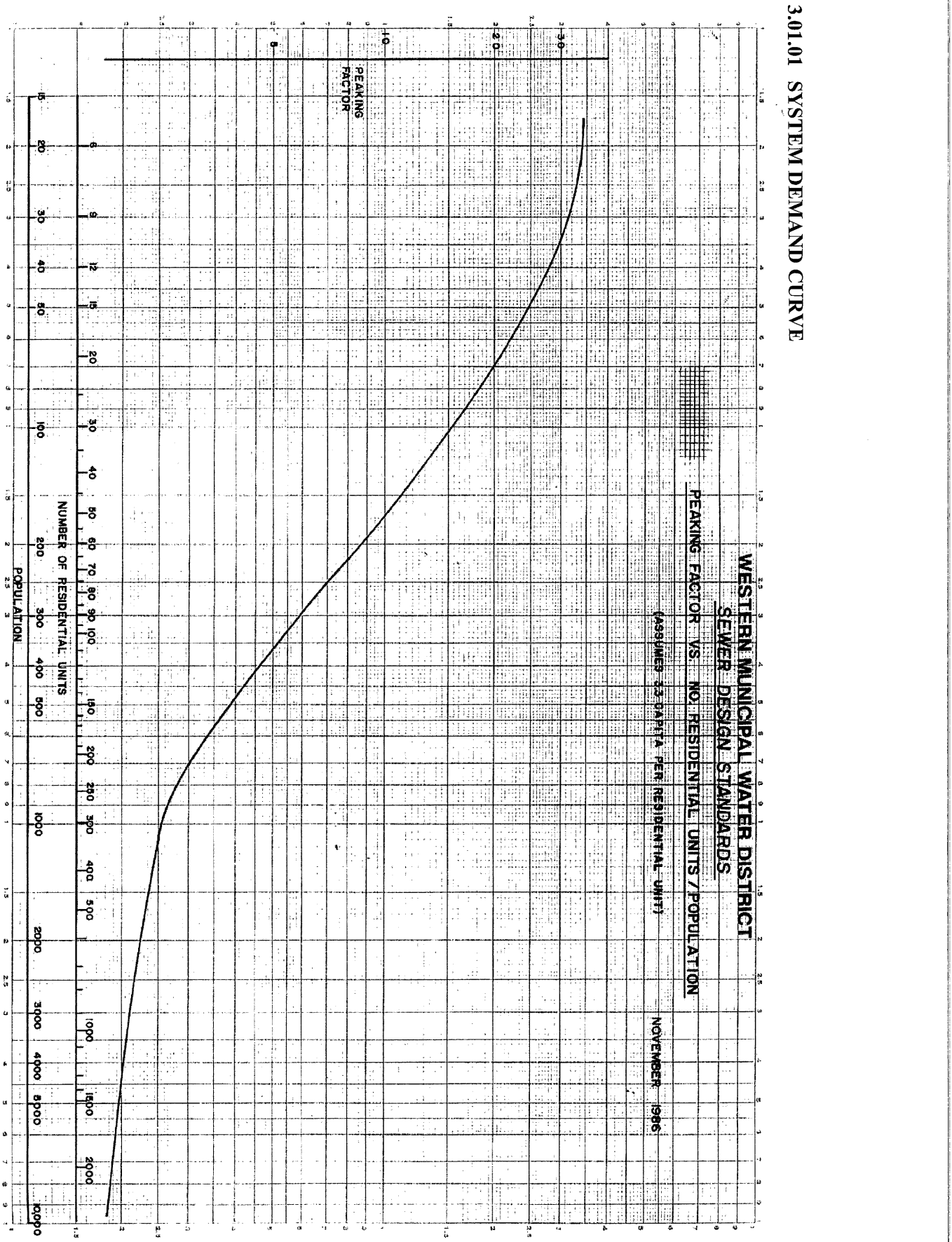
Jurupa	Daily Flow Average (MGD)		
Jun-05			
Jul-05			
Aug-05			
Sep-05			
Oct-05			
Nov-05			
Dec-05			
Jan-06			
Feb-06			
Mar-06			
Apr-06			
May-06			
Jun-06		0.000	**2006 Total**
Jul-06		#DIV/0!	**Average**
Aug-06			
Sep-06			
Oct-06			
Nov-06			
Dec-06			
Jan-07			
Feb-07			
Mar-07	0.308		
Apr-07	1.738		
May-07	2.042		
Jun-07	2.088	4.088	**2007 Total**
		1.363	**Average**

SRPS W-01A	Daily Flow Average (MGD)		
Jun-05	2.801		
Jul-05	2.796		
Aug-05	2.759		
Sep-05	2.743		
Oct-05	2.758		
Nov-05	2.742		
Dec-05	2.743		
Jan-06	2.738		
Feb-06	2.746		
Mar-06	2.775		
Apr-06	2.769		
May-06	2.787		
Jun-06	2.790	33.155	**2006 Total**
Jul-06	2.770	2.763	**Average**
Aug-06	2.814		
Sep-06	2.929		
Oct-06	2.872		
Nov-06	2.827		
Dec-06	2.750		
Jan-07	2.759		
Feb-07	2.709		
Mar-07	2.665		
Apr-07	2.642		
May-07	2.539		
Jun-07	2.770	33.066	**2007 Total**
		2.755	**Average**

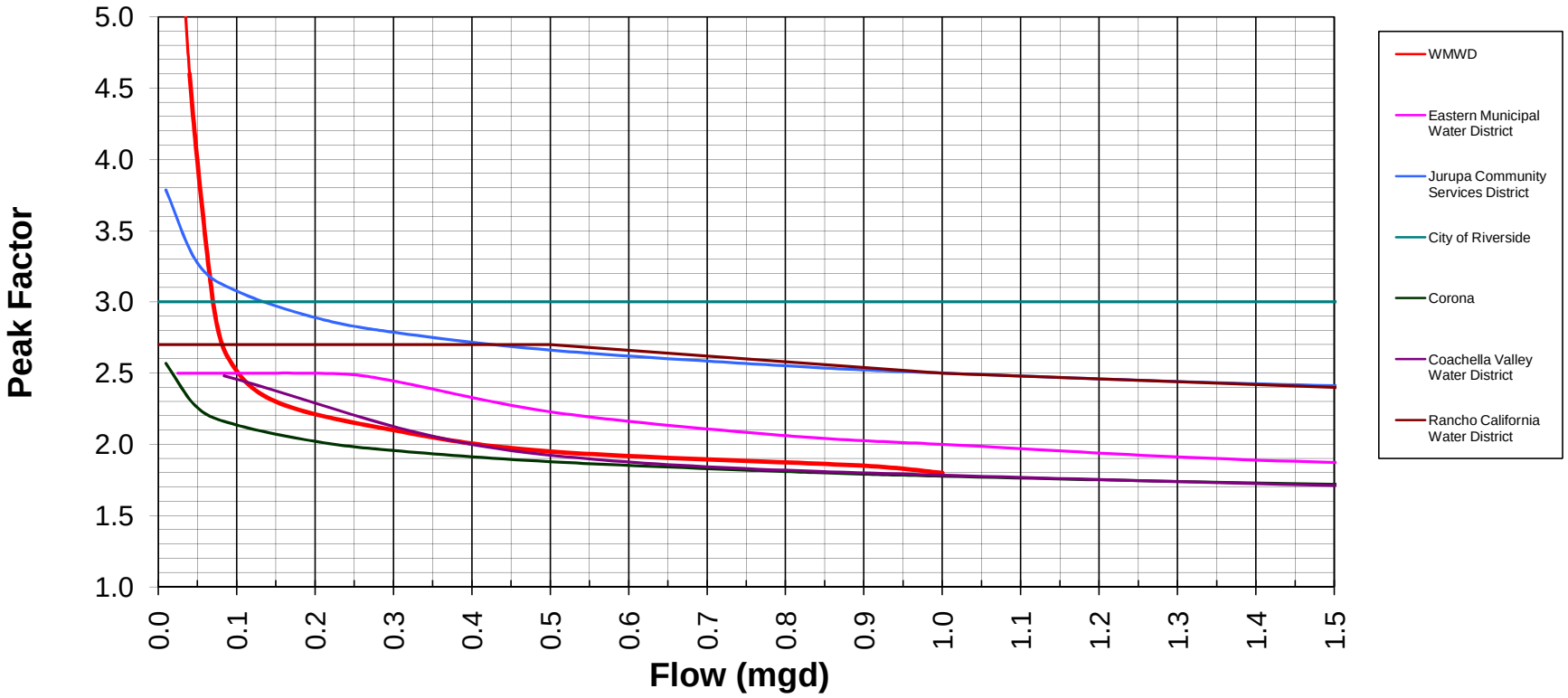
Appendix D

District Standard Peaking Factor
and
Peaking Factor Comparison

3.01.01 SYSTEM DEMAND CURVE



Peaking Factor Comparison



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Appendix E

Existing System
Average Daily Flow Summaries

Average Daily Flow Summary for Existing West Sewer System

Tributary Drainage Area No. [1]	Total Area (ac)	Existing EDU's from Active Acounts in 2007[2]			Total Flow[3] gpd
		Residential edu's	Commercial/Industrial edu's	School edu's	
101	12.4	33			6,600
102	17.4	40			8,000
103	19.1	44			8,800
104	14.5	37			7,400
105	10.8	53			10,600
106	77.9	179			35,800
107	63.6	159			31,800
108	25.9	29			5,800
109	33.4	33			6,600
110	12.6	0			0
111	7.9	10			2,000
112	14.9	51			10,200
113	9.1	28			5,600
114	11.1	27			5,400
115	17.0	30			6,000
116	46.3	73			14,600
117	6.3	7			1,400
118	15.9	26			5,200
119	17.1	62			12,400
120	25.6	87			17,400
121	26.6	91			18,200
122	4.0	15			3,000
123	19.8	103			20,600
124	10.2	50			10,000
125	25.1	10			2,000
126	13.5	57			11,400
127	43.6	166			33,200
128	20.8	109			21,800
129	19.4	89			17,800
130	9.8	53			10,600
131	35.9	148			29,600
132	25.7	135			27,000
133	21.8	180			36,000
134	50.1	107			21,400
135	22.9	89			17,800
136	12.0	38			7,600
137	14.5	41			8,200
138	16.5	69			13,800
139	10.1	42			8,400
140	31.1	112			22,400
141	13.8	38			7,600
142	29.5	80			16,000
143	43.3	49			9,800
144	22.3	32			6,400
145	13.7	19			3,800
146	21.0	26			5,200
147	15.9	11			2,200
148	58.9	206			41,200
149	14.1	41			8,200
150	30.6	37			7,400
151	75.8	42			8,400
152	29.2	81			16,200
153	42.7	59			11,800
154	22.5	17			3,400
155	40.5	49			9,800
156	24.4	28			5,600
157	218.7	3			600
158	104.9	0			0
159	47.9	0			0
160	40.9	0			0
161	57.0	62			12,400
162	25.3	41			8,200
163	40.0	72			14,400
164	24.4	47			9,400
165	12.0	16			3,200
166	15.3	61			12,200
167	24.3	82			16,400
168	70.9	81			16,200
169	40.4	44			8,800
170	21.2	56			11,200
171	9.4	24			4,800
172	17.7	42			8,400
173	37.0	131			26,242
174	24.8	35			7,000
176	131.8	3		34	2,300
177	109.3	0			0
178	54.8	16			3,200
179	22.8	0			0
Point Source Flow					
Norco Coda					1,450,000
Home Garden					450,000
Totals:	**2,540.9**	**4,343**		**34**	**2,770,342**

[1] Tributary numbers correspond to those shown in **Plate 3A**.

[2] Edu amounts are based on existing sewer account information provided by the District.

[3] Residential flows were calculated based on an existing wastewater generation factor of 200 gpd/edu.
Commercial/Industrial and School flows are estimated based on developed acreage.

Average Daily Flow Summary for Existing East Sewer System

Tributary Drainage Area No. [1]	Total Area (ac)	Existing EDU's from Active Acounts in 2007[2]			Total Flow[3] gpd
		Residential edu's	Commercial/Industrial edu's	School edu's	
201	58.5	12		268	15,800
206	21.8	86			17,200
207	23.6	62			12,400
208	23.9	68			13,600
209	21.5	63			12,600
210	11.2	39			7,800
211	15.4	45			9,000
212	14.1	39			7,800
213	15.9	53			10,600
214	15.6	52			10,400
215	10.5	33			6,600
218	39.5	0			0
219	160.5	128			25,600
220	72.8	117			23,400
221	107.3	72			14,400
222	21.1	58			11,600
223	32.6	88			17,600
224	12.9	41			8,200
225	12.2	47			9,400
226	20.4	82			16,400
227	12.8	45			9,000
228	9.6	37			7,400
229	18.6	49			9,800
230	11.6	33			6,600
231	18.4	1	31		1,750
March Air Reserve Base					
AFVW					65,000
MARB Bldg. 3412					10,000
MARB Bldg. 1269					240,000
Meridian		14	118		8,700
Markham (201, 206 -231)					284,950
MARB					323,700
Grand Totals:	**782.4**	**1,364**	**149**	**268**	**608,650**

[1] Tributary numbers correspond to those shown in **Plate 3B**.

[2] Edu amounts are based on existing sewer account information provided by the District.

[3] Residential flows were calculated based on an existing wastewater generation factor of 200 gpd/edu. Commercial/Industrial and School flows are estimated based on developed acreage.

Appendix F

Ultimate System
Average Daily Flow Summaries

Average Daily Flow Summary for Ultimate West Sewer System

Tributary Drainage Area No. [1]	Total Area (ac)	Residential[2]											Non-Residential Flows				Non-Wastwater Generating Landuse Types (ac)	Total[8] Q_{ADF} (gpd)
		Rural Residential (0.2-1 du/ac)	Very Low Density (1-2 du/ac)	Low Density (2 du/ac)	Medium Density (2-5 du/ac)	Med-High Density (5-8 du/ac)	High Density (8-14 du/ac)	Calculated[3] # of edu's	Adjusted[4] # of edu's	Proposed Developments Name	Reference ID	du's	Final[5] # of edu's	Q_{ADF}[6] (gpd)	Commercial Mixed (ac)	Industrial Mixed (ac)	Public Facilities (ac)	Q_{ADF}[7] (gpd)		
Existing Tributary Areas																				
101	12.4				12.35			37	33				33	6,600					0.09	6,600
102	17.4			1.52	15.80			50	40				40	8,000					0.04	8,000
103	19.1				19.08			57	44				44	8,800					0.01	8,800
104	14.5				4.67	9.66		72	37				37	7,400					0.13	7,400
105	10.8				10.80			32	53				53	10,600					0.04	10,600
106	77.9				50.79	7.59		198	179				179	35,800					19.54	35,800
107	63.6			22.99		40.56		289	159				159	31,800					0.02	31,800
108	25.9			25.52	0.33			52	29				29	5,800					0.03	5,800
109	33.4			12.00	21.37			88	33				33	6,600						6,600
110	12.6				12.52	0.02		38	38				38	7,600					0.03	7,600
111	7.9					7.86		47	10				10	2,000						2,000
112	14.9				14.88			45	51				51	10,200					0.03	10,200
113	9.1					9.12		55	28				28	5,600						5,600
114	11.1					11.12		67	27				27	5,400						5,400
115	17.0					8.64		52	30				30	6,000					8.34	6,000
116	46.3				46.07			138	73				73	14,600					0.23	14,600
117	6.3				5.56			17	7				7	1,400					0.73	1,400
118	15.9				15.80			47	26				26	5,200					0.06	5,200
119	17.1				17.07			51	62				62	12,400					0.04	12,400
120	25.6				25.50			76	87				87	17,400					0.15	17,400
121	26.6				26.39			79	91				91	18,200					0.18	18,200
122	4.0				4.02			12	15				15	3,000					0.00	3,000
123	19.8				19.76			59	103				103	20,600					0.07	20,600
124	10.2				10.16			30	50				50	10,000					0.06	10,000
125	25.1				23.37	0.00		70	10				10	2,000					1.76	2,000
126	13.5	0.67			0.67	10.48		65	57				57	11,400					1.66	11,400
127	43.6				43.48			130	166				166	33,200					0.08	33,200
128	20.8				3.86	16.96		114	109				109	21,800					0.00	21,800
129	19.4				0.05	19.39		116	89				89	17,800						17,800
130	9.8				9.80	0.02		29	53				53	10,600						10,600
131	35.9				35.85			108	148				148	29,600					0.03	29,600
132	25.7				25.70			77	135				135	27,000						27,000
133	21.8				0.65		17.06	190	180				180	36,000	3.51			5,970.40	0.55	41,970
134	50.1			2.44	47.70			148	107				107	21,400					0.00	21,400
135	22.9				22.83			68	89				89	17,800					0.06	17,800
136	12.0				11.96			36	38				38	7,600						7,600
137	14.5				12.83			39	41				41	8,200					1.66	8,200
138	16.5				16.49			49	69				69	13,800						13,800
139	10.1				10.08			30	42				42	8,400						8,400
140	31.1				31.07			93	112				112	22,400						22,400
141	13.8				12.58			38	38				38	7,600					1.19	7,600
142	29.5				25.27			76	80				80	16,000					4.21	16,000
143	43.3	15.88		0.68	22.58	0.60		76	76				76	15,200					3.51	15,200
144	22.3				14.04			42	32				32	6,400					8.23	6,400
145	13.7	0.02		13.72				27	19				19	3,800						3,800
146	21.0		0.00	7.96	6.04			34	26				26	5,200					7.03	5,200
147	15.9			1.79	10.00			34	11				11	2,200					4.09	2,200
148	58.9			1.82	57.12			175	206				206	41,200						41,200
149	14.1				14.07			42	41				41	8,200						8,200
150	30.6			13.23	15.50			72	37				37	7,400					1.86	7,400
151	75.8			15.95	23.49			102	42				42	8,400					36.34	8,400
152	29.2			4.87	22.99			79	81				81	16,200					1.30	16,200
153	42.7			9.46	30.55			111	59				59	11,800					2.70	11,800
154	22.5	0.02		6.95				14	17				17	3,400					15.54	3,400

Average Daily Flow Summary for Ultimate West Sewer System

Tributary Drainage Area No. [1]	Total Area (ac)	Residential[2]											Non-Residential Flows				Non-Wastwater Generating Landuse Types (ac)	Total[8] Q_{ADF} (gpd)
		Rural Residential (0.2-1 du/ac)	Very Low Density (1-2 du/ac)	Low Density (2 du/ac)	Medium Density (2-5 du/ac)	Med-High Density (5-8 du/ac)	High Density (8-14 du/ac)	Calculated[3] # of edu's	Adjusted[4] # of edu's	Proposed Developments Name / Reference ID / du's	Final[5] # of edu's	Q_{ADF}[6] (gpd)	Commercial Mixed (ac)	Industrial Mixed (ac)	Public Facilities (ac)	Q_{ADF}[7] (gpd)		
155	40.5		0.99	29.72				60	49		49	9,800					9.77	9,800
156	24.4		0.20	24.22				48	28		28	5,600						5,600
157	218.7	0.14	1.63	165.91				334	334		334	66,800					51.03	66,800
158	104.9			103.45	0.47			208	208		208	41,600					0.96	41,600
159	47.9			47.94				96	96		96	19,200					0.00	19,200
160	40.9			28.92				58	58		58	11,600					12.02	11,600
161	57.0			56.99				114	114		114	22,800						22,800
162	25.3			25.27				51	41		41	8,200						8,200
163	40.0			40.04				80	72		72	14,400						14,400
164	24.4			24.43				49	47		47	9,400						9,400
165	12.0			11.75	0.24			24	16		16	3,200						3,200
166	15.3			0.21	15.06			45	61		61	12,200						12,200
167	24.3				24.34			73	82		82	16,400					0.00	16,400
168	70.9			69.83	1.07			143	81		81	16,200						16,200
169	40.4			39.38	1.02			82	44		44	8,800					0.00	8,800
170	21.2			0.04	21.16			63	56		56	11,200					0.02	11,200
171	9.4				9.35			28	24		24	4,800					0.03	4,800
172	17.7			0.00	17.71			53	42		42	8,400					0.02	8,400
173	37.0			16.21		20.56		155	131		131	26,242					0.24	26,242
174	24.8				0.01	24.75		149	35		35	7,000						7,000
176	131.8	2.34	0.06	79.29	15.54			206	103		103	20,600			1.26	1,260.00	33.27	21,860
177	109.3			16.49	4.02			45	23		23	4,500					88.82	4,500
178	54.8			54.21				108	54		54	10,800					0.55	10,800
179	22.8			22.08				44	22		22	4,400					0.68	4,400
Future Tributary Areas																		
1051	155.4	43.96	6.62	99.54	0.28			216	216	TT33294 8 147	147	29,400					4.95	29,400
1052	142.2		97.58	27.69				153	153		153	30,600					16.88	30,600
1053	349.6	0.10	316.35	0.40				317	317		317	63,400					32.71	63,400
1054	357.1	138.12	177.37	35.03				275	275		275	55,000					6.55	55,000
1055	490.7	182.59	86.07	184.95	34.67			597	597		597	119,400					2.45	119,400
1056	178.8	48.98	1.21	37.86	42.14			213	213		213	42,600	13.08		34.42	56,656.60	1.16	99,257
1057	6.3	3.71			1.95	0.68		11	11		11	2,200						2,200
Point Source Flow[9]																		
Norco Coda (existing)																		1,450,000
Home Garden (existing)																		450,000
Totals:	**4,220.9**	**436.53**	**688.08**	**1382.72**	**1072.55**	**188.03**	**17.06**	**8,070**	**7,118**		**7,049**	**1,409,742**	**16.59**	**0.00**	**35.68**	**63,887**	**383.71**	**3,373,629**

[1] Existing and future tributary areas are shown in Plate **5A**.

[2] Landuse designation and density is based on RCIP General Plan Land Use designations 12/18/2003.

[3] The following densities values (du/ac) were used in each range to calculate edu's: RR (1), VLD (2), LD (3), MD (6), MHD (11), HD (200)

[4] Edu's were adjusted upwards for existing tributary areas where calculated edu's were lower than existing edu's. Edu's were adjusted downward for existing tributary areas where further expansion was not expected, or ultimate edu estimates were too high.

[5] Final edu's were adjusted for future tributary areas where planning reports provided ultimate edu's that were different than those calculated. Edu's were set to those specified in the planning reports.

[6] Residential flows were calculated based on a unit wastewater generation factor of 200 gpd/edu.

[7] Non-Residential flows were based on the following wastewater generation factors: Commercial = 1700 gpd/acre, Industrial = 2000 gpd/acre, Public Use = 1000 gpd/acre.

[8] Total flows were the sum of residential and non-residential flows.

[9] Point source flows were based on existing flows from those point sources. It was beyond the scope of this report to attempt to project ultimate flows from those areas.

Average Daily Flow Summary for Ultimate East Sewer System

Tributary Drainage Area No. [1]	Total Area (ac)	Residential [2]												Final [5] # of edu's	Q_{ADF} [6] (gpd)	Non-Residential Flows							Non-Wastwater Generating Landuse Types (ac)	Total [8] Q_{ADF} (gpd)
		Rural Residential (0.2-1 du/ac)	Very Low Density (1-2 du/ac)	Low Density (2 du/ac)	Medium Density (2-5 du/ac)	Med-High Density (5-8 du/ac)	High Density (8-14 du/ac)	Calculated [3] # of edu's	Adjusted [4] # of edu's	Proposed Developments Name	Reference ID	du's				Commercial Mixed (ac)	Industrial Mixed (ac)	Public Facilities (ac)	Proposed Developments Name	Reference ID	Q_{ADF} (gpd)	Q_{ADF} [7] (gpd)		
Existing Tributary Areas																								
201	58.5		58.49					58	280				280	56,000								0		56,000
206	21.8		0.06		0.14	17.68		106	106				106	21,200				3.83				3,826	0.10	25,026
207	23.6		0.89		21.87			67	67				67	13,400		0.88						1,503		14,903
208	23.9				21.67	1.63		75	75				75	15,000				0.57				566		15,566
209	21.5				7.48			22	63				63	12,600				13.67				13,672	0.39	26,272
210	11.2				11.15			33	39				39	7,800								0	0.00	7,800
211	15.4				15.39			46	46				46	9,200								0		9,200
212	14.1				2.57	11.10		75	75				75	15,000		0.45		0.02				775	0.00	15,775
213	15.9				10.46	5.48		64	64				64	12,800								0		12,800
214	15.6				4.17	11.21		79	79				79	15,800		0.22						379		16,179
215	10.5					10.49		63	63				63	12,600								0		12,600
218	39.5		9.61			27.08		172	172				172	34,400		2.77						4,712		39,112
219	160.5		160.10	0.38				161	161				161	32,200								0		32,200
220	72.8		1.13	71.64				144	144				144	28,800								0		28,800
221	107.3		1.02	88.24				177	177				177	35,400		18.02						30,636		66,036
222	21.1				21.12			63	63				63	12,600								0		12,600
223	32.6		0.51		29.48	2.62		105	105				105	21,000								0		21,000
224	12.9				7.71	3.53		44	44				44	8,800								0	1.70	8,800
225	12.2				1.67	7.71		51	51				51	10,200								0	2.86	10,200
226	20.4				9.16	9.90		86	86				86	17,200								0	1.34	17,200
227	12.8				8.11	3.60		46	46				46	9,200		1.07						1,826		11,026
228	9.6				9.56			29	37				37	7,400								0		7,400
229	18.6		3.78		0.24	14.63		93	93				93	18,600								0		18,600
230	11.6		7.53			4.09		33	33				33	6,600								0		6,600
231	18.4		0.08		1.68	16.59		105	105				105	21,000								0	0.04	21,000
Future Tributary Areas																								
1,201	38.6		5.06		33.57			106	106	TT33647	27	103	103	20,600			0	0.0				0		20,600
1,202	41.7				26.23			79	79	Tract "A"	27	92	92	18,400		15.50	0	0.0				26,343		44,743
1,203	175.2	10.24	164.94					167	167	"J"	6	240	240	48,000								0		48,000
1,204	78.9		78.40	0.49				79	79	"H"	6	80	80	16,000								0		16,000
1,205	154.3			108.22				216	216	TT29560	6		216	43,200								0	46.05	43,200
1,206	40.3			30.20				60	60	"D"	6	164	164	32,800		10.07		0.01				17,125		49,925
1,207	52.2			52.19				104	104	TT29649	6		104	20,800								0		20,800
1,208	521.6	5.67		329.03				659	659	"E"	6	1,000	1,000	200,000								0	186.86	200,000
1,209	43.1			28.70				57	57	"C"	6	115	115	23,000		0.00		14.42				14,421		37,421
1,210	395.6		267.14	103.39				474	474	"A"	6	560	560	112,000				0.04				38	25.01	112,038
1,211	198.2		138.79	59.37				258	258	"B"	6	50	50	10,000				0.02				18		10,018
1,212	14.4						0.03	0	0				0	0		14.36			DP Sodaro	27	22,000	22,000		22,000
1,213	18.2				18.21			55	55	Pattumadith	27	31	31	6,200								0		6,200
1,214	77.6			36.57	40.99			196	196	MRSP	27	94	94	18,800								0		18,800
1,215	9.2		4.48		4.72			18	18	LIN/TSAI	27	9	9	1,800								0		1,800
1,216	8.9		4.37		4.50			18	18	Pattumadith	27	9	9	1,800								0		1,800
1,217	35.5							0	0				0	0			35.52					71,044		71,044
1,218	60.0							0	0				0	0		48.74	11.27		March Life Care	29	108,248	108,248		108,248
1,219	180.1							0	0				0	0			101.61	78.49	Global Port			281,705		281,705
1,220	513.9				15.82			47	47				47	9,400		17.82	28.70	434.55				522,242	17.05	531,642
1,221	56.2				54.82			164	164	MJPA - HD	25	240	240	48,000		0.08		1.32				1,452		49,452
1,222	101.8				2.65			8	8				8	1,600		15.40		1.14				27,322	82.58	28,922
1,223	77.6							0	0				0	0		35.99	41.58		March Life Care	29	115,751	115,751		115,751
1,224	19.2							0	0				0	0		18.56	0.61		March Life Care	29	134,296	134,296		134,296
1,225	57.5							0	0				0	0		17.17	40.36					109,917	0.00	109,917
1,226	58.3				0.00			0	0				0	0		57.84		0.48				98,798		98,798
1,227	90.0				1.09			3	3				3	600		85.23	0.53		March Life Care	29	199,420	199,420	3.16	200,020
1,228	67.1		67.06					67	67	Bridgewalk	7	64	64	12,800								0		12,800
1,229	80.4			79.19				158	158	TT29647	6		158	31,600								0	1.16	31,600
1,230	79.9		71.57		8.31			97	97				97	19,400								0		19,400
1,231	202.5		201.16					201	201				201	40,200				1.33				1,333		41,533

Average Daily Flow Summary for Ultimate East Sewer System

Tributary Drainage Area No. [1]	Total Area (ac)	Residential [2]												Non-Residential Flows							Non-Wastwater Generating Landuse Types (ac)	Total[8] Q_{ADF} (gpd)
		Rural Residential (0.2-1 du/ac)	Very Low Density (1-2 du/ac)	Low Density (2 du/ac)	Medium Density (2-5 du/ac)	Med-High Density (5-8 du/ac)	High Density (8-14 du/ac)	Calculated[3] # of edu's	Adjusted[4] # of edu's	Proposed Developments Name	Reference ID	du's	Final[5] # of edu's	Q_{ADF}[6] (gpd)	Commercial Mixed (ac)	Industrial Mixed (ac)	Public Facilities (ac)	Proposed Developments Name	Reference ID	Q_{ADF} (gpd)	Q_{ADF}[7] (gpd)		
1,232	204.1	6.79	172.22					173	173				173	34,600							0	25.12	34,600
1,233	609.2				2.40			7	7				7	1,400	0.01	363.61	1.27	Bus. Park Unit 4	24	930,000	930,000	241.95	931,400
1,234	346.5							0	0				0	0	292.09		41.71	Bus. Park Unit 3	24	480,000	480,000	12.75	480,000
1,235	106.2							0	0				0	0		106.18		Bus. Park Unit 2	24	90,000	90,000		90,000
1,236	253.1							0	0				0	0	99.55	135.79	17.77	Bus. Park Unit 1	24	390,000	390,000	0.01	390,000
1,251	55.5		49.49					49	49	Mazzetti Prop.	27		49	9,800	6.05						10,277		20,077
1,252	27.2		25.23		1.98	0.01		31	31	Mazzetti Prop.	27		31	6,200	0.00						2		6,202
1,253	25.0		7.51					8	8				8	1,600	8.15	9.36		Mazzetti Prop.	27		32,578		34,178
1,254	236.1							0	0				0	0		59.91	176.16	Ben Clark T.C.	28	71,000	71,000	0.07	71,000
1,255	4.9		0.01					0	0				0	0	4.87			Mazzetti Prop.	27		8,281		8,281
1,256	233.7	10.46	94.90		89.22	7.94		413	413				413	82,600							0	31.20	82,600
1,257	61.5		61.43					61	61				61	12,200							0	0.07	12,200
1,258	70.1		70.11					70	70				70	14,000							0		14,000
1,259	153.0				153.00			459	459	AFVW	13	480	480	96,000			0.02				21	0.00	96,021
1,260	320.3				1.23			4	4				4	800			35.12				35,118	283.93	35,918
1,262	39.6			0.00	36.58			110	110				110	22,000	3.06						5,194		27,194
1,263	35.7							0	0				0	0		35.33					70,660	0.41	70,660
Totals:	**7,112.1**	**33.16**	**1,727.05**	**987.60**	**678.92**	**155.33**		**6,673**	**6,950**				**7,365**	**1,473,000**	**774**	**970**	**822**				**3,932,498**	**963.85**	**5,405,498**

[1] Existing and future tributary areas are shown in Plate **5B**.

[2] Landuse designation and density is based on RCIP General Plan Land Use designations 12/18/2003.

[3] The following densities values (du/ac) were used in each range to calculate edu's: RR (0.2), VLD (1), LD (2), MD (3), MHD (6), HD (11)

[4] Edu's were adjusted upwards for existing tributary areas where calculated edu's were lower than existing edu's. Edu's were set to existing edu values and were considered built-out.

[5] Final edu's were adjusted for future tributary areas where planning reports provided ultimate edu's that were different than those calculated. Edu's were set to those specified in the planning reports.

[6] Residential flows were calculated based on a unit wastewater generation factor of 200 gpd/edu.

[7] Non-Residential flows were based on the following wastewater generation factors: Commercial = 1700 gpd/acre, Industrial = 2000 gpd/acre, Public Use = 1000 gpd/acre. For areas where proposed developments projected flows that were different than those calculated, flows were set to proposed development projections.

[8] Total flows were the sum of residential and non-residential flows.

Appendix G

Facility Unit Costs
and
Treatment Unit Costs

Estimated Unit Costs per foot of Sewer Pipelines[1]

Sewer Line Diameter (in)	Construction Cost	Project Cost[2]
8	$77	$108
10	$88	$123
12	$100	$140
15	$133	$186
18	$153	$214
21	$181	$253
24	$215	$301
Pavement Repair	$23	$32
Force Main Daimeter (in)	**Construction Cost**	**Project Cost(2)**
4	$29	$41
6	$41	$57
8	$53	$74
10	$60	$84
12	$68	$95

(1) Unit costs are taken from recent cost estimates for sewer lines from the East Sewer Cost Study for Western Municiple Water District (Ref 17 in Appendix A). Costs were adjusted using the current ENR for Los Angeles.

(2) Project cost is 1.4 times construction cost rounded to nearest $1. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and basic environmental documentation. Costs are based on Engineering News Record (ENR) The Engineering News Record Construction Cost Index (Los Angeles) for January 2014 is 10,736.18 Escalation, financing, interest during construction, legal, land, R-O-W agent, and environmental impact report costs are not included.

Retail and Sewer Service Area Boundaries

PLATE 1

JURUPA VALLEY
EASTVALE
NORCO
RIVERSIDE
CORONA
MORENO VALLEY
PERRIS
LAKE ELSINORE

VAN-BUREN-BLV
MAGNOLIA-AVE
VICTORIA-AVE
ALESSANDRO-BLV
CAJALCO-RD

PLATE 2
PLATE 3

15
91
60
215

LEGEND

- WMWD SEWER RETAIL SERVICE AREA
- WMWD SEWER SERVICE BUT NOT WATER
- NON-SEWAGE PRODUCING AREAS
- CITY OF RIVERSIDE SEWER AND WMWD WATER
- GATEWAY PROJECT
- WMWD AGREEMENT NOT TO PROVIDE SEWER SERVICE
- EDGEMONT PROVIDED SEWER SERVICE AREA
- WMWD WATER RETAIL SERVICE AREAS
- WMWD GENERAL BOUNDARY
- CITY BOUNDARIES

Sources: WMWD, 2008; Riverside Co. GIS, 2014.

ALBERT A. WEBB ASSOCIATES

0 1 2 3 Miles

West Sewer Service Area Boundaries

PLATE 1A

CITY OF NORCO

CITY OF RIVERSIDE

CITY OF CORONA

91

MAGNOLIA AVE

LA SIERRA AVE

VICTORIA AVE

VAN BUREN BLV

DUFFERIN AVE

MOCKINGBIRD CANYON RD

EL SOBRANTE RD

LENNAR

BEAZER

LAKE HILLS

VICTORIA GROVE

LEGEND

- WMWD SEWER RETAIL SERVICE AREA
- WMWD SEWER SERVICE BUT NOT WATER
- WMWD WATER RETAIL SERVICE AREAS
- WMWD GENERAL BOUNDARY
- CITY BOUNDARIES

Sources: WMWD, 2008; Riverside Co. GIS, 2014.

ALBERT A. WEBB ASSOCIATES

0 1,500 3,000 4,500 Feet

East Sewer Service Area Boundaries

PLATE 1B

DUFFERIN-AVE

CITY OF RIVERSIDE

WOOD-RD

ALESSANDRO

MARCH JPA

MARCH JPA

215

CITY OF MORENO VALLEY

MARCH ARB CANTONEMENT AREA

VAN-BUREN-BLV

MISSION RANCH

GOLF COURSE

AFVW

CEMETERY

MOCKINGBIRD-CANYON-RD

WASHINGTON-ST

NANDINA-AVE

NANDINA-AVE

EL-SOBRANTE-RD

HARLEY

WOOD-RD

BARTON-ST

CITY OF PERRIS

BOULDER SPRINGS

CAJALCO-RD

CAJALCO-RD

LEGEND

- WMWD SEWER RETAIL SERVICE AREA
- NON-SEWAGE PRODUCING AREAS
- CITY OF RIVERSIDE SEWER AND WMWD WATER
- WMWD AGREEMENT NOT TO PROVIDE SEWER SERVICE
- EDGEMONT PROVIDED SEWER SERVICE AREA
- WMWD WATER RETAIL SERVICE AREAS
- WMWD GENERAL BOUNDARY
- CITY BOUNDARIES

Sources: WMWD, 2008; Riverside Co. GIS, 2014.

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000 6,000 Feet

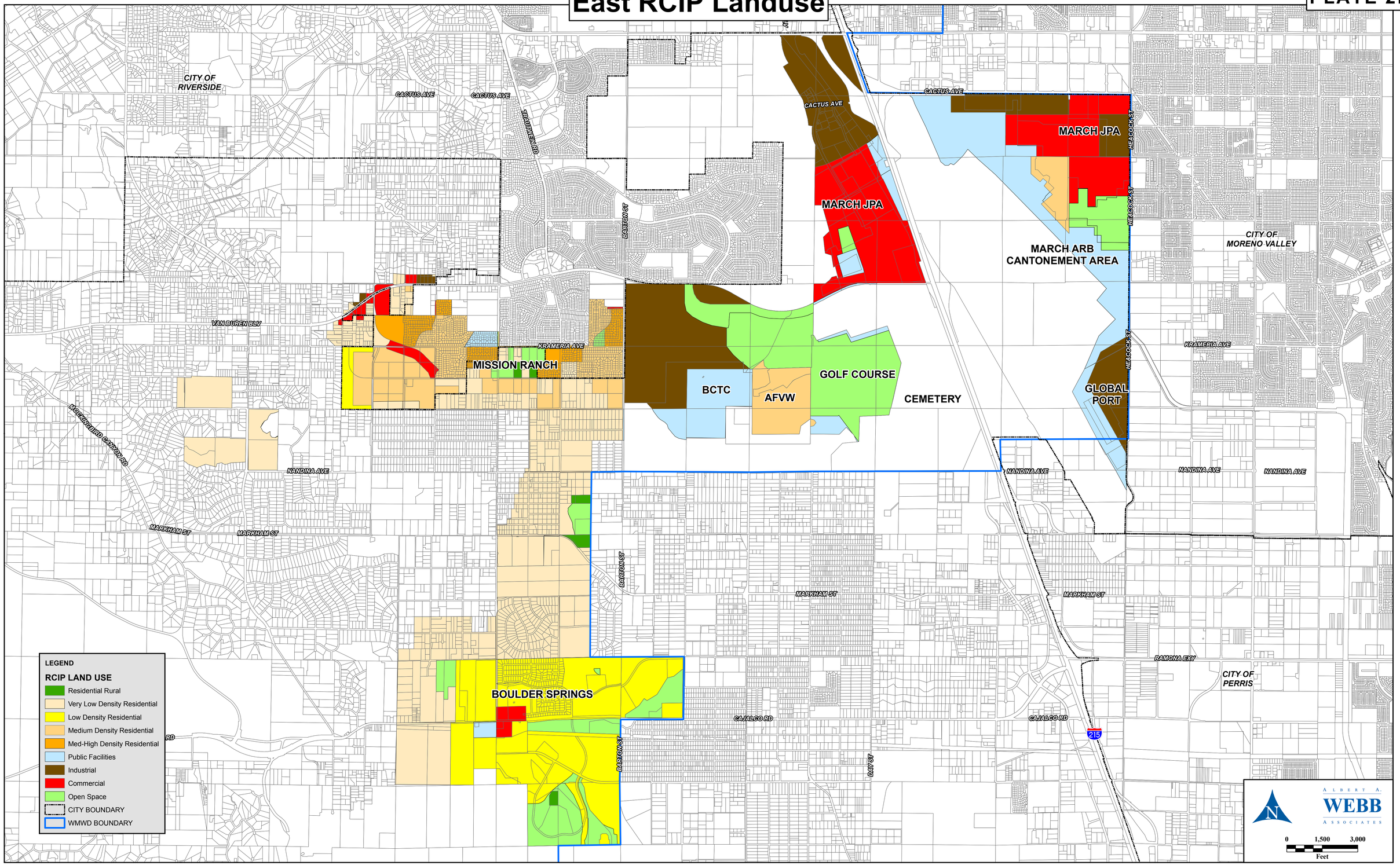
West RCIP Landuse

PLATE 2A

CITY OF NORCO
CITY OF RIVERSIDE
CITY OF CORONA
CITY OF CORONA
LAKEHILLS
LENNAR
BEAZER
VICTORIA GROVE
LAKE MATHEWS
SAMPSON AVE
MAGNOLIA AVE
MAGNOLIA AVE
MAGNOLIA

East RCIP Landuse

PLATE 2B



LEGEND

RCIP LAND USE

- Residential Rural
- Very Low Density Residential
- Low Density Residential
- Medium Density Residential
- Med-High Density Residential
- Public Facilities
- Industrial
- Commercial
- Open Space
- CITY BOUNDARY
- WMWD BOUNDARY

ALBERT A. WEBB ASSOCIATES

0 1,500 3,000

Feet

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Map revised July 16, 2008. G:\2007\07-0236\Gis\East Landuse.mxd

Existing West Sewer System and Tributary Areas

PLATE 3A

WESTERN RIVERSIDE COUNTY WASTEWATER RECLAMATION AUTHORITY (WRCRWA)

CORYDON L.S.

2ND ST. L.S.

SOUTH REGIONAL L.S.

SKY RIDGE L.S.

SPRING CANYON L.S.

Beazer Sewer L.S. # 3

Beazer Sewer L.S. # 1

Beazer Sewer L.S. # 2

Victoria Grove Sewer L.S.

Norco Cota

Home Gardens

McKinley

Buchanan

Filmore

Arizona

LAKE NORCONIAN

CITY OF NORCO

CITY OF RIVERSIDE

CITY OF CORONA

HOME GARDENS

LAKEHILLS

EAGLE VALLEY

VICTORIA GROVE

ID1

SIXTH ST

2ND ST

COUNTY CLUB DR

HIDDEN VALLEY

RINCON ST

RIVER RD

PROMENADE AVE

MCKINLEY ST

MAGNOLIA AVE

SAMPSON AVE

INDIANA AVE

STERLING AVE

FILLMORE ST

ARIZONA AVE

MADERA AVE

DUFFERIN AVE

TYLER ST

VAN BUREN AVE

LINCOLN AVE

MAIN ST

VICTORIA AVE

BUCHANAN ST

91

15

LEGEND

- LIFT STATION
- METERING STATIONS
- FORCE MAIN
- GRAVITY MAIN
- MODELED PIPE
- TRIBUTARY AREAS
- RETAIL SERVICE AREA
- CITY BOUNDARY

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000

Feet

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Existing East Sewer System and Tributary Areas

PLATE 3B

CITY OF RIVERSIDE
CACTUS AVE
TRAUTWEIN RD
BARTON ST
VAN BUREN BLV
KRAMERIA AVE
CANYON RD
NANDINA AVE
MARKHAM ST
CAJALCO RD
HEACOCK ST
CITY OF MORENO VALLEY
CITY OF PERRIS
RAMONA EXY
NANDINA

Dauchy Avenue Sewer L.S.
MARB Bldg. 2313 Sewer L.S.
MARB Bldg. 2240 Sewer L.S.
MARB Bldg. 429 Sewer L.S.
Van Buren Sewer L.S.
'1269'
MARB Fire Station Sewer L.S.
MARB Philips Bldg. Sewer L.S.
AFVW
MARB Bldg. 3412 Sewer L.S.
MARB WWTP
CONNECTION TO EMWD
Markham Sewer L.S.
Cajalco Sewer L.S.

201
206
207
208
209
210
211
212
213
214
215
218
219
220
221
222
223
224
225
226
227
228
229
230
231

LEGEND
- LIFT STATION
- FORCE MAIN
- GRAVITY MAIN
- MODELED PIPE
- TRIBUTARY AREAS
- CITY BOUNDARY
- WMWD BOUNDARY

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000
Feet

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Existing West Trunk Systems

PLATE 4A

WESTERN RIVERSIDE COUNTY WASTEWATER RECLAMATION AUTHORITY (WRCRWA)

CORYDON L.S.

2ND ST. L.S.

SOUTH REGIONAL L.S.

SKY RIDGE L.S.

SPRING CANYON L.S.

Beazer Sewer L.S. # 1

Beazer Sewer L.S. # 2

Beazer Sewer L.S. # 3

Victoria Grove Sewer L.S.

Norco Cota

Home Gardens

McKinley

Buchanan

Filmore

Arizona

MCKINLEY

BUCHANAN

FILLMORE

ARIZONA

HOME GARDENS

LAKEHILLS

VICTORIA GROVE

EAGLE VALLEY

CITY OF NORCO

CITY OF RIVERSIDE

CITY OF CORONA

LAKE NORCONIAN

SIXTH ST

2ND ST

HIDDEN VALLEY

COUNTY CLUB DR

RINCON ST

RIVER RD

PROMENADE AVE

MCKINLEY ST

MAGNOLIA AVE

SAMPSON AVE

INDIANA AVE

STERLING AVE

FILLMORE ST

ARIZONA AVE

MADERA AVE

DUFFERIN AVE

VAN BUREN AVE

LINCOLN AVE

TYLER ST

MAIN ST

VICTORIA AVE

ID1

91

15

LEGEND

- LIFT STATION
- METERING STATIONS
- FORCE MAIN
- GRAVITY MAIN
- MODELED PIPE
- TRUNK SYSTEMS
- RETAIL SERVICE AREA
- CITY BOUNDARY

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000

Feet

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Map revised July 17, 2008. G:\2007\07-0236\Gis\Existing_West_Trunk_Systems.mxd

Existing East Trunk Systems

PLATE 4B

CITY OF RIVERSIDE
CACTUS AVE
TRAUTMAN RD
BARTON ST
VAN BUREN BLV
KRAMERIA AVE
CANYON RD
NANDINA AVE
MARKHAM ST
CAJALCO RD
CITY OF MORENO VALLEY
HEACOCK ST
CITY OF PERRIS
RAMONA EXY
215

Dauchy Avenue Sewer L.S.
DAUCHY
COLE
AFVW
MARB Bldg. 3412 Sewer L.S.
MARB Bldg. 2313 Sewer L.S.
MARB Bldg. 2240 Sewer L.S.
MARB Bldg. 429 Sewer L.S.
Van Buren Sewer L.S.
'1269'
MARB Fire Station Sewer L.S.
MARB Philips Bldg. Sewer L.S.
CONNECTION TO EMWD
MARB WWTP
Markham Sewer L.S.
CAJALCO
Cajalco Sewer L.S.

LEGEND

- LIFT STATION
- FORCE MAIN
- GRAVITY MAIN
- MODELED PIPE
- TRIBUTARY AREAS
- CITY BOUNDARY
- WMWD BOUNDARY

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000
Feet

Map revised July 17, 2008. G:\2007\07-0236\Gis\Existing_East_Trunk_Systems.mxd

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Ultimate West Sewer System and Tributary Areas

PLATE 5A

WESTERN RIVERSIDE COUNTY WASTEWATER RECLAMATION AUTHORITY (WRCRWA)

CORYDON L.S.

2ND ST. L.S.

SOUTH REGIONAL L.S.

SUNSET P.S./Metering Sta.

Norco Cota

Home Gardens

McKinley

Buchanan

Filmore

Arizona

SKY RIDGE L.S.

SPRING CANYON L.S.

LAKE HILLS

Beazer Sewer L.S. # 1

Beazer Sewer L.S. # 2

Beazer Sewer L.S. # 3

Victoria Grove Sewer L.S.

VICTORIA GROVE

EAGLE VALLEY

IDU1

ID1

CITY OF NORCO

CITY OF CORONA

CITY OF RIVERSIDE

MAGNOLIA AVE

VICTORIA AVE

DUFFERIN AVE

VAN BUREN BLV

L.A.SIERRA AVE

EL SOBRANTE RD

91

15

LEGEND

- Proposed Lift Station
- Proposed Gravity Main
- Proposed Force Main
- Proposed Sewer Master Facilities
- Existing Lift Station
- Ex. Metered/Monitoring MH
- Existing WMWD Gravity Main
- Existing Force Main
- IEBL
- Future Tributary Areas
- Existing Tributary Areas
- Retail Service Area
- City Boundary

Sources: WMWD, 2008; Riverside Co. GIS, 2014.

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000 6,000 8,000 Feet

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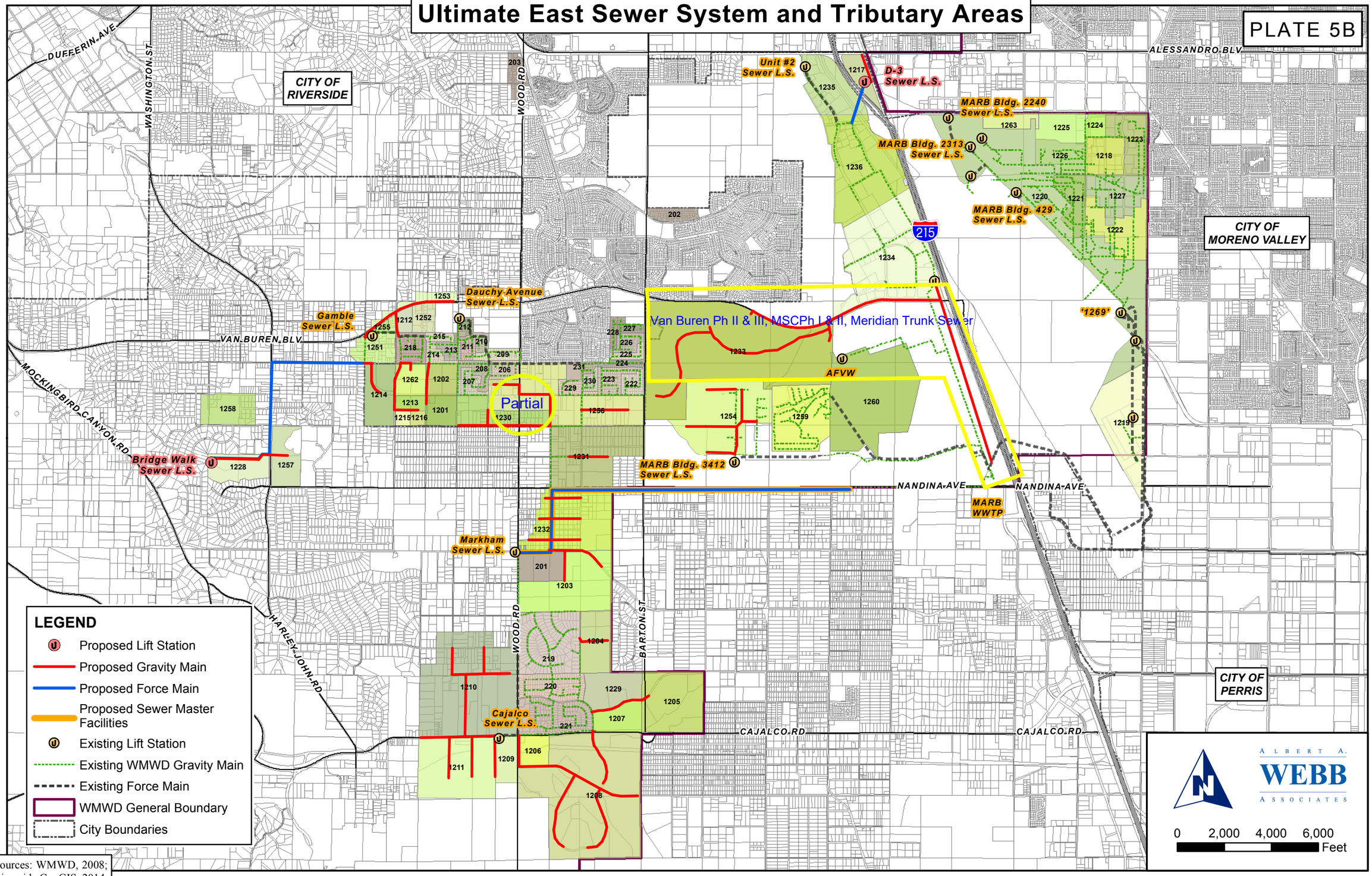
Ultimate East Sewer System and Tributary Areas

PLATE 5B



Sources: WMWD, 2008; Riverside Co. GIS, 2014.

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West System Benefit Areas

PLATE 6A

WESTERN RIVERSIDE COUNTY WASTEWATER RECLAMATION AUTHORITY (WRCRWA)

CORYDON L.S.

2ND ST. L.S.

SOUTH REGIONAL L.S.

Norco Cota

SUNSET P.S./Metering Sta.

Home Gardens

CITY OF NORCO

CITY OF CORONA

CITY OF RIVERSIDE

McKinley

Buchanan

Filmore

Arizona

SKY RIDGE L.S.

SPRING CANYON L.S.

LAKE HILLS

EAGLE VALLEY

IDU1

ID1

Beazer Sewer L.S. # 3

Beazer Sewer L.S. # 1

Beazer Sewer L.S. # 2

Victoria Grove Sewer L.S.

VICTORIA GROVE

EL SOBRANTE RD

SIERRA AVE

VAN BUREN BLV

MAGNOLIA AVE

VICTORIA AVE

DUFFERIN AVE

LA SIERRA AVE

91

15

LEGEND

- Proposed Gravity Main
- Proposed Sewer Master Facilities
- Existing Lift Station
- Ex. Metered/Monitoring MH
- Existing WMWD Gravity Main
- Existing Force Main
- IEBL
- Benefit Areas
- Retail Service Area
- City Boundary

Sources: WMWD, 2008; Riverside Co. GIS, 2014.

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000 6,000 8,000 Feet

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East System Benefit Areas

PLATE 6B

DUFFERIN AVE
WASHINGTON ST
CITY OF RIVERSIDE
WOOD RD
ALESSANDRO BLV
CITY OF MORENO VALLEY
Unit #2 Sewer L.S.
D-3 Sewer L.S.
MARB Bldg. 2240 Sewer L.S.
MARB Bldg. 2313 Sewer L.S.
MARB Bldg. 429 Sewer L.S.
Dauchy Avenue Sewer L.S.
Gamble Sewer L.S.
VAN BUREN BLV
MOCKINGBIRD CANYON RD
Bridge Walk Sewer L.S.
AFVW
'1269'
MARB Bldg. 3412 Sewer L.S.
NANDINA AVE
NANDINA AVE
MARB WWTP
Markham Sewer L.S.
WOOD RD
BARTON ST
HARLEY JOHN RD
Cajalco Sewer L.S.
CAJALCO RD
CAJALCO RD
CITY OF PERRIS
215
2
3
4
5
6
7
8

LEGEND

- Proposed Lift Station
- Proposed Gravity Main
- Proposed Force Main
- Existing Lift Station
- Existing WMWD Gravity Main
- Existing Force Main
- Benefit Areas
- WMWD General Boundary
- City Boundaries

Sources: WMWD, 2008; Riverside Co. GIS, 2014.

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000 6,000 Feet

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West System Analysis Results

PLATE 7A

WESTERN RIVERSIDE COUNTY WASTEWATER RECLAMATION AUTHORITY (WRCRWA)

CORYDON L.S.

2ND ST. L.S.

SOUTH REGIONAL L.S.

Norco Cota

SUNSET P.S./Metering Sta.

Home Gardens

CITY OF NORCO

CITY OF CORONA

CITY OF RIVERSIDE

LA SIERRA AVE

VAN BUREN BLV

MAGNOLIA AVE

VICTORIA AVE

DUFFERIN AVE

EL SOBRANTE RD

91

15

Filmore

Arizona

Buchanan

McKinley

SKY RIDGE L.S.

SPRING CANYON L.S.

LAKE HILLS

Beazer Sewer L.S. # 3

Beazer Sewer L.S. # 1

Beazer Sewer L.S. # 2

Victoria Grove Sewer L.S.

1

2

3

12 inch

8 inch

10 inch

ID1

VICTORIA GROVE

EAGLE VALLEY

IDU1

LEGEND

- Existing Lift Station
- Ex. Metered/Monitoring MH
- Existing WMWD Gravity Main
- IEBL
- Force Main
- Future Pipes
- Pipes Above Capacity
- Retail Service Area
- City Boundary

Sources: WMWD, 2008; Riverside Co. GIS, 2014.

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000 6,000 8,000 Feet

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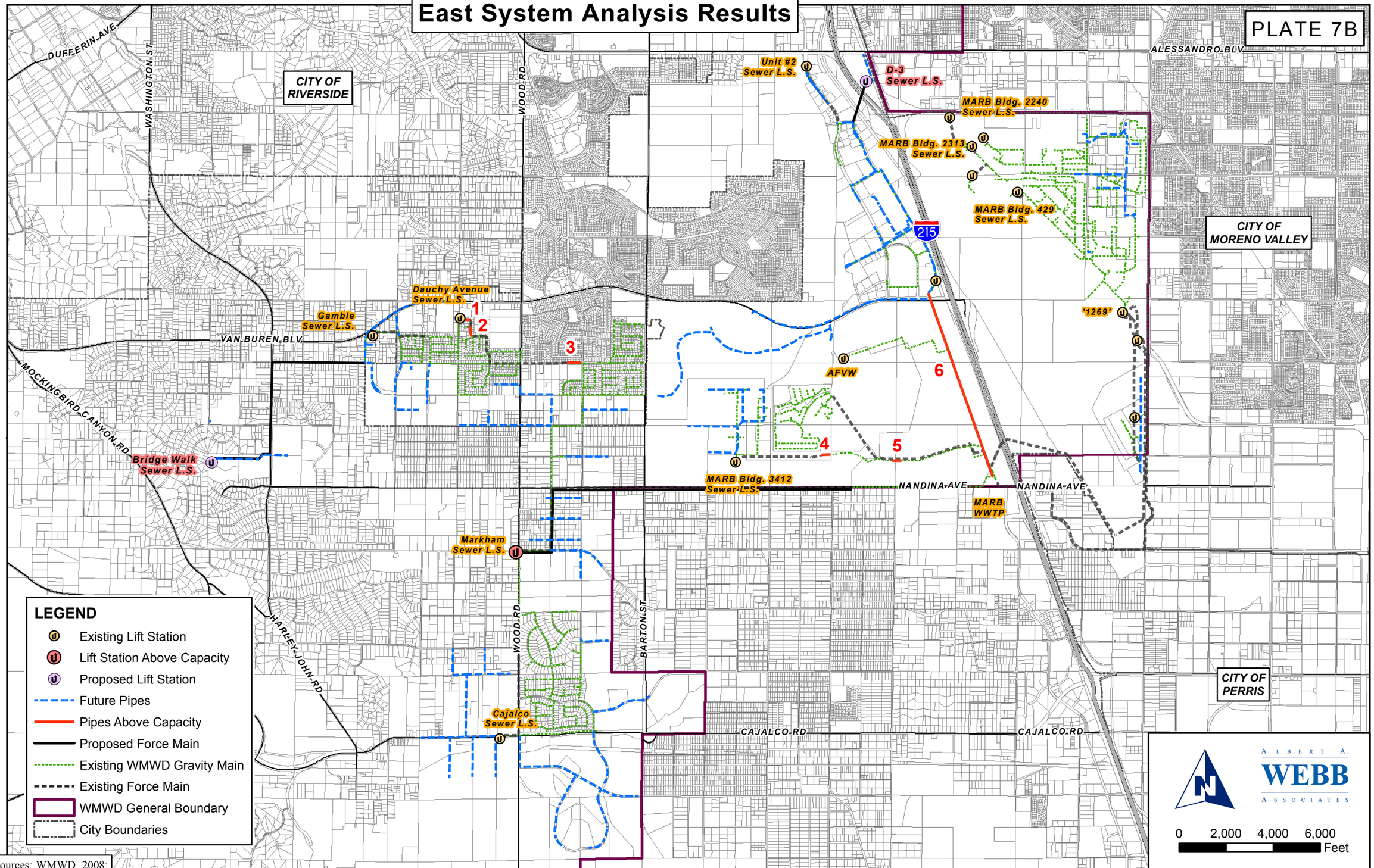
East System Analysis Results

PLATE 7B



Sources: WMWD, 2008; Riverside Co. GIS, 2014.

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West System Fee Facilities

PLATE 8A

WESTERN RIVERSIDE COUNTY WASTEWATER RECLAMATION AUTHORITY (WRCRWA)

1A

1B

3

CORYDON L.S.

2ND ST. L.S.

SOUTH REGIONAL L.S.

Norco Cota

SUNSET P.S./Metering Sta.

Home Gardens

CITY OF NORCO

CITY OF RIVERSIDE

CITY OF CORONA

6

5

4

7

McKinley

Buchanan

Filmore

Arizona

SKY RIDGE L.S.

SPRING CANYON L.S.

LAKE HILLS

Beazer Sewer L.S. # 3

Beazer Sewer L.S. # 1

Beazer Sewer L.S. # 2

Victoria Grove Sewer L.S.

ID1

VICTORIA GROVE

EAGLE VALLEY

IDU1

SIERRA AVE

VAN BUREN BLVD

MAGNOLIA AVE

VICTORIA AVE

DUFFERIN AVE

EL SOBRANTE RD

LA SIERRA AVE

91

15

LEGEND

- Proposed Gravity Main
- Existing Lift Station
- Ex. Metered/Monitoring MH
- Proposed Fee Facilities
- Fee Facilities
- Existing WMWD Gravity Main
- Existing Force Main
- IEBL
- Benefit Areas
- Retail Service Area
- City Boundary

Sources: WMWD, 2008; Riverside Co. GIS, 2014.

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000 6,000 8,000 Feet

G:\2013\13-0306\GIS\SewerMP_West_FeeAreas.mxd: Map revised June 22, 2014.

East System Fee Facilities

PLATE 8B

CITY OF RIVERSIDE

CITY OF MORENO VALLEY

CITY OF PERRIS

DUFFERIN AVE

WOOD RD

ALESSANDRO BLV

VAN BUREN BLV

MOCKINGBIRD CANYON RD

WASHINGTON ST

NANDINA AVE

HARLEY JOHN RD

BARTON ST

CAJALCO RD

EL

215

Unit #2 Sewer L.S.

D-3 Sewer L.S.

MARB Bldg. 2240 Sewer L.S.

MARB Bldg. 2313 Sewer L.S.

MARB Bldg. 429 Sewer L.S.

'1269'

AFVW

MARB Bldg. 3412 Sewer L.S.

MARB WWTP

Dauchy Avenue Sewer L.S.

Gamble Sewer L.S.

Bridge Walk Sewer L.S.

Markham Sewer L.S.

Cajalco Sewer L.S.

1 2 8 9 10 11 12 13 14 15 16 17 18 19 21 22 23 24 25 26 27 28 29

LEGEND

- Existing Lift Station
- Proposed Lift Station
- Fee Facilities
- Proposed Gravity Main
- Existing WMWD Gravity Main
- Existing Force Main
- Benefit Areas
- WMWD General Boundary
- City Boundaries

Sources: WMWD, 2008; Riverside Co. GIS, 2014.

ALBERT A. WEBB ASSOCIATES

0 2,000 4,000 6,000 Feet

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