
APPENDIX D23

Preliminary Sanitary Sewer Capacity Study



PRELIMINARY SANITARY SEWER CAPACITY STUDY

The District at Jurupa Valley Jurupa Valley, California

December 2022

KHA Project # 194399001
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I. Background and Previous Studies

The City of Jurupa Valley lies within Riverside County. Wastewater services are provided by Rubidoux Community Services District (RCSD) for the eastern portion of the City. RCSD is located in northwestern Riverside County and encompasses an area of approximately 5,369 acres (8.4 square miles). As of 2021, the District (RCSD) owns over 72 miles of active wastewater pipelines and collects an approximate average of 1.75 million gallons per day (MGD) of wastewater.

The District through a series of agreements with the City of Riverside has 3.055 MGD of capacity rights in the Riverside Water Quality Control Plant (RWQCP) treatment facilities. The RWQCP provides preliminary, primary, secondary, and tertiary treatment and meets all Title 22 requirements for recycled water. It has a rated capacity of 46 MGD.

RCSD prepared a District-wide Sewer Master Plan in May 2022. The Master Plan conducted flow tests throughout the RCSD service area, evaluated sewer main lines and lift stations, identified potential sewer deficiencies, and recommended a Capital Improvement Plan for the RCSD sewer system. The flow tests taken at some locations within the District were utilized to calibrate sewage generation rates and a peaking factor formula. The design factors set forth in the Master Plan are summarized in the methodology section of this study.

The Master Plan did reference a previous version of the Districts at Jurupa Valley project in its section 2.5.3. The project was summarized as follows:

“The Emerald Meadows Ranch Specific Plan was adopted in 2006 by the County Board of Supervisors and provides for various densities of residential neighborhoods, school, park, and church sites, and a commercial site at Rubidoux Blvd. and the State Route 60 Freeway. To date, the City Council has not approved changes to the 2006 land use plan. The Specific Plan property is currently vacant and within the District’s service area. The land uses of this Specific Plan are already shown in the City’s land use plan, therefore the wastewater generation projections for this development are calculated using the land use plan designations. In addition, the population projections assumed herein include the potential population of this Specific Plan beginning in 2025. The current landowner is now calling the project ‘The District @ Jurupa Valley’. This new project is currently in the entitlement stage under this new name. Sewer generation projects for the project may change and a

detailed assessment of the impact of these changes on this master plan will be necessary once any entitlement changes are adopted.”

Per RCSD, the previous specific plan uses generated 283,697 gpd average.

II. Project Description

The District at Jurupa Valley Specific Plan (“Specific Plan”) is approximately 248-acre area located at the eastern portion of the City adjacent to the Santa Ana River and State Route 60 in the County of Riverside. Refer to the “Vicinity Map” and “RCSD Boundary Map” in Appendix 1. The Specific Plan is located approximately 50 miles east of downtown Los Angeles and 2.5 miles south from the jurisdictional boundaries between the County of Riverside and the County of San Bernardino. Regional access is provided via the following freeways: State Route 60 (SR-60), Interstate 215 (I-215), State Route (SR-91), and Interstate 15 (I-15).

The Specific Plan area contains approximately 246 acres of single ownership and 2.1 acres of existing residential parcels, for a total of 248 acres. Reference Appendix 1 for the “Land Use Sewer Generation Exhibit”. The proposed Tentative Map (Tentative Tract map 38318) would consolidate existing multiple lots into consolidated plan. There will be subsequent final maps and lotting to support future development. The companion Environmental Impact Report (EIR) discusses the impact of the development of the proposed Specific Plan.

The development plan allows for a variety of residential and non-residential uses that incorporate strong employment opportunities through the warehouse/industrial and commercial land uses that would generate demand for retail services and businesses. In addition to economic development, the residential land uses will support the General Plan’s Housing Element by providing new housing opportunities to meet the City’s Regional Housing Needs Assessment.

The Land Use Plan allows for a mix of land uses that enables the opportunity to provide a well-balanced community where residents, businesses and commercial uses can coexist and thrive. The Land Use Plan provides for residential, commercial, and warehouse/industrial uses that benefit from convenient regional access routes, growing market demand within the City of Jurupa Valley, strong local labor force, that are tied together through the use of development standards and design guidelines.

The Specific Plan allows for the development of approximately 248-acres, comprised of the following land uses: Residential, Commercial, Hospitality, Warehouse/Industrial and Open Space. Table 1 below outlines the Specific Plan land uses:

Table 1: Specific Plan Land Use Summary	
Land Use	Gross Acreage
Commercial - Neighborhood	20.3
Commercial - Retail	69.8
Commercial – Existing Non-conforming	1.1
Commercial - Tourist	5.9
Commercial Subtotal	97.1
High Density Residential Subtotal	41.6
Business Park	6.8
Business Park – Existing non-Conforming	1.0
Business Park Subtotal	7.8
Industrial Subtotal	72.1
Public Improvements/Open Space	29.8
Total	248.4

III. Existing Conditions

The Specific Plan area abuts the SR-60 right-of-way to the north, 34th Street to the south, Santa Ana River to the east and Rubidoux Boulevard to the west. Reference Appendix 1 for the “Vicinity and RCSD Service Area Maps”. The southern border of the Specific Plan area is irregular and does not include a majority of the existing uses along 34th Street. The Specific Plan area is characterized as predominantly vacant land, with limited previous development of older residential properties. The surrounding neighborhoods have been developed over time with residential, commercial, and industrial uses. Land uses surrounding the Specific Plan are generally described as follows:

- North: N-A (Natural Assets), R-3(General Residential), C-1/C-P (General Commercial) and M-SC (Manufacturing Service Commercial)
- South: R-1(single family dwellings including churches and educational institutions), R-2(multiple family dwellings), and A-1(light agriculture)
- East: Santa Ana River and City of Riverside jurisdictional boundary
- West: R-3 (General Residential)

Access to the site is primarily from the Frontage Road, 30th Street, Hall Avenue, Rubidoux Boulevard, 34th Street and Wallace Street. These existing public streets are paved roads with varying widths though not all roads have curb, gutter, or sidewalks. The existing residences within the Specific Plan area take direct access from Wallace Street. Per RCSD,

“The proposed project, The District @ Jurupa Valley, is within RCSD’s sewer service area and was included in the recent Sewer Master Plan update under the previously approved land use. RCSD’s sewer master plan did not envision any new master planned facilities for the proposed project. The existing 18-in sewer bisecting the property along Wallace Street and the downstream facilities have capacity to handle sewer generated by the project,”

The “project” refers to the previously approved Specific Plan land uses. RCSD’s facilities currently serve the limited existing conditions development.

The existing RCSD 18” sewer bisects the site and runs in a north-south direction from a State Route 60 crossing on the north property boundary (as a 15-inch pipe) to Wallace Street at the south property boundary (as an 18-inch pipe). Refer to the “RCSD Existing Infrastructure Map” in Appendix 1. The pipe carries significant upstream off-site flows, approximately 0.8305 MGD total flow from area north of State Route 60. Approximately 0.8547 MGD total flow exits the site at Wallace Street and 34th Street, the south edge of the Specific Plan.

IV. **Proposed Conditions**

The Specific Plan will create a variety of uses that are connected by a proposed street network with proposed sewer mains serving the various uses across the site. Refer to the “Pipe Layout Exhibit” in Appendix 1. The majority of the RCSD trunk line will be relocated from approximately 500 feet south of State Route 60 to the Wallace/34th Street intersection. Most of the relocated trunk line will be located in Street “B” of the proposed Specific Plan. See the Land Use Exhibit for the land use and street network layout and the Pipe Layout Exhibit for more information on the proposed pipe network.

V. **Methodology**

This Study utilizes the same sewage generation factors, peak flow factors, allowable flow depths and pipe capacity formula as the RCSD Master Plan with one exception.

- 500 gpd/acre average daily sewage generation across all commercial uses.
- The maximum allowable d/D is 0.50 for 8-inch and 12-inch diameter sewers.
- The maximum allowable d/D 0.75 for sewers 12 inches in diameter and larger.
- Manning’s equation with $n=0.013$ is utilized for pipe flow calculations.
- The peak flow rate is determined by the formula $Q_{peak}=2.3(Q_{avg})^{0.89}$

The Master Plan used 210 gpd/unit for residential uses. This per unit generation is appropriate for single family residential development. RCSD does not have a generation rate for multi-family residential development. Several surrounding jurisdictions have generation rates defined for multi-family uses at a similar density to the 25 DU/acre density in the Specific Plan residential zone, as summarized in Table 2 below. Reference Appendix 3 for more information regarding the generation rates.

Table 2: Comparative Multi Family Generation Rates			
Jurisdiction	Use	Generation (gpd/acre)	Density (DU/Acre)
JCSD	Multi-Family Residential	4,500 (Based on 180 gpd/unit)	25
City of Ontario	Medium Density Residential	4,200	11-25
City of Riverside	Very High Density Residential	4,000	30

Based on the surrounding agency generation rates, 4,200 gpd/acre, the middle value of the three, will be utilized for analysis purposes. The Specific Plan allocates 42 acres to residential. At 25 DU/acre, 42 acres yields 1,050 units total. Since 1,196 units will be entitled at the site, the residential acreage will be artificially raised to 47.84 acres to account for the number of entitled units.

VI. Analysis

Table 3 below summarizes the total generation rate for the proposed Specific Plan uses.

Table 3: Specific Plan Sewer Generation			
Use	Generation Rate (gpd/acre)	Area (acre)	Average Daily Flow (gpd)
Commercial Subtotal	500	97.1	48,550
High Density Residential Subtotal	4,200	47.84*	200,928
Business Park Subtotal	500	7.8	3,900
Industrial Subtotal	500	72.1	36,050
Public/Open Space Subtotal	0	29.8	0
Total	N/A	254.64*	289,428

*Increased from 41.6 acres to allow for the 1,196 entitled units

A more detailed area breakdown is provided in the calculations in Appendix 2. Individual pipe flow analyses and an analysis of the relocated RCSD trunk line are also provided based on RCSD-standard design factors.

VII. Conclusion

RCSD, in its 2022 Master Plan identified no deficiencies downstream of the Specific Plan based on the previously approved uses. Those previously approved uses were projected to generate approximately 283,697 gpd average. The Specific Plan, with updated uses is projected to generate approximately 289,428 gpd average, an increase of approximately 2.0%. Since the generation rate of the Specific Plan is substantially similar to the uses studied in the RCSD Master Plan, the Specific Plan should not require any additional downstream improvements or any downstream facility upgrades.

All on-site mains are sized to meet the RCSD flow depth, and slope requirements.

Appendix 1 – Exhibits and Reference Maps

Vicinity Map

RCSD Service Area Map

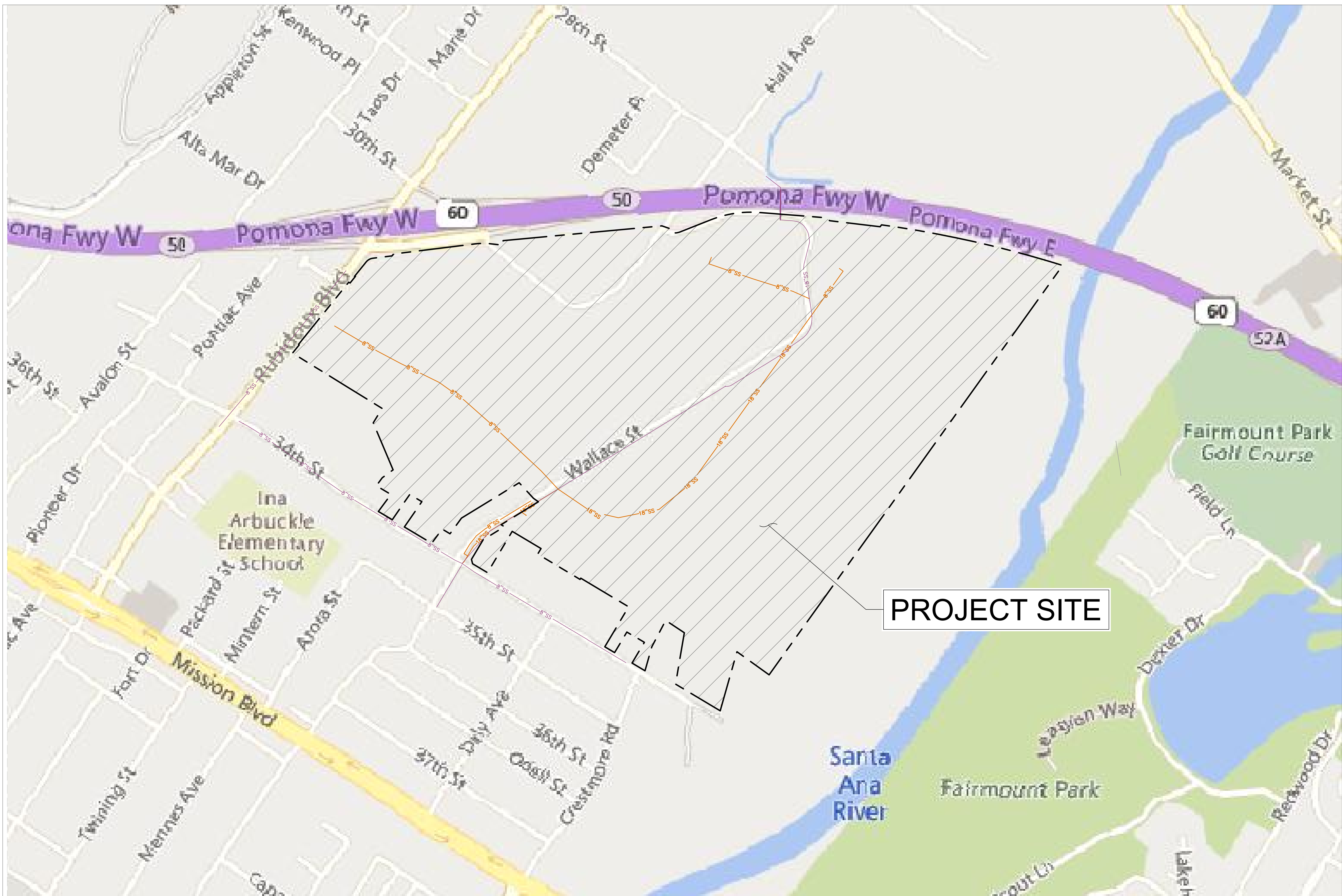
RCSD Existing Infrastructure Map

Pipe Layout Exhibit

Proposed and Existing Sewer Line Exhibit

Land Use Exhibit

Plotted By: Divisior, Horns Sheet, Set: Khs Layout: CS October 31, 2022 07:23:12pm K:\ORA_LDEV\194399001 Districts of Rubidoux\CAD\PlanSheets\VICINITY MAP - SEWER REPORT.dwg
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PROJECT SITE

LEGEND

- PROPOSED SEWER LINE — 18"SS —
- EXISTING SEWER LINE — 18"SS —
- PROJECT SITE

VICINITY MAP
SCALE: NTS



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KHA PROJECT
194399001
DATE
10/31/2022
SCALE AS SHOWN
DESIGNED BY HS
DRAWN BY NS/KM
CHECKED BY MR

THE DISTRICT
JURUPA VALLEY

LICENSED PROFESSIONAL
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DATE: 6/30/2024

VICINITY MAP

SHEET NUMBER

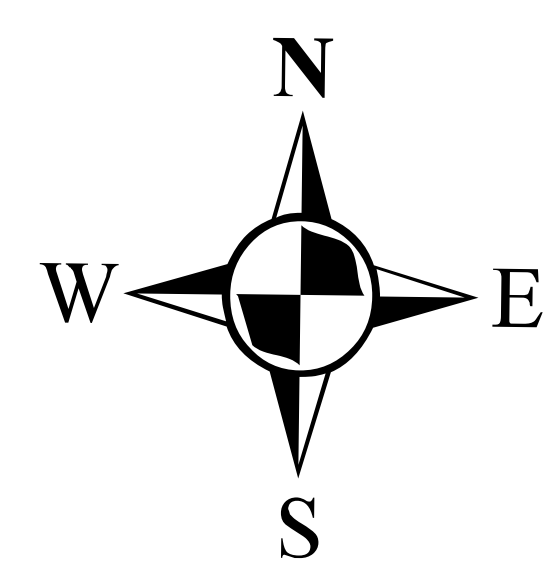
Rubidoux Community Services District

FUTURE RCSD BOUNDARY

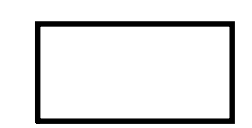
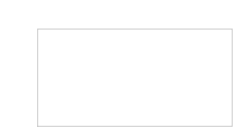
CURRENT RCSD BOUNDARY

PROJECT SITE

Current RCSD Boundary



Legend

-  RCSD_Boundary
-  Parcels

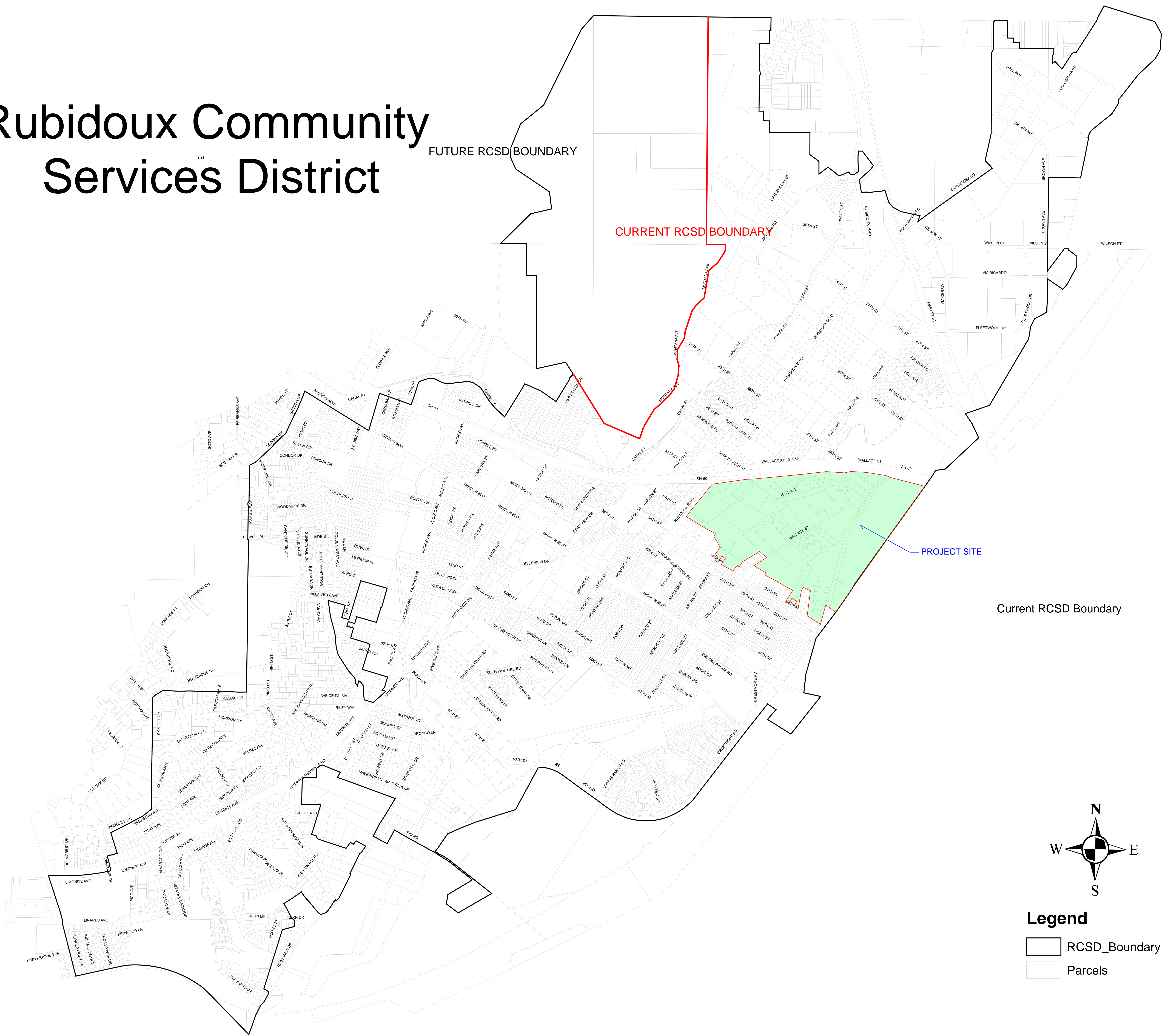
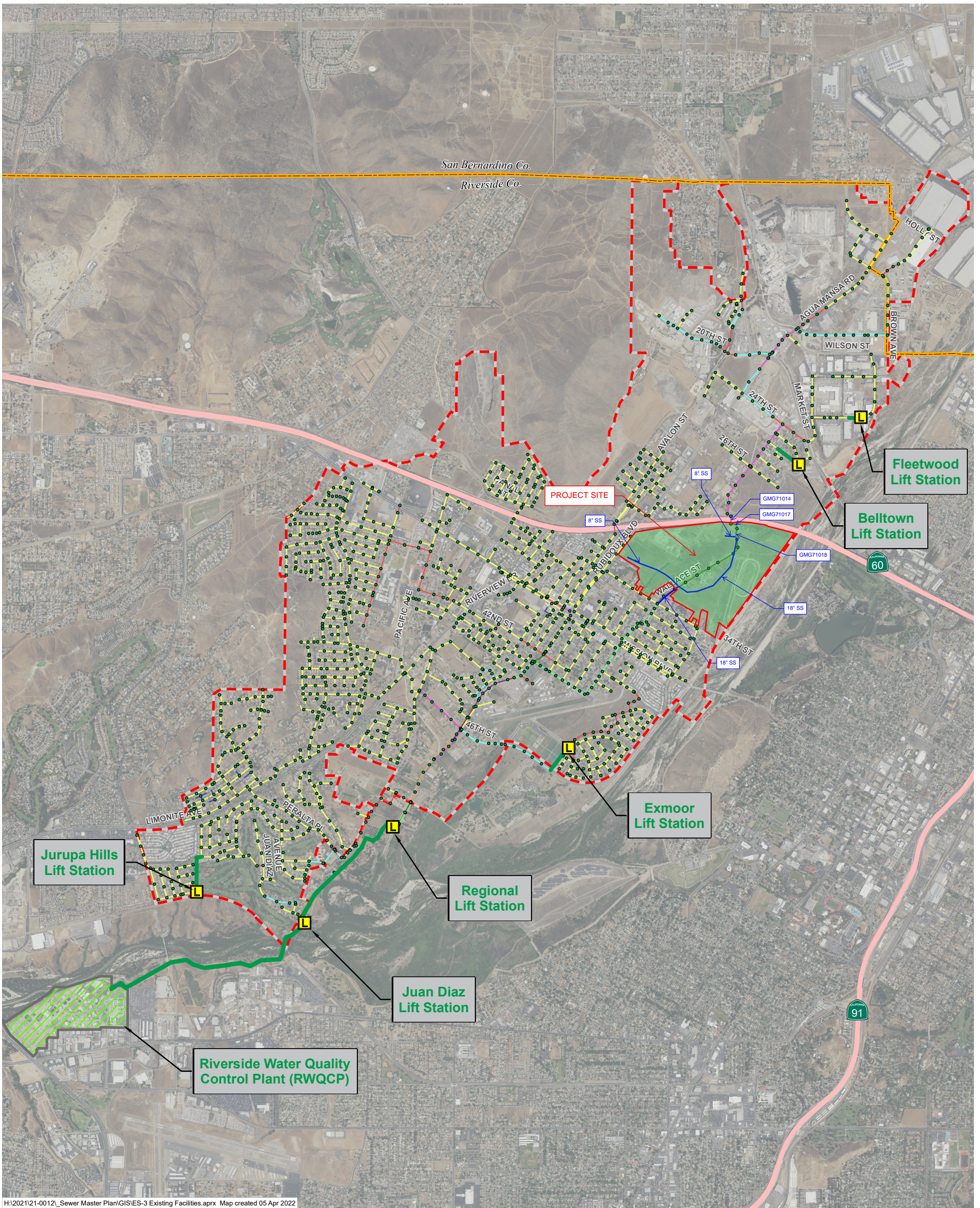


FIGURE ES-3

EXISTING FACILITIES




H:\2021\21-0012\ Sewer Master Plan\GIS\ES-3 Existing Facilities.aprx Map created 05 Apr 2022

LEGEND

- - - RCSD Current Service Area
- L Lift Stations
- Forcemains
- City of Riverside RWQCP Treatment Facility
- Manholes

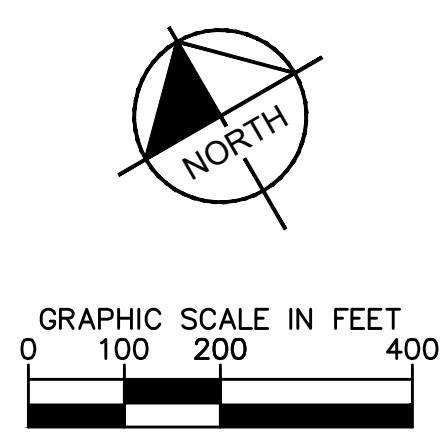
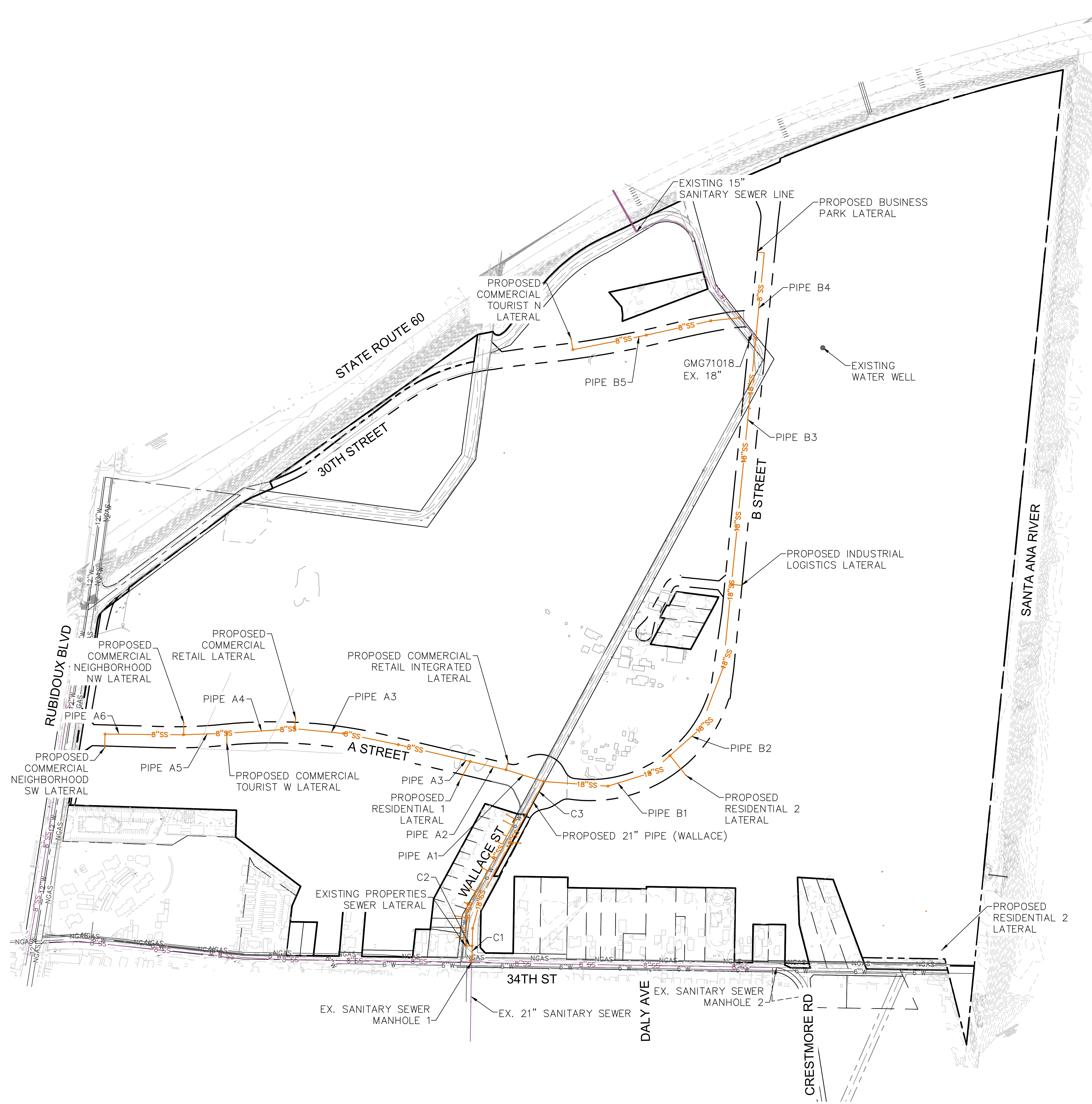
Gravity Mains	
— 6" Diameter	— 15" Diameter
— 8" Diameter	— 18" Diameter
— 10" Diameter	— 21" Diameter
— 12" Diameter	— 24" Diameter
	— 27" Diameter or Larger





Sources: RCSD GIS, 2015; NAIP 2016

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KHA PROJECT	194399001
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SCALE	AS SHOWN
DESIGNED BY	HS
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CHECKED BY	MR

THE DISTRICT

JURUPA VALLEY

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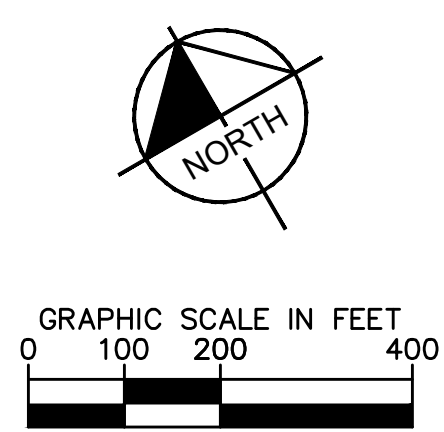
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PRELIMINARY SEWER MAIN LAYOUT PLAN

SHEET NUMBER

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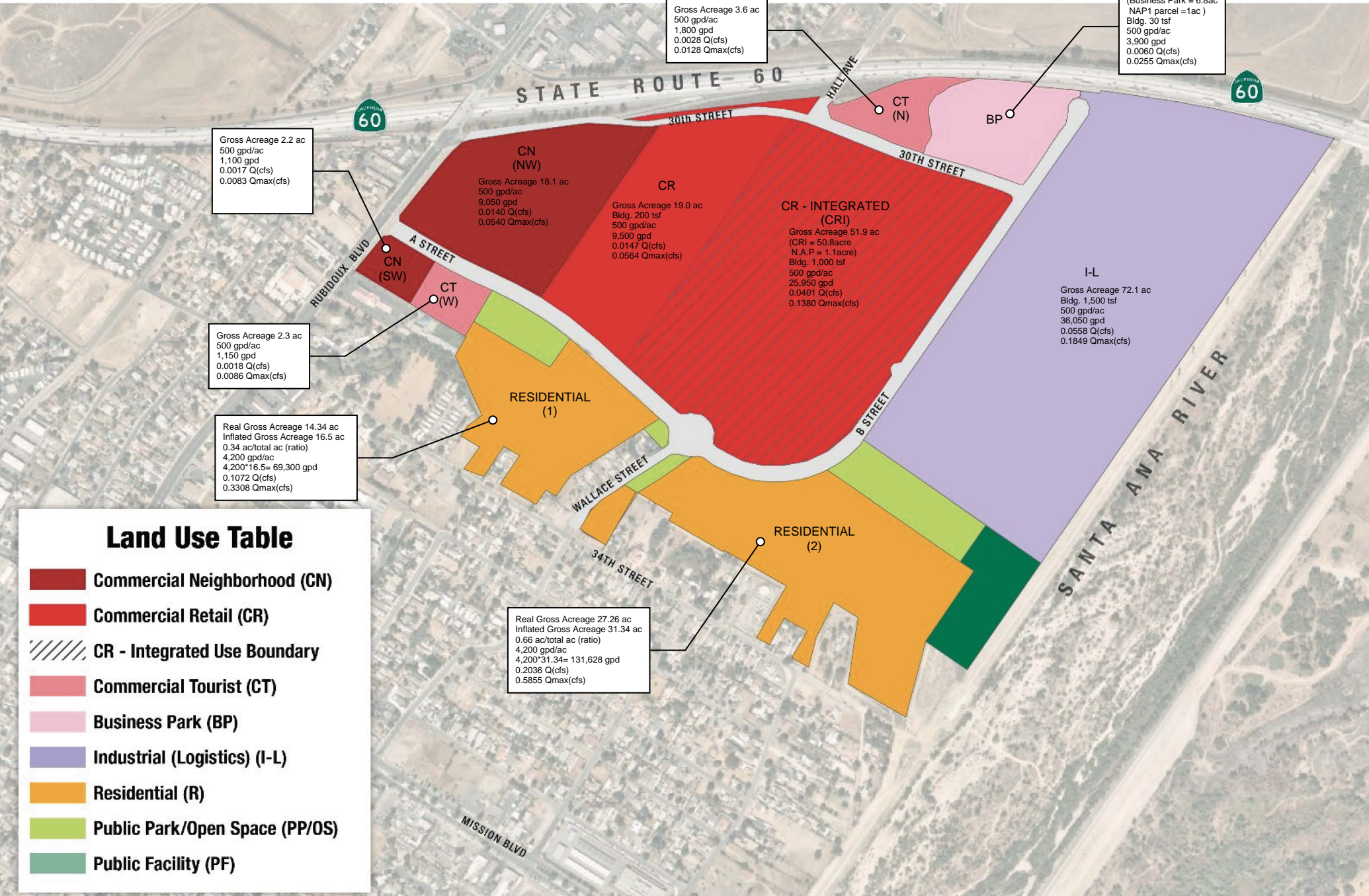
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 CHECKED BY MR

THE DISTRICT
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**PRELIMINARY SEWER MAIN
 LAYOUT AND EXISTING
 SEWER PLAN**

SHEET NUMBER



Gross Acreage 2.2 ac
500 gpd/ac
1,100 gpd
0.0017 Q(cfs)
0.0083 Qmax(cfs)

Gross Acreage 3.6 ac
500 gpd/ac
1,800 gpd
0.0028 Q(cfs)
0.0128 Qmax(cfs)

Gross Acreage 7.8 ac
(Business Park = 6.8ac
NAP1 parcel = 1ac)
Bldg. 30 tsf
500 gpd/ac
3,900 gpd
0.0060 Q(cfs)
0.0255 Qmax(cfs)

Gross Acreage 2.3 ac
500 gpd/ac
1,150 gpd
0.0018 Q(cfs)
0.0086 Qmax(cfs)

Real Gross Acreage 14.34 ac
Inflated Gross Acreage 16.5 ac
0.34 ac/total ac (ratio)
4,200 gpd/ac
4,200*16.5= 69,300 gpd
0.1072 Q(cfs)
0.3308 Qmax(cfs)

Real Gross Acreage 27.26 ac
Inflated Gross Acreage 31.34 ac
0.66 ac/total ac (ratio)
4,200 gpd/ac
4,200*31.34= 131,628 gpd
0.2036 Q(cfs)
0.5855 Qmax(cfs)

Land Use Table

- Commercial Neighborhood (CN)
- Commercial Retail (CR)
- CR - Integrated Use Boundary
- Commercial Tourist (CT)
- Business Park (BP)
- Industrial (Logistics) (I-L)
- Residential (R)
- Public Park/Open Space (PP/OS)
- Public Facility (PF)

Appendix 2 - Sewer Calculations

A.1 - MAXIMUM ALLOWABLE DISCHARGE TABLE BY FLOWMASTER

n=0.013 PVC FlowMaster				
Diameter (in)	Slope (ft/ft)	Normal Depth (in)	Discharge (cfs)	d/D Ratio
8	0.40%	4	0.38	0.50
	0.50%		0.43	
	1.00%		0.60	
10	0.30%	5	0.60	0.50
	0.50%		0.77	
	1.00%		1.10	
12	0.30%	9	1.78	0.75
	0.50%		2.30	
	1.00%		3.25	
15	0.20%	11.25	2.36	0.75
	0.50%		4.17	
	1.00%		5.89	
18	0.20%	13.5	4.28	0.75
	0.50%		6.77	
	1.00%		9.58	
21	0.20%	15.75	6.46	0.75
	0.50%		10.22	
	1.00%		14.45	
24	0.20%	18	9.23	0.75
	0.50%		14.59	
	1.00%		20.63	

A.2 - LAND USE SEWER GENERATION

CONNECT TO EX. MANHOLE 1 OFF 34TH STREET				Average Flows		Peak Flows	
ZONE	Units	Gross Acre	GPD/ac	GPD	Q(cfs)	MGD	Qmax(cfs)
COMMERCIAL NEIGHBORHOOD-NW (CNNW)	-	18.1	500	9,050	0.0140	0.0349	0.0540
COMMERCIAL NEIGHBORHOOD-SW (CNSW)	-	2.2	500	1,100	0.0017	0.0054	0.0083
COMMERCIAL RETAIL-INTEGRATED (CRI)	-	51.9	500	25,950	0.0401	0.0892	0.1380
COMMERCIAL TOURIST-N (CTN)	-	3.6	500	1,800	0.0028	0.0083	0.0128
BUSINESS PARK (BP)	-	7.8	500	3,900	0.0060	0.0165	0.0255
COMMERCIAL TOURIST-W (CTW)	-	2.3	500	1,150	0.0018	0.0056	0.0086
COMMERCIAL RETAIL (CR)	-	19.0	500	9,500	0.0147	0.0365	0.0564
INDUSTRIAL LOGISTICS (I)	-	72.1	500	36,050	0.0558	0.1195	0.1849
ZONE	Units	Gross Acre	GPD/ac	GPD	Q(cfs)	MGD	Qmax(cfs)
RESIDENTIAL - 1 (R1)*	1,196	16.5	4,200	69,300	0.1072	0.2138	0.3308
RESIDENTIAL - 2 (R2)*		31.34	4,200	131,628	0.2036	0.3784	0.5855
Proposed Total Flow				289,428	0.4477	0.7630	1.1805

* Refer to page 5 for residential areas calculations.

PROPOSED SEWER MAIN LINE SIZING
HYDRAULIC CALCULATION - ULTIMATE CONDITION
Ultimate condition*: Offsite northerly flow rate coming from 60 FWY in ultimate condition provided by RCSD.

B.1- Sewer Calculation for "B" Street - Cumulative flow rates (in gpd)

	Lateral Flow Added	Pipe	Size	Average Flow		Peak Flow		Pipe Slope	d/D @ Pipe Slope
				CUM. GPD	Q(cfs)	MGD	Qmax(cfs)		
	ZONE		STREET B						
Segment 1	CTN	B5	8"	1,800	0.0028	0.0083	0.0128	4.14%	0.05
	GMG71014*	N/A	Ex. 18"	909,129	1.4092	2.1130	3.2693	0.40%	0.49
	BP	B4	8"	3,900	0.0060	0.0165	0.0255	1.61%	0.09
	GMG71014*+BP	B3	18"	913,029	1.4152	2.1211	3.2818	0.43%	0.48
Segment 2	I	B2	18"	949,079	1.4710	2.1955	3.3969	0.20%	0.63
	R2	B1	18"	1,080,707	1.6746	2.4645	3.8131	0.20%	0.68
	Street B Total			1,080,707	1.6746	2.4645	3.8131	0.20%	0.68

B.2 - Sewer Calculation for "A" Street - Cumulative flow rates (in gpd)

	Lateral Flow Added	Pipe	Size	Average Flow		Peak Flow		Pipe Slope	d/D @ Pipe Slope
				CUM. GPD	Q(cfs)	MGD	Qmax(cfs)		
	ZONE		STREET A						
Segment 3	CNSW	A6	8"	1,100	0.0017	0.0054	0.0083	3.21%	0.07
	CNNW	A5	8"	10,150	0.0157	0.0387	0.0598	3.21%	0.11
	CTW	A4	8"	11,300	0.0175	0.0426	0.0658	0.40%	0.20
Segment 4	CR	A3	8"	20,800	0.0322	0.0732	0.1133	0.40%	0.26
	R1	A2	10"	90,100	0.1394	0.2700	0.4178	0.30%	0.41
	CRI	A1	10"	116,050	0.1795	0.3383	0.5234	0.30%	0.46
	Street A Total			116,050	0.1795	0.3383	0.5234	0.30%	0.46

B.3 - Sewer Calculation for S. Wallace St. - Cumulative flow rates (in gpd)

	Lateral Flow Added	Pipe	Size	Average Flow		Peak Flow		Pipe Slope	d/D @ Pipe Slope
				CUM. GPD	Q(cfs)	MGD	Qmax(cfs)		
	ZONE		SOUTH WALLACE STREET						
Segment 5	"A" total + "B" total	C3	18"	1,196,757	1.8514	2.6987	4.1755	0.20%	0.73
	NAP 4	C2	8"	10,758	0.0166	0.0407	0.0630	0.40%	0.19
	Total	C1	18"	1,207,515	1.8680	2.7203	4.2089	0.20%	0.74

B.4 - Offsite northerly flow provided by RCSD in Ultimate Condition

Pipe ID per RCSD data	Average Flow		Peak Flow	
	GPD	CFS	MGD	CFS
GMG71014	907,329	1.4036	2.1093	3.2638

B.5 - Sewer Generated by Existing parcels along S. Wallace St.

Flow Added	Gross Acre	GPD/ac	Average Flow		Peak Flow	
			GPD	Q(cfs)	MGD	Qmax(cfs)
Existing Parcels	2.56	4,200	10,758	0.0166	0.0407	0.0630

Note: Qmax was calculated from the equation below:

$$Q_{peak} = 2.3(Q_{avg})^{0.89}$$

**PROPOSED SEWER MAIN LINE SIZING
HYDRAULIC CALCULATION - EXISTING CONDITION**

Existing condition*: Offsite northerly flow rate coming from 60 FWY in existing condition provided by RCSD.

C.1 - Sewer Calculation for "B" Street - Cumulative flow rates (in gpd)

	Lateral Flow Added	Pipe	Size	Average Flow		Peak Flow		Pipe Slope	d/D @ Pipe Slope
				CUM. GPD	Q(cfs)	MGD	Qmax(cfs)		
	ZONE		STREET B						
Segment 1	CTN	B5	8"	1,800	0.0028	0.0083	0.0128	4.14%	0.05
	GMG71014*	N/A	Ex. 18"	320,172	0.4981	0.8347	1.2914	0.40%	0.30
	BP	B4	8"	3,900	0.0060	0.0165	0.0255	1.61%	0.09
	GMG71014*+BP	B3	18"	324,072	0.5041	0.8437	1.3054	0.43%	0.29
Segment 2	I	B2	18"	360,122	0.5599	0.9268	1.4339	0.20%	0.38
	R2	B1	18"	491,750	0.7635	1.2229	1.8921	0.20%	0.44
	Street B Total			491,750	0.7635	1.2229	1.8921	0.20%	0.44

C.2 - Sewer Calculation for "A" Street - Cumulative flow rates (in gpd)

	Lateral Flow Added	Pipe	Size	Average Flow		Peak Flow		Pipe Slope	d/D @ Pipe Slope
				CUM. GPD	Q(cfs)	MGD	Qmax(cfs)		
	ZONE		STREET A						
Segment 3	CNSW	A6	8"	1,100	0.0017	0.0054	0.0083	3.21%	0.07
	CNNW	A5	8"	10,150	0.0157	0.0387	0.0598	3.21%	0.11
	CTW	A4	8"	11,300	0.0175	0.0426	0.0658	0.40%	0.20
Segment 4	CR	A3	8"	20,800	0.0322	0.0732	0.1133	0.40%	0.26
	R1	A2	10"	90,100	0.1394	0.2700	0.4178	0.30%	0.41
	CRI	A1	10"	116,050	0.1795	0.3383	0.5234	0.30%	0.46
	Street A Total			116,050	0.1795	0.3383	0.5234	0.30%	0.46

C.3 - Sewer Calculation for S. Wallace Street - Cumulative flow rates (in gpd)

	Lateral Flow Added	Pipe	Size	Average Flow		Peak Flow		Pipe Slope	d/D @ Pipe Slope
				CUM. GPD	Q(cfs)	MGD	Qmax(cfs)		
	ZONE		SOUTH WALLACE STREET						
Segment 5	"A" total + "B" total	C3	18"	607,800	0.9403	1.4766	2.2847	0.20%	0.49
	NAP 4	C2	8"	10,758	0.0166	0.0407	0.0630	0.40%	0.19
	Total	C1	18"	618,558	0.9569	1.4999	2.3207	0.20%	0.49

C.4 - Offsite northerly flow provided by RCSD in Existing Condition

Pipe ID per RCSD data	Average Flow		Peak Flow	
	GPD	CFS	MGD	CFS
GMG71014	318,372	0.4925	0.8305	1.2851

C.5 - Sewer Generated by Existing parcels along S. Wallace St.

Flow Added	Gross Acre	GPD/ac	Average Flow		Peak Flow	
			GPD	Q(cfs)	MGD	Qmax(cfs)
Existing Parcels	2.56	4,200	10,758	0.0166	0.0407	0.0630

Note: Qmax was calculated from the equation below:

$$Q_{peak} = 2.3(Q_{avg})^{0.89}$$

Appendix 3 - References

JCSD Sewer Criteria

City of Ontario Sewer Criteria

City of Riverside Sewer Criteria

Rubidoux Community Services District (RCSD) Sewer Master Plan

JCSD Rates

2. Average Daily Rates:

a. Residential Areas:	<u>GPCD</u>	<u>Pop./Unit</u>	<u>GPD/Unit</u>
Apartments	90	2.0	180
Single Family			
Tributary to City of Riverside Water Quality Control			252 Plant
Tributary to Western Riverside County Regional Wastewater Authority Plant			220

b. Commercial and Industrial: For initial planning, District will use 2000 gpd/gross acre to estimate average daily flows. For final sizing, investigate each installation

3. Peak Flow Rates:

- a. Residential Areas: $Q_{PEAK} = 2.5Q_{ADF}^{(0.91)}$
Where Q_{PEAK} & Q_{ADF} are in millions of gallons per day (mgd)
- b. Commercial & Industrial: Investigate each installation

D. PIPE SIZING

Pipe sizing for gravity mains shall be determined as shown below:

- 1. for 8" diameter mains and smaller:
 - a. $n = 0.013$;
 - b. D/d (depth of water to pipeline diameter ratio) ≤ 0.50 (i.e. 50% \pm full)
- 2. for 10" diameter mains and larger:
 - a. $n = 0.013$
 - b. D/d ratio ≤ 0.75 (i.e. 91% \pm full)
- 3. House Connection Laterals (at 2% slope, utilizing 45° connection at main)

Sewer Unit Flow Factors

The sewer unit flow factors shown in Table 4-3 were used for this study.

The residential unit flow factors in gpd/du are primarily based upon the City's Edenglen Lift Station Capacity Study and the calibrated unit flow factors developed for OMC, which were based on flow monitoring data and water use records. The projected population densities for each type of residential land use were also taken into consideration.

**Table 4-3
Ultimate Unit Flow Factors**

Landuse		Density (du/ac)	Density (people/du)	FAR	Average Dry Weather Unit Flow Factor ¹			
Residential								
Rural Residential	RR	0 - 2	4.0		250	gpd/du	500	gpd/ac
Low Density Residential	LDR	2 - 5	4.0		240	gpd/du	1,200	gpd/ac
Low Medium Density Residential	LMDR	5 - 11	4.0		240	gpd/du	2,000	gpd/ac
Medium Density Residential (OMC)	MDR	11 - 25	3.8		210	gpd/du	4,200	gpd/ac
Medium Density Residential (NMC)	MDR	11 - 25	3.3		182	gpd/du	4,200	gpd/ac
High Density Residential (OMC)	HDR	25 - 45	3.3		180	gpd/du	6,300	gpd/ac
High Density Residential (MU Areas)	HDR	25 - 45	2.0		110	gpd/du	5,000	gpd/ac
Commercial								
Business Park	BP			0.40	70	gpd/tsf	1,200	gpd/ac
General Commercial	GC			0.30	70	gpd/tsf	900	gpd/ac
Hospitality ²	HOS			1.00	100	gpd/tsf	140	gpd/room
Neighborhood Commercial	NC			0.30	100	gpd/tsf	1,300	gpd/ac
Office Commercial	OC			0.75	90	gpd/tsf	3,000	gpd/ac
Restaurant ³					1,000	gpd/tsf		
Industrial								
Industrial	IND			0.55	70	gpd/tsf	1,600	gpd/ac
Mixed Use								
Mixed Use	MU				Use various unit flow factors for			
Open Space								
Open Space Non-Recreational	OS-NR						200	gpd/ac
Open Space Recreational	OS-R						200	gpd/ac
Public								
Public Facility	PF						1,500	gpd/ac
Public School - Elementary ⁴	PS				15	gpd/stu		
Public School - Junior High or High School ⁴	PS				20	gpd/stu		

¹ Unit Flow Factor Abbreviations:

ac = acre

du = dwelling unit

gpd = gallons per day

room = hotel/motel room

stu = student

tsf = thousand square feet

² For future hospitality areas, sewage loads can be estimated based on the number of projected rooms. It is not recommended to estimate the load based on acreage.

³ For future restaurants, sewage loads can be estimated based on the building square footage.

⁴ For future schools, sewage loads should be estimated based on the number of students. It is not recommended to estimate the load based on acreage.

- The flow factors for each isolated flow metering tributary were then adjusted up or down (balanced) so that the calculated average flows from each tributary area match what was measured during the flow monitoring period.
- Once the flow factors for each basin were balanced, the weighted average of the coefficients for each land use type was calculated based on the acreage contribution from each basin.

The calibrated wastewater flow factors developed for this Master Plan range from 60 gpd/ac to 4,300 gpd/ac, and are summarized in Table 5.4. Appendix 5A contains detailed information about the wastewater flow balance by sewer basin.

5.4.3 Wastewater Flow Projections

Table 5.4 summarizes the projected wastewater flow at build-out of the City service area (excluding Jurupa, Rubidoux, and Edgemont CSDs, but including the Highgrove area). As shown in Table 5.4, it is estimated that the City's service area could generate a total flow of approximately 29 mgd. Figure 5.1 shows the projected wastewater flows through the year 2037, based on the established per-capita generation rate of 77 gpcd. As shown on Figure 5.1, build-out would occur at approximately year 2032. Table 5.5 summarizes the existing and projected flows by basin.

Table 5.4 Wastewater Flow Factors

Land Use Type	Developable Vacant or Not Connected (acres)	Wastewater Flow Factor (gpd/ac)	Projected Average Flow Increase (mgd)
Agricultural/Rural Residential	4,669	60	0.280
Hillside Residential	4,078	130	0.530
Semi Rural Residential	152	350	0.053
Very Low Density Residential	2,145	350	0.751
Low Density Residential	136	640	0.087
Medium Density Residential	1,134	1,000	1.134
Medium High Density Residential	153	1,700	0.260
High Density Residential	52	2,800	0.146
Very High Density Residential	2	4,000	0.010
Commercial	188	710	0.134
Commercial Regional Center	3	640	0.002
Office	71	640	0.045
Business/Office Park	850	680	0.578
Industrial	184	670	0.123
Downtown Specific Plan	31	1,000	0.031
Orangecrest Specific Plan	7	1,000	0.007



Flow coming from the Hwy 60 in existing & ultimate conditions.

Ultimate Wet Weather

Order	ID	Diameter (in)	Length (ft)	Slope	Total Flow (mgd)
1	GMG71005	15	342.9535	0.0056	2.1044
2	GMG71012	15	135.1197	0.048	2.1093
3	GMG71014	15	236.6116	0.009	2.1093
4	GMG71017	18	282.5766	0.0038	2.1093

Existing Wet Weather

Order	ID	Diameter (in)	Length (ft)	Slope	Total Flow (mgd)
1	GMG71005	15	342.9535	0.0056	0.8289
2	GMG71012	15	135.1197	0.048	0.8305
3	GMG71014	15	236.6116	0.009	0.8305
4	GMG71017	18	282.5766	0.0038	0.8305

RCSD Sewer Master Plan

Table 5-3 Ultimate Scenario Wastewater Generation Factors by Land Use Category

Land Use Categories	Density (DU/acre)	Generation Factor	Generation Factor Units
<i>Residential</i>			
EDR - Ranch ⁽¹⁾	0.5	126	gpd/acre
VLDR - Rural Neighborhood ⁽¹⁾	0.5	126	gpd/acre
LDR - Country Neighborhood ⁽¹⁾	1.25	315	gpd/acre
MDR - Medium Density Residential ⁽¹⁾	4.0	1008	gpd/acre
MHDR - Medium High Density Residential ⁽¹⁾	6.0	1,512	gpd/acre
HDR - High Density Residential	11.0	2,310	gpd/acre
VHDR - Very High Density Residential	13.0	2,730	gpd/acre
HHDR - Highest Density Residential	12.0	2,520	gpd/acre
<i>Commercial/Industrial</i>		500	gpd/acre
CO - Commercial Office	-	500	gpd/acre
CR - Commercial Retail	-	500	gpd/acre
CT - Commercial Tourist	-	500	gpd/acre
LI - Light Industrial	-	500	gpd/acre
HI - Heavy Industrial	-	500	gpd/acre
BP - Business Park	-	500	gpd/acre
<i>Commercial/Industrial</i>			gpd/student
CO - Commercial Office	-	500	gpd/student
CR - Commercial Retail	-	500	gpd/acre
CT - Commercial Tourist	-	500	gpd/acre
<i>Mixed Use and Other</i>		200	gpd/acre
PF - Public Facilities	-	200	gpd/acre
OS-R - Open Space Recreation	-	200	gpd/acre

⁽¹⁾ Wastewater generation factors were increased by 20 percent to account for future ADUs, assumed that half of the lots would add an ADU that would house an additional 2 people.

5.1.5 Equivalent Dwelling Unit Definition

An Equivalent Dwelling Unit (EDU) definition for the wastewater master plan is 1 Medium Density Residential lot. The wastewater generated by one EDU is 210 gpd.

1 EDU = 210 gpd wastewater generation

This value was derived by using the generation factor of 1,008 gpd per acre, eliminating 20% increase to eliminate the ADU contribution from the calculation and then dividing by 4.0 DU/acre. Each ADU will equal 0.4 EDU.