

# VALLECITOS WATER DISTRICT

## *PICO VILLAGE WATER AND SEWER STUDY*

*WORK ORDER # 266179*

FINAL TECHNICAL MEMORANDUM

April 6, 2023

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### **INTRODUCTION**

The proposed Pico Village project (Project) is a 16-unit multi-family residential development on 0.69-acres, located on Pico Avenue south of Mission Road and north of San Marcos Boulevard (APN's 220-140-05, 220-140-06 & 220-140-16).

The Project is located within Vallecitos Water District's (VWD) boundaries for water and wastewater service. The property does not need to annex, both water and wastewater services can be provided by VWD.

All new projects undergo evaluation by VWD to determine if the current water and sewer infrastructure is sufficient to accommodate the proposed water demands and sewage generation.

This study projects water demand and sewage generation increases due to the project densification. It analyzes the following aspects of VWD's infrastructure and makes recommendations for capital improvements for impacts that are created due to the land use change:

- Water distribution system, including the need to upsize pipelines, install new pipelines, or install flow control facilities.
- Water storage, including the need for additional storage and the adequacy of existing storage tanks and reservoirs to serve the proposed development.
- Water pump stations, including the need to install new pump stations or upsize existing pump stations to serve the proposed development.
- Wastewater collection system, including the need to upsize pipelines and manholes, or the need to install new pipelines and manholes.
- Wastewater lift stations, including the need to install new lift stations or upsize existing lift stations to serve the proposed development.
- Wastewater land outfall, including the need to construct a parallel land outfall to serve this and other proposed developments.

- Wastewater treatment facilities, including the need for obtaining additional capacity at the Encina Water Pollution Control Facility (EWPCF) or for expanding the Meadowlark Water Reclamation Facility (MRF).
- Existing VWD water and/or sewer facilities not being utilized for proposed development will need to be abandoned per VWD Standards and Specifications. Asbestos cement pipe shall be properly removed and legally disposed of by the Developer.

**WATER SYSTEM ANALYSIS**

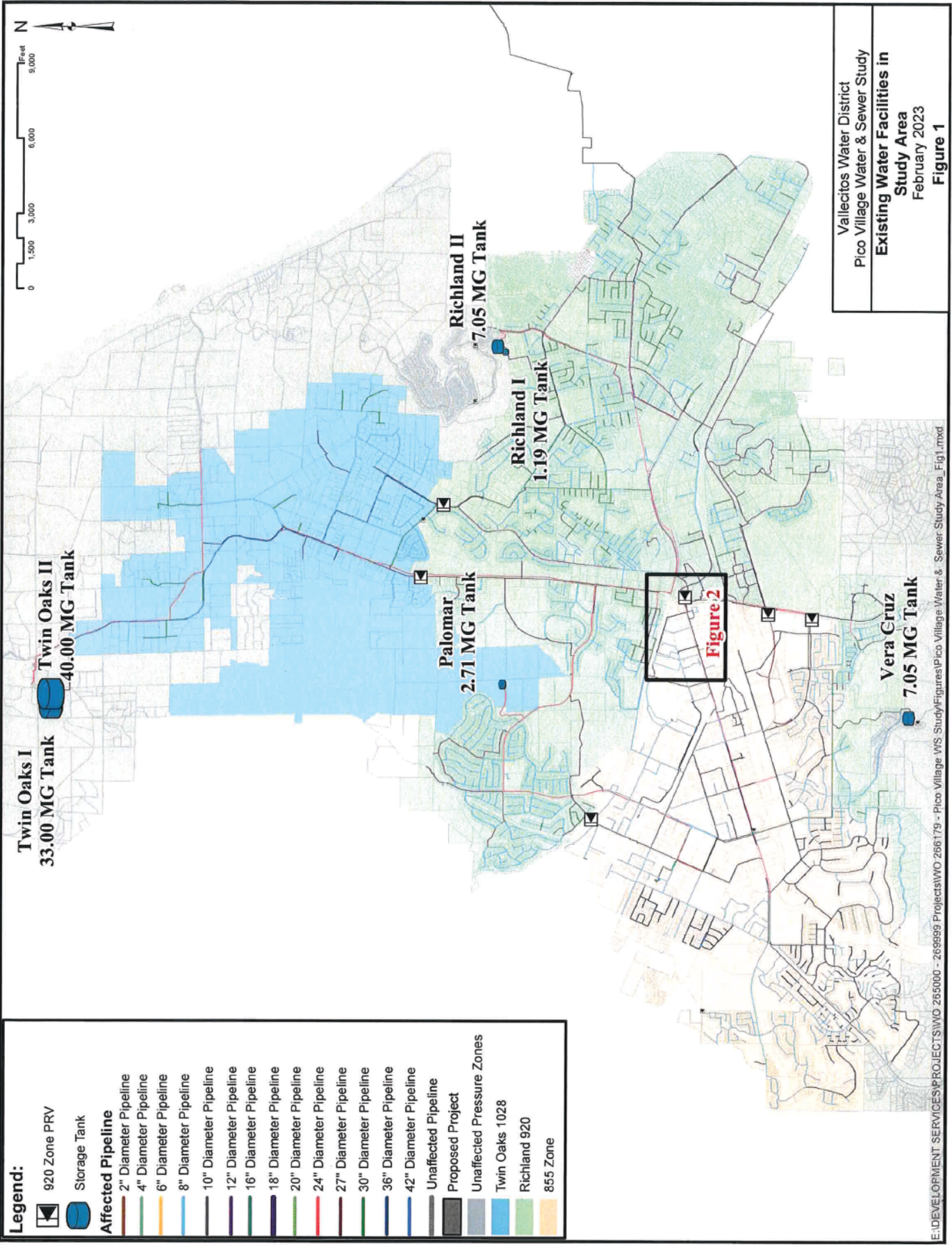
The proposed 0.69-acre Project lies completely within VWD’s 855 Pressure Zone. Figures 1 and 2 show the development’s location in relation to pressure zone boundaries, identify pipelines within the vicinity of the development, and identify storage reservoirs that supply the development area.

***Water Demand Projections***

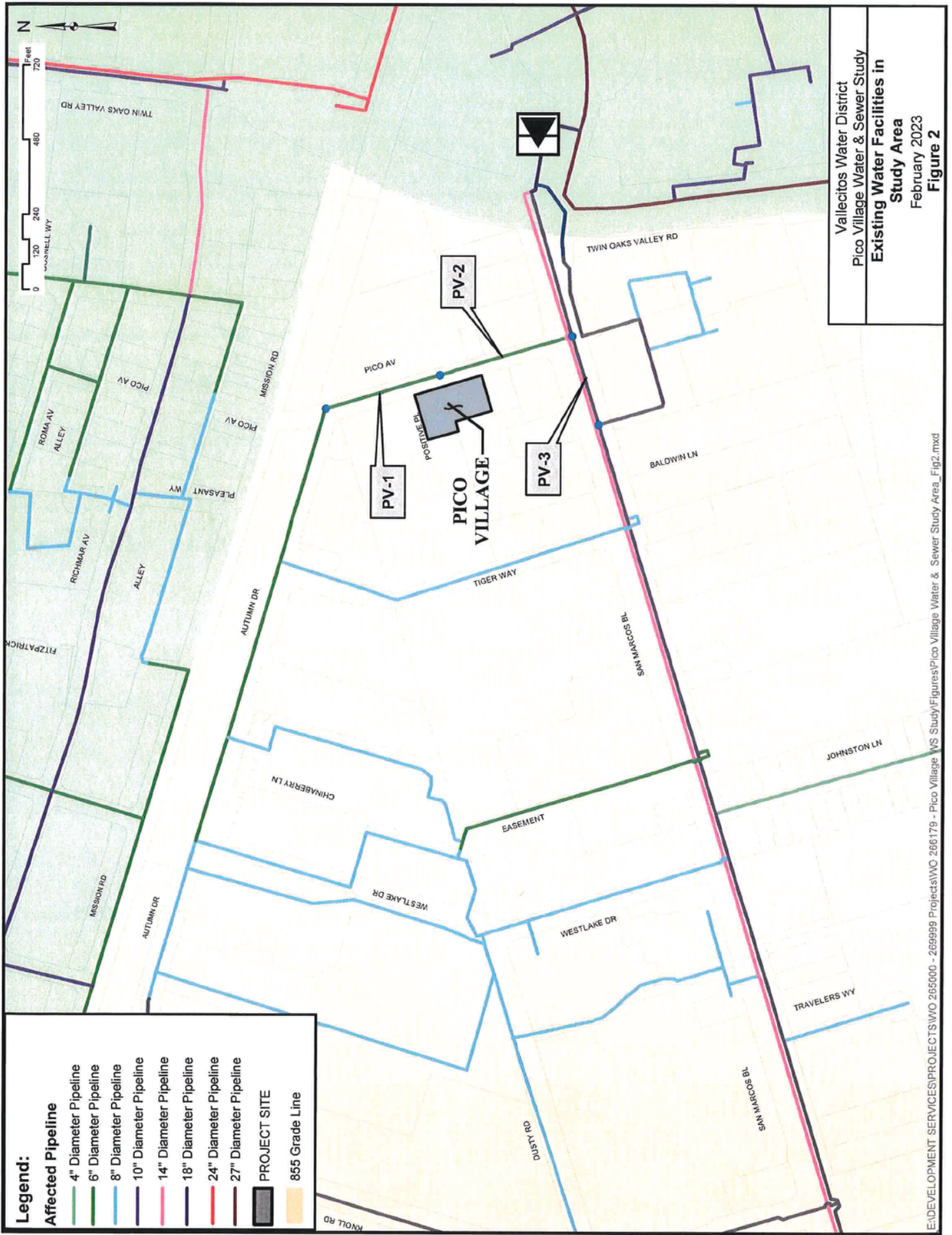
The City of San Marcos’ approved land use designation for the proposed Project is Commercial and Residential 3-6 (R-3-6). The 2018 Master Plan based its ultimate water demand planning on Public Facilities. Table 1 provides the average water demand generated both under the density planned for the 2018 Master Plan and for the proposed Project. The table shows that Pico Village will increase the projected average water demand from the 2018 Master Plan land use by **3,450** gallons per day.

**Table 1 – Project Estimated Water Demands for Pico Village**

Land Use Type	Area (acres)	Residential Units	Duty Factor (gpd/ac)	Water Demand (gpd)
<b>2018 Master Plan Land Use Demand</b>				
Public Facilities	0.69		1,000	690
<b>Total</b>	<b>0.69</b>			<b>690</b>
<b>Proposed Project Demand</b>				
Residential (20-30 du/ac)	0.69	16	6,000	4,140
<b>Total</b>	<b>0.69</b>			<b>4,140</b>
<b>Water Demand Increase</b>				<b>3,450</b>



Vallecitos Water District  
Pico Village Water & Sewer Study  
**Existing Water Facilities in Study Area**  
February 2023  
**Figure 1**



Vallecitos Water District  
 Pico Village Water & Sewer Study  
**Existing Water Facilities in  
 Study Area**  
 February 2023  
**Figure 2**

### ***Water Distribution System Analysis***

The 2018 Master Plan water system distribution and pressure criteria are as follows:

#### *Water Distribution Infrastructure Criteria*

The water service pressure criteria to be met by this development are as follows:

- Minimum allowable pressure at peak hour demand: 40 psi
- Minimum allowable pressure at max day plus fire demand: 20 psi
- Maximum allowable pressure: 150 psi

The City of San Marcos Fire Marshall has set the required fire demand at 935 gpm for the Project.

To avoid excessive velocity and headloss within the distribution system, the following pipeline design criteria was also utilized:

- Maximum allowable velocity: 7 feet per second
- Maximum allowable headloss gradient: 15 feet per 1,000 feet
- Hazen-Williams C-factor: 130

#### *Water Model Scenarios*

The following scenarios were modeled to identify system impacts that may be created by the proposed water demands, and to recommend any improvements required to provide service to the Project:

- Average Day Demand with existing demands at the Project site
- Average Day Demand with the proposed Project
- Maximum Day Demand with existing demands at the Project site
- Maximum Day Demand with the proposed Project
- Peak Hour Demand with existing demands at the Project site
- Peak Hour Demand with the proposed Project
- Maximum Day Demand plus Fire Flow with existing demands at the Project site
- Maximum Day Demand plus Fire Flow with the proposed Project

Per the 2018 Master Plan, maximum day demands for this project are 300% those of average day demands, and peak hour demands are 620% those of average day demands.

*Water Model Results*

Modeling focused on the infrastructure in the direct vicinity of the Project as shown in Figure 2. The model found the Project did not create any distribution system deficiencies under average day demand or during maximum day plus fire flow demand conditions. See Table 2 below for results:

**Table 2– Potable Water Pipeline Results under Maximum Day Demand Plus Fire Flow**

Pipe ID Number	Length (ft)	Existing Pipe Diameter (in)	Velocity under Average Day Demand (ft/s)	Velocity under Maximum Day + Fire Flow (ft/s)	Upsized Pipe Diameter (in)	Velocity under Maximum Day + Fire Flow w/ Upsized Pipe (ft/s)
PV-1	374	6	1.46	4.00	-	-
PV-2	451	6	1.46	6.78	-	-
PV-3	613	10	2.88	2.58	-	-

**Water Storage Analysis**

The 2018 Master Plan outlines VWD’s potable water storage reservoirs for each pressure zone as follows:

1.5 times ADD (operational storage) + 3.0 times ADD (emergency storage) + fire flow demand = 4.5 times ADD + fire flow demand

OR

5.0 times ADD, whichever is greater.

The Project is located entirely within the VWD 855 pressure zone. Water storage for this zone is located within the 920 zone and 1028 Twin Oaks pressure zones, as shown in Figure 1. Table 3 shows the required storage in the 855, 920, and 1028 Twin Oaks pressure zones for existing and ultimate build-out (Master Plan) conditions relative to the existing storage provided within each zone.

**Table 3 – Existing Reservoir Storage Capacity and Requirements**

Pressure Zone	Existing ADD (MGD)	Existing Storage Requirement (MG)	Ultimate ADD (MGD)	Ultimate Storage Requirement (MG)	Existing Storage Available (MG)
855	3.74	50.05	6.79	101.25	0
920	5.61		10.40		18
1028 Twin Oaks	0.66		3.06		73
<b>Totals</b>	10.01	<b>50.05</b>	20.25	<b>101.25</b>	<b>91</b>

The Project will increase the projected average water demand by approximately **3,450** gallons per day as shown in Table 1.

The amount of additional reservoir storage required is 500% of the development’s average day demand or:

$$3,450 \text{ gallons} * 500\% = 17,250 \text{ gallons}$$

The analysis finds that water storage capacity is currently available to serve the Project’s increased storage requirements. Master Plan projects address and accommodate the ultimate build-out storage deficiency and Water Capital Facility Fees paid by this project will be used for the increase in storage necessitated by the Project’s demand calculated above.

**Water Pump Station Analysis**

Since the proposed Project is located in a pressure zone that is not served by pumping, there are no impacts to existing or proposed pump stations by this Project.

**WASTEWATER SYSTEM ANALYSIS**

The proposed 0.69-acre Project lies completely within VWD sewer shed 16C. Figures 3 through 5 show the development’s location in relation to sewer shed boundaries, identify wastewater infrastructure within the vicinity of the development, and identify the downstream collection infrastructure that will be impacted by the development.

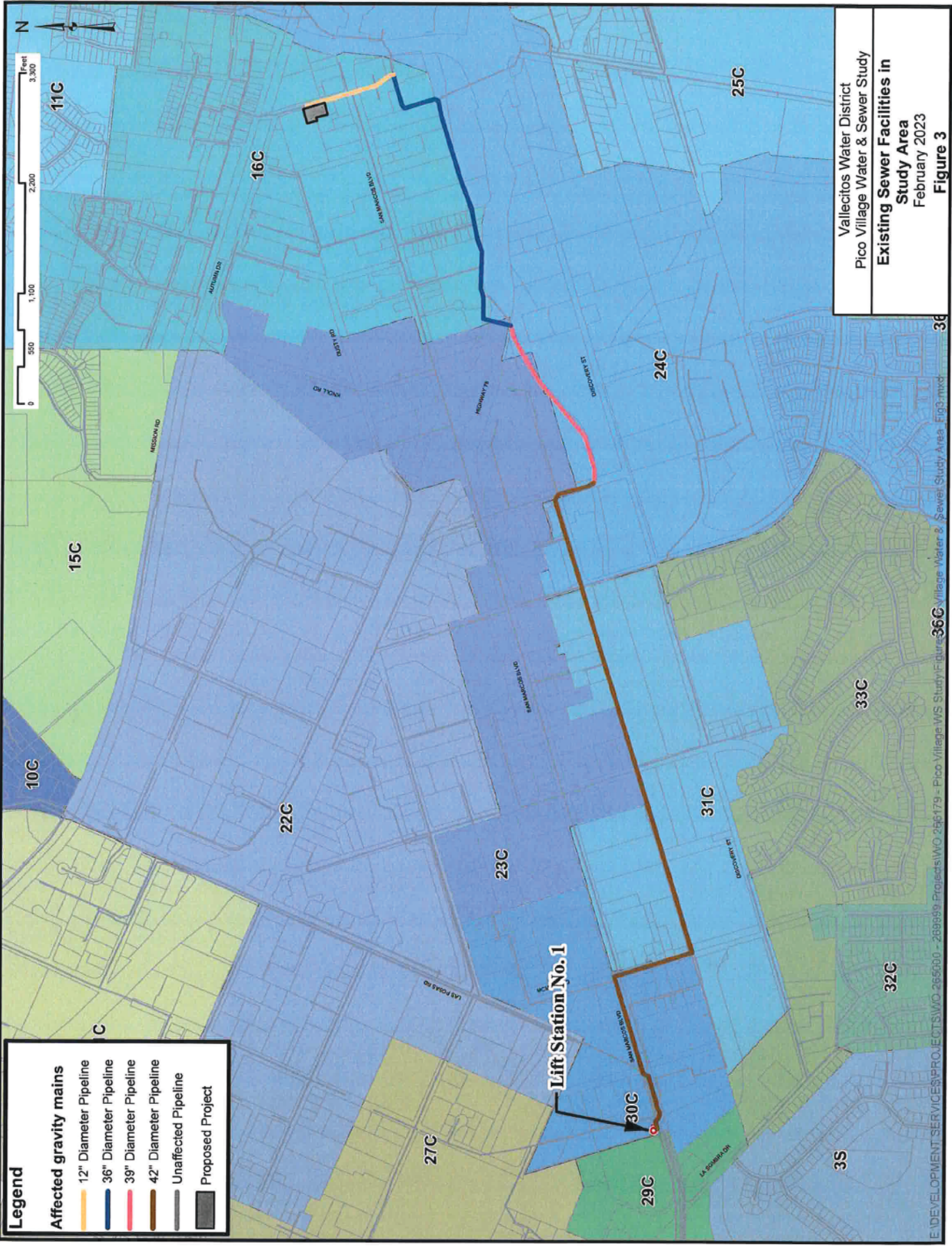
***Wastewater Flow Projections***

The Project property’s City of San Marcos approved land use designation for the proposed Project is Commercial Space and Residential 3-6 (R-3-6). The 2018 Master Plan based its ultimate wastewater generation planning on Public Facilities. Table 4 provides the average wastewater flow generated both under the density planned for the 2018 Master Plan and with the proposed Project. The table shows Pico Village project will increase the projected average wastewater generation from the 2018 Master Plan land use by **2,553** gallons per day.

**Table 4 – Project Estimated Wastewater Flows for Pico Village**

Land Use Type	Area (acres)	Residential Units	Duty Factor (gpd/ac)	Wastewater Flow (gpd)
<b>2018 Master Plan Land Use Flows</b>				
Public Facilities	<b>0.69</b>		800	552
<b>Total</b>	<b>0.69</b>			<b>552</b>
<b>Proposed Project Demand</b>				
Residential (20-30 du/ac)	0.69	16	4,500	3,105
<b>Total</b>	<b>0.69</b>			<b>3,105</b>
<b>Sewer Generation Increase</b>				<b>2,553</b>



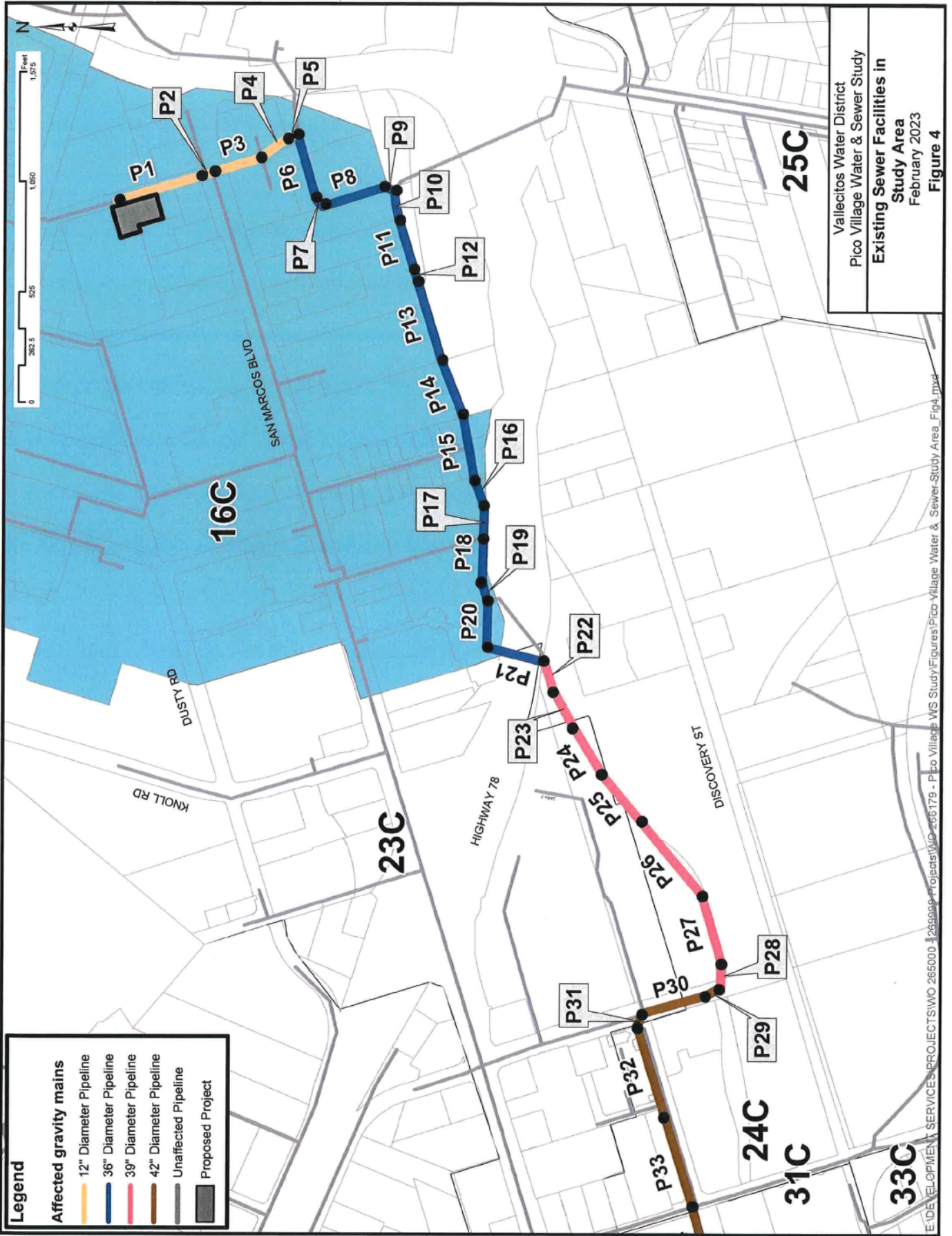


**Legend**

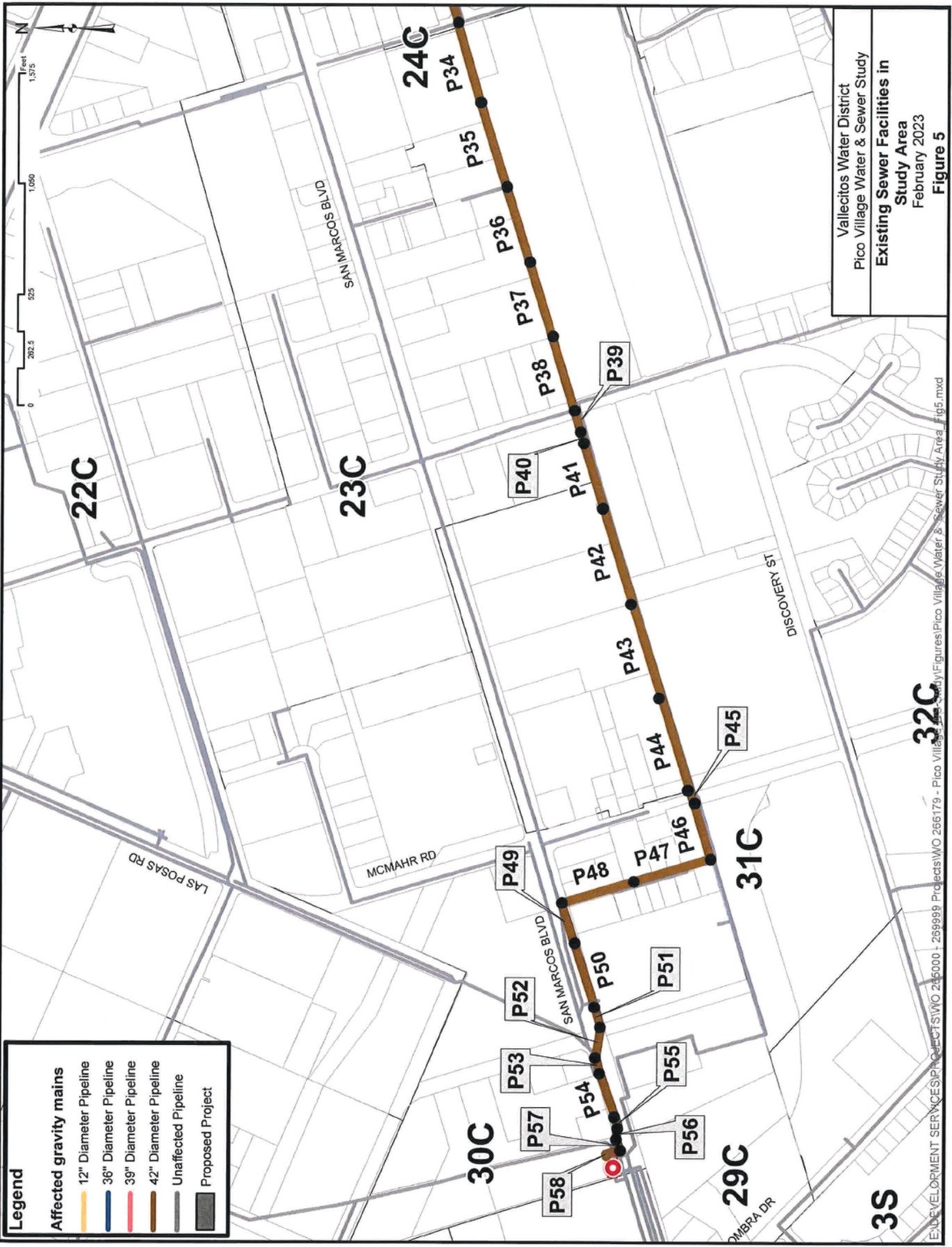
**Affected gravity mains**

- 12" Diameter Pipeline
- 36" Diameter Pipeline
- 38" Diameter Pipeline
- 42" Diameter Pipeline
- Unaffected Pipeline
- Proposed Project

Vallecitos Water District  
 Pico Village Water & Sewer Study  
**Existing Sewer Facilities in  
 Study Area**  
 February 2023  
**Figure 3**



Vallecitos Water District  
 Pico Village Water & Sewer Study  
**Existing Sewer Facilities in  
 Study Area**  
 February 2023  
**Figure 4**



**Legend**

- Affected gravity mains
  - 12" Diameter Pipeline
  - 36" Diameter Pipeline
  - 39" Diameter Pipeline
  - 42" Diameter Pipeline
- Unaffected Pipeline
- Proposed Project

Vallecitos Water District  
 Pico Village Water & Sewer Study  
**Existing Sewer Facilities in  
 Study Area**  
 February 2023  
**Figure 5**

### ***Wastewater Collection System Analysis***

The 2018 Master Plan outlines VWD's wastewater system design criteria which are as follows:

#### *Wastewater Collection Infrastructure Criteria*

The wastewater pipeline criteria to be met both within and downstream of the development are as follows:

- Pipes 12 inches in diameter and smaller: ½ full maximum at peak flow
- Pipes over 12 inches in diameter: ¾ full maximum at peak flow
- Minimum velocity: 2 feet per second
- Maximum velocity: 10 feet per second
- Manning's n for gravity pipes: .013
- Hazen-Williams C-factor for force mains/siphons: 120
- Slope for pipes 8 inches in diameter and smaller: 0.4% minimum
- Slope for pipes over 8 inches in diameter: to be determined by VWD

When flow depth in gravity pipes exceeds maximum levels as stated above, a pipe upsize will be specified.

#### *Wastewater Model Scenarios*

The following scenarios were modeled to identify system impacts that may be created by the proposed sewer generation, and to recommend any improvements required to provide service to the Project:

- Average Dry Weather Flow with existing flows at the Project site
- Average Dry Weather Flow with the proposed Project
- Peak Dry Weather Flow with existing flows at the Project site
- Peak Dry Weather Flow with the proposed Project
- Peak Wet Weather Flow with existing flows at the Project site
- Peak Wet Weather Flow with the proposed Project

The peak dry weather curve is:

$$\text{Peak Dry Weather Factor} = 2.16 \times (\text{Average Dry Weather Flow Rate})^{-0.1618}$$

The wet weather peak curve is:

$$\text{Peak Wet Weather Factor} = 2.78 \times (\text{Average Dry Weather Flow Rate})^{-0.087}$$

Wastewater Model Results

Modeling focused not only on the sewer collection infrastructure in the direct vicinity of the Project, but also on all downstream infrastructure from the development to Lift Station No. 1 on San Marcos Boulevard that would be impacted by the proposed Project flows (see Figures 3 - 5).

Table 5 presents a summary of the modeling results from this analysis. The modeling results showed that no deficiencies were identified under the currently approved density under peak wet weather flows during ultimate build-out conditions.

**Pico Village Table 5 - Wastewater Model Results and Recommended Gravity Main Improvements**

Pipe ID Number	Length (ft)	Diameter (in)	Slope	Wastewater Flows with Existing Density				Wastewater Flows with Proposed Density					
				Peak Wet Weather Flow (gpm)	PWWF Depth-to-Diameter Ratio	Replacement Diameter (in)	Replacement PWWF Depth-to-Diameter Ratio	Peak Wet Weather Flow (gpm)	PWWF Depth-to-Diameter Ratio	Replacement Diameter (in)	Replacement PWWF Depth-to-Diameter Ratio		
P-1	414	12	0.0040	342	0.41					351	0.41		
P-2	39	12	0.0030	351	0.45					360	0.45		
P-3	246	12	0.0100	355	0.33					364	0.33		
P-4	184	12	0.0400	355	0.23					364	0.23		
P-5	23	12	0.1830	355	0.16					364	0.16		
P-6	318	36	0.0040	6340	0.40					6,349	0.40		
P-7	39	36	0.0040	6342	0.40					6,351	0.40		
P-8	319	36	0.0040	6346	0.40					6,355	0.40		
P-9	38	36	0.0040	6348	0.40					6,357	0.40		
P-10	139	36	0.0040	8460	0.47					8,469	0.47		
P-11	294	36	0.0030	8,464	0.51					8,473	0.51		
P-12	12	36	0.0170	8,465	0.32					8,474	0.32		
P-13	438	36	0.0050	8,472	0.44					8,481	0.45		
P-14	229	36	0.0050	8,479	0.45					8,488	0.45		
P-15	371.2	36	0.0060	8,486	0.42					8,495	0.42		
P-16	123.6	36	0.0050	8,491	0.45					8,500	0.45		
P-17	167.2	36	0.0050	8,496	0.45					8,505	0.45		
P-18	201	36	0.0040	8,793	0.48					8,802	0.48		
P-19	91	36	0.0050	8,801	0.45					8,810	0.45		
P-20	220	36	0.0050	8,801	0.45					8,810	0.45		
<b>PROPOSED DENSITY:</b>											<b>9</b>	<b>GPM</b>	

**Pico Village Table 5 - Wastewater Model Results and Recommended Gravity Main Improvements**

Pipe ID Number	Length (ft)	Diameter (in)	Slope	Wastewater Flows with Existing Density				Wastewater Flows with Proposed Density					
				Peak Wet Weather Flow (gpm)	PWWF Depth-to-Diameter Ratio	Replacement Diameter (in)	Replacement PWWF Depth-to-Diameter Ratio	Peak Wet Weather Flow (gpm)	PWWF Depth-to-Diameter Ratio	Replacement Diameter (in)	Replacement PWWF Depth-to-Diameter Ratio		
P-21	286	36	0.0050	8805	0.45					8,814	0.45		
P-22	210	39	0.0040	8871	0.43					8,880	0.43		
P-23	176	39	0.0030	8876	0.47					8,885	0.47		
P-24	271	39	0.0020	8881	0.53					8,890	0.53		
P-25	297	39	0.0020	8886	0.53					8,895	0.53		
P-26	452	39	0.0020	8891	0.53					8,900	0.53		
P-27	337	39	0.0020	8895	0.53					8,904	0.53		
P-28	123	39	0.0080	9088	0.36					9,097	0.36		
P-29	58	42	0.0040	9090	0.39					9,099	0.39		
P-30	308	42	0.0030	9093	0.42					9,102	0.42		
P-31	69	42	0.0010	9,095	0.58					9,104	0.59		
P-32	448	42	0.0030	9,098	0.42					9,107	0.43		
P-33	448	42	0.0030	9,103	0.42					9,112	0.43		
P-34	404	42	0.0060	9,460	0.36					9,469	0.36		
P-35	404	42	0.0060	9,465	0.36					9,474	0.36		
P-36	368	42	0.0030	9,472	0.43					9,481	0.43		
P-37	368	42	0.0030	9,476	0.43					9,485	0.43		
P-38	368	42	0.0030	9,479	0.43					9,488	0.43		
P-39	120	42	0.0020	9,504	0.49					9,513	0.49		
P-40	14	42	0.0030	9,504	0.44					9,513	0.44		
<b>PROPOSED DENSITY:</b>										<b>9</b>		<b>GPM</b>	

**Pico Village Table 5 - Wastewater Model Results and Recommended Gravity Main Improvements**

Pipe ID Number	Length (ft)	Diameter (in)	Slope	Wastewater Flows with Existing Density				Wastewater Flows with Proposed Density			
				Peak Wet Weather Flow (gpm)	PWWF Depth-to-Diameter Ratio	Replacement Diameter (in)	Replacement PWWF Depth-to-Diameter Ratio	Peak Wet Weather Flow (gpm)	PWWF Depth-to-Diameter Ratio	Replacement Diameter (in)	Replacement PWWF Depth-to-Diameter Ratio
P-41	352	42	0.0050	9506	0.38			9,515	0.38		
P-42	472	42	0.0040	9508	0.40			9,517	0.40		
P-43	429	42	0.0050	9510	0.38			9,519	0.38		
P-44	460	42	0.0040	9510	0.40			9,519	0.40		
P-45	9	42	0.0260	9510	0.25			9,519	0.25		
P-46	310	42	0.0050	9510	0.38			9,519	0.38		
P-47	372	42	0.0040	9516	0.40			9,525	0.40		
P-48	351	42	0.0050	9526	0.38			9,535	0.38		
P-49	209	42	0.0040	9526	0.40			9,535	0.40		
P-50	319	42	0.0040	9526	0.40			9,535	0.40		
P-51	94	42	0.0060	9,526	0.36			9,535	0.36		
P-52	112	42	0.0030	9,526	0.44			9,535	0.44		
P-53	138	42	0.0040	9,849	0.41			9,858	0.41		
P-54	347	42	0.0010	9,858	0.62			9,867	0.62		
P-55	18	42	0.0030	9,860	0.44			9,869	0.44		
P-56	10	42	0.0340	9,862	0.24			9,871	0.24		
P-57	10	42	0.0100	10,049	0.33			10,058	0.33		
P-58	73	42	0.0040	10,618	0.43			10,627	0.43		
<b>PROPOSED DENSITY:</b>											
										<b>9</b>	<b>GPM</b>



### ***Wastewater Lift Station Analysis***

Lift stations are sized for peak wet weather flow with manufacturer’s recommended cycling times for pumping equipment. Since the proposed Project is not located in a sewer shed that is served by a lift station, there are no lift station upgrade requirements for this project.

### ***Parallel Land Outfall Analysis***

VWD’s existing land outfall is shown in Figure 6. The outfall is approximately 8 miles in length and consists of 4 gravity pipeline sections and 3 siphon sections varying in diameter from 20 inches to 54 inches. VWD maintains the entire pipeline from Lift Station No. 1 to the Encina Water Pollution Control Facility (EWPCF). From Lift Station No. 1 to El Camino Real, VWD is the sole user of this pipeline. From El Camino Real to the EWPCF, the ownership capacity is as shown in Table 6 below:

**Table 6 – Land Outfall Capacity Ownership by Agency**

Agency	Ownership Percentage	Capacity (MGD)
Carlsbad	23.98%	5.00
Vista	17.99%	3.75
VWD	58.03%	12.10
<b>Totals</b>	<b>100.00%</b>	<b>20.85</b>

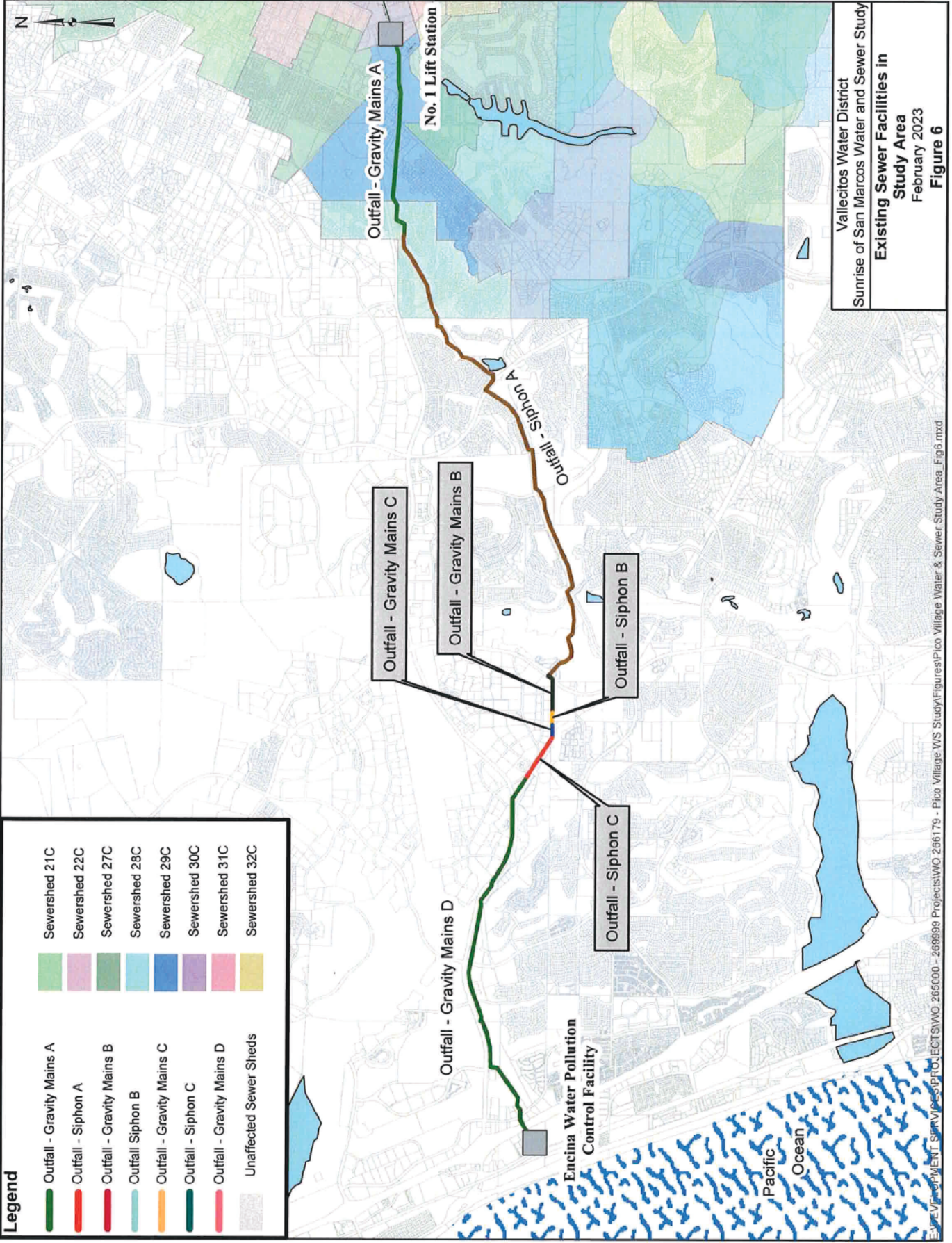
The Meadowlark Water Reclamation Facility (MRF) has a capacity of 5.0 MGD with a peak wet weather capacity of 8.0 MGD. Therefore, VWD has a combined peak wet weather wastewater collection capacity of 20.10 MGD (12.10 MGD + 8.0 MGD).

VWD’s 2014 average daily wastewater flow through the land outfall was 7.5 MGD. This corresponds to a peak wet weather flow of 17.5 MGD, which falls within VWD’s combined peak wet weather collection capacity.

The 2018 Master Plan estimated that, under approved land uses, VWD has an ultimate build-out average dry weather flow of 14.4 MGD. This corresponds to a peak wet weather flow of 31.7 MGD, which exceeds VWD’s combined peak wet weather collection capacity. To accommodate additional wastewater flows from planned development, the 2018 Master Plan recommended conveyance of peak flows to the EWPCF through a parallel land outfall.

The Project proposes to generate **2,553** gallons per day of additional average wastewater flow that was not accounted for in the Land Outfall’s capacity studied in the 2018 Master Plan.

The analysis finds that outfall capacity is currently available to serve the Project’s proposed wastewater generation. Wastewater Capital Facility Fees paid by this Project will be used toward design and construction of a parallel land outfall to be sized to accommodate ultimate build-out wastewater flows.



### ***Wastewater Treatment Facility Analysis***

VWD utilizes two wastewater treatment facilities to treat wastewater collected within its sewer service area.

- The Meadowlark Reclamation Facility (MRF) has liquids treatment capacity of up to 5.0 MGD with a peak wet weather capacity of 8.0 MGD. MRF does not have solids treatment capacity, and therefore all solids are treated at the Encina Water Pollution Control Facility (EWPCF).
- The EWPCF is located in the City of Carlsbad. This is a regional facility with treatment capacity of up to 40.51 MGD. VWD's current ownership capacity is noted below.

#### *Solids Treatment Capacity*

VWD currently owns 10.47 MGD of solids treatment capacity at EWPCF. VWD's 2014 average daily wastewater flow was 7.5 MGD. Therefore, the analysis finds that adequate solids treatment capacity exists at this time to serve the Project.

The ultimate average wastewater flow identified in the 2018 Master Plan is 14.4 MGD, resulting in a projected solids treatment capacity deficiency of 3.93 MGD. Wastewater Capital Facility Fees paid by this Project will be used towards the deficiency to accommodate the solid treatment capacity wastewater flow.

#### *Liquids Treatment Capacity*

VWD currently owns 7.67 MGD of liquids treatment capacity at the EWPCF in addition to the liquid's treatment capacity of 5.0 MGD at MRF for a total of 12.67 MGD of liquids treatment capacity. VWD's 2014 average daily wastewater flow was 7.5 MGD. Therefore, the analysis finds that adequate liquids treatment capacity exists at this time to serve the Project.

The ultimate average wastewater flow identified in the 2018 Master Plan is 14.4 MGD, resulting in a projected liquids treatment capacity deficiency of 1.73 MGD. Wastewater Capital Facility Fees paid by this Project will be used towards the deficiency to accommodate the ultimate average wastewater flow.

#### *Ocean Disposal Capacity*

VWD currently owns 10.47 MGD of ocean disposal capacity at the EWPCF. VWD's 2014 average daily wastewater flow was 7.5 MGD. Therefore, the analysis finds that adequate ocean disposal capacity exists at this time to serve the Project.

The ultimate average wastewater flow identified in the 2018 Master Plan is 14.4 MGD, resulting in an ocean disposal deficiency of 3.93 MGD. Wastewater Capital Facility Fees paid by this Project will be used towards the deficiency to accommodate the ocean disposal wastewater flow.

The District has determined that adequate wastewater treatment and disposal capacity exists for the proposed Project at this time subject to the qualifications referenced in the Conclusions and Conditions.

### **CONCLUSION AND CONDITIONS**

The proposed Pico Village Project is expected to increase average daily water demands by 3,450 gallons per day and wastewater flows by 2,553 gallons per day over the ultimate flows projected in the 2018 Master Plan.

The study concludes that the proposed development will result in the following impacts:

- An increase of 3,450 gallons per day in water demand for proposed project.
- An increase of 17,250 gallons of potable water storage requirement.
- An increase of 2,553 gallons per day in solids handling, liquids handling and ocean disposal capacity requirements at Encina Water Pollution Control Facility.
- An increase of 2,553 gallons per day in the parallel land outfall's capacity requirement.

The following conditions are required for providing service to the proposed Project:

- Payment of all applicable Water and Wastewater Capital Facility Fees in affect at the time service is committed in accordance with District rules and regulations.
- Construction and Board acceptance of all water and sewer facilities prior to service.

The District currently has water and sewer capacity available to serve the Project as proposed with the conditions herein addressed by the Developer. However, the ability to provide water and sewer service in the future depends upon ultimate build-out of the Project and could change depending upon the timing of the build-out, as well as build-outs of other development projects, continued reliable water supplies from the San Diego County Water Authority, the District's treatment capacity at the EWPCF and other factors affecting growth in the District which may change over time.

This Study is based on the current adopted land use utilized in VWD's 2018 Master Plan. The study addresses the incremental facility impacts of this Project only and does not include or consider any additional projects within VWD's service area that have deviated from adopted Master Plan land uses. Any land use changes upstream and/or downstream of the Study area may necessitate a revision of any onsite and offsite studies. VWD shall determine if and when revisions to the Study are necessary. Costs for revising this Study shall be borne by the Developer. The results of this study are not the accepted conditions for the development, final conditions shall be part of the construction agreement process or issued separately by the District.