CITY OF REDLANDS
RHNA REZONE

Proposed Conditions Infrastructure Report for Water and Sewer

City of Redlands
San Bernardino County, California

Prepared For:

EPD Solutions
2 Park Plaza, Suite 1120
Irvine, CA 92614

Prepared By:

FUSCOE ENGINEERING, INC.
15535 Sand Canyon Ave, Unit 100
Irvine, CA 92618
949.474.1960
www.fuscoe.com

Date Prepared: October 16, 2024

Table of Contents

List of Figures

List of Tables

APPENDICES

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

The City of Redlands ("City") is currently undergoing a General Plan Amendment (GPA), specific plan amendment, and zone change in order to rezone certain properties to accommodate for additional residential development in the City pursuant to the City's Housing Element. A General Plan is the principal long-range policy and planning document for guiding California cities and counties' physical development, conservation, and enhancement of. As part of the GPA and the California Environmental Quality Act (CEQA), infrastructure such as water and sewer systems that support the existing and proposed land uses will be evaluated at a programmatic level in connection with the proposed land use changes and focus areas.

1.2 SCOPE OF WORK

The City of Redlands is situated at the base of the San Bernardino Mountains in San Bernardino County and is approximately 60 miles east of Los Angeles and 45 miles west of Palm Springs. It lies along the Interstate 10 (I-10) corridor, connecting! it to cities like San Bernardino, Fontana, Ontario, and Los Angeles to the west, and Yucaipa, Beaumont, and Coachella Valley to the east. State Route 210 (SR-210) begins in the City and moves northwest, reaching Highland and Pasadena. The proposed Housing Element Regional Housing Needs Allocation (RHNA) encompasses 196 housing sites and Site 24 needs a zone change to align with existing school use and future surrounding residential uses. The sites are divided into two areas: Sites 1 through 16A and 24, located in the western part of the City within the East Valley Corridor Specific Plan (EVCSP), and Sites 17 through 23, situated northeast of the first group and near SR-210, just south of East San Bernardino Boulevard in North Redlands, close to I-10 and Downtown Redlands. These rezone sites are part of the Housing Element Sites Inventory, which is crucial for meeting housing targets within the City. See Figure 1 for an aerial extent of the Redlands RHNA Rezone area.

This infrastructure assessment report describes the primary water and sewer infrastructure systems that support the City of Redlands and those areas specifically within the proposed GPA rezone areas. As part of the California Environmental Quality Act (CEQA) process, infrastructure, and utilities that support the existing and proposed land uses will be analyzed at a level consistent with the program level of an Environmental Impact Report ("EIR"). This report will evaluate the existing conditions of the infrastructure systems that serve the City's proposed rezone sites ("Project" or "RHNA Rezone"). Under the proposed GPA, the proposed buildout and land use changes will alter demands on existing infrastructure and utilities. The analysis within this report will review, identify, and summarize the effects of the proposed conditions on the existing infrastructure within the water and sewer systems. Any significant deficiencies will be identified, along with the tools available to address them, including any major Capital Improvements Plans (CIP) to remedy existing or prospective deficiencies within the City's RHNA Rezone.

1.3 LAND USE DESCRIPTION

Under the City's existing General Plan Update (GPU), which was certified in July 2017, the report provided a long-term policy and plan of action for the City through the year 2035. Under the 2017 GPU the City projected that the areas being considered for rezoning would initially encompass 116.2 acres of land with a mix of 111, Medium Density Residential (MDR) and High Density Residential (HDR) residential dwelling units (DUs), in addition to approximately 2.2 million non-residential Commercial/Industrial and Commercial/Admin Professional square feet (SF).

See Figure 2 and Table 1 below for a breakdown of the City's existing zoning designations within the proposed RHNA Rezone areas.

Table 1 - Existing General Plan Buildout

Plot Number	Acres	General Plan Land Use Designation	Zoning	Residential Buildout Capacity (DU)	Non-Residential Buildout Capacity (SF)
1	8.91	Commercial/ Industrial	EV/IC		194,060
2	4.26	Commercial/Industrial	EV/IC		92,783
3	5.84	Commercial/Industrial	EV/IC		127,195
4	3.15	Commercial/Industrial	EV/IC		68,607
5	1.07	Commercial/Industrial	EV/IC		23,305
6	1.9	Commercial/Industrial	EV/IC		41,382
7	1.9	Commercial/Industrial	EV/IC		41,382
8	4.07	MDR	EV3000RM	40	
9	2.5	Commercial/Industrial	EV/IC		54,450
10	4.03	Commercial/Industrial	EV/IC		87,773
10A	0.08	Commercial/Industrial	EV/IC		1,742
11	4.70	Commercial/Industrial	EV/IC		102,366
12	2.31	Commercial/Industrial	EV/IC		50,312
13	4.70	Commercial/Industrial	EV/IC		103,019
14	4.21	Commercial/Industrial	EV/IC		91,694
15	8.86	Commercial/Industrial	EV/IC		192,971
15A	0.02	Commercial/Industrial	EV/IC		436
16	10.7	Commercial/Industrial	EV/IC		231,957
16A	0.01	Commercial/Industrial	EV/IC		218
17	14.05	Commercial/Admin Professional	CP-4		306,009
18	5	Commercial/Admin Professional	CP-4		108,900
19	6.31	Commercial/Admin Professional	CP-4		137,432
20	4.76	MDR	A-1	1	
21	1.64	MDR	R-1	9	
22	0.33	HDR	R-2	4	
23	3.96	HDR	R-2	57	
24	6.94	Commercial/Industrial	EV/IC		151,048
Total	**116**			**111**	**2,209,040**

Source: City of Redlands RHNA Rezone, Project Description "Table 3-1 Existing General Plan Buildout"

Basemap Aerial (World Imagery)

City of Redlands RHNA Rezone Aerial Extent

Figure 1

Redlands, CA

6/24/2024

FUSCOE ENGINEERING
FULL CIRCLE THINKING

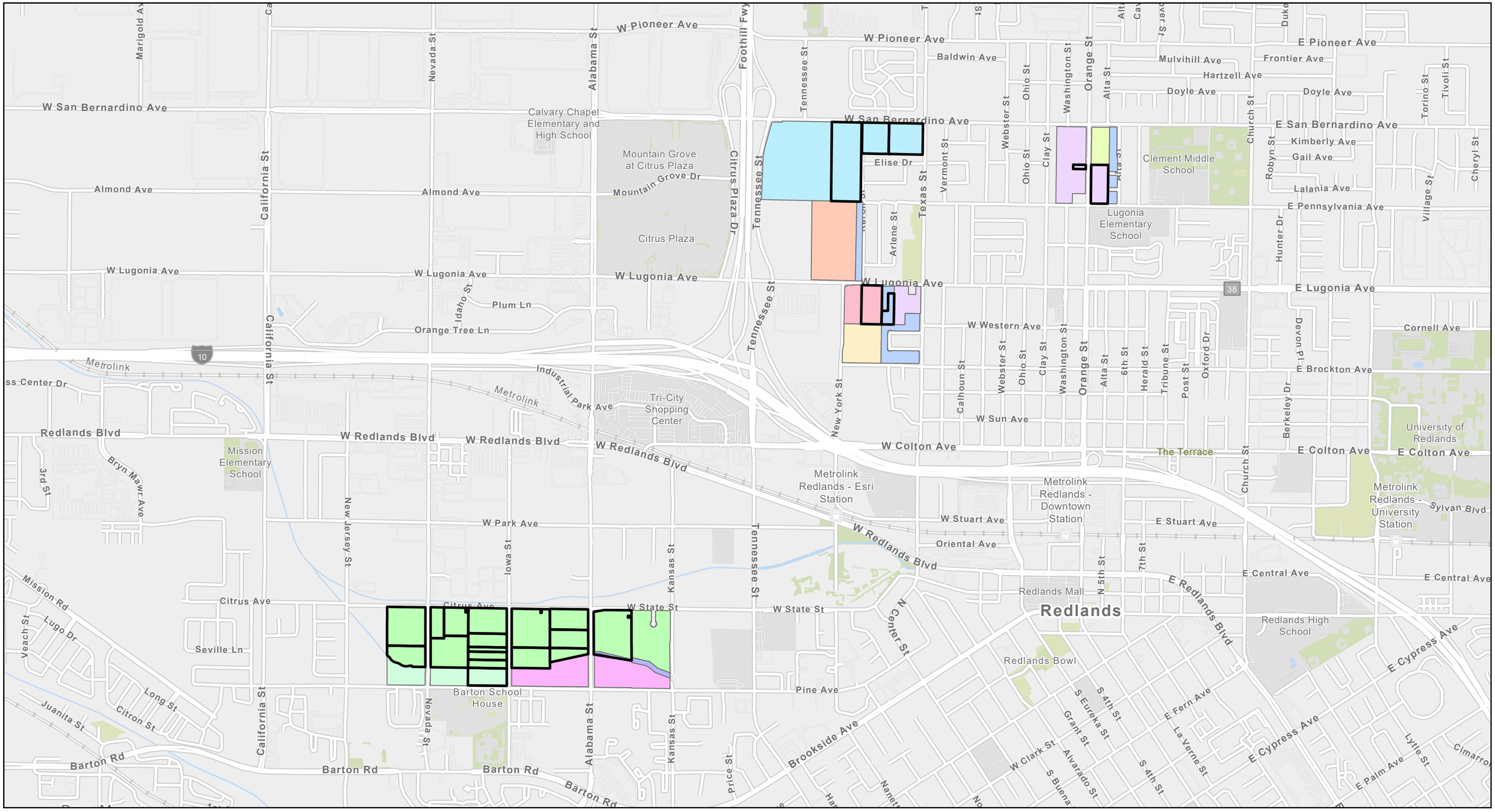
Project Parcels
City Boundary

N

1 inch = 5,000 feet

0 5,000 10,000 Feet

X:\Projects\1448\06\MXD\1_AerialExtent.aprx



City of Redlands RHNA Rezone Existing Land Use Zoning

Figure 2

Redlands, CA

6/24/2024

FUSCOE ENGINEERING
FULL CIRCLE THINKING

Project Parcels

Zoning
- Agricultural (A-1)
- Commercial/Industrial (EV/IC)
- Commercial/Admin Professional (CP-4)
- Flood Plain (FP)
- Light Industrial (M-1)
- Medium Density Residential (R-1)
- Medium Density Residential (EV2500RM)
- Medium Density Residential (EV3000RM)
- High Density Residential (R-2)
- High Density Residential (R-3)
- Commercial (C-2)

N

1 inch = 1,500 feet

0 1,500 3,000 Feet

X:\Projects\1448\06\MXD\Exhibits\2_landuse.aprx

LAND USE AND HOUSING ELEMENT

The City of Redlands 2021-2029 Housing Element outlines how the City plans to meet its housing needs as mandated by the California Department of Housing and Community Development (HCD) through the Regional Housing Needs Assessment (RHNA). The Southern California Association of Governments (SCAG), the regional planning agency for Southern California, assigned the City a target of 3,516 new housing units to be incorporated by 2029. To comply with this RHNA assignment, the City prepared a Housing Element covering the period from October 15, 2021, to October 15, 2029. This plan was adopted on February 1, 2022, and includes measures to increase residential zoning capacity and promote various housing types and affordability levels. Thus, the Housing Element identified 196 sites suitable for new housing, with 23 requiring rezoning to support medium and high-density residential developments.

PROPOSED GENERAL PLAN AMENDMENT

As a result of the land use and housing element the City of Redlands is proposing a General Plan Amendment (GPA) to change the land use designations of multiples sites from Commercial/Industrial or Commercial/Administrative Professional to Medium Density Residential or High Density Residential. The 24 sites identified within the land use and housing element have a capacity for up to 2,436 housing units and 151,048 square feet of Public/Institutional space, with development anticipated through 2035. Although, no specific development project is currently proposed, this report will address and analyze the impacts of developing the maximum buildout under the new rezoning standards.

See Table 2 below for a specific breakdown of the City's proposed rezone sites and maximum buildout plans under the GPA.

Table 2 - Proposed General Plan Buildout

Site Number	Proposed GP Land Use Designation	Proposed Zoning	Proposed Density (DU/acre)	Acres	Proposed Maximum Buildout	
1	MDR	R-2	15	8.91	133	DU
2	MDR	R-2	15	4.26	63	DU
3	HDR	R-3	30	5.84	175	DU
4	HDR	R-3	30	3.15	94	DU
5	HDR	R-3	30	1.07	32	DU
6	HDR	R-3	30	1.9	57	DU
7	HDR	R-3	30	1.9	57	DU
8	MDR	EV2500RM	15	4.07	61	DU
9	HDR	R-3	30	2.5	75	DU
10	HDR	R-3	30	4.03	120	DU
10A	MDR	R-3	30	0.08	2	DU
11	MDR	R-2	15	4.7	70	DU
12	MDR	R-2	15	2.31	34	DU
13	HDR	R-3	30	4.73	141	DU
14	HDR	R-3	30	4.21	126	DU
15	HDR	R-3	30	8.86	265	DU
15A	HDR	R-3	30	0.02	1	DU

Site Number	Proposed GP Land Use Designation	Proposed Zoning	Proposed Density (DU/acre)	Acres	Proposed Maximum Buildout	
16	MDR	R-2	15	10.7	159	DU
16A	MDR	R-2	15	0.01	-	DU
17	MDR	R-2	15	14.1	210	DU
18	HDR	R-3	30	5	150	DU
19	HDR	R-3	30	6.31	189	DU
20	MDR	R-2	15	4.76	71	DU
21	MDR	R-2	15	1.64	24	DU
22	HDR	R-3	30	0.33	9	DU
23	HDR	R-3	30	3.96	118	DU
24	Public/Institutional (PI)	EV/IP	0.5 Floor Area Ratio (FAR)	6.94	**151,048**	**SF**
			Total	**116**	**2,436**	**DUs**

Source: City of Redlands RHNA Rezone, Project Description "Table 3-2: Proposed General Plan Buildout"

As shown in the table above, the GPA would propose a zone change for all sites to enable medium and high-density residential development, with the exception of Site 24 which would change to Public/ Institutional uses.

To see a summary of the City's approved general plan buildout to the proposed GPA buildout see Table 3 below.

Table 3 - Comparison of Approved General Plan Buildout to Proposed Project

Land Use	Unit	Sites 1-16A		Sites 17-24		GP Total	Proposed Total	Proposed Project minus Approved GP
		Approved GP	Proposed Project	Approved GP	Proposed Project			
Commercial/ Institutional	SF	1,505,651	-	151,048	-	1,656,700	-	(1,656,700)
Commercial	SF	-	-	552,341	-	552,341	-	(552,341)
Public/ Institutional	SF	-	-	-	151,048	-	151,048	151,048
MDR	DU	40	522	10	305	50	825	777
HDR	DU	-	1,143	61	466	61	1,611	1,548
Total Residential	**DU**	**40**	**1,665**	**71**	**771**	**111**	**2,436**	**2,325**
Total Nonresidential	**SF**	**1,505,651**	**-**	**703,389**	**151,048**	**2,209,041**	**151,048**	**(2,057,992)**

Source: City of Redlands RHNA Rezone, Project Description "Table 3 3: Comparison of Approved General Plan Buildout to Proposed Project"

As shown above, the proposed project aims to convert approximately 2,057,992 SF of planned nonresidential land uses to residential land uses to accommodate up to 2,436 housing units.

2. WATER

2.1 WATER SYSTEM ENVIRONMENTAL SETTING & INFRASTRUCTURE

CITY OF REDLANDS

The City's water service area includes about 72,000 residents in its water supply system. To ensure reliable water supply distribution the City operates an extensive network of water facilities. Some of these facilities include distribution pipelines, two water treatment plants, storage reservoirs, and booster stations. The City's water system infrastructure is divided into three main categories: Non-Potable Water (NPW), Potable Water (PW), and Recycled Water (RW). Each system is designed to serve specific demands and utilizes different water sources and treatment processes to ensure safe and reliable water delivery. These water system facilities support the City's efforts to provide reliable water supply, and meeting existing and future demands through regular monitoring, maintenance, and improvements plans. These facilities are described in more detail below.

POTABLE WATER SYSTEM (PW)

Water Treatment Plants (WTPs). The City operates two major water treatment plants, the Tate WTP and the Hinckley WTP. These facilities treat surface water and groundwater to meet drinking water standards. The Tate WTP has a capacity of 14 million gallons per day (MGD), while the Hinckley WTP has a capacity of 12 MGD. The primary processes provided at the WTPs include coagulation, flocculation, sedimentation, filtration, and disinfection.

Distribution Network: The City's potable water distribution system includes a network of approximately 466 miles of pipelines ranging from 6 to 60 inches in diameter, 13 storage reservoirs with a total capacity of 51.6 million gallons, and 12 booster stations. This distribution network ensures the delivery of treated water to residential, commercial, and institutional users throughout the City. Infrastructure throughout the City is strategically placed to maintain the water systems pressure and storage capacity.

NON-POTABLE WATER SYSTEM (NPW)

Distribution Network: The non-potable water system primarily supplies water for irrigation and industrial uses. NPW is sourced from untreated groundwater and surface water. The NPW system includes separate pipelines and storage facilities that deliver water to parks, golf courses, and large landscaped areas. Specifically, infrastructure for NPW specifically includes 15 miles of pipelines ranging in size from 4 to 36 inches in diameter, and storage tanks with a total capacity of 7.5 million gallons, which are separate from the potable water system to prevent cross-contamination. This system is essential for the City in its efforts to conserve potable water by using NPW water where appropriate.

RECYCLED WATER SYSTEM (RW)

Treatment Process: Recycled water is produced from treated wastewater at the City's wastewater treatment plant, which has a capacity of 9.5 MGD. This water undergoes advanced treatment processes, including secondary and tertiary treatment, to remove contaminants and meet regulatory standards for non-potable reuse.

Distribution Network: Specifically, the recycled water system includes 30 miles of pipelines ranging in diameter of 4 to 24 inches, and the system distributes treated effluent for landscape

irrigation, industrial cooling, and other non-potable applications. This system helps reduces City's potable water demands and promotes sustainable water use.

PRESSURE ZONES

The City's water distribution system is divided into multiple pressure zones to ensure the consistent delivery of water across its varying elevations and demand areas. These zones are designed to maintain adequate water pressure for all demands, prevent excessive pressure that could damage infrastructure, and optimize the operational efficiency of the water system. Each pressure zone is managed through a network of booster stations, reservoirs, and pressure-reducing valves (PRVs) that regulate and stabilize water pressure. The PRVs system provides real-time data allowing for operation adjustments in response to demand changes, which stabilize the distribution network.

PRESSURE ZONE 1570 – RHNA REZONE AREA

All RHNA Rezone areas within the City are located within Pressure Zone 1570, which is equipped with a range of infrastructure designed to manage water distribution effectively at higher elevations. This zone includes a reservoir known as the 1570 Zone Reservoir, which has a capacity of approximately 2.5 million gallons. This reservoir helps to store and regulate water pressure and ensure efficient distribution within the RHNA Rezone areas.

To support the elevation needs of Zone 1570, the area is serviced by a primary booster station, that is equipped with multiple pumps with speed controls, allowing for adjustments in flow rates and maintaining consistent pressures. The function of this booster station is crucial as it "lifts" water from lower elevation zones up to the 1570 Zone, which ensures a steady and reliable water supply throughout the City.

The pipeline network within Pressure Zone 1570 includes pipelines of various sizes, designed to handle the increased pressure required for higher elevations. The primary pipelines in the RHNA Rezone Areas range from 12 inches to 24 inches in diameter, with a few areas with distribution pipeline sizes as small as 6-inches or as large as 16-inches in diameter. These larger diameter pipelines are necessary for maintaining adequate flow rates, velocities, and pressures to support both residential and commercial water needs.

Recycled water is treated effluent from the City's WWTP and is primarily used for equipment cooling at the SCE Mountain View Power Plant, dust control at the City landfill, and for landscape irrigation customers. There are no current recycled water facilities serving the rezone areas.

Managing water pressure in Zone 1570 involves addressing challenges such as potential pressure fluctuations due to changes in demand and elevation variations. However, the use of advanced monitoring and control systems, such as the pressure-reducing valves (PRVs), helps to mitigate these issues by providing real-time data on pressure levels and allowing for rapid adjustments.

Throughout the City, water pressures vary, and the City maintains GIS data on water pressure layers covering the City, along with layers for pipe sizes. Based on the GIS data, the rezone areas fall within the following pressures and are serviced by the following watermain sizes:

- The southwest rezone area has pressures that range from 140 pounds per square inch (PSI) at the easterly portion to 160 psi at the westerly portion, with watermain pipe sizes in the 8-inch to 12-inch range.

- The northeast rezone area has pressures in the 80 psi to 90 psi range, with watermain pipe sizes ranging from 6-inch to 8-inch.

- The north (central) and northwest rezone areas have pressures in the 110 psi to 120 psi range, with watermain pipe sizes ranging from 8-inch to 16-inch distribution lines, along with a 30-inch transmission line.

Based on American Water Works Association (AWWA) standards, the static pressure for a water system is recommended to be between 45 psi and 80 psi, with a maximum pressure of up to 150 psi. Based on this criteria, most of the RHNA areas may require pressure-reducing valves to maintain acceptable pressures.

See Figure 3 for a view of the water system facilities within the RHNA Rezone area and Figure 4 for a view of the City's pressure zones.

City of Redlands RHNA Rezone Existing Water System Facilities

Figure 3

Redlands, CA

7/1/2024

FUSCOE ENGINEERING
FULL CIRCLE THINKING

Project Parcels
Recycle Water Line

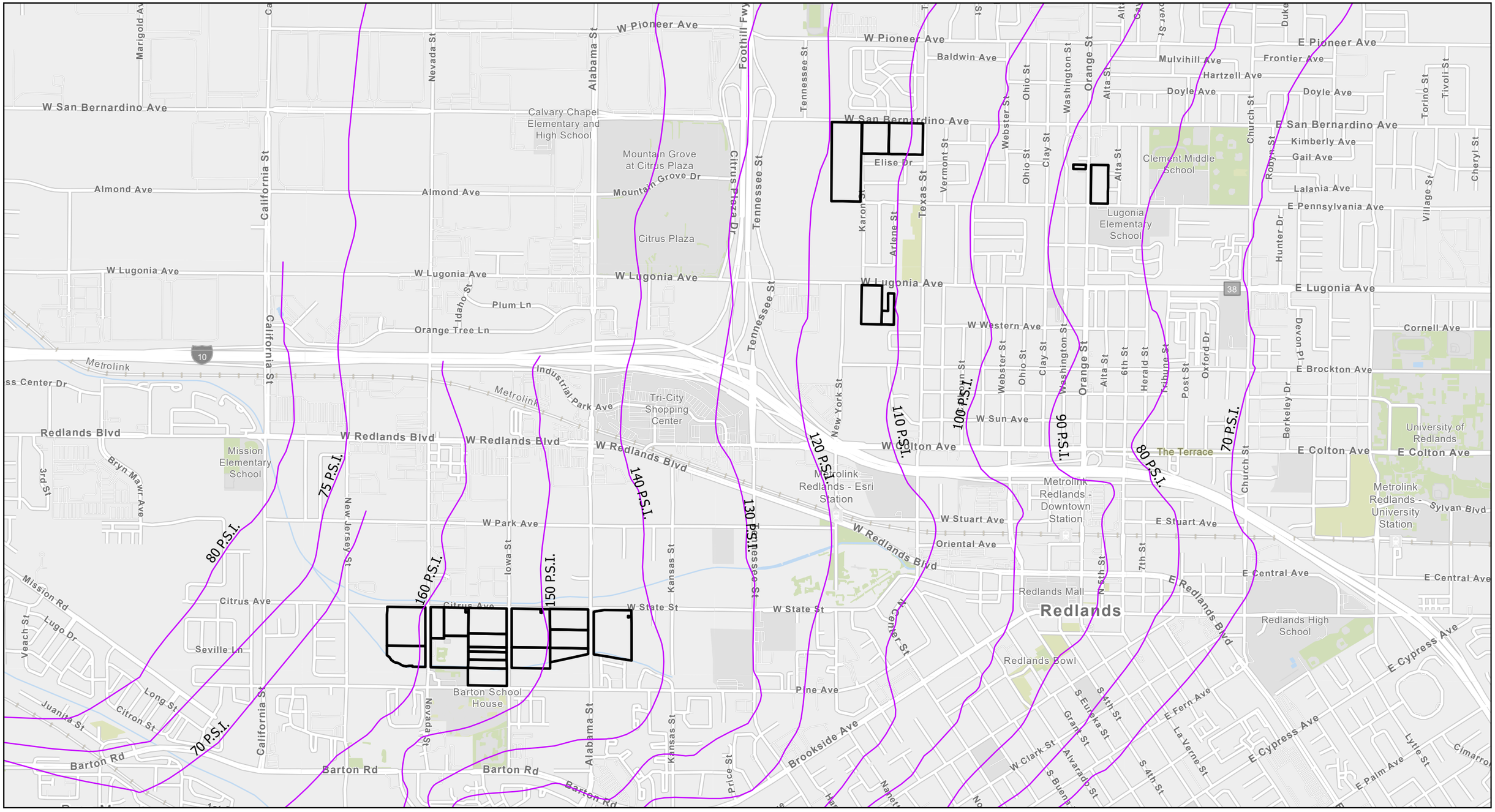
Water Mains
- < 9"
- 9" to 12"
- 12" to 18"
- 18" to 30"

N

1 inch = 2,000 feet

0 2,000 4,000 Feet

X:\Projects\1448\06\MXD\Exhibits\3_water.aprx



City of Redlands RHNA Rezone Water System Pressure Zones

Figure 4

Redlands, CA

6/24/2024

FUSCOE ENGINEERING
FULL CIRCLE THINKING

Pressure Lines

- 100 P.S.I.
- 110 P.S.I.
- 120 P.S.I.
- 130 P.S.I.
- 140 P.S.I.
- 150 P.S.I.
- 160 P.S.I.
- 70 P.S.I.
- 75 P.S.I.
- 80 P.S.I.
- 90 P.S.I.
- Project Parcels

N

1 inch = 1,500 feet

0 1,500 3,000 Feet

X:\Projects\1448\06\MXD\Exhibits\4_sewer.aprx

2.2 EXISTING WATER DEMANDS

LOCAL – THE RHNA REZONE AREA

As described previously, the City is proposing a GPA and zone change to rezone 24 different sites from commercial/industrial sites to residential and public/institutional uses. Doing so will allow the City to meet its RHNA requirements, as the rezoned areas will accommodate up 2,436 residential DUs and 151,048 non-residential SF, in comparison to the existing 2017 GPU land uses. The following tables will present a detailed analysis of the City's water use factors and water demands for various land use designations under the existing GPU and proposed GPA project. These factors are necessary to understand how current water demands will be altered when projecting future water needs under the RHNA Rezone project.

Water Use Factors: The water use factors used to estimate the City's existing and proposed water demands are normally based on the City-wide 2022 Water Systems Master Plan (WSMP), which expresses demand in acre-feet per year per acre (AFY/Acre) for different land uses. These factors were developed through an analysis of historical water usage data across various land use categories, including residential, commercial, industrial, and agricultural sectors. The water use factor in the 2022 WSMP lumps all multi-family residential into one category and does not differentiate between medium density and high-density land uses. Therefore, an alternative approach was utilized to estimate water demands for different multi-family densities. The RHNA Rezone project allows for a density of 15 to 30 dwelling units per acre. Thus, the alternative method applied relies on sewage flow factors from the City-wide 2021 Wastewater Master Plan (WWMP), which uses unit flow factors, gallons per day per dwelling unit (GPD/DU) adjusted for the proposed high and medium residential densities. This method, as outlined in the WWMP, accounts for distinct water usage patterns associated with various residential densities, providing a more accurate reflection of projected water demands. For each sewer flow factor, a 20% increase has been applied to derive a water use factor for each land use category. For consistency purposes, the sewer flow rate for commercial has also been used from the WWMP with a 20% multiplier to account for water demands. The City's thorough approach ensures that the water use factors as shown in Table 4 below represent actual usage patterns, support sustainable water management, and inform decision-making for land use planning throughout the City.

Table 4 – City of Redlands WSMP Water Use Factors

Land Use Designation	Unit Flow Factor		Density	
High Density Residential	144	GPD/ DU	30	DU/ Acre
Medium Density Residential	198	GPD/ DU	15	DU/ Acre
Commercial	3,600	GPD/ Acre		

Source: 2021 Wastewater Master Plan - Table 3.2: Unit Sewage Flow Factors

Note: The sewer generation values from the 2021 WWMP are increased by 20% to estimate the water generation factors. This adjustment assumes a sewer-to-water return ratio of 0.8.

See Table 5 below for an estimate of existing water demands from the RHNA Rezone areas.

Table 5 – Redlands RHNA Rezone Existing Water Demands

Existing Land Use Designation	Maximum Buildout		Existing Water Use Factor		Existing Water Use (GPD)		Existing Water Use (AFY)	
High Density Residential	61	DU	144	GPD/ DU	8,784	GPD	10	AFY
Medium Density Residential	50	DU	198	GPD/ DU	9,900		11	
Non-Residential	2,209,041	SF	3,600	GPD/ Acre	182,565		204	
TOTAL					**201,249**	**GPD**	**225**	**AFY**

Source: 2021 Wastewater Master Plan - Table 3.2: Unit Sewage Flow Factors

* The sewer generation values from the 2021 WWMP are increased by 20% to estimate the water generation factors. This adjustment assumes a sewer-to-water return ratio of 0.8. Some numbers may not sum precisely due to rounding.

As shown in the table above it is estimated that the existing land uses within the RHNA Rezone Areas require approximately 225 AFY or 201,249 GPD of water.

2.3 PROPOSED WATER DEMANDS

See Table 6 below for an estimate of proposed water demands from the RHNA Rezone areas.

Table 6 – Redlands RHNA Rezone Proposed Water Demands

Proposed Land Use Designation	Maximum Buildout		Proposed Water Use Factor		Proposed Water Use (GPD)		Proposed Water Use (AFY)	
High Density Residential	1,611	DU	144	GPD/ DU	231,984	GPD	260	AFY
Medium Density Residential	825	DU	198	GPD/ DU	163,350	GPD	183	
Public/Institutional (PI)	151,048	SF	3,600	GPD/ Acre	12,483	GPD	14	
TOTAL					**407,817**	**GPD**	**457**	**AFY**

Source: 2021 Wastewater Master Plan - Table 3.2: Unit Sewage Flow Factors

* The sewer generation values from the 2021 WWMP are increased by 20% to estimate the water generation factors. This adjustment assumes a sewer-to-water return ratio of 0.8. Some numbers may not sum precisely due to rounding.

As shown in the table above the RHNA Rezone will potentially increase the number of residential units from 111 DUs to 2,436 DUs and will reduce the nonresidential SF from 2,209,041 SF to 151,048 SF. This large change in land use from commercial /industrial to medium and high density residential and public/institutional uses has the potential to generate demands of up to 457 AFY or 407,817 GPD.

The difference between the water demands calculated in Table 5 and Table 6 are representative of the net change in demands for the City's RHNA Rezone areas. See Table 7 below for more details.

Table 7 – Redlands RHNA Rezone Net Change in Water Demands

Net Change (Proposed - Existing GPU) Water Demands				
Proposed Demand	407,817	GPD	457	AFY
Existing Demand	201,249	GPD	225	AFY
Net Change	**206,568**	**GPD**	**231**	**AFY**
* Note some numbers may not sum precisely due to rounding				

As shown above, going from the buildout of the sites pursuant to the current GPU designations to buildout under the proposed project would increase water demand by roughly 206,568 GPD. This translates to an average day demand (ADD) of 143 gallons per minute (GPM) for all rezoned areas combined. The City's water supply is sufficient to meet the projected demand increase (see Section 2.4 for a description of available water resources throughout the City). Table 8 shows the net change for each separate rezone area.

Table 8 – Redlands RHNA Net Change in Water Demand Per Rezone Area

Land Use Designation GPU	Water Use (GPD)		Water Use (ADD)		Water Use (GPM)	
Between Citrus Avenue and Orange Avenue						
Proposed Demand	280,323	GPD	0.280	MGD	195	GPM
Existing Demand	144,837	GPD	0.145	MGD	101	GPM
Net Change	**135,486**	**GPD**	**0.135**	**MGD**	**94**	**GPM**
Between W San Bernardino Avenue and W Pennsylvania Ave						
Proposed Demand	90,396	GPD	0.090	MGD	63	GPM
Existing Demand	45,648	GPD	0.046	MGD	32	GPM
Net Change	**44,748**	**GPD**	**0.045**	**MGD**	**31**	**GPM**
Between W Lugonia Ave and W Brockton Ave						
Proposed Demand	18,810	GPD	0.019	MGD	13	GPM
Existing Demand	1,980	GPD	0.002	MGD	1	GPM
Net Change	**16,830**	**GPD**	**0.017**	**MGD**	**12**	**GPM**
Between E San Bernardino Avenue and E Pennsylvania Ave						
Proposed Demand	18,288	GPD	0.018	MGD	13	GPM
Existing Demand	8,784	GPD	0.009	MGD	6	GPM
Net Change	**9,504**	**GPD**	**0.010**	**MGD**	**7**	**GPM**
OVERALL NET CHANGE	**206,568**	**GPD**	**0.207**	**MGD**	**143**	**GPM**

2.4 WATER SYSTEM CAPACITY ASSESSMENT

2022 WATER MASTER PLAN EXISTING CONDITIONS FINDINGS

Provided that the deficiencies identified in the 2022 WSMP are implemented the General Plan Updates are not expected to adversely impact the existing water system.

A review of the City's 2022 Water Systems Master Plan (WSMP) was performed to identify any existing condition deficiencies related to the water system serving the rezone areas. The primary purpose of the WSMP is to present an analysis of the City's existing water systems, and provide recommendations to improve distribution efficiency, reduce non-revenue water, and accommodate growth within the City water service areas.

The WSMP provides specific water infrastructure planning and design criteria used to evaluate existing infrastructure and to develop CIP project recommendations. Scenarios including average day demands (ADD), Maximum Day Demands (MDD) with and without fire flow, and Peak Hour Demands (PHD) are modeled to identify deficiencies within each system. Additionally, the WSMP summarizes additional hydraulic modeling to identify deficiencies as project demands within each system are applied through the planning horizon. The results are used to develop CIP project recommendations for each system.

2.4.1 WATER CAPITAL IMPROVEMENT PLANS

Based on the Summary of Deficiencies (Chapter 7 of the WSMP), twelve (12) potable water system deficiencies were identified City-wide, and CIP projects were recommended. The deficiencies are related to high velocities, low fire flow pressure, and undersized pipelines. Of these twelve CIP projects, two of them are in the vicinity of the rezone areas, as follows:

- CIP-5 – Pennsylvania Avenue from Lassen Street to Church Street. This CIP project is located about 350 feet easterly of the northeast rezone area. The project includes upsizing about 1,142 lineal feet (LF) of 6-inch watermain with 8-inch diameter ductile iron pipe (DIP). It is anticipated that this improvement would alleviate the issue of fire flow pressure issues in the existing 6-inch water main.

- CIP-9 – Park Avenue from City limits to Essex Court. This CIP project is located about 2,600 feet to the northeasterly of the southwest rezone area. The CIP was identified due to potential fire flow pressure issues. However, the project is not included with the other potential upgrades and is shown as TBD in the 2022 WSMP.

The CIP projects listed above are shown on Figure 5 – RHNA Rezone Proposed Water System Facilities. There are no near-term CIP projects anticipated that would extend recycled water service lines to the rezone areas but changes in demand and other factors could potentially bring recycled water for irrigation purposes in the future. If recycled water becomes available in the future, it could result in a reduction of potable water demand for the rezone areas.

Net Change (Proposed - Existing) Water				
posed Demand	407,817	GPD	457	AFY
ting Demand	201,249	GPD	225	AFY
Net Change	**206,569**	**GPD**	**231**	**AFY**

Between W San Bernardino Avenue and W Pennsylvania Ave								
Proposed Demand	90,396	GPD	0.090	MGD	63	GPM	101	AFY
Existing Demand	45,648	GPD	0.046	MGD	32	GPM	51	AFY
Net Change	**44,748**	**GPD**	**0.045**	**MGD**	**31**	**GPM**	**50**	**AFY**

Between E San Bernardino Avenue and E Pennsylvania Ave								
Proposed Demand	18,288	GPD	0.018	MGD	13	GPM	20	AFY
Existing Demand	8,784	GPD	0.009	MGD	6	GPM	10	AFY
Net Change	**9,504**	**GPD**	**0.010**	**MGD**	**7**	**GPM**	**11**	**AFY**

Between W Lugonia Ave and W Brockton Ave								
Proposed Demand	18,810	GPD	0.019	MGD	13	GPM	21	AFY
Existing Demand	1,980	GPD	0.002	MGD	1	GPM	2	AFY
Net Change	**16,830**	**GPD**	**0.017**	**MGD**	**12**	**GPM**	**19**	**AFY**

Between Citrus Avenue and Orange Avenue								
Proposed Demand	280,323	GPD	0.280	MGD	195	GPM	314	AFY
Existing Demand	144,837	GPD	0.145	MGD	101	GPM	162	AFY
Net Change	**135,486**	**GPD**	**0.135**	**MGD**	**94**	**GPM**	**152**	**AFY**

City of Redlands RHNA Rezone Proposed Water System Facilities

Figure 5

Redlands, CA

7/9/2024

FUSCOE ENGINEERING
FULL CIRCLE THINKING

Project Parcels
Recycle Water Line

Existing Water Mains
- < 9"
- 9" to 12"
- 12" to 18"
- 18" to 30"

Proposed Water Main CIP (2022 Water Systems Master Plan (WSMP))
- CIP-5 (1142 LF 8" to replace 6")
- CIP-9 (Potential Fire Flow Issues/ TBD)

N

1 inch = 2,000 feet

0 2,000 4,000 Feet

X:\Projects\1448\06\MXD\Exhibits\5_proposedwater.aprx

2.5 PROPOSED LAND USE AND CEQA THRESHOLD ANALYSIS

The following question regarding Utilities and Service Systems are identified in the CEQA Checklist related to water.

Would the Project:

A. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

Should the answer to this prove to be a potentially significant impact, mitigation measures would be required to reduce those impacts to a less-than-significant threshold. The following impact assessments are based on the significance criteria established earlier in the section.

Impact A: Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

Impact Analysis: In regard to the City's water system the implementation of the proposed Redland RHNA Rezone will have the potential to increase water demands in the range of 206,568 GPD (231 AFY) over the existing conditions. Although the RHNA Rezone will generate an additional water demand the City will maintain a surplus of water supplies of up to 3,817 to 4,869 AF of water over the next 25 years under varying drought conditions. Implementation of projects consistent with the land use will require the construction of new water infrastructure where existing water lines are not sufficient to accommodate the increased supply demands. These determinations will be made on a project-by-project basis including site specific fire flow tests and hydraulic pressure analyses. The proposed improvements may include upsizing water lines on-site and off-site and additions of boosters in low pressure areas.

The water pressures in the rezone areas are within the acceptable range to be able to adequately provide water to these areas. The net increases in the water demand would occur in the southwest rezone area, and the northwest rezone area. The north and northeast rezone areas are not expected to experience increases in water demands. The net increase in water demands for the two identified areas are 94 GPM (ADD) for the southwest area, and 31 GPM (ADD) for the northwest area. These net demand increases are not expected to adversely affect the existing water infrastructure based on the existing water pressures. Therefore, Project impacts associated with the proposed buildout of the rezone areas would be less than significant.

The construction of the on-site and off-site water lines and associated improvements will primarily include trenching for the pipelines. All construction will be performed in accordance with the Construction General Permit and all associated requirements. Any work that may affect services to the existing water lines will be coordinated with the City. When considering impacts resulting from the installation of any required water infrastructure, all impacts are of a relatively short-term duration and would cease to occur once the installation is complete. Therefore, Project impacts on water associated with construction activities would be less than significant.

3. SEWER

3.1 SEWER SYSTEM ENVIRONMENTAL SETTING & INFRASTRUCTURE

The City of Redlands was incorporated in 1888. The current (2022) population is 73,849. Sewer system collection and treatment operation and maintenance is provided by the City's Municipal Utilities and Engineering Department (MUED). The mission of the MUED is to provide reliable service to the community with professionalism, integrity, accountability, quality, transparency, and innovation. MUED plans, designs, constructs, operates, and maintains Redlands' physical infrastructure for the residents and businesses in the City, making its community a desirable place to live, work, and visit.

REGIONAL – CITY OF REDLANDS

The existing sewer collection system comprises about 245 miles of gravity sewer pipelines, with diameters of up to 48-inches. Most of the pipelines (80%) are 8-inches in diameter or smaller. Approximately 82% of the sewer material is vitrified clay pipe (VCP), with approximately 16% polyvinyl chloride (PVC) pipeline. The age of the sewer pipelines ranges from 2 years-old to approximately 120 years old. Approximately 34% of the sewer pipelines are over 50 years old. All wastewater flows generated within the City are conveyed to the City's existing 9.5 MGD Redlands Wastewater Treatment Facility (WWTF) for treatment and disposal. The WWTF operates two parallel treatment systems, a membrane bioreactor treatment process with the capacity to produce up to 6.0 MGD of recycled water, and a conventional process of 3.5 MGD.

The existing sewer collection system includes six (6) inverted siphons. An inverted siphon is a dip or sag in a sewer pipe, used to cross under a structure, channel, or stream. The sewer pipe in the inverted siphon is below the theoretical hydraulic grade line (HGL) of the sewage flow, and thus the siphon is always full of wastewater and under low pressure. In siphon design, it is good practice to have multi-barrel siphon configuration to allow for both redundancy and cleaning during normal operation.

There are two (2) diversion manholes in the City of Redlands, which are larger than 10-inches in diameter. Diversion manholes are unique manholes where wastewater can be conveyed through more than one outlet. Typically stop-logs are used to intentionally block one outlet to "force" the wastewater into an intended downstream path. This is typically done by raising the "overflow" sewer line, to direct the main flows to the main pipeline, while allowing overflows to the secondary sewer after the capacity of the main sewer has been reached or exceeded. Evaluation of system capacity is important to accurately represent flow patterns through diversion manholes.

The existing sewer system in the City of Redlands includes one (1) active City-owned, operated, and maintained sewer lift station located at San Bernardino Avenue and Mountain View Avenue. In the event of a power outage, the San Bernardino/Mountain View Lift Station has a discharge pipe that diverts wastewater to the San Bernardino Wastewater Facility.

LOCAL – THE RHNA REZONE AREA

The RHNA Rezone Areas include portions within the City that are proposing to increase the residential and commercial components to numbers greater than those included in the current General Plan.

Approximately 41,000 lineal feet of sewer mainline currently accepts wastewater from the RHNA rezone areas, with pipe sizes varying from 8-inches to 30-inches in diameter. The

proposed wastewater discharges associated with the RHNA Rezone development would contribute to the various sewer reaches in Nevada Street, W. Lugonia Avenue, Citrus Plaza Drive, Alabama Street, and Palmetto Avenue. The locations of the RHNA Rezone areas in the vicinity of the City's sewer system reaches are shown on the Existing Sewer Systems Facilities, included as Figure 6.

Two of the City's six inverted siphons are downstream of the RHNA Rezone Area, with both of them in the vicinity of the Southwest Area. The siphons are listed below:

- Nevada Street and Orange Avenue, crossing Morey Arroyo Creek (Triple-Barrel/ 15-inch, 8-inch, 15-inch)
- Nevada Street and Orange Blossom Trail, crossing flood control channel (Triple-Barrel, 15-inch, 8-inch, 15-inch)

There is an existing diversion manhole located downstream of the central, north, and northeast RHNA Rezone sites. This diversion manhole MH_N37_8 is located on Palmetto Avenue, 1,300 feet east of Nevada Street. The main sewer line is a 48-inch diameter pipeline, with a northerly direction. The overflow pipeline is a 20-inch diameter line, with an invert that is 2.7 feet higher than the main pipeline.

The existing San Bernardino/Mountain View Lift Station is not downstream of the RHNA Rezone Area, and therefore is not impacted by the proposed development.

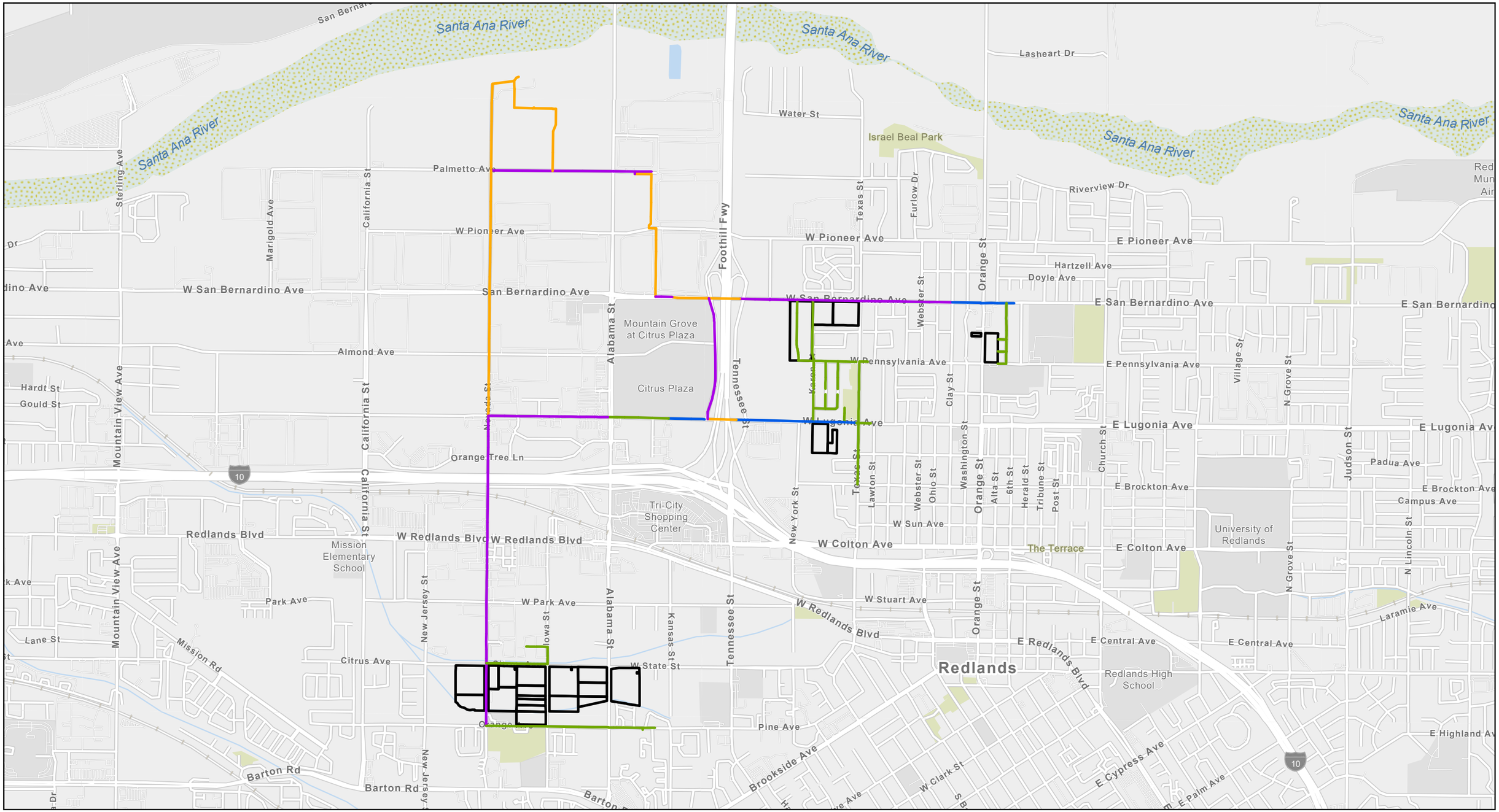
WASTEWATER TREATMENT PLANT (WWTP)

The City's system ultimately conveys untreated wastewater to the WWTP which has the capacity to treat up to 9.5 MGD. The City's WWTP includes two treatment systems: a membrane bioreactor with a capacity of 6.0 MGD for producing recycled water, and an activated sludge process with a capacity of 3.5 MGD. The plant's total permitted annual average flow is 9.5 MGD and has an average daily flow around 6 MGD.

- The Membrane Bioreactor (MBR) System involves secondary treatment followed by membrane filtration and the recycled water produced by the MBR system is provided to the Mountainview Power Company for cooling towers and to a nearby landfill for dust control. Additionally, other approved downstream users utilize the recycled water for irrigation and agricultural purposes.

- The Conventional Activated Sludge (CAS) System includes preliminary, primary, and secondary treatment steps, but it does not have membrane filtration like the MBR. The secondary treated water from the CAS system typically flows directly to percolation ponds without disinfection.

The City's existing sewer facilities are presented in Figure 6.



City of Redlands RHNA Rezone Existing Sewer System Facilities

Figure 6

Redlands, CA

7/9/2024

Gravity Main
- 8 inches or less
- 10 - 15 inches
- 18 - 24 inches
- 27 - 48 inches

Project Parcels

N

1 inch = 2,000 feet

0 2,000 4,000 Feet

X:\Projects\1448\06\MXD\Exhibits\6_sewer.aprx

3.2 EXISTING WASTEWATER GENERATION

REGIONAL – CITY OF REDLANDS

As of the City's 2020 UWMP there were approximately 5.9 MG of wastewater treated daily at the WWTP, which has a capacity to treat up to 9.0 MGD. Up to 7.2 MGD of the wastewater can be treated to Title 22-RecycledWater level. Based on 2020 volumes, approximately 1.6 MGD of treated wastewater was used as recycled water supply for customers, and 3.4 MGD was used for groundwater basin recharge. The remaining water was used within the WWTP or accounted for as losses through the process, meter inaccuracies or evaporation. See Table 9 below to see how much wastewater was collected by the City in 2020.

Table 9 – City of Redlands 2020 Wastewater Collection (AFY)

City of Redlands Wastewater Treatment Facility	Volume Treated	Volume Discharged	Volume Recycled
Discharge Location –Spreading Basin	6,620	3,813	1,806
Source: 2020 City of Redlands IRUWMP (Part 2, Chapter 4), "Table 4-10 Wastewater Treatment and Discharge within Service Area in 2020 (AF)"			

As shown above the City treated 6,620 AFY of which it discharged over 50% into spreading basins and recycled over 25%. The City plans to expand WWTPs recycled water system within pressure zone 1350 and 1570 as the demand for dual metering for irrigation increases.

LOCAL – THE RHNA REZONE AREA

As described previously the City is proposing a GPA and zone change that will allow the City to rezone 23 different sites from commercial/industrial sites to residential and public/ institutional uses. Doing so will allow the City to meet its RHNA requirements, as the rezoned areas will accommodate up to 2,436 residential DUs and 151,048 non-residential SF, in comparison to the existing General Plan land uses. The following tables will present a detailed analysis of the City's sewer flow factors and wastewater generation for various land use designations under the existing GPU and proposed GPA. These factors are necessary to understand how current sewer flows will be altered when projecting future wastewater generation from the RHNA Rezone.

Sewer Flow Factors: The sewer flow factors were obtained from the Citywide Wastewater Master Plan (WWMP), prepared by Dudek in December 2021. To estimate wastewater generation from planned development projects, sewage flow factors were developed for each land use type, based on information from neighboring agencies and industry standards. These sewer flow factors are presented in Table 10.

Table 10 – City of Redlands WWMP Sewer Flow Factors

Land Use Designation	Unit Flow Factor			
High Density Residential	120	GPD/ DU	30	DU/ Acre
Medium Density Residential	165	GPD/ DU	15	DU/ Acre
Commercial	3,000	GPD/ Acre	-	SF/Acre
Source: 2021 Wastewater Master Plan - Table 3.2: Unit Sewage Flow Factors				

Seeing that the existing and proposed land uses under the City's GPU and GPA are either high or medium density residential or commercial/industrial, the sewer flow factors of 120 GPD/DU, 165 GPD/DU, and 3,000 GPD/Acre were used respectively.

The wastewater flows have been estimated for the full build-out of the existing general plan condition in the RHNA Rezone areas and are included in Table 11 below.

Table 11 – Redlands RHNA Rezone Existing Wastewater Generation

Existing Land Use Designation	Maximum Buildout		Wastewater Generation Factor		Existing Wastewater Generation			
High Density Residential	61	DU	120	GPD/ DU	7,320	GPD	8	AFY
Medium Density Residential	50	DU	165	GPD/ DU	8,250	GPD	9	AFY
Non-Residential	2,209,041	SF	3,000	GPD/ Acre	152,138	GPD	170	AFY
				TOTAL	**167,708**	**GPD**	**188**	**AFY**

Source: 2021 Wastewater Master Plan - Table 3.2: Unit Sewage Flow Factors
** Note some numbers may not sum precisely due to rounding*

Based on the results of the analysis of the existing wastewater generation in the RHNA areas, the total existing wastewater generation is approximately 0.17 million gallons per day (MGD) or approximately 188 AFY. It should also be noted that the estimated wastewater generation value is less than the projected water demand value from the previous section, due to applying a 20-percent increase to the sewer generation factors that were used to estimate water demand. The reason for this is that water usage is typically about 20% higher than sewer usage, due to evaporation and indoor watering of plants. See Appendix B for a breakdown of what flows come from each group of RHNA Rezone areas.

3.3 PROPOSED WASTEWATER GENERATION

The sewer flows associated with the full build-out of the proposed RHNA areas have been determined, based on the sewage generation factors specified in the WWMP and the proposed project development. The net new sewer flows have been calculated and evaluated based on the available capacity in the City's existing sewer system. See Table 12 for the proposed wastewater generation.

Table 12 – Redlands RHNA Rezone Proposed Wastewater Generation

Existing Land Use Designation	Maximum Buildout		Wastewater Generation Factor		Existing Wastewater Generation			
High Density Residential	1,611	DU	120	GPD/ DU	193,080	GPD	216	AFY
Medium Density Residential	825	DU	165	GPD/ DU	136,455	GPD	153	AFY
Non-Residential	151,048	SF	3,000	GPD/ Acre	10,403	GPD	11.7	AFY
				TOTAL	**339,938**	**GPD**	**381**	**AFY**

Source: 2021 Wastewater Master Plan - Table 3.2: Unit Sewage Flow Factors
** Note some numbers may not sum precisely due to rounding*

The difference between the sewer flows calculated in Table 11 and Table 12 are representative of the net change in wastewater generation for the City's RHNA Rezone areas. See Table 13 below for more details.

Table 13 – Redlands RHNA Rezone Net Change in Wastewater Generation

Net Change (Proposed - Existing GPU) Wastewater Generation						
Proposed Demand	339,938	GPD	0.34	MGD	381	AFY
Existing Demand	167,708	GPD	0.17	MGD	188	AFY
Net Change	**172,230**	**GPD**	**0.172**	**MGD**	**193**	**AFY**

The net new wastewater flows have been determined, based on the difference between the proposed project flows, less the wastewater flows associated with the original existing approved development. The overall net change in the wastewater flows would be approximately 0.172 MGD, which is equivalent to 0.32 cfs. Further, using the peaking factor of 3.2 from the table on page 36 of the City's Sewer System Standard Plans (2024) the net peak flow would be 0.27 x 3.2, which is 1.0 cfs. The breakdown of net change in wastewater generation for each area are presented in Appendix B and Figure 7.

3.4 SEWER SYSTEM CAPACITY ASSESSMENT

In order to assure that the sewer system is functioning effectively, the City and its Municipal Utilities and Engineering Department utilizes its Wastewater Master Plan and other resources to monitor, improve, and repair local sewer infrastructure and treatment facilities.

WASTEWATER MASTER PLAN (WWMP)

The purpose of the City's Wastewater Master Plan was to develop an understanding of the sewer system collection needs and includes sewer flow factors to estimate wastewater flows. Additionally, the WWMP identifies sewer reaches recommended for upgrades.

The WWMP discusses that the City's population levels are expected to grow, and includes existing and projected sewer flows, which are presented in Table 14 below.

Table 14 – City of Redlands Existing and Projected Sewer Flows

Year	ADWF (MGD)	PDWF (MGD)	AWWF (MGD)	PWWF (MGD)
2020	5.8	8.1	6.5	12.0
2030	6.9	10.4	7.6	12.9
2045	7.7	10.9	8.4	14.2
2070	8.0	11.6	8.7	15.0

Notes: ADWF: Average Dry-Weather Flows, PDWF: Peak Dry-Weather Flows, AWWF: Average Wet-Weather Flows, PWWF: Peak Wet-Weather Flows

The figures and tables in the WWMP indicate that most of the sewer systems receiving wastewater flows from the proposed RHNA areas are operating at or below 50% of their maximum depth/Diameter (d/D). Thus the sewer system has the capacity to accommodate potential changes to the City's buildout, including those related to the RHNA land use updates.

Based on the sewer systems standards (2024), sewer pipes larger than 12-inches in diameter are designed to flow up to 75%-full. Therefore, since most of the existing sewer systems are flowing at or less than 50%-full, there is additional capacity to handle an increase in wastewater.

The flow-depths of the existing sewer systems (21-inches to 30-inches) have been evaluated to confirm the amount of additional wastewater capacity available. The results are included in Table 15.

Table 15 – Available Wastewater Capacity

Existing Sewer Reach	Additional Peak Capacity
21-Inch VCP (Nevada Street, San Bernardino Avenue)	2.29 CFS
24-inch VCP (Nevada Street)	2.99 CFS
30-inch VCP (Nevada Street)	4.55 CFS
Net Peak Flows	**1.0 CFS (0.54MGD)**

The results of the sewer capacity analyses show that the net peak flows of 1.0 cfs would have a negligible effect on the existing sewer system. The sewer flow-depth calculations are included in Appendix C.

All sewage generated within the City of Redlands is ultimately conveyed via the City's sewer pipelines to the City's WWTP. The City's WWMP includes a process evaluation of the facility. The analysis in the WWMP concluded that the existing treatment system is sufficient to meet the projected demands in the near-term, long-term, and ultimate build-out. Therefore, based on the nominal net increase in average sewer flow of 0.172 MGD , and peak sewer flow of 0.54 MGD, it is our opinion the proposed RHNA project would not adversely impact the City's WWTP.

PREVENTATIVE MAINTENANCE PRORGRAM

The City works proactively to maintain and ensure the optimal operations of its sewer system through the preventative maintenance program in place. Specifically, the City is committed to cleaning and closed caption television (CCTV) inspecting 50 miles or twenty-percent of the City's sewer system annually and doing and entire system check every five years. Based on the maintenance data from the City the WWMP indicated that the City is meeting or exceeding its stated preventative maintenance goals. The only recommended improvements are for the City to conduct a cleaning of the entire system every two years.

See Figure 7 below for a visual of the City's proposed and recommended sewer system upgrades alongside the proposed flows generated from each RHNA Rezone area.

Net Change (Proposed - Existing) Wastewater Generation						
Proposed Demand	339,848	GPD	0.34	MGD	381	AFY
Existing Demand	167,707	GPD	0.17	MGD	188	AFY
Net Change	**172,141**	**GPD**	**0.172**	**MGD**	**193**	**AFY**

Between W San Bernardino Avenue and W Pennsylvania Ave						
Proposed Demand	75,330	GPD	0.075	MGD	84	AFY
Existing Demand	38,040	GPD	0.038	MGD	43	AFY
Net Change	**37,290**	**GPD**	**0.037**	**MGD**	**42**	**AFY**

Between E San Bernardino Avenue and E Pennsylvania Ave						
Proposed Demand	15,240	GPD	0.015	MGD	17	AFY
Existing Demand	7,320	GPD	0.007	MGD	8	AFY
Net Change	**7,920**	**GPD**	**0.008**	**MGD**	**9**	**AFY**

Between W Lugonia Ave and W Brockton Ave						
Proposed Demand	15,675	GPD	0.016	MGD	18	AFY
Existing Demand	1,650	GPD	0.002	MGD	2	AFY
Net Change	**14,025**	**GPD**	**0.014**	**MGD**	**16**	**AFY**

Between Citrus Avenue and Orange Avenue						
Proposed Demand	233,693	GPD	0.234	MGD	262	AFY
Existing Demand	120,697	GPD	0.121	MGD	135	AFY
Net Change	**112,995**	**GPD**	**0.113**	**MGD**	**127**	**AFY**

City of Redlands RHNA Rezone Proposed Sewer System Facilities

Figure 7

Redlands, CA

7/9/2024

FUSCOE ENGINEERING — FULL CIRCLE THINKING

Gravity Main
- 8 inches or less
- 10 - 15 inches
- 18 - 24 inches
- 27 - 48 inches

Project Parcels

Abandon Exisiting Sewer
- 18 - 24 inches
- 27 - 48 inches

City's WWMP Recommended Sewer Upgrades

N

1 inch = 2,000 feet

0 2,000 4,000 Feet

X:\Projects\1448\06\MXD\Exhibits\7_proposed sewer.aprx

3.4.1 SEWER CAPITAL IMPROVEMENT PLANS

The WWMP evaluates the operation and capacity of the existing wastewater collection system, and wastewater treatment plant within the City of Redlands, providing recommendations for future system improvements. The 2021 WWMP is the first wastewater master plan in over two decades, identifies sewer reaches downstream of the proposed project for recommended upgrades as shown in Table 16 and Figure 7. While these upgrades should occur as identified in the most recent 2021 WWMP, the RHNA rezone projects are not the impetus for the recommended upgrades.

Table 16 – WWMP Recommended Sewer Upgrades

Project Name	CIP Phase / Fiscal Year	Project Summary
P-3 – Alabama Street Pipeline Upsizing and Realignment	On-going FY 2020	Install concrete plug to abandon 3,100 LF of existing 24-inch and 30-inch; build 920 LF of new 24-inch in San Bernardino Avenue; build 2,700 LF of 36-inch in Alabama Street
P-5 – Citrus Plaza Drive Pipeline Upsizing	Near-Term FY 2030	Upsize 350 LF of 24-inch to 27-inch
P-6 – Nevada Street Pipeline Upsizing (North of Palmetta Avenue)	On-going FY 2020	Upsize 1,900 LF of 27-inch to 30-inch

Based on our review of the WWMP and of the net new wastewater flows associated with the revised RHNA areas, it is our opinion that the revised land use will not adversely impact the existing City of Redlands sewer system.

3.5 PROPOSED CONDITION AND CEQA THRESHOLD ANALYSIS

The following questions regarding Utilities and Service Systems are identified in the CEQA Checklist related to sewer.

Would the Project:

A. Require or result in the relocation or construction of new or enhanced water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?
B. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Should the answers to these environmental factors prove to be a potentially significant impact, mitigation measures would be required to reduce those impacts to a less-than-significant threshold.

Impact A: Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

Impact Analysis: As compared to the buildout of the existing general plan land uses, the proposed development of the RHNA project areas would result in minor increases

in the wastewater amount to the City's existing sewer systems. Based on our evaluation of the existing sewer system and available capacities, these increases would not trigger the need for relocations or construction of new or expanded sewer pipelines or treatment systems. Therefore, no adverse impacts resulting from the proposed project development are anticipated.

The construction of any on-site and off-site sewer lines and associated improvements would primarily include trenching for the pipelines. All construction would be performed in accordance with the Construction General Permit and all associated requirements. Any work that may affect services to the existing sewer lines will be coordinated with the City. When considering impacts resulting from the installation of any required sewer infrastructure, all impacts would be of a relatively short-term duration and would cease to occur once the installation is complete. Therefore, Project impacts on sewer infrastructure associated with construction activities would be less than significant.

Impact B: Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Impact Analysis: The proposed estimated increase in the average wastewater amount, as compared to buildout pursuant to the existing general plan land use designations, would be 0.172 MGD, which amounts to less than 3% of the total wastewater amount of 5.8 MGD (2020). The capacity of the Redlands Waste Water Treatment Facility is 9.5 MGD currently, which is sufficient to handle the wastewater flows generated within the City. Therefore, the proposed project would be less than significant, and no adverse impacts from the proposed RHNA project development are anticipated.

4. Appendices

Appendix A Water Demand Calculations
Appendix B Wastewater Generation Calculations
Appendix C Sewer Capacity Calculation

APPENDIX A

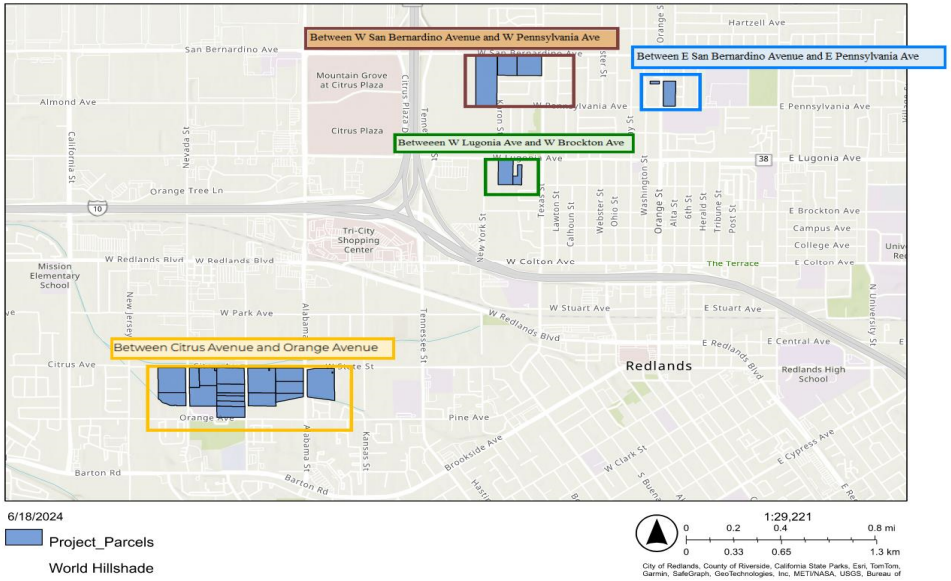
WATER DEMAND CALCULATIONS

NET CHANGE - Water Demand - Existing to Proposed				
Land Use Designation	**Water Use (GPD)**	**Water Use (MGD)**	**Water Use (GPM)**	**Water Use (AFY)**
Between Citrus Avenue and Orange Avenue				
Proposed Demand	280,323 GPD	0.280 MGD	195 GPM	314 AFY
Existing Demand	144,837 GPD	0.145 MGD	101 GPM	162 AFY
Net Change	**135,486 GPD**	**0.135 MGD**	**94 GPM**	**152 AFY**
Between W San Bernardino Avenue and W Pennsylvania Ave				
Proposed Demand	90,396 GPD	0.090 MGD	63 GPM	101 AFY
Existing Demand	45,648 GPD	0.046 MGD	32 GPM	51 AFY
Net Change	**44,748 GPD**	**0.045 MGD**	**31 GPM**	**50 AFY**
Between W Lugonia Ave and W Brockton Ave				
Proposed Demand	18,810 GPD	0.019 MGD	13 GPM	21 AFY
Existing Demand	1,980 GPD	0.002 MGD	1 GPM	2 AFY
Net Change	**16,830 GPD**	**0.017 MGD**	**12 GPM**	**19 AFY**
Between E San Bernardino Avenue and E Pennsylvania Ave				
Proposed Demand	18,288 GPD	0.018 MGD	13 GPM	20 AFY
Existing Demand	8,784 GPD	0.009 MGD	6 GPM	10 AFY
Net Change	**9,504 GPD**	**0.010 MGD**	**7 GPM**	**11 AFY**
OVERALL NET CHANGE	**206,569 GPD**	**0.207 MGD**	**143.5 GPM**	**231 AFY**

WATER USE FACTORS				
Land Use Designation	**Unit Flow Factor**			
High Density Residential	144	GPD/ DU	30	DU/ Acre
Medium Density Residential	198	GPD/ DU	15	DU/ Acre
Commercial	3,600	GPD/ SF		

Source: 2021 Wastewater Master Plan - Table 3.2: Unit Sewage Flow Factors
Note: The sewer generation values are increased by 20% to estimate the water generation factors. This adjustment assumes a sewer-to-water return ratio of 0.8

Redlands Rezone



EXISTING WATER DEMANDS

Site Number	Existing Land Use Designation	Existing Zoning	Acres	Existing Maximum Buildout	Water Use Factor	Existing Water Use (GPD)	Existing Water Use (MGD)	Existing Water Use (AFY)
Between Citrus Avenue and Orange Avenue								
1	Commercial/ Industrial	EV/IC	8.91	194,060 SF	3,600 GPD/ SF	16,038 GPD	0.016 MGD	18 AFY
2	Commercial/Industrial	EV/IC	4.26	92,783 SF	3,600 GPD/ SF	7,668 GPD	0.008 MGD	9 AFY
3	Commercial/Industrial	EV/IC	5.84	127,195 SF	3,600 GPD/ SF	10,512 GPD	0.011 MGD	12 AFY
4	Commercial/Industrial	EV/IC	3.15	68,607 SF	3,600 GPD/ SF	5,670 GPD	0.006 MGD	6 AFY
5	Commercial/Industrial	EV/IC	1.07	23,305 SF	3,600 GPD/ SF	1,926 GPD	0.002 MGD	2 AFY
6	Commercial/Industrial	EV/IC	1.9	41,382 SF	3,600 GPD/ SF	3,420 GPD	0.003 MGD	4 AFY
7	Commercial/Industrial	EV/IC	1.9	41,382 SF	3,600 GPD/ SF	3,420 GPD	0.003 MGD	4 AFY
8	MDR	EV3000RM	4.07	40 DU	198 GPD/ DU	7,920 GPD	0.008 MGD	9 AFY
9	Commercial/Industrial	EV/IC	2.5	54,450 SF	3,600 GPD/ SF	4,500 GPD	0.004 MGD	5 AFY
10	Commercial/Industrial	EV/IC	4.03	87,773 SF	3,600 GPD/ SF	7,254 GPD	0.007 MGD	8 AFY
10A	Commercial/Industrial	EV/IC	0.08	1,742 SF	3,600 GPD/ SF	144 GPD	0.000 MGD	0.16 AFY
11	Commercial/Industrial	EV/IC	4.7	102,366 SF	3,600 GPD/ SF	8,460 GPD	0.008 MGD	9 AFY
12	Commercial/Industrial	EV/IC	2.31	50,312 SF	3,600 GPD/ SF	4,158 GPD	0.004 MGD	5 AFY
13	Commercial/Industrial	EV/IC	4.73	103,019 SF	3,600 GPD/ SF	8,514 GPD	0.009 MGD	10 AFY
14	Commercial/Industrial	EV/IC	4.21	91,694 SF	3,600 GPD/ SF	7,578 GPD	0.008 MGD	8 AFY
15	Commercial/Industrial	EV/IC	8.86	192,971 SF	3,600 GPD/ SF	15,948 GPD	0.016 MGD	18 AFY
15A	Commercial/Industrial	EV/IC	0.02	436 SF	3,600 GPD/ SF	36 GPD	0.000 MGD	0.04 AFY
16	Commercial/Industrial	EV/IC	10.65	231,957 SF	3,600 GPD/ SF	19,170 GPD	0.019 MGD	21 AFY
16A	Commercial/Industrial	EV/IC	0.01	218 SF	3,600 GPD/ SF	18 GPD	0.000 MGD	0.02 AFY
24	Commercial/Industrial	EV/IC	6.94	151,048 SF	3,600 GPD/ SF	12,483 GPD	0.012 MGD	14 AFY
TOTAL			**80.14 acres**			**144,837 GPD**	**0.145 MGD**	**162 AFY**
Between W San Bernardino Avenue and W Pennsylvania Ave								
17	Commercial/Admin Professional	CP-4	14.05	306,009 SF	3,600 GPD/ SF	25,290 GPD	0.03 MGD	28 AFY
18	Commercial/Admin Professional	CP-4	5	108,900 SF	3,600 GPD/ SF	9,000 GPD	0.01 MGD	10 AFY
19	Commercial/Admin Professional	CP-4	6.31	137,432 SF	3,600 GPD/ SF	11,358 GPD	0.01 MGD	13 AFY
TOTAL			**25.36 acres**			**45,648 GPD**	**0.05 MGD**	**51 AFY**
Between W Lugonia Ave and W Brockton Ave								
20	MDR	A-1	4.76	1 DU	198 GPD/ DU	198 GPD	0.00 MGD	0 AFY
21	MDR	R-1	1.64	9 DU	198 GPD/ DU	1,782 GPD	0.00 MGD	2 AFY
TOTAL			**6.4 acres**			**1,980 GPD**	**0.00 MGD**	**2 AFY**
Between E San Bernardino Avenue and E Pennsylvania Ave								
22	HDR	R-2	0.33	4 DU	144 GPD/ DU	576 GPD	0.00 MGD	1 AFY
23	HDR	R-2	3.96	57 DU	144 GPD/ DU	8,208 GPD	0.01 MGD	9 AFY
TOTAL			**4.29 acres**			**8,784 GPD**	**0.01 MGD**	**10 AFY**
OVERALL TOTAL			**116 acres**			**201,249 GPD**	**0.20 MGD**	**225 AFY**

PROPOSED WATER DEMANDS

Site Number	Proposed Land Use Designation	Proposed Zoning	Proposed Density (DU/acre)	Acres	Proposed Maximum Buildout	Water Use Factor	Existing Water Use (GPD)	Existing Water Use (MGD)	Existing Water Use (AFY)
Between Citrus Avenue and Orange Avenue									
1	MDR	R-2	15	8.91	133 DU	198 GPD/ DU	26,334 GPD	0.03 MGD	29 AFY
2	MDR	R-2	15	4.26	63 DU	198 GPD/ DU	12,474 GPD	0.01 MGD	14 AFY
3	HDR	R-3	30	5.84	175 DU	144 GPD/ DU	25,200 GPD	0.03 MGD	28 AFY
4	HDR	R-3	30	3.15	94 DU	144 GPD/ DU	13,536 GPD	0.01 MGD	15 AFY
5	HDR	R-3	30	1.07	32 DU	144 GPD/ DU	4,608 GPD	0.00 MGD	5 AFY
6	HDR	R-3	30	1.9	57 DU	144 GPD/ DU	8,208 GPD	0.01 MGD	9 AFY
7	HDR	R-3	30	1.9	57 DU	144 GPD/ DU	8,208 GPD	0.01 MGD	9 AFY
8	MDR	EV2500RM	15	4.07	61 DU	198 GPD/ DU	12,078 GPD	0.01 MGD	14 AFY
9	HDR	R-3	30	2.5	75 DU	144 GPD/ DU	10,800 GPD	0.01 MGD	12 AFY
10	HDR	R-3	30	4.03	120 DU	144 GPD/ DU	17,280 GPD	0.02 MGD	19 AFY
10A	MDR	R-3	30	0.08	2 DU	144 GPD/ DU	288 GPD	0.00 MGD	0 AFY
11	MDR	R-2	15	4.7	70 DU	198 GPD/ DU	13,860 GPD	0.01 MGD	16 AFY
12	MDR	R-2	15	2.31	34 DU	198 GPD/ DU	6,732 GPD	0.01 MGD	8 AFY
13	HDR	R-3	30	4.73	141 DU	144 GPD/ DU	20,304 GPD	0.02 MGD	23 AFY
14	HDR	R-3	30	4.21	126 DU	144 GPD/ DU	18,144 GPD	0.02 MGD	20 AFY
15	HDR	R-3	30	8.86	265 DU	144 GPD/ DU	38,160 GPD	0.04 MGD	43 AFY
15A	HDR	R-3	30	0.02	1 DU	144 GPD/ DU	144 GPD	0.00 MGD	0 AFY
16	MDR	R-2	15	10.7	159 DU	198 GPD/ DU	31,482 GPD	0.03 MGD	35 AFY
16A	MDR	R-2	15	0.01	- DU	198 GPD/ DU	- GPD	- MGD	- AFY
24	Public/ Institutional (PI)	EV/IP	0.5 Floor Area Ratio (FAR)	6.94	151,048 SF	3,600 GPD/ SF	12,483 GPD	0.01 MGD	14 AFY
TOTAL				**80.1 acres**			**280,323 GPD**	**0.2803 MGD**	**314 AFY**
Between W San Bernardino Avenue and W Pennsylvania Ave									
17	MDR	R-2	15	14.1	210 DU	198 GPD/ DU	41,580 GPD	0.04 MGD	47 AFY
18	HDR	R-3	30	5	150 DU	144 GPD/ DU	21,600 GPD	0.02 MGD	24 AFY
19	HDR	R-3	30	6.31	189 DU	144 GPD/ DU	27,216 GPD	0.03 MGD	30 AFY
TOTAL				**25.4 acres**			**90,396 GPD**	**0.09 MGD**	**101 AFY**
Between W Lugonia Ave and W Brockton Ave									
20	MDR	R-2	15	4.76	71 DU	198 GPD/ DU	14,058 GPD	0.01 MGD	16 AFY
21	MDR	R-2	15	1.64	24 DU	198 GPD/ DU	4,752 GPD	0.00 MGD	5 AFY
TOTAL				**6.4 acres**			**18,810 GPD**	**0.02 MGD**	**21 AFY**
Between E San Bernardino Avenue and E Pennsylvania Ave									
22	HDR	R-3	30	0.33	9 DU	144 GPD/ DU	1,296 GPD	0.00 MGD	1 AFY
23	HDR	R-3	30	3.96	118 DU	144 GPD/ DU	16,992 GPD	0.02 MGD	19 AFY
TOTAL				**4.29 acres**			**18,288 GPD**	**0.0183 MGD**	**20 AFY**
OVERALL TOTAL				**116 acres**			**407,817 GPD**	**0.41 MGD**	**457 AFY**

APPENDIX B

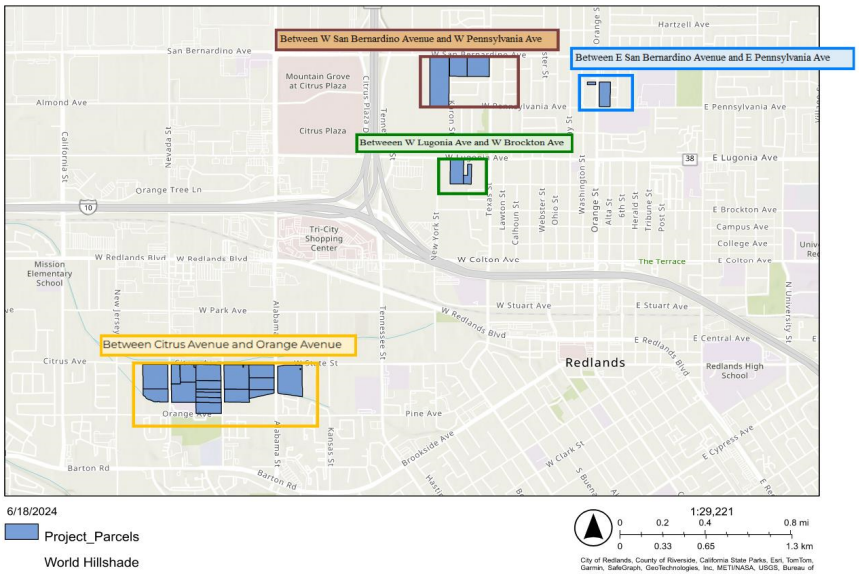
WASTEWATER GENERATION CALCULATIONS

NET CHANGE - Wastewater Generation - Existing to Proposed								
Land Use Designation	**Wastewater Generation (GPD)**		**Wastewater Generation (MGD)**		**Wastewater Generation (AFY)**	
Between Citrus Avenue and Orange Avenue						
Proposed Demand	233,693	GPD	0.234	MGD	262	AFY
Existing Demand	120,697	GPD	0.121	MGD	135	AFY
Net Change	**112,995**	**GPD**	**0.113**	**MGD**	**127**	**AFY**
Between W San Bernardino Avenue and W Pennsylvania Ave						
Proposed Demand	75,330	GPD	0.075	MGD	84	AFY
Existing Demand	38,040	GPD	0.038	MGD	43	AFY
Net Change	**37,290**	**GPD**	**0.037**	**MGD**	**42**	**AFY**
Between W Lugonia Ave and W Brockton Ave						
Proposed Demand	15,675	GPD	0.016	MGD	18	AFY
Existing Demand	1,650	GPD	0.002	MGD	2	AFY
Net Change	**14,025**	**GPD**	**0.014**	**MGD**	**16**	**AFY**
Between E San Bernardino Avenue and E Pennsylvania Ave						
Proposed Demand	15,240	GPD	0.015	MGD	17	AFY
Existing Demand	7,320	GPD	0.007	MGD	8	AFY
Net Change	**7,920**	**GPD**	**0.008**	**MGD**	**9**	**AFY**
OVERALL NET CHANGE	**172,231**	**GPD**	**0.172**	**MGD**	**193**	**AFY**

WASTEWATER GENERATION FACTORS						
Land Use Designation	**Unit Flow Factor**					
High Density Residential	120	GPD/ DU	30	DU/ Acre		
Medium Density Residential	165	GPD/ DU	15	DU/ Acre		
Single Family Residential	210	GPD/ DU	3	DU/ Acre		
Hotel	110	GPD/ DU	-	GPD/ Acre		
Institutional	1,000	GPD/ Acre	-	SF/Acre		
Commercial	3,000	GPD/ Acre	-	SF/Acre		
Industrial	3,200	GPD/ Acre	-	SF/Acre		

2021 Wastewater Master Plan - Table 3.2: Unit Sewage Flow Factors

Redlands Rezone



EXISTING WASTEWATER GENERATION

Site Number	Existing Land Use Designation	Existing Zoning	Acres	Existing Maximum Buildout	Wastewater Generation Factor	Wastewater Generation (GPD)	Wastewater Generation (MGD)	Wastewater Generation (AFY)
Between Citrus Avenue and Orange Avenue								
1	Commercial/ Industrial	EV/IC	8.91	194,060 SF	3,000 GPD/ Acre	13,365 GPD	0.013 MGD	15 AFY
2	Commercial/Industrial	EV/IC	4.26	92,783 SF	3,000 GPD/ Acre	6,390 GPD	0.006 MGD	7 AFY
3	Commercial/Industrial	EV/IC	5.84	127,195 SF	3,000 GPD/ Acre	8,760 GPD	0.009 MGD	10 AFY
4	Commercial/Industrial	EV/IC	3.15	68,607 SF	3,000 GPD/ Acre	4,725 GPD	0.005 MGD	5 AFY
5	Commercial/Industrial	EV/IC	1.07	23,305 SF	3,000 GPD/ Acre	1,605 GPD	0.002 MGD	2 AFY
6	Commercial/Industrial	EV/IC	1.9	41,382 SF	3,000 GPD/ Acre	2,850 GPD	0.003 MGD	3 AFY
7	Commercial/Industrial	EV/IC	1.9	41,382 SF	3,000 GPD/ Acre	2,850 GPD	0.003 MGD	3 AFY
8	MDR	EV3000RM	4.07	40 DU	165 GPD/ DU	6,600 GPD	0.007 MGD	7 AFY
9	Commercial/Industrial	EV/IC	2.5	54,450 SF	3,000 GPD/ Acre	3,750 GPD	0.004 MGD	4 AFY
10	Commercial/Industrial	EV/IC	4.03	87,773 SF	3,000 GPD/ Acre	6,045 GPD	0.006 MGD	7 AFY
10A	Commercial/Industrial	EV/IC	0.08	1,742 SF	3,000 GPD/ Acre	120 GPD	0.000 MGD	0.13 AFY
11	Commercial/Industrial	EV/IC	4.7	102,366 SF	3,000 GPD/ Acre	7,050 GPD	0.007 MGD	8 AFY
12	Commercial/Industrial	EV/IC	2.31	50,312 SF	3,000 GPD/ Acre	3,465 GPD	0.003 MGD	4 AFY
13	Commercial/Industrial	EV/IC	4.73	103,019 SF	3,000 GPD/ Acre	7,095 GPD	0.007 MGD	8 AFY
14	Commercial/Industrial	EV/IC	4.21	91,694 SF	3,000 GPD/ Acre	6,315 GPD	0.006 MGD	7 AFY
15	Commercial/Industrial	EV/IC	8.86	192,971 SF	3,000 GPD/ Acre	13,290 GPD	0.013 MGD	15 AFY
15A	Commercial/Industrial	EV/IC	0.02	436 SF	3,000 GPD/ Acre	30 GPD	0.000 MGD	0.03 AFY
16	Commercial/Industrial	EV/IC	10.65	231,957 SF	3,000 GPD/ Acre	15,975 GPD	0.016 MGD	18 AFY
16A	Commercial/Industrial	EV/IC	0.01	218 SF	3,000 GPD/ Acre	15 GPD	0.000 MGD	0.02 AFY
24	Commercial/Industrial	EV/IC	6.94	151,048 SF	3,000 GPD/ Acre	10,403 GPD	0.010 MGD	12 AFY
TOTAL			**80.14**	**acres**		**120,697 GPD**	**0.121 MGD**	**135 AFY**
Between W San Bernardino Avenue and W Pennsylvania Ave								
17	Commercial/Admin Professional	CP-4	14.05	306,009 SF	3,000 GPD/ Acre	21,075 GPD	0.02 MGD	24 AFY
18	Commercial/Admin Professional	CP-4	5	108,900 SF	3,000 GPD/ Acre	7,500 GPD	0.01 MGD	8 AFY
19	Commercial/Admin Professional	CP-4	6.31	137,432 SF	3,000 GPD/ Acre	9,465 GPD	0.01 MGD	11 AFY
TOTAL			**25.36**	**acres**		**38,040 GPD**	**0.04 MGD**	**43 AFY**
Between W Lugonia Ave and W Brockton Ave								
20	MDR	A-1	4.76	1 DU	165 GPD/ DU	165 GPD	0.000 MGD	0.185 AFY
21	MDR	R-1	1.64	9 DU	165 GPD/ DU	1,485 GPD	0.001 MGD	1.663 AFY
TOTAL			**6.4**	**acres**		**1,650 GPD**	**0.002 MGD**	**2 AFY**
Between E San Bernardino Avenue and E Pennsylvania Ave								
22	HDR	R-2	0.33	4 DU	120 GPD/ DU	480 GPD	0.00048 MGD	0.538 AFY
23	HDR	R-2	3.96	57 DU	120 GPD/ DU	6,840 GPD	0.0068 MGD	7.662 AFY
TOTAL			**4.29**	**acres**		**7,320 GPD**	**0.00732 MGD**	**8.199 AFY**
OVERALL TOTAL			**116**	**acres**		**167,707 GPD**	**0.17 MGD**	**188 AFY**

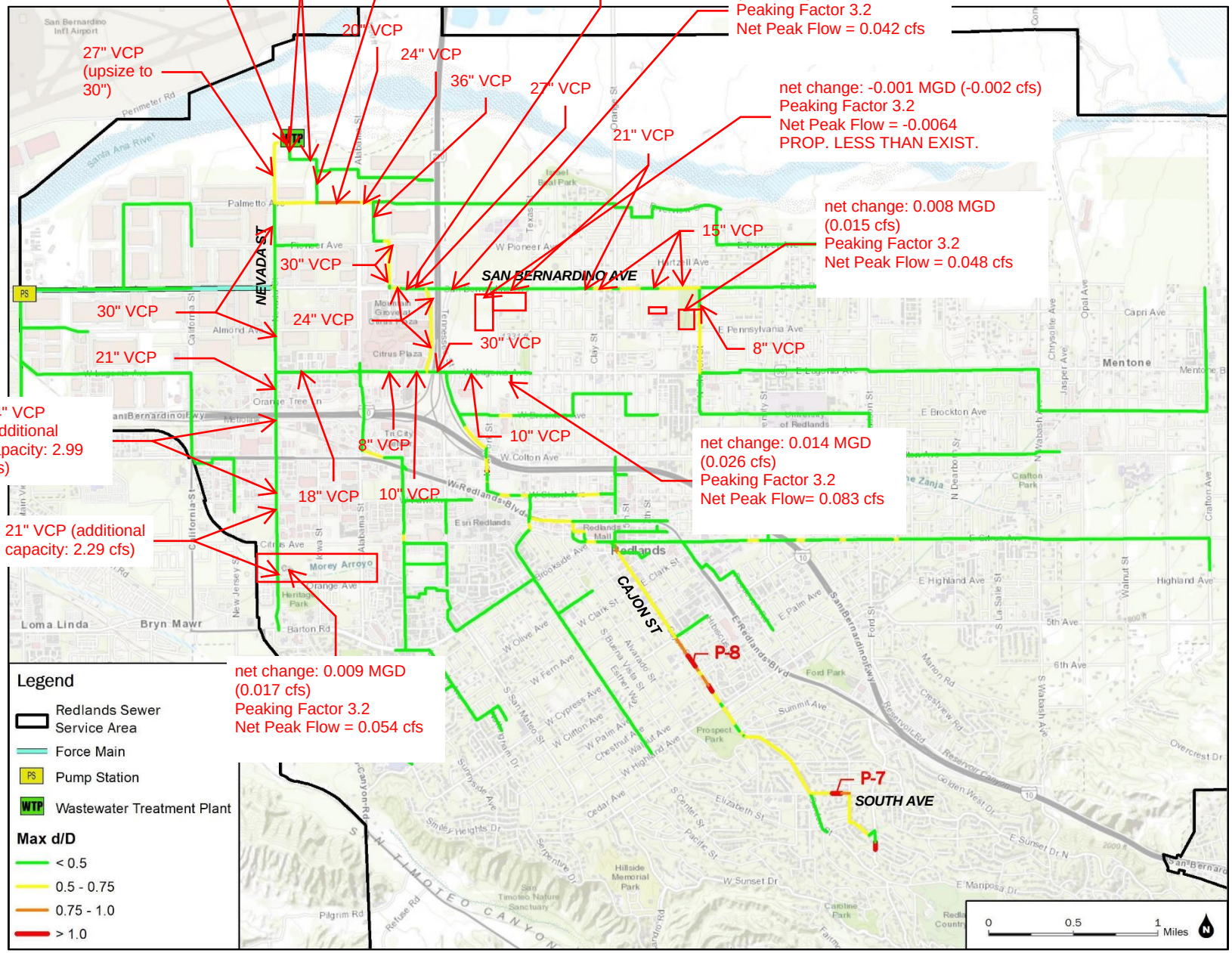
PROPOSED WASTEWATER GENERATION

Site Number	Proposed Land Use Designation	Proposed Zoning	Proposed Density (DU/acre)	Acres	Proposed Maximum Buildout	Proposed Sewer Generation Factor	Wastewater Generation (GPD)	Wastewater Generation (MGD)	Wastewater Generation (AFY)
Between Citrus Avenue and Orange Avenue									
1	MDR	R-2	15	8.91	133 DU	165 GPD/ DU	21,945 GPD	0.02 MGD	25 AFY
2	MDR	R-2	15	4.26	63 DU	165 GPD/ DU	10,395 GPD	0.01 MGD	12 AFY
3	HDR	R-3	30	5.84	175 DU	120 GPD/ DU	21,000 GPD	0.02 MGD	24 AFY
4	HDR	R-3	30	3.15	94 DU	120 GPD/ DU	11,280 GPD	0.01 MGD	13 AFY
5	HDR	R-3	30	1.07	32 DU	120 GPD/ DU	3,840 GPD	0.00 MGD	4 AFY
6	HDR	R-3	30	1.9	57 DU	120 GPD/ DU	6,840 GPD	0.01 MGD	8 AFY
7	HDR	R-3	30	1.9	57 DU	120 GPD/ DU	6,840 GPD	0.01 MGD	8 AFY
8	MDR	EV2500RM	15	4.07	61 DU	165 GPD/ DU	10,065 GPD	0.01 MGD	11 AFY
9	HDR	R-3	30	2.5	75 DU	120 GPD/ DU	9,000 GPD	0.01 MGD	10 AFY
10	HDR	R-3	30	4.03	120 DU	120 GPD/ DU	14,400 GPD	0.01 MGD	16 AFY
10A	MDR	R-3	30	0.08	2 DU	165 GPD/ DU	330 GPD	0.00 MGD	0 AFY
11	MDR	R-2	15	4.7	70 DU	165 GPD/ DU	11,550 GPD	0.01 MGD	13 AFY
12	MDR	R-2	15	2.31	34 DU	165 GPD/ DU	5,610 GPD	0.01 MGD	6 AFY
13	HDR	R-3	30	4.73	141 DU	120 GPD/ DU	16,920 GPD	0.02 MGD	19 AFY
14	HDR	R-3	30	4.21	126 DU	120 GPD/ DU	15,120 GPD	0.02 MGD	17 AFY
15	HDR	R-3	30	8.86	265 DU	120 GPD/ DU	31,800 GPD	0.03 MGD	36 AFY
15A	HDR	R-3	30	0.02	1 DU	120 GPD/ DU	120 GPD	0.00 MGD	0 AFY
16	MDR	R-2	15	10.7	159 DU	165 GPD/ DU	26,235 GPD	0.03 MGD	29 AFY
16A	MDR	R-2	15	0.01	- DU	165 GPD/ DU	- GPD	- MGD	- AFY
24	Public/ Institutional (PI)	EV/IP	0.5 Floor Area Ratio (FAR)	6.94	151,048 SF	3,000 GPD/ Acre	10,403 GPD	0.01 MGD	12 AFY
TOTAL				**80.1**	**acres**		**233,693 GPD**	**0.23 MGD**	**262 AFY**
Between W San Bernardino Avenue and W Pennsylvania Ave									
17	MDR	R-2	15	14.1	210 DU	165 GPD/ DU	34,650 GPD	0.03 MGD	39 AFY
18	HDR	R-3	30	5	150 DU	120 GPD/ DU	18,000 GPD	0.02 MGD	20 AFY
19	HDR	R-3	30	6.31	189 DU	120 GPD/ DU	22,680 GPD	0.02 MGD	25 AFY
TOTAL				**25.4**	**acres**		**75,330 GPD**	**0.08 MGD**	**84 AFY**
Between W Lugonia Ave and W Brockton Ave									
20	MDR	R-2	15	4.76	71 DU	165 GPD/ DU	11,715 GPD	0.01 MGD	13 AFY
21	MDR	R-2	15	1.64	24 DU	165 GPD/ DU	3,960 GPD	0.00 MGD	4 AFY
TOTAL				**6.4**	**acres**		**15,675 GPD**	**0.02 MGD**	**18 AFY**
Between E San Bernardino Avenue and E Pennsylvania Ave									
22	HDR	R-3	27	0.33	9 DU	120 GPD/ DU	1,080 GPD	0.001 MGD	1 AFY
23	HDR	R-3	27	3.96	118 DU	120 GPD/ DU	14,160 GPD	0.01 MGD	16 AFY
TOTAL				**4.29**	**acres**		**15,240 GPD**	**0.02 MGD**	**17 AFY**
OVERALL TOTAL				**116**	**acres**		**339,938 GPD**	**0.34 MGD**	**381 AFY**

APPENDIX C

SEWER CAPACITY CALCULATIONS

Figure 4.11: Results of Long-Term (2045) Capacity Evaluation – Improvements



Existing 18-inch sewer in W. Lugonia Ave. (west of Alabama St. to Nevada St.)

Cells that are highlighted can be changed

GIVEN:

Qgiven=	**3.550**	cfs	*<== Discharge*
n=	**0.013**		*<== Roughness coefficient*
S=	**0.0014**		*<== Slope V:H*
r=	**0.750**	ft	*<== Radius*

TRIAL DEPTH:

h= **13.500** in *<== Vary this depth to get $Q_{assume} = Q_{given}$*

1.125 ft

CACULATIONS:

beta=	120.00	degree
R=	0.453	ft
C=	99.239	
V=	2.498	ft/sec
A=	1.422	sq. ft.
Q_{assume}=	3.551	cfs
$Q_{halffull}$ =	**1.92**	**cfs**

Existing sewer flows, based on 1/2-full per 2021 Sewer Master Plan for Future Conditions

Allowable peak dry-weather sewer flows, based on 2024 Sewer Specifications

$Q_{3/4full}$ = 3.55 cfs

RESULT:

(Qgiven-Qassume) / Qgiven %= 0% <======= **OK**

Flow Depth (in) =	**13.500**
Capacity d/r =	**150.00%**
$Q_{capacity}$ =	**3.551 cfs**
Capacity $Q_{given}/Q_{capacity}$ =	**99.97%**

3.55 cfs - 1.92 cfs = 1.63 cfs additional peak dry-weather flows allowed (= 1.05 MGD)

($Q_{halffull}$ =	1.92	**cfs**	**($Q_{3/4full}$ =**	3.55	**cfs**
$beta_{halffull}$=	90.000	degree	$beta_{3/4full}$=	120.00	degree
$R_{halffull}$ =	0.375	ft	$R_{3/4full}$=	0.453	ft
$C_{halffull}$ =	94.958	ft	$C_{3/4full}$=	99.239	ft
$A_{halffull}$ =	0.884	sq. ft.	$A_{3/4full}$=	1.422	sq. ft.
$V_{halffull}$ =	2.176	ft/sec)	$V_{3/4full}$=	2.498	ft/sec)

Existing 21-inch sewer in Nevada Street (Orange Ave. to W. Park Ave. & I-10 to W. Lugonia Ave.) & San Bernardino Ave. (Texas St. to Foothill Freeway (210))

Cells that are highlighted can be changed

GIVEN:

Qgiven=	**5.000**	cfs	*<== Discharge*
n=	**0.013**		*<== Roughness coefficient*
S=	**0.0012**		*<== Slope V:H*
r=	**0.875**	ft	*<== Radius*

TRIAL DEPTH:

h=	**15.750**	in	*<== Vary this depth to get Q_{assume} = Q_{given}*
	1.313	ft	

CACULATIONS:

beta=	120.00	degree
R=	0.528	ft
C=	102.569	
V=	2.582	ft/sec
A=	1.935	sq. ft.
Q_{assume}=	4.996	cfs
$Q_{halffull}$ =	**2.71**	**cfs**

Existing sewer flows, based on 1/2-full per 2021 Sewer Master Plan for Future Conditions

Allowable peak dry-weather sewer flows, based on 2024 Sewer Specifications

$Q_{3/4full}$ = 5.00 cfs

RESULT:

(Qgiven-Qassume) / Qgiven %= 0% <======= **OK**

Flow Depth (in) =	**15.750**
Capacity d/r =	**150.00%**
$Q_{capacity}$ =	**4.996 cfs**
Capacity $Q_{given}/Q_{capacity}$ =	**100.09%**

5.0 cfs - 2.71 cfs = 2.29 cfs additional peak dry-weather flows allowed (= 1.48 MGD)

($Q_{halffull}$ =	2.71	**cfs**	**($Q_{3/4full}$ =**	5.00	**cfs**
$beta_{halffull}$=	90.000	degree	$beta_{3/4full}$=	120.00	degree
$R_{halffull}$ =	0.438	ft	$R_{3/4full}$=	0.528	ft
$C_{halffull}$ =	98.330	ft	$C_{3/4full}$=	102.569	ft
$A_{halffull}$ =	1.203	sq. ft.	$A_{3/4full}$=	1.935	sq. ft.
$V_{halffull}$ =	2.254	ft/sec)	$V_{3/4full}$=	2.582	ft/sec)

Existing 24-inch sewer in Nevada Street (W. Park Ave. to I-10)
& San Bernardino Avenue west of Foothill Freeway (210)

Cells that are highlighted can be changed

GIVEN:

Qgiven=	**6.540**	cfs	*<== Discharge*
n=	**0.013**		*<== Roughness coefficient*
S=	**0.0010**		*<== Slope V:H*
r=	**1.000**	ft	*<== Radius*

TRIAL DEPTH:

h=	**18.000**	in	*<== Vary this depth to get $Q_{assume} = Q_{given}$*
	1.500	ft	

CACULATIONS:

beta=	120.00	degree
R=	0.603	ft
C=	105.367	
V=	2.588	ft/sec
A=	2.527	sq. ft.
Q_{assume}=	6.541	cfs
$Q_{halffull}$ =	**3.55**	**cfs**

Existing sewer flows, based on 1/2-full per 2021 Sewer Master Plan for Future Conditions

Allowable peak dry-weather sewer flows, based on 2024 Sewer Specifications

$Q_{3/4full}$ = 6.54 cfs

RESULT:

(Qgiven-Qassume) / Qgiven %= 0% <======== **OK**

Flow Depth (in) =	**18.000**	
Capacity d/r =	**150.00%**	
$Q_{capacity}$ =	**6.541**	**cfs**
Capacity $Q_{given}/Q_{capacity}$ =	**99.98%**	

6.54 cfs - 3.55 cfs = 2.99 cfs additional peak dry-weather flows allowed (= 1.93 MGD)

($Q_{halffull}$ =	3.55	**cfs**	**($Q_{3/4full}$ =**	6.54	**cfs**
$beta_{halffull}$=	90.000	degree	$beta_{3/4full}$=	120.00	degree
$R_{halffull}$ =	0.500	ft	$R_{3/4full}$=	0.603	ft
$C_{halffull}$ =	101.116	ft	$C_{3/4full}$=	105.367	ft
$A_{halffull}$ =	1.571	sq. ft.	$A_{3/4full}$=	2.527	sq. ft.
$V_{halffull}$ =	2.261	ft/sec)	$V_{3/4full}$=	2.588	ft/sec)

Existing 27-inch sewer in Nevada Street, north of Palmetto Avenue & San Bernardino Ave, east of Foothill Freeway (I-210))

Cells that are highlighted can be changed

GIVEN:

Qgiven=	**8.030**	cfs	*<== Discharge*
n=	**0.013**		*<== Roughness coefficient*
S=	**0.0008**		*<== Slope V:H*
r=	**1.125**	ft	*<== Radius*

TRIAL DEPTH:

h=	**20.250**	in	*<== Vary this depth to get Q_{assume} = Q_{given}*
	1.688	ft	

CACULATIONS:

beta=	120.00	degree
R=	0.679	ft
C=	107.713	
V=	2.510	ft/sec
A=	3.199	sq. ft.
Q_{assume}=	8.029	cfs

$Q_{halffull}$ =	**4.37 cfs**	**$Q_{3/4full}$ =**	**8.03 cfs**

RESULT:

(Qgiven-Qassume) / Qgiven %= 0% **<======== OK**

Flow Depth (in) =	**20.250**
Capacity d/r =	**150.00%**
$Q_{capacity}$ =	**8.029 cfs**
Capacity $Q_{given}/Q_{capacity}$ =	**100.01%**

($Q_{halffull}$ =	4.37 **cfs**	**($Q_{3/4full}$ =**	8.03 **cfs**
$beta_{halffull}$=	90.000 degree	$beta_{3/4full}$=	120.00 degree
$R_{halffull}$ =	0.563 ft	$R_{3/4full}$=	0.679 ft
$C_{halffull}$ =	103.491 ft	$C_{3/4full}$=	107.713 ft
$A_{halffull}$ =	1.988 sq. ft.	$A_{3/4full}$=	3.199 sq. ft.
$V_{halffull}$ =	2.196 ft/sec)	$V_{3/4full}$=	2.510 ft/sec)

Existing 30-inch sewer in Nevada Street (W. Lugonia Ave. to Palmetto Ave.)

Cells that are highlighted can be changed

GIVEN:

Qgiven=	**9.970**	cfs	*<== Discharge*
n=	**0.013**		*<== Roughness coefficient*
S=	**0.0007**		*<== Slope V:H*
r=	**1.250**	ft	*<== Radius*

TRIAL DEPTH:

h=	**22.500**	in	*<== Vary this depth to get $Q_{assume} = Q_{given}$*
	1.875	ft	

CACULATIONS:

beta=	120.00	degree
R=	0.754	ft
C=	109.870	
V=	2.525	ft/sec
A=	3.949	sq. ft.
Q_{assume}=	9.969	cfs
$Q_{halffull}$ =	**5.42**	**cfs**

Existing sewer flows, based on 1/2-full per 2021 Sewer Master Plan for Future Conditions

Allowable peak dry-weather sewer flows, based on 2024 Sewer Specifications

$Q_{3/4full}$ = 9.97 cfs

RESULT:

(Qgiven-Qassume) / Qgiven %= 0% <======= **OK**

Flow Depth (in) =	**22.500**
Capacity d/r =	**150.00%**
$Q_{capacity}$ =	**9.969 cfs**
Capacity $Q_{given}/Q_{capacity}$ =	**100.01%**

9.97 cfs - 5.42 cfs = 4.55 cfs additional peak dry-weather flows allowed (= 2.94 MGD)

($Q_{halffull}$ =	5.42	**cfs**	**($Q_{3/4full}$ =**	9.97	**cfs**
$beta_{halffull}$=	90.000	degree	$beta_{3/4full}$=	120.00	degree
$R_{halffull}$ =	0.625	ft	$R_{3/4full}$=	0.754	ft
$C_{halffull}$ =	105.644	ft	$C_{3/4full}$=	109.870	ft
$A_{halffull}$ =	2.454	sq. ft.	$A_{3/4full}$=	3.949	sq. ft.
$V_{halffull}$ =	2.210	ft/sec)	$V_{3/4full}$=	2.525	ft/sec)