

VALLECITOS WATER DISTRICT
ARTIS SENIOR LIVING WATER AND SEWER STUDY
WORK ORDER # 204962

FINAL TECHNICAL MEMORANDUM

October 31, 2018

Prepared By: Robert Scholl, P.E. and Eileen Koonce

INTRODUCTION

The proposed Artis Senior Living development (Project) is a 64-unit assisted living residential facility on 2.18 acres north of San Elijo Road and east of Rancho Santa Fe Road within the City of San Marcos (APN 223-651-01).

The Project property is located within the VWD water and sewer service boundaries. Both water and wastewater services are to be provided by the Vallecitos Water District (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)

WATER SYSTEM ANALYSIS

The proposed 2.18-acre Project lies completely within VWD's 750 Pressure Zone which is fed by the 877 Pressure Zone through the Northstar Pressure Reducing Station. 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 Project property's General Plan designation by the City of San Marcos as of June 30, 2008 was Light Industrial as part of the University Commons SPA. The 2008 Master Plan based its ultimate water demand planning on this approved land use. The Project proposes a density increase with a 64-unit assisted living facility on 2.18 acres.

Table 1 provides the average water demand generated both under the density planned for in the 2008 Master Plan and under the proposed Project densification. The table shows that the densification will increase the projected average water demand from the 2008 Master Plan land use by 4,730 gallons per day.

Table 1 – Project Estimated Water Demands

Land Use Type	Area (acres)	Assisted Living Residential Units	Duty Factor (gpd/acre)	Duty Factor (gpd/du)	Water Demand (gpd)
2008 Master Plan Land Use Demand					
Light Industrial	2.18		1,500		3,270
Total	2.18	-			3,270
Proposed Project Demand					
Assisted Living Facility	2.18	64		125	8,000
Total	2.18	-			8,000
Water Demand Increase					4,730

Legend:

750 Zone, Fallview PRV

Storage Tank

Affected Pipeline

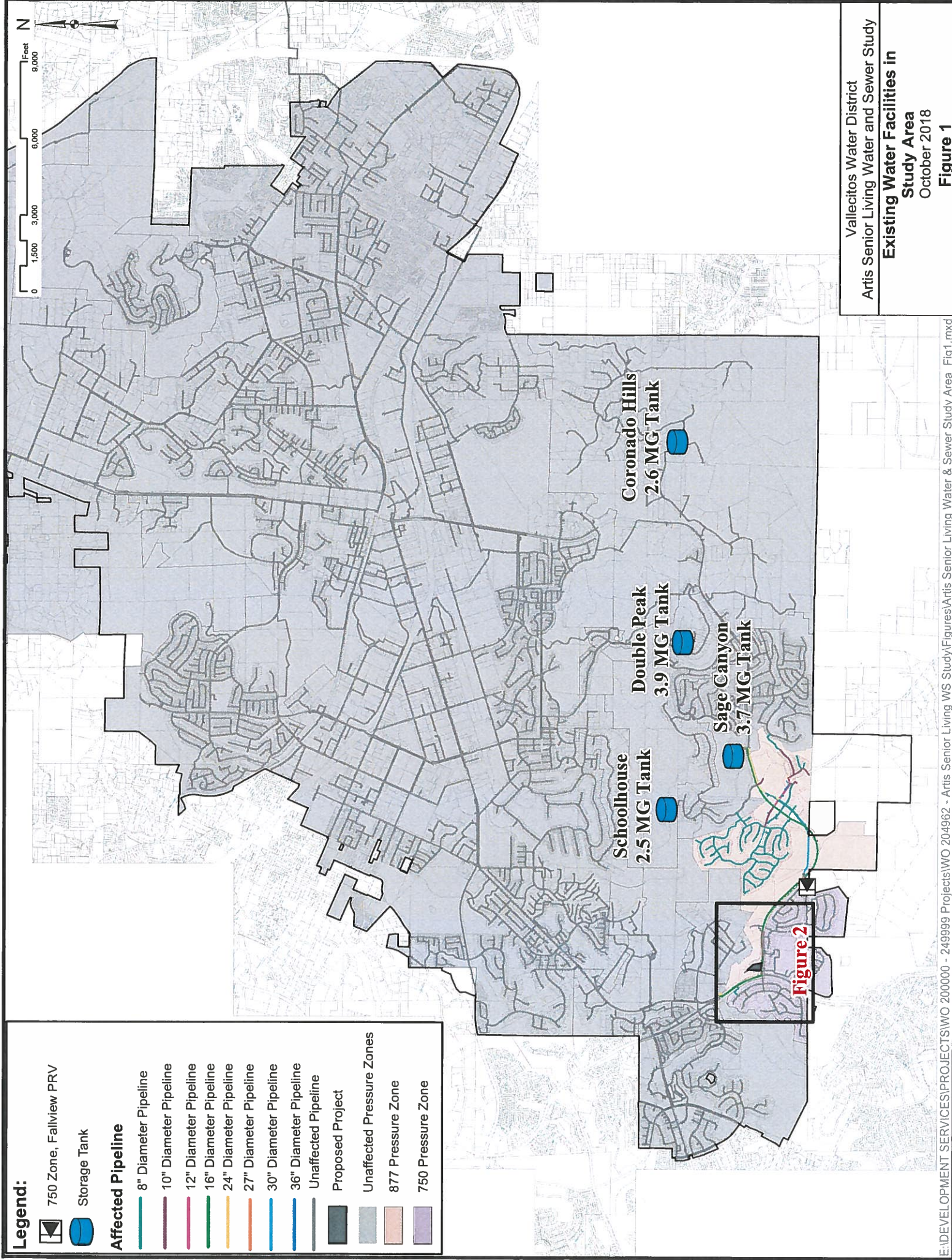
- 8" Diameter Pipeline
- 10" Diameter Pipeline
- 12" Diameter Pipeline
- 16" Diameter Pipeline
- 24" Diameter Pipeline
- 27" Diameter Pipeline
- 30" Diameter Pipeline
- 36" Diameter Pipeline
- Unaffected Pipeline

Proposed Project

Unaffected Pressure Zones

877 Pressure Zone

750 Pressure Zone



Water Distribution System Analysis

The 2008 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 1,500 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 2008 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. The model found that the Project did not create any distribution system deficiencies under average day demand or maximum day plus fire flow demand conditions. Table 2 presents a summary of the modeling results for this analysis.

Table 2 – Potable Water Pipeline Results under Maximum Day Demand plus Fire Flow Conditions

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)
A-1	298	12	0.02	4.30		
A-2	185	12	0.01	0.03		
A-3	74	12	0.01	0.03		
A-4	90	12	0.00	0.00		
A-5	70	12	0.00	0.00		
A-6	154	12	0.00	0.00		
A-7	122	12	0.00	0.00		
A-8	681	12	0.00	0.00		
A-9	157	10	0.01	4.27		
A-10	118	12	0.01	0.03		
A-11	524	12	0.00	0.00		

Water Storage Analysis

The 2008 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 750 pressure zone which is fed by the 877 pressure zone through the Northstar Pressure Reducing Station. Water storage for this zone is located within the 877, 1115, 1530 Coronado Hills and 1530 Double Peak pressure zones, as shown in Figure 1. Table 3 shows the required storage in the 877, 1115, 1530 Coronado Hills and 1530 Double Peak pressure zones for Year 2015 (current) and Year 2030 (Master Plan) relative to the existing storage provided within each zone.

Table 3 – Existing Reservoir Storage Capacity and Requirements

Pressure Zone	Year 2015 ADD (MGD)	Year 2015 Storage Requirement (MG)	Year 2030 ADD (MGD)	Year 2030 Storage Requirement (MG)	Existing Storage Available (MG)
877 Sage Canyon	0.79	3.97	0.79	3.97	3.71
1115 Schoolhouse	0.63	3.16	0.63	3.16	2.53
1530 Combined	1.90	9.63	1.90	9.63	6.41
Totals	3.32	16.76	3.32	16.76	12.65

The Project will increase the projected average water demand by approximately 4,730 gallons per day as shown in Table 1.

Therefore, the amount of additional reservoir storage required is 500% of the development's average day demand, or:

$$4,730 \text{ gallons} * 500\% = \mathbf{23,650 \text{ gallons}}$$

The analysis finds that water storage capacity is not currently available to serve the Project's increased storage requirements. Master Plan projects address and accommodate the Year 2030 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

Pump stations are sized to supply maximum day flows while meeting all pressure criteria within their service areas. The proposed development is within a pressure zone that is served by the San Elijo Hills Pump Station as well as the District's VAL 7 connection to the San Diego County Water Authority aqueduct. The San Elijo Hills Pump Station is a supplemental pump station that supplies a set amount of water from the Olivenhain Municipal Water District to the 750 Pressure Zone. There are no plans to upsize the pump station's capacity. All water demands above what is supplied through this pump station are met by the VAL 7 connection, which is not pumped. The VAL 7 connection is the primary potable water source for the pressure zone; therefore, no pump station upgrades will be required for this project.

WASTEWATER SYSTEM ANALYSIS

The proposed 2.18-acre Project lies completely within VWD sewer shed 8S. Figures 3 & 4 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

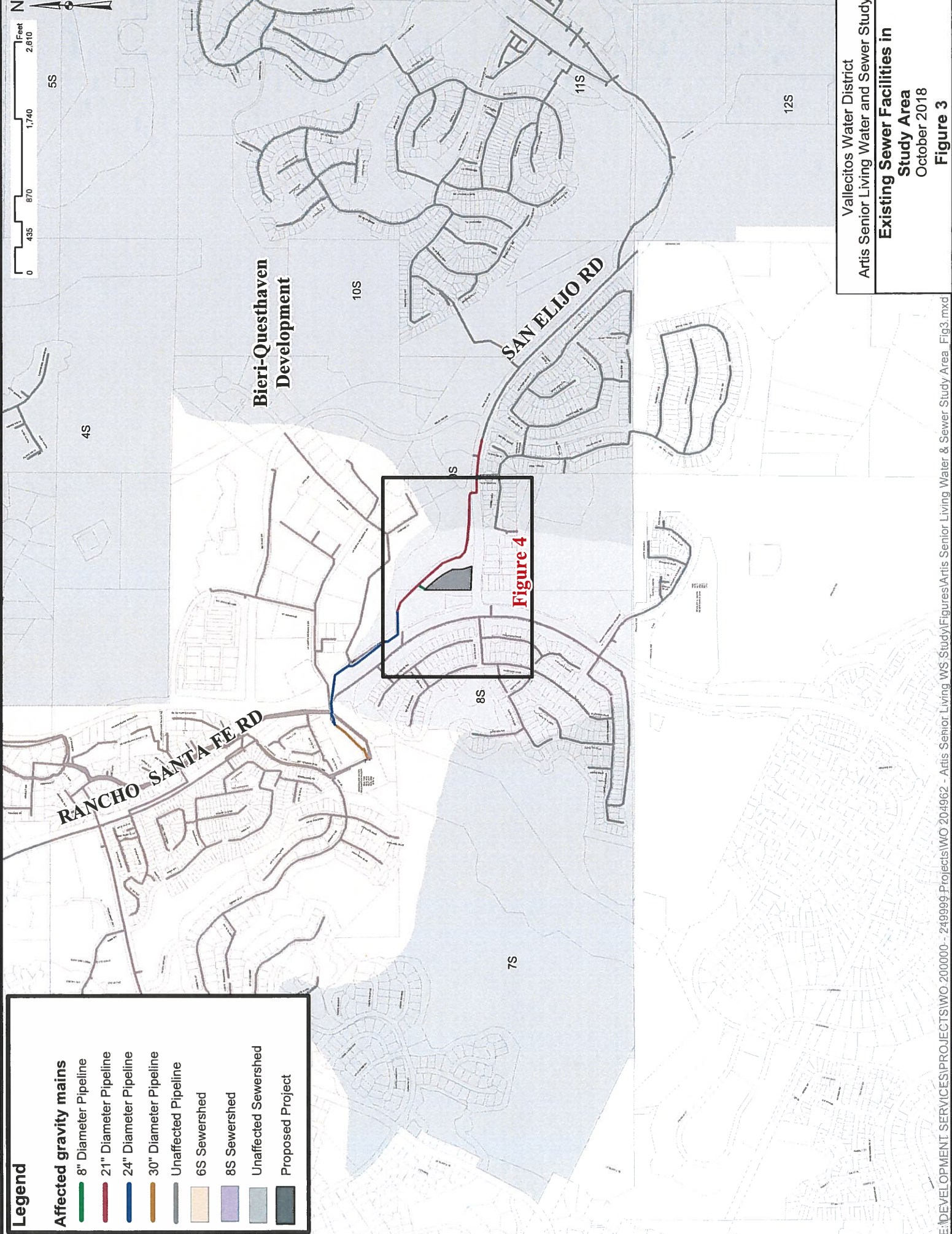
Wastewater Flow Projections

The Project property's General Plan designation by the City of San Marcos as of June 30, 2008 was Light Industrial as part of the University Commons SPA. The 2008 Master Plan based its ultimate wastewater generation planning on this approved land use. The Project proposes a density increase with a 64-unit assisted living facility on 2.18 acres.

Table 4 provides the average wastewater flow generated both under the density planned for in the 2008 Master Plan and under the proposed Project densification. The table shows that the densification will increase the projected average wastewater generation from the 2008 Master Plan land use by 5,166 gallons per day.

Table 4 – Project Estimated Wastewater Flows

Land Use Type	Area (acres)	Assisted Living Residential Units	Duty Factor (gpd/acre)	Duty Factor (gpd/du)	Water Demand (gpd)
2008 Master Plan Land Use Flows					
Light Industrial	2.18		1,300		2,834
Total	2.18	-			2,834
Proposed Project Demand					
Assisted Living Facility	2.18	64		125	8,000
Total	2.18	-			8,000
Sewer Generation Increase					5,166



Legend

Affected gravity mains

- 8" Diameter Pipeline
- 21" Diameter Pipeline
- 24" Diameter Pipeline
- 30" Diameter Pipeline
- Unaffected Pipeline
- 6S Sewershed
- 8S Sewershed
- Unaffected Sewershed
- Proposed Project

Vallecitos Water District
Artis Senior Living Water and Sewer Study

**Existing Sewer Facilities in
Study Area**
October 2018

Figure 3

Legend

Affected gravity mains

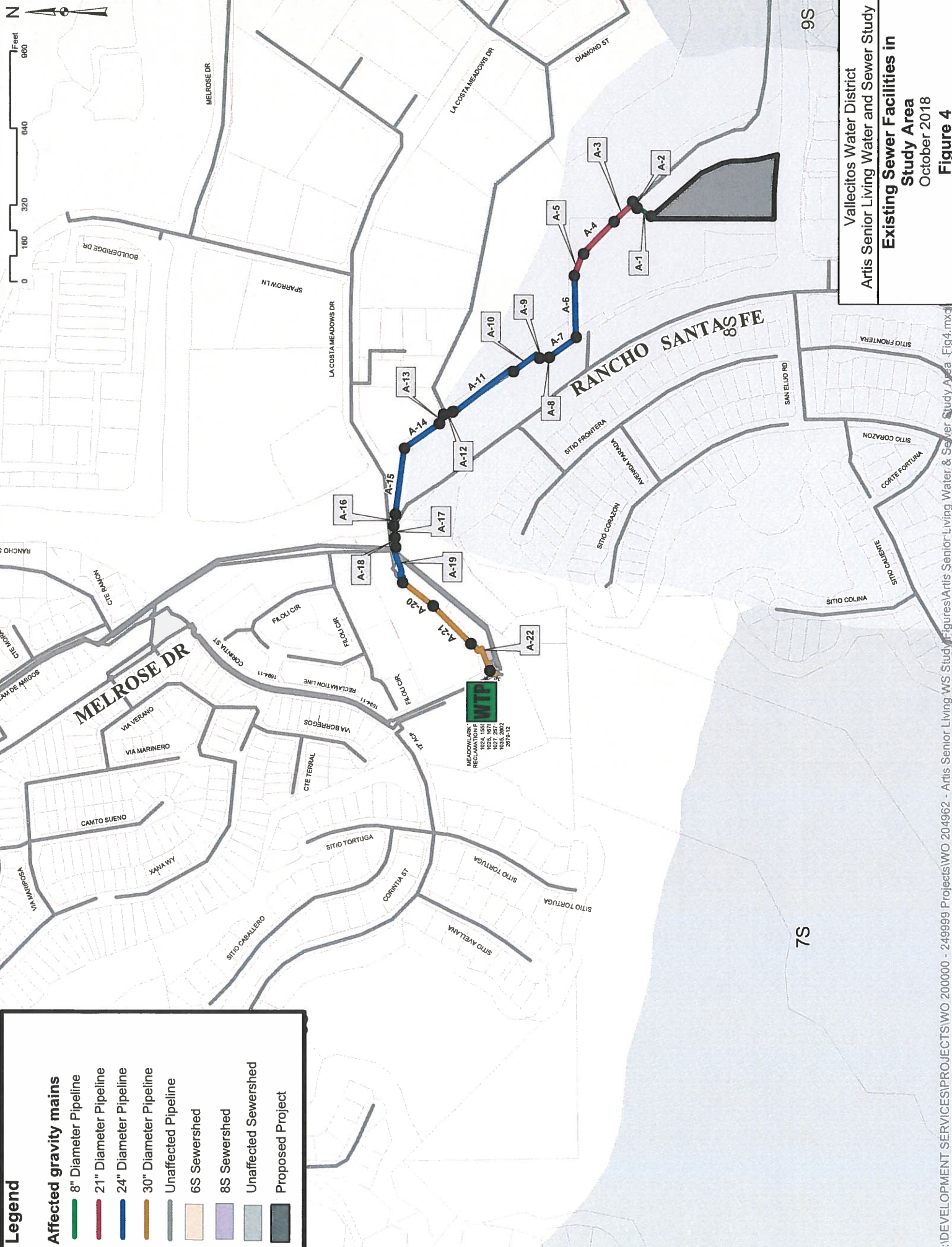
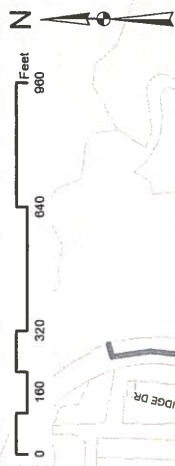
- 8" Diameter Pipeline
- 21" Diameter Pipeline
- 24" Diameter Pipeline
- 30" Diameter Pipeline
- Unaffected Pipeline

6S Sewershed

8S Sewershed

Unaffected Sewershed

Proposed Project



Vallecitos Water District
 Artis Senior Living Water and Sewer Study
Existing Sewer Facilities in Study Area
 October 2018
Figure 4

Wastewater Collection System Analysis

The 2008 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 12 inches in diameter and smaller: 0.4% minimum
- Slope for pipes over 12 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 Meadowlark Reclamation Facility near Melrose Drive and Rancho Santa Fe Road (see Figure 4).

The modeling results showed that the wastewater flow from the proposed Project does not result in any system deficiencies under peak wet weather flows during ultimate build-out conditions. Table 5 presents a summary of the modeling results from this analysis.

Table 5 - Wastewater Model Results and Recommended Gravity Main Improvements

				Wastewater Flows with Existing Density at Project Site				Wastewater Flows with Proposed Project Development			
				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
A-1	69	8	0.418	44	0.08			58	0.09		
A-2	26	8	0.004	44	0.25			58	0.28		
A-3	133	21	0.003	1996	0.51			2010	0.51		
A-4	185	21	0.005	1998	0.44			2012	0.44		
A-5	94	21	0.004	1998	0.47			2012	0.47		
A-6	245	24	0.005	2000	0.37			2014	0.37		
A-7	213	24	0.017	2000	0.27			2014	0.27		
A-8	16	24	0.016	2001	0.27			2015	0.27		
A-9	6	24	0.050	2001	0.21			2015	0.21		
A-10	100	24	0.140	2001	0.16			2015	0.16		
A-11	308	24	0.003	2001	0.42			2015	0.42		
A-12	33	24	0.065	2000	0.19			2014	0.19		
A-13	50	24	0.040	2080	0.22			2094	0.22		
A-14	192	24	0.004	2079	0.40			2093	0.40		
A-15	300	24	0.002	2076	0.48			2090	0.48		
A-16	48	24	0.004	2072	0.40			2086	0.40		
A-17	22	24	0.005	2175	0.38			2189	0.38		
A-18	49	24	0.002	2174	0.49			2188	0.49		
A-19	98	24	0.001	2173	0.61			2187	0.61		
A-20	164	30	0.002	2792	0.41			2806	0.41		
A-21	214	30	0.002	2788	0.41			2802	0.41		
A-22	164	30	0.003	2790	0.36			2804	0.37		

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 5. 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
Totals	100.00%	20.85

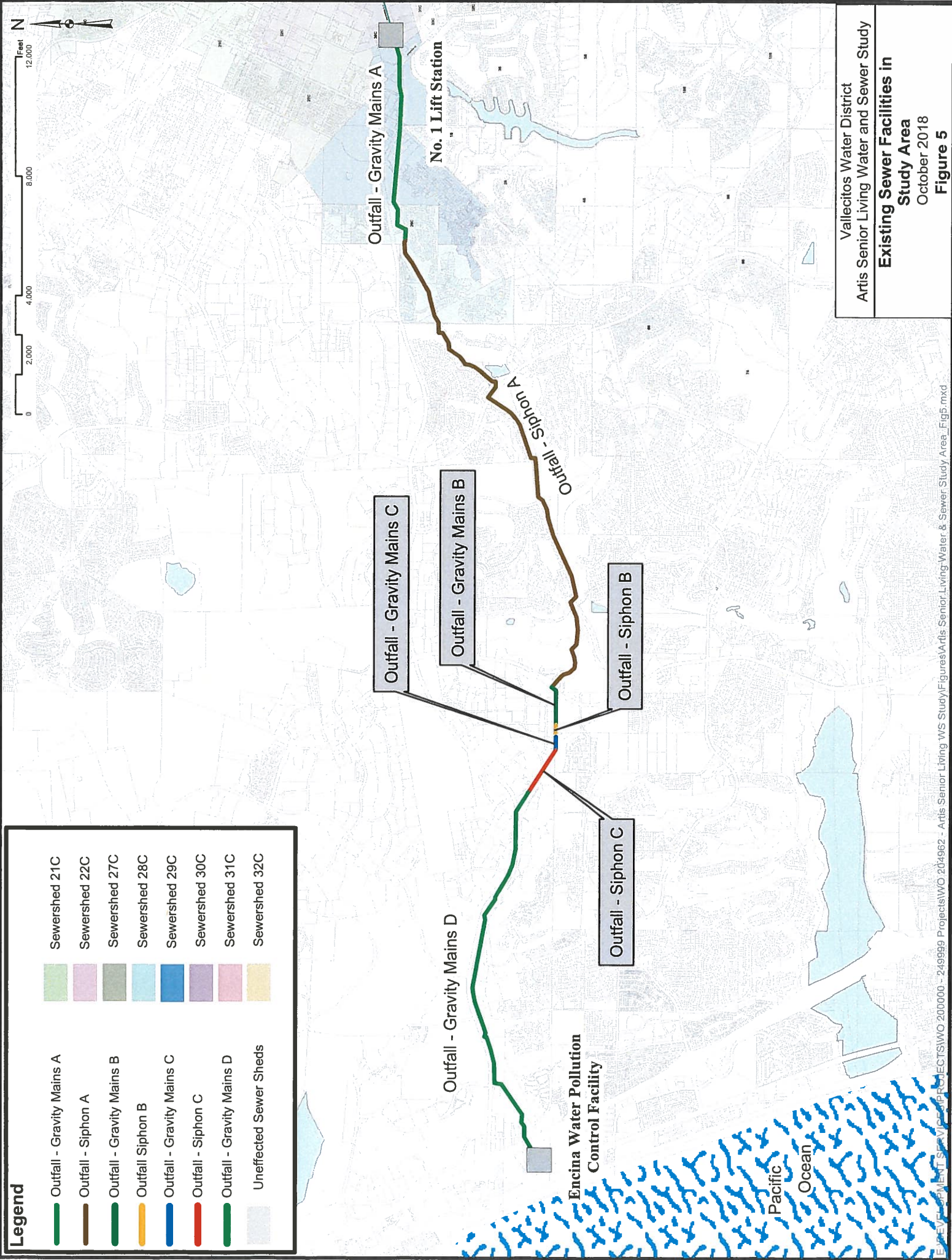
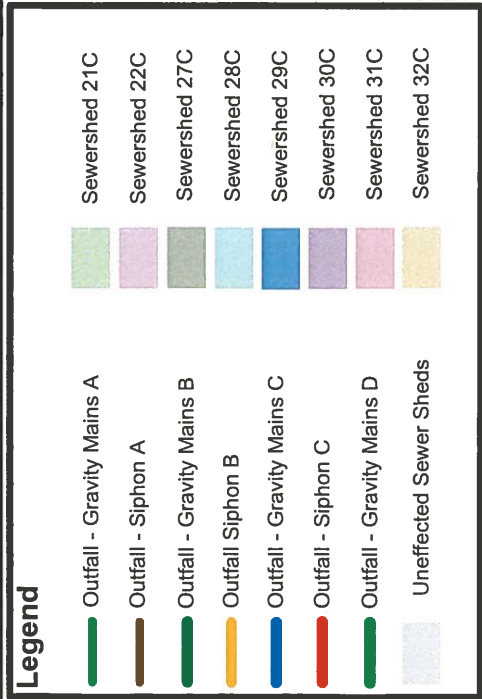
The Meadowlark Water Reclamation Facility (MRF) has a capacity of 5.0 MGD with a peak wet weather capacity of 8.0 MGD. Therefore, VWD has a combined peak wet weather wastewater collection capacity of 20.10 MGD (12.10 MGD + 8.0 MGD).

VWD's 2014 average daily wastewater flow was 7.2 MGD. This corresponds to a peak wet weather flow of 16.9 MGD, which falls within VWD's combined peak wet weather collection capacity.

The 2008 Master Plan estimated that, under approved land uses, VWD has an ultimate build-out average dry weather flow of 13.3 MGD. This corresponds to a peak wet weather flow of 29.5 MGD, which exceeds VWD's combined peak wet weather collection capacity. To accommodate additional wastewater flows from planned development, the 2008 Master Plan recommended conveyance of peak flows to the EWPCF through a parallel land outfall.

The Project proposes to generate 5,166 gpd of additional average wastewater flow that was not accounted for in the Land Outfall's capacity studied in the 2008 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 7.2 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 2008 Master Plan is 13.3 MGD, resulting in a projected solids treatment capacity deficiency of 2.83 MGD.

Liquids Treatment Capacity

VWD currently owns 7.67 MGD of liquids treatment capacity at the EWPCF in addition to the liquids 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 7.2 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 2008 Master Plan is 13.3 MGD, resulting in a projected liquids treatment capacity deficiency of 0.63 MGD.

Ocean Disposal Capacity

VWD currently owns 10.47 MGD of ocean disposal capacity at the EWPCF. VWD's 2014 average daily wastewater flow was 7.2 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 2008 Master Plan is 13.3 MGD, resulting in an ocean disposal deficiency of 2.83 MGD.

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 Project is expected to increase average daily water demands by 4,730 gallons per day over the ultimate demands projected in the 2008 Master Plan. The Project is also expected to increase wastewater flow by 5,166 gallons per day over ultimate flows projected in the 2008 Master Plan.

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

- An increase of 23,650 gallons of potable water storage requirement.
- An increase of 5,166 gpd in solids handling, liquids handling and ocean disposal capacity requirements at the Encina Water Pollution Control Facility.
- An increase of 5,166 gpd in the parallel land outfall's capacity requirement.

The following items are required as conditions of 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 acceptance of all on-site water and sewer facilities prior to service.

The District currently has water and sewer capacity available to serve the Project as proposed. 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 annexations and 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 2008 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.