San Simeon CSD Master Plan –

Potable Water, Wastewater, Recycled Water and Road Network Improvement Plan

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San Simeon Community Services District

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Introduction

Community Overview

San Simeon is a small unincorporated community situated within San Luis Obispo County on California's central coast. It is located along State Highway 1 approximately halfway between Los Angeles and San Francisco, about 5 minutes north of the community of Cambria. The San Simeon community is bordered on the east side by open space owned by the Hearst Corporation, and the north and south sides by State Parks property. As an aside, Hearst Castle is visible from portions of the District. The community is located on a coastal plain, bordered by the Pacific Ocean on the west and the Santa Lucia mountain range on the east. Pico Creek is a perennial stream that fluctuates based on groundwater levels in the upstream watershed as well as rainfall. The groundwater basin associated with the creek is the sole source of potable water for the community. The community is approximately 100 acres in size and has a residential and commercial (tourist centric) component. There are no industrial uses within the community. The community is governed by a five-member elected Board of Directors. San Simeon's development occurred primarily in the 1960s and continued in the 1970s. Growth in recent years has been held at a moratorium level due to the shortage of potable water supply. Originally called San Simeon Acres, the community water and wastewater systems have been developed over many decades based on the originally purchased infrastructure. The community is bifurcated by historic and frequently traveled State Route 1 (SR 1). The majority of the community is located on the east side of SR 1 (approximately 75%) and the other 25% is located on the west side of SR 1. Figure 1 shows the community land use zoning, assessor parcel numbers and parcel lines as well as the street network.

The community weather pattern is relatively cool. San Simeon receives approximately 20 inches on average of rainfall. However, due to the fluctuations in rainfall and the location of the groundwater basin relative to the coast, the community has experienced past situations where a water shortage has been declared by the Board of Directors numerous times in the past decade. This has limited the use of outdoor watering and restricted the community to conserve the limited water resource.

According to the 2010 census, San Simeon Community Services District has 462 residents, living in approximately 301 dwelling units. The community does not contain any industrial facilities and is primarily residential with a small commercial land use component. The commercial portion of the community is focused on tourism which represents a major component of the community water usage and wastewater production. This is evident because water use and wastewater flows are notably increased in the spring and summer months due to the transient tourist populations. There are approximately 706 hotel/motel units in SSCSD's service area according to the previously prepared Master Plan document (Boyle Engineering, 2006).

The San Simeon Community Services District (SSCSD) provides potable water and recycled water service to the surrounding community, as well as wastewater treatment services. SSCSD manages two primary production wells (as well as a third well that is leased and used on an infrequent basis), a reverse osmosis treatment unit that is used during high chloride events within the groundwater basin, a 150,000 gallon storage reservoir, a potable water distribution network consisting of 225 active customer accounts (as of April 2018), a side stream recycled water treatment system, a gravity sewer system consisting of approximately 1.6 miles of small diameter (6- and 8-inch) pipelines, and a wastewater treatment plant that treats both the community's wastewater and wastewater from the nearby Hearst San Simeon Historical Monument.

The existing potable water distribution system consists of primarily 6- and 8 inch diameter asbestos cement pipelines. An overview of the existing potable water distribution system can be seen in Figure 2. The community water supply is comprised entirely of groundwater. Water is produced in the two primary production ground water wells located in the northwest boundary of the community adjacent to the SSCSD office. The District shares a third emergency use well with the Hearst Corporation that is located further upgradient from the main wellfield. From the wells, water is redirected to the reverse osmosis treatment unit if chloride levels necessitate treatment. Otherwise, water enters the distribution system and is stored in the 150,000 gallon lined, buried concrete reservoir located approximately 800 feet northeast of the District office.

Wastewater service is provided to the residents of the community as well as the Hearst San Simeon Historical Monument. The collection system is comprised of primarily 6 inch diameter vitrified clay pipe (VCP) and access structures. The entire system operates by gravity to the wastewater treatment plant located on the coast (west side of the community). Figure 5 shows the existing wastewater system (manholes and pipelines).

Portions of the community street road network are the responsibility of SSCSD. Street ownership and maintenance for all streets except Hearst Drive, Castillo Avenue and San Simeon Avenue is the responsibility of the residents.

Methodology

This master plan document was written with the intent of recommending improvements to SSCSD's potable water system, sanitary sewer system, recycled water system, and network of roads and sidewalks to maintain compliance with regulatory requirements, to meet the demands of the community's projected rate of growth, and to provide an organized replacement program for the existing infrastructure. For this study, SSCSD provided recent monthly potable water customer meter data and daily wellhead production data, wastewater inflow data and metering records, and record drawings related to the existing system. Additionally, visual condition assessment was performed on the roads in the community. The methodologies used to analyze specific facets of SSCSD's assets are discussed further in following sections of the report. Once the existing systems had been analyzed (and modeled in the case of the potable water system and the sanitary sewer system), deficiencies were noted. In the case of the potable water and sanitary sewer systems, the necessary improvements were identified and the models were populated to account for buildout conditions. System improvements were included and the systems analyzed to determine the benefit of the proposed improvements. The goal of the modeling was to achieve compliance with specific analysis criteria. Phasing of improvements was determined once proposed improvements were finalized. Table 1 shows the specific criteria used in each section of the analysis.

Table 1 – Modeling and Analysis Criteria

System	Modeling Analysis Criteria	Value	Source/Commentary
Potable Water	Existing Demand – Average Day (ADD)	76,500 gpd 53 gpm	3-year Average from Data
	Existing Demand – Maximum Day (MDD)	133,000 gpd 92 gpm	Observation of Peak in Data
	Existing Demand – Peak Hour (PHD)	184 gpm	Application of a 2.0 factor to MDD value
	Projected Future Demand – Average Day (ADD)	122,400 gpd 85 gpm	1.6 x Existing ADD
	Projected Future Demand – Maximum Day (MDD)	212,800 gpd 148 gpm	1.6 x Existing MDD
	Projected Future Demand – Peak Hour (PHD)	294 gpm	1.6 x Existing PHD
	Fire Flow – Typical Hydrant Flow	1,500 gpm or per Table 5	Higher values for Hotels used as needed based on California Fire Code requirements
	Fire Flow – Minimum Pressure	20 psi	
	Fire Flow – Maximum Velocity	15-20 fps[2]	

System	Modeling Analysis Criteria	Value	Source/Commentary
Sanitary Sewer	Existing Flows – Peak Hourly Wet Weather Flow (PWWF)	212 gpm	
	Existing Flows – Peak Hourly Dry Weather Flow (PDWF)	162 gpm	
	Future Flows – Peak Hourly Wet Weather Flow (PWWF)	339 gpm	
	Future Flows – Peak Hourly Dry Weather Flow (PDWF)	259 gpm	
Recycled Water	No modeling was performed – analysis was based on available infrastructure and anticipated future customers.		
Roads and Sidewalks	No modeling was performed – analysis was based on visual assessment.		

Notes:

1. All criteria noted above are discussed in more detail in the following sections of the report.
2. Maximum velocities above 20 feet per second (fps) were documented in the short segments of pipeline associated with a specific flowing fire hydrant. Typical pipeline velocities were maintained below 10 to 12 fps.

Projected Growth

The growth of the community is limited by the current moratorium on building permits/approvals enacted by the SSCSD Board of Directors. This has restricted the growth of the community for several decades. As an unincorporated community in San Luis Obispo County, the area is subject to the North Coast Land Use and Circulation Elements of the San Luis Obispo County General Plan. In that document, it states that the County's Growth Management Ordinance limits growth County wide to 2.3%. While it is recognized that San Simeon has not allowed for development of parcels within the community, the analyses within this report include the buildout conditions as projected in the County adopted planning documents.

Potable Water

Existing Demands

Water meter data by account was collected and analyzed from July 2012 - June 2017 to determine the average and peak demands of the system and in individual areas of the system. The data was reviewed for anomalies such as uncharacteristic high readings, inactive accounts or active accounts with zero usage for extended periods of time. Many homes in SSCSD's service area are vacation homes and thus have regular zero-reading months; these were assumed to be normal. Once anomalies were identified, discussions with SSCSD staff assisted in determining which readings could be eliminated from consideration. If an account was determined to be active, but had non-standard readings, that data were replaced with average readings for the account in question. The next section discusses the methodology for determining the potable water Average Daily Demand (ADD) and Maximum Daily Demand (MDD) values of the community.

Average Daily Demand (ADD) and Maximum Daily Demand (MDD) Development

Average Daily Demand is a measurement of the potable water consumption by a community. It is exactly what it says: the average potable water consumption on a daily basis. Typically, the Average Daily Demand (ADD) is a representation across all of the land uses and is not specific to commercial, residential or industrial uses. In this report, ADD is the average daily consumption spread over an entire calendar year.

Many communities read potable water consumption of the residents on a monthly basis. For the calculation of average and maximum daily demands, daily potable water readings would have been convenient. As daily potable water consumption meter data were not available for analysis, well production data as an approximate indicator of system demands on a day to day basis was used as a determination of average daily demands and maximum daily demand. This is an approximation, as it includes loss and waste in the system, but was selected as a more conservative method to model system demands based on the information that was available. Daily well production values were provided from the District's monthly Superintendent's Reports from January 2014 to December 2016 and those daily values were averaged for each individual year in the data set to determine the Average Daily Demand (ADD) in the system (determined to be 76,500 gallons per day). By determining the ADD over a multi-year span it provides a defendable analysis while still using data no more than 4 years old.

Maximum Daily Demand (MDD) reviews the daily potable water consumption for each year and determines which day contained the highest consumption value. From that determination, the MDD peaking factor is a ratio of the maximum day consumption to the average day consumption. As stated previously, the well production records provided daily values of water produced. In calculating the MDD value, consideration was made to the fact that well pumping sometimes occurs overnight, occasionally crossing over the midnight hour from one day into another, or in excess one day followed by a lower pumped volume the following day(s). This operation manifests in the data large production volumes shown one day with low or no production volume reflected in the next day, or vice versa. For example, if in one day production occurred both in the early morning hours (e.g. 1:00 am to 5:00 am) and in the evening hours (8:00 pm to 12:00 am), a volume twice as large as expected would be shown for that day, and low or no volume would be shown on the next day (unless significant pumping occurred in the evening before midnight on that next day). These "high volume" pumping days were eliminated from consideration as they were considered to not be representative as single day demands. Utilizing this method of analysis, the maximum daily demand observed in the period of data analyzed was August 6, 2016, where 133,000 gallons of potable water were produced by the wells (Figure 17). August was determined to be representative of a peak usage month, as seen in Figure 14, which is the monthly trends witnessed in the customer meter data. The MDD determinations are shown in Figures 15 through 17.

Peaking Factor Development

The calculated MDD peaking factor from the data shown in Table 2 is 1.73 (ratio of MDD to ADD). For the purposes of this report, a peaking factor of 2.0 was used. SSCSD does not have hourly production records for their potable water system. For the purposes of this report, it was decided to maintain consistency with the 2007 Master Plan document so a peak hour value of 2.0 was used.

The results of the ADD and MDD analysis for the potable water demands used are summarized in Table 2.

Table 2 – Existing Conditions Potable Water Demands

Demand Type	Value	Determined By	Comparison to 2007 Master Plan [1]
Average Daily Demand	76,500 gpd	3-year average (January 2014-December 2016)	95,747 gpd
Average Daily Demand	53 gpm	Converted from gpd	66.5 gpm
Maximum Daily Demand	133,000 gpd	Observation of peak (August 6, 2016)	191,500 gpd
Maximum Daily Demand	92 gpm	Converted from gpd	133 gpm
Peak Hour Demand	184 gpm	Application of a 2.0 factor to MDD value	266 gpm

Notes:

1. 2007 Master Plan and Wastewater Collection System Evaluation, Boyle Engineering, November 2007.
2. The reduced values in the current analysis are believed to be reflective of the increased water conservation techniques that the community practices as well as the introduction of recycled water to certain areas of the community.

Flushing and Unaccounted-for Water

Any typical potable water system will experience some “loss” or unaccounted-for water that is either lost due to leaks in the system, unmetered users, or maintenance activities such as flushing, fire suppression, etc. This value can be obtained by comparing customer meter data to well production values. This analysis was performed and resulted in the data found in Table 3.

Table 3 – Unaccounted For Water Analysis

Year	Water Produced (cf)	Water Metered (cf)	Difference (cf)
2014	3,333,170	3,107,600	225,570
2015	3,941,565	3,171,500	771,065
2016	3,902,572	3,043,400	859,172
Average	*3,725,769*	*3,107,500*	*618,269*

Notes:

1. Note that 2014 does not represent a full year of data, as "billing months" (a billing month being based on the read date of the previous month to the read date of the next month; holidays and weekends may alter the date) were used and summed into "billing years." The earliest data available was January 1, 2014, so January 2014 data was not a full "billing month."
2. Water metered is based off adjusted meter data that was reviewed for accuracy and adjusted (as noted elsewhere in this report).

As can be seen in Table 3, the average difference between the water produced and the water metered was approximately 618,300 cubic feet a year, or approximately 17% of the water produced. District staff has reduced this value to 7% at the time of this report preparation. This difference may be likely to breaks or leaks in the system (which will most likely be fixed by proposed improvements discussed later in this report), unmetered use (also likely to be fixed by proposed improvements), maintenance activities, or may be the result of anomalies in the customer meter data. As discussed earlier in the report, an analysis of the customer meter data was performed and several identified anomalies were adjusted, but due to the transient nature of the community (with many homes being second homes and infrequently occupied) it is outside the scope of this report to identify if there are meters that are inoperable or missing data, as many customers have frequent "zero" readings.

Projected Future Demands

To ensure that the system is adequately sized to serve future population increases in the community, future demands must be projected and modeled. To achieve this, the North Coast Area Plan ("NCAP," revised 2007) and 2010 United States Census were both referenced. The NCAP makes a variety of statements regarding possible population growth within the community. In Chapter 2, Subsection C.2, the Plan references the County's Growth Management Ordinance, which limits the number of new dwelling units to no more than 2.3% of the existing number of dwelling units (County-wide). Chapter 2, Subsection C.2.A further goes on that based on the number and size of vacant or partially developed sites present at the time of the development of the NCAP, there is sufficient space available for approximately 530 additional dwelling units, which based on historical population rates, would result in a population of between 400 and 740 people in San Simeon, with limitations consisting of water supply, wastewater generation, school capacity, and road capacity. Further in the NCAP in Chapter 3 Subsection F.1, it is stated that the maximum density of population in San Simeon would be 1,229 people, assuming all public service constraints can be resolved. This Subsection of the NCAP also discusses the highly transient nature of the community given the considerable number of vacation homes and the resulting difficulties in estimating population. Recognizing the constraints listed above, for purposes of this report the 740-person population value was selected as a reasonable estimation of the future population.

According to the 2010 census (the most recent census data available), the population of San Simeon was 462 at that time. Dividing 740 by 462 yields a buildout factor of approximately 1.60 or 160%, which was used in the calculations in this report for buildout conditions.

It is noted that the NCAP includes its own projection of anticipated water demands in Figure 3-5 of that report. Their projection appears to indicate a demand of approximately 130 acre-feet per year in 2020. The data collected from 2014 to 2016 yielded an average daily demand of 76,500 gallons per day, which translates to an average annual demand of 85.6 acre-feet.

Applying the buildout factor to the existing condition potable water demands yields the future potable water demands shown in Table 4, which were used in the analysis.

Table 4 – Future Conditions Potable Water Demands

Demand Type	Value	Determined By
Average Daily Demand	122,400 gpd	1.60 x 76,500 gpd
Average Daily Demand	85 gpm	Converted from gpd
Maximum Daily Demand	212,800 gpd	1.60 x 133,000 gpd
Maximum Daily Demand	148 gpm	Converted from gpd
Peak Hour Demand	294 gpm	1.6 x 184 gpm

Notes:

1. The values shown in Table 2 for existing conditions are used to determine the buildout values.

Fire Flow Requirements

The flows that would be required during a fire event were determined using the 2016 California Fire Code (Appendix BB, Table BB105.1 of that document) and conversations with the local Cal Fire representative who provided clarification of the Fire Code. Fire flow requirements are based on the square footages of properties within the community as well as their materials of construction. The San Simeon Lodge was determined to have the highest fire flow requirements by this method, with fire suppression flows being 6,000 gallons per minute for a four-hour period. This property sets the minimum required fire suppression storage for the community (discussed later in this report), but multiple large footprint properties were analyzed when sizing pipelines throughout the community. Calculation of the size of the pipelines involved transporting the required fire flow to the respective locations, but also sufficient pipeline diameter to maintain adequate system pressures during a fire event. The California State Water Resources Control Board Division of Drinking Water (SWRCB DDW) regulations state that a minimum of 20 psi must be maintained in the distribution system at all times. The identified properties and their respective fire flow requirements are summarized in Table 5.

Table 5 – Fire Flow Requirements for Select Properties

Property	Fire Flow Requirement
San Simeon Lodge	6,000 gpm
Gaviotas	5,250 gpm
Silver Surf	5,250 gpm
Cavalier	5,000 gpm
Sea Gate	1,500 gpm
Motel 6[3]	3,000 gpm

Notes:

1. Fire flow requirements are determined based on Table BB105.1 of the California Fire Code, 2016.
2. Properties were selected as representing a sample of the largest fire flow requirements for single properties in the community.
3. The square footage of Motel 6 was not confirmed, so an intermediate value for required fire flow was assumed for modeling purposes.

Existing System

Distribution and Transmission Pipelines

The existing system consists of mostly 6- and 8 inch diameter asbestos cement pipelines. A small amount of the system has been constructed of PVC. Additionally, there is an existing pipe bridge adjacent to the wastewater treatment plant containing ductile iron pipeline material. In total, the existing system consists of approximately 10,500 linear feet of mainline pipeline, as well as associated customer meters, fire hydrants, valves, and other appurtenances. Figure 2 shows the existing potable water system.

Production and Storage

SSCSD sources its water from two groundwater wells located north of the community, between SSCSD's offices and Pico Creek, to the north. There is a third, smaller capacity well available for intermittent District use on the nearby Hearst property when the District's wells are under the influence of high chloride values. According to the 2007 Master Plan document, Well 1 was constructed in 1952 and consists of a 12 inch diameter well casing and extends 47 feet underground. Well 2 was constructed in 1967 and has a 12 inch diameter casing. That well extends 60 feet below grade. The wells are operated under permits from the SWRCB DDW.

Disinfection with liquid chlorine through injection in the well discharge pipeline occurs at the wellheads. From the wellfield, the water is pumped east to the District's potable water storage reservoir, which is a concrete underground structure with 150,000 gallons of storage capacity. The well pumps operate based on the level of the reservoir, with the system operating via gravity from the 150,000 gallon reservoir. There is only one pressure zone within the community and it is set by the level in the reservoir.

Adjacent to SSCSD offices is a newly constructed reverse osmosis (RO) and filtration treatment facility. This facility was installed as a response to annual introduction of high chloride levels which affected the groundwater quality. When high chloride levels are detected, flow from the wellhead site is diverted to the RO treatment facility, treated by reverse osmosis, then boosted to the reservoir by pumps located within the treatment facility. This facility recently was improved by the addition of a filtration unit as well.

Hydraulic Model Analysis

Construction of Model of Existing System

The data collected and information about the existing system was used to create a hydraulic model of SSCSD's service area. This model was prepared in WaterCAD. Figure 3 shows the water system model layout. The model was created utilizing previously collected topographic and survey data, maps of the existing system which included pipe types and diameters, hydrant locations, pump curves for the pumps in the wells, discussions with District staff, and record drawings of the reservoir as well as information from the 2007 Master Plan document.

First, georeferenced parcel lines were imported into the model to provide reference locations as a base map. Next, an existing system layout was created by developing a system of nodes (nodes being the term used by the system for junctions, hydrants, pumps, tanks, etc.) that followed the layout of the system. A node was placed at every location where there was a fitting in the pipelines, a connection to a fire hydrant, transitions between pipeline diameters and materials, and in some cases in intermediate locations to allow for proper distribution of demands (as discussed under "demand distribution" below). These nodes were then connected by pipelines and data for diameter and pipeline material were input into the model database for each pipeline segment. Fire hydrants were also included in a similar manner. The two wellhead pumps and the existing storage reservoir were in the model. The reservoir was input into the model as a tank node type, because top and bottom elevations are known and the reservoir has a discrete volume. The pump curves for the wellhead pumps (Grundfos model 300N200-5 PEO) were input utilizing verified performance tests. The pumps are programmed within the model to begin operating at midnight and to operate until the reservoir has been filled. This is not a completely accurate depiction of the operation of the system, as pumping does not always begin at midnight and only occasionally involves both pumps; however, this does not affect the model results because it only affects the speed and time at which the reservoir achieves full capacity.

Once all elements of the system were entered into the model, available topographic data was imported to set the elevation of the nodes throughout the system. These were backchecked for accuracy, and in instances where no topographic data was available or where data irregularities were found, elevations were manually entered as estimated using the topographic elevations available in Google Earth.

Assumptions

The following assumptions were made in the process of modeling the water system:

- The reverse osmosis system was neglected. The boosting of flow at the termination of treatment in the reverse osmosis treatment unit was assumed to not have a significant impact on the operation of the water distribution system.
- Fire hydrants and their connections to their adjacent mains are assumed to be in accordance with County of San Luis Obispo Standard Drawing No. W-2, which requires 6 inch diameter connections to the main line constructed of the same material as the main line. Exceptions were made only for cases in which a hydrant connects to a 4 inch diameter main, in which a 4 inch diameter connection was assumed.
- The model does not account for limitations in wellhead pumping and assumes that consistent and sufficient flow can be delivered.

- Minimum and maximum reservoir water levels were modeled as 3 feet above the base elevation (taken from record drawings) and 3 feet below the overflow elevation (also taken from record drawings). Given the irregular shape of the reservoir, square footage was estimated such that the calculated operational volume of the reservoir is approximately equal to 150,000 gallons.
- Minor system losses are neglected.

Daily Demand Modeling

To model the effects of daily demands customer demands had to be distributed throughout the model and had to be applied in a pattern of peaks and lows throughout the course of the day. MDD and ADD for both existing system and future are summarized in Table 6 below. To accurately represent the distribution of the potable system demands, the customer meter data (discussed earlier in the report) was arranged by address and each account was assigned to its nearest junction within the water system model. The total and average demand at each junction (equal to the sum of all meters assigned to each junction) was determined, as seen in Figure 18. Note that some junctions did not have any nearby customers and are not included in Figure 18. The percent of the total average demand was then determined for each junction considered, as seen in Figure 18. These percentages were used as the basis for distributing demands throughout the system.

Table 6 – Daily Demand Cases

Daily Demand Case	Flow (gpd)	Flow (gpm)
Existing ADD	76,500	53
Existing MDD	133,000	92
Future ADD	122,400	85
Future MDD	212,800	148

Notes:

1. gpd = gallons per day
2. gpm = gallons per minute
3. Future ADD and MDD are determined by multiplying existing ADD and MDD by 1.60 as discussed earlier in the report.

Four model scenarios were created in the hydraulic model – Existing ADD, Existing MDD, Future ADD, and Future MDD (these scenarios are listed in this report as demand cases). Within each model scenario, demands were input into the system at the junctions listed in Figure 18 by multiplying each junction's percentage of the total average demand by the flow rate (in gpm) shown in Table 6 for that demand case. For example, in the Future ADD model run, node J-33 was given a demand of 5.67 gpm, equal to 6.67% of 85 gpm. These demands represent the average flow rate demanded by each junction throughout the course of the day. The results of these modeling analyses can be seen in Appendices 1, 2, 4 and 5. These appendices show the pressure at every junction, and the flow and velocity of the water moving through each pipeline at peak hourly demand. As can be seen in Appendices 1 and 4, in with average daily demands in both the existing and future demand cases, adequate pressures are seen throughout the system (with an adequate pressure being defined at above 20 psi). Velocities are low throughout the system due to the relatively low demands of the community. In Appendices 2 and 5, the same data sets are shown for the maximum daily demands. The reservoir hydraulic grade included in Appendix 5 shows that under future maximum daily demand, the reservoir empties at approximately 6pm. The existing reservoir is inadequately sized to meet these demands.

Fire Flow Modeling

Fire flow modeling was accomplished via two separate approaches: first, by using WaterCAD's built in fire flow modeling tools which allow specification of required flows at each hydrant, minimum pressure in the system, and maximum velocity in the system, and runs an analysis and returns the maximum calculated fire flow available at each hydrant based on the input criteria. This is referred to as Available Flow Modeling in this report. The second methodology used was modeling specific fire flow requirements at hydrants located near each of the properties defined in Table 5 based on their required fire suppression flows as determined by the California Fire Code and observing the pressures and velocities present in the system while those specific hydrants are being used for fire suppression. This method is referred to as Required Flow for Fire Suppression Modeling in this report.

Fire flows were modeled in conjunction with the existing MDD and future MDD demand cases to reflect conditions of a maximum demand day and a fire event which is a conservative condition used to provide recommendations for pipeline sizing. This is consistent with the 2007 Master Plan document and industry standards.

Available Flow Modeling

For the first set of model runs (using WaterCAD's built in fire flow feature), a minimum system pressure of 20 psi was used. The upper limit for velocity was set as 20 feet per second (fps). Twenty fps is a higher velocity than would typically be preferred, but it was determined that these flows related to the short segment of pipe connected to the hydrants. The maximum flow from each hydrant was set to 1,500 gpm. In the large structure cases shown in Table 5, the required fire flows shown in Table 5 were split amongst the required number of nearby hydrants to achieve the total required fire flow. Results of these runs are shown in Appendices 3 and 6. As seen in Appendix 3 under existing MDD demand conditions there are only 5 junctions in the existing system that can provide the fire flows specified, and as seen in Appendix 6 under future MDD demand conditions there are only 3 junctions in the existing system that can provide those flows.

Required Flow for Fire Suppression Modeling

For the second set of model runs (using specific fire events at specific properties shown in Table 5), the approach was to input the hydrant demands for each fire event (with the required fire flow being split amongst one to four hydrants, depending on the property) and to observe how it affected the existing system, and then incremental improvements were made to the system (in the form of replacing and increasing the diameter of pipelines or adding new loops as needed) until the system could run with the hydrant demands and still produce adequate pressures (in excess of 20 psi throughout the system) and not exceed 15 fps velocities. It was assumed that all pipeline replacements would be performed with PVC pipe, except for pipelines to be constructed underneath Highway 1, which would be constructed of ductile iron (or alternatively concrete encased, to be determined during the design process). Similar to the previous fire flow model runs, it was assumed that velocities exceeding 15 fps were acceptable in the pipelines connecting the hydrants to the main line and that the reservoir/proposed tanks would be adequately sized to supply flow for the duration of the fire event. The hydrants that were assigned demands for each fire event were given their own demand patterns such that they would demand their full required flow for four hours. The results of these model runs can be seen in Appendices 9 through 14. Each appendix identifies the active hydrants, what demands they have been assigned, and the improvements that were required to meet pressure and velocity requirements over the entire duration of the fire event.

The results of the modeling were consistent with the results in the 2007 Master Plan document. At the time of the preparation of that document, calibration of the potable water system was performed. It was determined that model calibration was not necessary because the results showing improvement areas were similar to the 2007 Master Plan report which used a calibrated model.

Proposed Improvements

Based on the results of the hydraulic modeling analyses, fire flow requirements are by far the controlling factor which require improvements to the existing system. While modeling of the future MDD demand case revealed inadequacy of the existing reservoir capacity to meet buildout demands, far larger reservoir capacity is required to meet fire flow requirements. Additionally, the ADD and MDD models indicated that pressures throughout the potable water system would be adequate in all demand cases given the existing system configuration, but fire flow modeling produced inadequate pressures under the required fire flow demands.

Pipeline Improvements

To determine the overall required pipeline improvements, all the improvements required by the fire flow model runs shown in Appendices 9 through 14 were combined to allow for the proposed system to be sized to provide adequate fire flows to be provided for any of the fires modeled. A summary of all the proposed pipeline upgrades is shown in the Table 7. The complete proposed system can be seen in Figure 4. The proposed phasing of these improvements can be seen in Figures 9 through 12.

Table 7 – Proposed Potable Water System Improvements

Project Description	Existing Size	Proposed Size
Pipeline from reservoir to intersection of Pico and Avonne	8" dia.	14" dia.
New dedicated tank feed pipeline	--	14" dia.
New loop connecting Jasper Ave cul-de-sac to Pico	--	10" dia.
Jasper Ave cul-de-sac to Avonne	6" dia.	10" dia.
Avonne from Pico to Otter Way	6" dia.	12" dia.
Otter Way from Avonne to Castillo	6" dia.	10" dia.
Freeway pipeline connecting Otter Way and San Simeon Ave	6" dia.	10" dia.
Pico from Avonne to Castillo	6" dia.	10" dia.
Pipeline from the intersection of Pico and Castillo to first hydrant along Hearst Dr. south of Pico	6" dia.	10" dia.
New loop along Castillo Dr. from Pico to Otter Way	--	10" dia.
Avonne south of Otter Way	6" dia.	10" dia.

Project Description	Existing Size	Proposed Size
Castillo south of Otter Way	6" dia.	10" dia.
New loop connecting Avonne and Castillo	--	10" dia.
Pipeline from first hydrant along Hearst Dr south of Pico to San Simeon Ave	6" dia.	8" dia.
New loop connecting Castillo and Vista Del Mar	--	8" dia.
Pipeline from furthest hydrant in Sea Gate community, along Balboa and Vista Del Mar to Hearst Dr.	6" dia.	8" dia.
Replacement of existing 6 inch diameter potable asbestos cement pipeline between the Sea Gate Community and the pipe bridge adjacent to San Simeon Avenue with PVC	6" dia.	6" dia.
Replacement of existing 6 inch diameter potable asbestos cement pipeline in an easement behind the Sea Breeze Inn with PVC	6" dia.	6" dia.
Replacement of existing 10 inch diameter asbestos cement pipeline between the District Office and the wellheads with PVC	10" dia.	10" dia.

Notes:

1. This plan does not include the improvement of a small pipeline at the south end of Avonne Avenue. This pipeline should be replaced at some point in the future as part of SSCSD's general maintenance program.

With these proposed improvements implemented, new model runs were performed for future MDD and available fire flows at each hydrant under future MDD demand conditions. These results can be seen in Appendices 7 and 8. As can be seen in Appendix 8, fire flow requirements are met with only a few exceptions, at each junction of the system. Hydrants shown as not meeting the required fire flows are partially due to the velocity constraints shown (20 fps). As discussed earlier in the report, for fire events higher velocities may be witnessed in the pipelines connecting hydrants to the main lines and are acceptable.

Storage Capacity Improvements

Water storage facilities are sized based on three components of storage: operational storage, emergency storage and fire storage. Operational storage covers the day to day demands of the existing system that exceed the average demands of the system (peak and maximum day for example). The 2007 Master Plan recommended that the operational storage component be calculated at 25% of the maximum day demand or 33,250 gallons.

Emergency storage is storage that is present in a water tank for events such as short-term emergency events such as extended power loss or events that would prevent the system from operating under normal conditions. As outlined in the 2007 Master Plan, emergency storage is based on the concept of providing basic sanitary needs for up to 48 hours. That document also stated that a conservative approach was to provide emergency storage equal to 50% of the maximum day demand or 66,500 gallons.

Fire storage is the volume of water required to provide the required system fire flow for the duration as stated in the California Fire Code. The 2016 version, Table BB105.1 provides the required fire flow based on the type of construction of a structure and the square footage. From that table, the required fire storage can be determined.

In previous discussions with Cal Fire representatives and extensive discussions with District staff, it was determined that existing potable water storage volume availability is far below what is required for fire suppression. The previous master plan had estimated that a total storage capacity of 750,000 gallons was needed based on a 2,500 gpm fire flow requirement. Discussion with Mr. Tony Gomes, the local Cal Fire representative responsible for the area covering the District, stated that the 2016 California Fire Code was to be followed. Based on Table BB105.1 of the California Fire Code (2016) and the square footage of the largest building in the Community (the San Simeon Lodge), the volume of water needed for fire suppression was determined to be 6,000 gallons per minute for a duration of 4 hours. This works out to 1.44 million gallons of required fire suppression storage. As with many communities, the fire storage requirement far exceeds the requirements of the other two components.

The total storage required for the community is 1.54 million gallons (MG). The Board of Directors for the District has elected to meet the storage requirement through the construction of four 400,000 gallon aboveground steel storage tanks (resulting in a total of 1.60 million gallons of potable water storage for the community). The existing 150,000 gallon belowground reservoir will be converted to recycled water use, as discussed further in the report.

A concern that will accompany this required dramatic increase of potable water storage capacity in the community will be the potential for water quality concerns. When water is stored for extended periods of time, loss of chlorine residual can cause bacterial growth and affecting drinking water safety. Additional concerns include sediment buildup within the tank and stratification (which occurs in tanks that are both filled and drained from the bottom, where the water at the bottom of the tank is constantly being turned over, but the water at the top of the tank remains in the tank for extended periods of time). Steps that will need to be taken to avoid these issues may include continuous mixing, monitoring of chlorine levels, and tank design considerations (such as separate inlet and outlets in the tanks).

Wastewater

Diurnal Curve Development

To determine the average dry weather diurnal curve for use as an approximation of the hourly flow fluctuations in the wastewater system, metering data for all of 2016 was gathered for the wastewater treatment plant influent meter located upstream of the equalization basins. Representative dry weather days were selected utilizing the Superintendent's Reports, only choosing days on which no precipitation was recorded and on which the total wastewater influent daily flow (in gallons) was close to the average dry weather daily flow. The circular charts showing recorded meter data were then observed on those dates, with diurnal curves being built for each date. These diurnal curves were then divided by average flowrates on each day and averaged together to create Figure 23, the average dry weather diurnal curve. This diurnal curve was used as a basis of determining flow fluctuations throughout the day to determine average peak and low hours in the community for modeling purposes.

Existing Flows

To model the wastewater system, peak dry weather and peak wet weather flows for both existing and future cases had to be determined. In pursuit of this, daily wastewater influent and daily rainfall from January 2014 to December 2016 were extracted from the Superintendent's Reports and analyzed. In all analyses, state sewer inflows were subtracted as they do not represent flows that enter San Simeon's wastewater collection system and thus do not need to be considered for the modeling of the sewer system.

First, dry weather data and wet weather data were separated based on the presence or absence of measurable rainfall on a day to day basis, then averaged to determine average wet weather flows and average dry weather flows. All data was then plotted alongside precipitation values to visually identify the peak wet weather and dry weather months. These were identified as January 2016 (for wet weather) and August 2016 (for dry weather). Note that both the maximum dry and wet weather days falling in the same year was purely coincidental; three years' worth of data was analyzed. Daily data for both January 2016 and August 2016 were then plotted to determine the maximum dry and wet weather days. The data related to August 2016 can be seen in Figure 19 and January 2016 can be seen in Figure 20. As seen in Figure 19, the maximum dry weather flow was identified as August 5, 2016, with 124,300 gallons of influent (subtracting state sewer inflows for that day). As seen in Figure 22, the maximum wet weather flow was identified as January 19, 2016, which received 1.26 inches of rainfall and had 149,400 gallons of wastewater influent (subtracting state sewer inflows for that day). Given these two dates, the circular chart readings for the equalization basin meter at the wastewater treatment plant were used to create diurnal curves for those days. These curves can be seen in Figures 21 and 22. This meter data includes the flow contributed by the State sewer therefore, the diurnal curves were then reduced by an amount equal to the State sewer inflow that day converted to gallons per minute. These figures were then used to determine the peak dry weather flow and peak wet weather flows of 162 and 212 gpm, respectively. These modeling values are summarized in Table 8.

Table 8 – Sewer Modeling Values

Case	Description	Date	Value
Existing	Average Dry Weather Flow*	N/A	79,500 gpd
	Average Wet Weather Flow*	N/A	81,900 gpd
	Peak Dry Weather Month*	August 2016	398,700 cf
	Peak Wet Weather Month*	January 2016	352,500 cf
	Maximum Dry Weather **Total** Flow	August 5, 2016	131,200 gpd
	Minus state sewer	*August 5, 2016*	*6,900 gpd*
	Maximum Dry Weather Flow*	**August 5, 2016**	**124,300 gpd**
	Maximum Wet Weather **Total** Flow	January 19, 2016	163,800 gpd
	Minus state sewer	*January 19, 2016*	*14,400 gpd*
	Maximum Wet Weather Flow*	**January 19, 2016**	**149,400 gpd**
	Peak Dry Weather Total Flow	August 5, 2016	167 gpm
	Minus state sewer	*August 5, 2016*	*5 gpm*
	Peak Dry Weather Flow*	**August 5, 2016**	**162 gpm**
	Peak Wet Weather Total Flow	January 19, 2016	222 gpm
	Minus state sewer	*January 19, 2016*	*10 gpm*
	Peak Wet Weather Flow*	**January 19, 2016**	**212 gpm**
	Maximum Dry Weather Per Capita Flow	August 5, 2016	269 gpd
	Maximum Wet Weather Per Capita Flow	January 19, 2016	323 gpd
Future	**Peak Dry Weather Flow***	**N/A**	**259 gpm**
	Peak Wet Weather Flow*	**N/A**	**339 gpm**

Notes:
1. All values with an asterisk (*) exclude state sewer.
2. cf = cubic feet.
3. Future values are equal to existing values multiplied by 1.60, as discussed previously in the report.
4. Per capita flows are determined by dividing maximum daily flows by the 2010 population, 462.
5. All values are rounded.

System Modeling

Because of the relatively small size of the community, it was determined that using a spreadsheet-based model of the wastewater collection system network for planning purposes was sufficient. Maps of the existing system were used to create a spreadsheet-based model of the existing sewer system. Flow capacities for the collection system were determined using Manning's equation for open channel flow (see Appendix 15 for Manning's Calculations). In accordance with industry standards, it was assumed that dry weather flow should use no more than 60% of the available flow depth within the pipes, and wet weather flow should use no more than 75% of the available flow depth. A spreadsheet was populated with the data for each segment of pipeline within the system, including upstream and downstream node names (defined as a manhole or cleanout), upstream and downstream node elevations, length between nodes, and pipeline material. Using that data, slope was calculated and the Manning's equation was utilized to determine the capacity of the pipeline. A roughness coefficient of 0.012 was assumed. Once these flow capacities based on 50% or 75% flow depth were determined, they were compared with average and peak flows within each individual pipe, respectively. Flows through specific pipelines in the system were determined by distributing average and peak wastewater flow rates through the system based on densities and locations of individual customer meter data (the percentages shown in Figure 18); it was assumed that customers with high potable water meter readings would produce high wastewater flow rates as well because outdoor irrigation using potable water is not allowed in the community. Using the customer meter data, percentages of wastewater flow were distributed to the nodes throughout the wastewater model, collecting cumulatively as pipelines converge throughout the system. Once these flows were distributed, they were compared with the Manning's equation capacities determined and any pipelines in which average or maximum flow rates exceed the calculated flow capacities the pipelines in question were flagged for future upsizing. Increasing the diameters of these pipelines would in turn increase the calculated flow capacity.

Modeling Results

The model of the existing sewer system is shown in Figure 24. From Figure 24, the following pipelines were calculated to be deficient or close to deficient:

Table 9 – Existing Sewer System Modeling Results (Deficiencies Only)

	Peak Dry Weather Flow			**Peak Wet Weather Flow**		
Pipeline	Calculated Capacity (gpm)	Existing Flow (gpm)	Future Flow (gpm)	Calculated Capacity (gpm)	Existing Flow (gpm)	Future Flow (gpm)
MH #6 to MH#7	72	44	71	131	58	93
MH #20 to MH #24	123	139	223	224	182	291
MH #24 to Headworks	162	150	240	295	196	314

Notes:

1. Calculated capacities are based on 50% of available flow depth for the peak dry weather flow and 75% of the available flow depth for the peak wet weather flow.
2. Orange highlighted values are instances where existing or projected flows exceed existing capacity. Yellow highlighted values are instances where existing or projected flows come close (within 90% of the calculated capacity) to exceeding existing capacity.

For each pipeline, modeling the system with deficient pipelines increased to the next standard diameter (i.e. increasing 6 inch diameter pipes to 8 inch diameter pipes and increasing 8 inch diameter pipes to 10 inch diameter pipes) resulted in sufficient capacity, as can be seen in the improved results in Table 10 and Figure 25. This table reflects the increased calculated capacities.

Table 10 – Proposed Sewer System Modeling Results (Increased Pipelines Only)

	Peak Dry Weather Flow			Peak Wet Weather Flow		
Pipeline	Calculated Capacity (gpm)	Existing Flow (gpm)	Future Flow (gpm)	Calculated Capacity (gpm)	Existing Flow (gpm)	Future Flow (gpm)
MH #6 to MH#7	155	44	71	282	58	93
MH #20 to MH #24	264	139	223	482	182	291
MH #24 to Headworks	294	150	240	535	196	314

As a part of these improvements, an additional manhole will be added in the center of the line connecting MH #6 and MH #7. In the existing system, the distance between these manholes is 470 feet, which is longer than preferred for maintenance and inspection purposes. As the pipeline will be already be excavated for replacement, the incremental additional cost of adding an additional manhole will be negligible.

Infiltration and Inflow

As a part of the sewer analysis, a visual inspection of diurnal data was performed to determine if there were infiltration and/or inflow issues in the community. Infiltration occurs typically in areas of high groundwater where the increased flows in a collection system are introduced in cracks within the pipelines or at service connections. Infiltration is recognized in a collection system by increased collection system flow rates that do not closely follow a rainfall event. Increased flows measured in the collection system will slowly increase over time and slowly decrease after time following several rain events. Inflow is evident in a collection system when flows at the treatment plant are elevated immediately after a rainfall event and the increased flows disappear very soon after the rainfall event. Common causes of inflow are low lying infrastructure access points (i.e. manhole lids or cleanouts) or illegal drain connections.

Unaccounted for flow increases are also difficult to determine in a collection system. In the three years of data observed (January 2014 to December 2016), there were eight instances of dry weather months where wastewater influent exceeded water production (subtracting State Sewer influent). The peak month witnessed 7% of the wastewater influent entering the plant to be "unaccounted for," not including potential water losses in the potable water system. This implies illegal connections, dumping, or other sources of unaccounted for dry-weather inflows are present in the system. While not related to infiltration or inflow connected to a rainfall event, source control of wastewater increases is required.

In wet weather months, increased wastewater influent accounted for as much of 38% of total wastewater influent (subtracting the base State Sewer flow rates). While this may partially be caused by the potential illegal connections, comparison of rainfall graphs with meter data from the wastewater treatment plant showed evidence of peaking at the treatment plant following rainfall surges on a slight delay. This implies that inflow may be an issue in the system. Inflow requires the treatment system to process and discharge storm water. Processing storm water is an additional cost to the community.

To prevent inflow, the District should perform pipeline inspections including CCTV inspections and smoke tests to detect sources of inflow and lessen loads on the wastewater treatment plant. Manholes or cleanouts located at low elevations relative to the surrounding area could be a source of inflow.

Summary of Proposed Improvements

As discussed in the modeling section above, three pipelines are recommended to be upsized (including MH #6 to MH #7 (6 inches to 8 inches), MH #20 to MH #24 (6 inches to 8 inches), and MH #24 to the headworks (8 inches to 10 inches). The proposed wastewater system can be seen in Figure 6, and the phasing of these improvements can be seen in Figure 13. In addition, to prevent inflow, it is recommended that any manholes located in unpaved areas be raised and smoke testing be performed to detect illegal drain connections. Due to the age of the vitrified clay pipelines in the collection system, the District should consider lining the entire sewer system with Cured In Place Pipeline (CIPP) material. CIPP is a no-dig pipeline rehabilitation solution, which creates a continuous pipe within the existing pipeline with no joints. When properly installed, the manufacturer states that the lining will extend a collection system pipeline with a 50 year liner. It will need to be determined through a design-level analysis if the community is a suitable candidate for this rehabilitation method.

Additionally, the District is aware of a sag in the pipeline on Castillo Drive south of Otter Way. As part of the phased improvements, this section of pipeline will be replaced to repair the sag.

Recycled Water

Existing System

The existing recycled water system started out as a small stream water recycling facility at the wastewater treatment plant. The facility uses ozone disinfection coupled with a cassette filtration system to achieve Title 22 unrestricted water. The system was developed for this facility as a packaged system. The existing system also contains three 2,500 gallon water storage tanks to provide backflushing/filter cleaning source water as well as distribution water. The system is permitted by the Regional Water Quality Control Board (RWQCB) for irrigation use within the community. A wharf head hydrant and pumped discharge system is located at the treatment plant to allow District staff to fill the community water truck or allow residents to obtain District supervised water container filling to be used for irrigation. District staff then distributes the recycled water to various approved locations in the community.

Recommended Improvements

As part of the recommended improvements to the potable water system, many pipelines within the community will be abandoned in place and replaced with new larger diameter PVC pipelines. These pipelines could be repurposed for recycled water use for a comparatively small cost in lieu of installing new, dedicated recycled water pipelines. Specifically, existing asbestos cement pipelines along Pico Avenue, Avonne Avenue, and Otter Way would serve as the backbone of the recycled water system east of (and underneath) State Route 1. West of State Route 1, portions of the existing potable water system will not be replaced, but existing civil designs have been previously prepared for a recycled water pipeline within these areas. To supply the proposed recycled water system, a recycled water pump station would need to be constructed at (or near) the existing wastewater treatment plant. Additionally, the existing 150,000 gallon potable water storage reservoir would be converted to irrigation water use (which will involve piping adjustments at the reservoir site once the transition is ready to be made). The potential customers that could be gained by this improved distribution system are shown on Figure 7 and are summarized in Table 11, below.

Table 11 – Proposed Recycled Water System Improvements

Type of Improvement	Recommendations
Pipeline	• Conversion of existing asbestos cement pipelines from potable water service to recycled water service ○ Pico Avenue from reservoir to intersection of Avonne Ave. ○ Avonne Ave from Pico Ave to Otter Way. ○ Otter Way (including pipeline underneath State Route 1). • Construction of new recycled water pipelines ○ Hearst Dr ○ San Simeon Ave ○ Vista Del Mar Ave ○ Balboa Ave
Facilities	• Conversion of existing 150,000 gallon reservoir from potable water service to recycled water service. • Installation of a new recycled water pump station.

Road Network Improvement Plan

Existing Road Network

The existing road network in the District is made up of three different jurisdictions: the State Department of Transportation, the County of San Luis Obispo and the District. The State Department of Transportation (Caltrans) has owns and maintains State Route 1 that bifurcates the community. Caltrans also maintains a large section of right of way bordering SR 1. Additionally, the County of San Luis Obispo is responsible for the maintenance of the pavement on Hearst Drive and Castillo Drive. The remaining streets are owned and maintained by the District. Figure 1 shows the existing road network in the community.

The roads within the District are constructed of asphalt concrete at all locations. There are no concrete public roads within the community. Asphalt concrete is defined as a flexible pavement meaning it deflects depending on the vehicle loading. Rigid concrete pavements do not deflect within the material matrix. One of the benefits of flexible pavements is that they react to the vehicle loads. Asphalt concrete is comprised of an asphaltic binder, aggregate/fines and sometimes additives to provide resistance to temperature and service locations. Sometimes Counties or regulatory agencies provide specifications related to the type of pavement material that they allow within their jurisdictions. Road widths are also typically regulated to allow for proper fire truck movements, parking, and traveling. Road pavement design usually is dictated by the regulatory authority responsible for the pavement. For the District, while not governed by the County of San Luis Obispo, the County road standards are a good guide for existing and future design criteria.

Many engineering design factors are considered in pavement design whether it is flexible or rigid. Pavement loading (vehicle number and type), pavement base material and subgrade material will calculate a pavement structural section. The designer can vary the thickness of the pavement material thickness or the base thickness to allow for some cost savings in material. However, there are limits to this. Traffic index (TI) values are based on the number and type of vehicle using the roadway.

The community is relatively small and the existing road widths vary from 25 feet to 36 feet which is typical of residential (local) and minor collector streets. The County defines Local Roads or Streets as, "one which is or will be used primarily for access to abutting property." Collector Roads or Streets as, "one which is or will be used primarily to enable traffic to move to and from Local Roads or Streets and Arterial Roads or Streets." These definitions are consistent with the streets within the District. There are no connected sidewalk paths within the District. Portions of sidewalk have been installed, obviously as a condition of development of the parcel, but no consistency is present within the community. Sidewalks start and stop randomly creating an awkward pedestrian path of travel. This leads to pedestrians walking in the street with vehicle traffic or over unimproved parcel frontages.

Pavement management falls into three distinct categories: maintenance, rehabilitation and replacement.

Many of the streets terminate at cul de sac configurations and do not loop. There is a portion of Avonne Avenue that is looped to Otter Way and the two County maintained roads (Hearst Drive and Castillo Drive) are connected on both ends to SR 1 and community streets. The road network is as shown in

Table 12. The streets are represented there showing the overall dimensions and ownership. Figure 1 shows the overall map of the community and the road network.

Table 12 – Community Existing Road Network

Road Name	Ownership	From	To	Width (ft)	Length (ft)	Total Square Footage (ft^2)
Pico Avenue	District	SR-1	End	20	800	16,000
Pen Way	District	Avonne Avenue	Jasper Ave	23	475	10,925
Jasper Avenue	District	Pen Way	End	25	600	15,000
Avonne Ave	District	Pico Avenue	End	36	2,450	88,200
Vista Del Mar Avenue	District	Hearst Drive	Balboa Avenue	30	715	21,450
Balboa Avenue	District	Vista Del Mar Avenue	End	36	775	27,900
Otter Way	District	Avonne Avenue	Castillo Drive	36	335	12,060
Pico Avenue (west)	District	Hearst Drive	End	32	245	7,840
San Simeon Avenue	Private	Hearst Drive	End	38	415	15,770
Castillo Drive	County	SR-1 North	SR-1 South	36	2,275	81,900
Hearst Drive	County	SR-1 North	SR-1 South	36	2,200	79,200

Notes:
1. Measurements of width verified by representative measurements at various locations along the roadway length. Length of the roadway estimated from Google Earth imagery.
2. San Simeon Avenue is shown for reference only.

The roadway structural section is not known. Record information on the construction of the asphalt concrete pavement, road base or subgrade materials is not known. The road network was constructed at separate times and over the past decades certain road repairs have been made. A surface observation (windshield survey) of the pavement was performed at several locations in the community. Unfortunately, no testing of the pavement or coring of the pavement to determine the existing pavement thickness was performed as part of this process. This section relied on engineering judgement and opinion in determining the recommendations to the road pavement network.

Inadequate asphalt concrete thickness can lead to premature failure of the pavement. Typical pavement failures can be attributed to failure of the subgrade or base material, water penetration of the pavement matrix, block cracking due to age, failed compaction of utility trenches to name a few.

Pavement maintenance falls into three categories: maintenance, rehabilitation, replacement. The magnitude of the cost of each category increases from the least costly/impact to the most cost/impact. Typical maintenance activities include crack sealing, slurry sealing, microsurfacing. Those pavement maintenance activities must be performed every 5 to 7 years to maximize the life of the pavement. This assumes that there are no inherent issues with the pavement such as failing base or subgrade or pavement that has already exceeded its design life. Maintenance is required to maximize the life of the pavement product.

Pavement rehabilitation includes pavement overlays or the addition of pavement material thickness. Some agencies grind the surface of the pavement off and install a pavement layer back. Other agencies, do not grind and simply install additional thickness over the existing pavement layer. While less expensive than grinding the pavement, the second option will lead to an increasing crown of the pavement which eventually affects the cross slope of the street. Pavement rehabilitation is performed typically when the pavement maintenance programs are not providing the continued result, or the underlying pavement begins to fail. Rehabilitation projects occur depending on the failure mechanism, but should be budgeted for on a 15 to 20-year basis.

Pavement replacement is a complete removal of the pavement material and depending on the condition of the base material or subgrade it may require removal also. Pavement replacement occurs when the pavement has reached complete failure due to age or structural issues. The typical life of well-maintained pavement is 30 to 40 years depending on climate and use.

Assumptions had to be made regarding the pavement thickness and configuration. Typical asphalt concrete pavement thickness for residential vehicle traffic is dependent on the thickness of the road base material and the subgrade material. While unconventional, it is assumed that residential vehicle loading will average a pavement thickness greater than 4 inches with a nominal aggregate base thickness. This is greatly dependent on the number of truck or heavy vehicle loads encountered and frequency of loading. The District is a small community and based on experience, the number of vehicle trips on the streets is relatively low. For this report, it was assumed that the existing asphalt pavement section of the District streets is 4 inches thick over 4 inches of aggregate base. Table 13 shows the road pavement visual condition assessment as well as a typical recommendation for rehabilitation.

Table 13 –Road Pavement Condition Survey

Road Name	Condition Assessment	Recommendation
Pico Avenue	Aged pavement with isolated pockets of failure and deep cracking	Dig outs of isolated areas of failure with a grind and overlay
Pen Way	General failure of the pavement especially at trench areas – cracking evident	Grind and overlay
Jasper Avenue	Isolated cracking of pavement; pavement structure appears to be intact	Dig outs of isolated areas and slurry sealing
Avonne Ave	Extensive network of pavement patches that occurred over time. Failures at several locations	Grind and overlay
Vista Del Mar Avenue	Extensive pavement failure (alligatoring) of the pavement	Grind and overlay, but in depth investigation may warrant full pavement removal
Balboa Avenue	Evidence of full width pavement placement different than original. Original pavement has failed extensively	Grind and overlay of failed section; slurry sealing of areas of more recent pavement
Otter Way	Extensive pavement failure (alligatoring) of the pavement	Grind and overlay, but in depth investigation may warrant full pavement removal

Road Name	Condition Assessment	Recommendation
Pico Avenue (west)	Aged pavement with extensive cracking indicative of complete replacement	Grind and overlay
San Simeon Avenue	Recently slurry sealed.	Continued slurry sealing – eventual grind and overlay

Notes:

1. Condition assessment performed while driving the different street segments represented in the table above. Recommendations are based on the existing condition. Pavement investigation such as coring or potholing separate locations is recommended to finalize the pavement design approach.
2. San Simeon Avenue is a private street and shown for reference.

Recommended Pavement Improvements

Actual testing of the pavement thickness is highly encouraged to better understand the existing network. Pavement design/testing should be performed when the recommended pavement projects are performed. It is also recommended that when the District performs or allows other utilities to perform excavation of the pavement section, that in situ measurements of the pavement thickness and aggregate base thickness be performed and a database of the pavement within the District boundary be maintained. Opinions of Probable Construction Costs (OPCC) were provided for the recommended improvements to the pavement network. The OPCCs were based on recent bid results; however, due to the location of the community and potential phasing of the improvements determined based on funding for the work, the costs of the individual projects may vary. Table 14 lists the pavement review of the existing conditions and the recommended improvements as well as a range of potential improvement costs for each project. The proposed pavement improvements are shown in Figure 8.

Table 14 – Pavement Recommendations

Road Name	Roadway Surface Area (SF)	Cost Per SF
Pico Avenue	16,000	$3-$5
Pen Way	10,925	$3-$5
Jasper Avenue	15,000	$2-$3
Avonne Ave	88,200	$3-$5
Vista Del Mar Avenue	21,450	$3-$5
Balboa Avenue	27,900	$3-$5
Otter Way	12,060	$3-$5
Pico Avenue (west)	7,840	$3-$5

Notes:

1. Measurements of width verified by representative measurements at various locations along the roadway length. Length of the roadway estimated from Google Earth imagery.
2. Values in the table were rounded to the nearest $1,000.
3. Values shown are from recent bid results; however, the actual project costs may be skewed based on the location of the community and the distance to the nearest asphalt concrete batch plant.

It is recommended that the District perform in depth testing of the existing pavement network as part of the design of the individual pavement projects. As mentioned previously, it is recommended that any time an excavation is performed in the community, a pavement thickness as well as a pavement base measurement be taken to begin to document what the existing pavement profile is. It is possible to retain the services of a pavement coring company to perform existing pavement investigation at various locations within the community to gather the same information on an accelerated, focused schedule. This information will be important for the design. The analysis in this report for the existing pavement conditions is limited to the aboveground visual review.

Additionally, a regular pavement maintenance program should be budgeted for on an annual basis so adequate funding is available for long term maintenance purposes.

Improvement Phasing

Phasing of the recommended improvements was designed with budgetary concerns, constructability concerns, system importance and regulatory need for the improvements, and the needs of the community in mind. The most processing need to the addressed in the phasing determination was the immediate need for additional potable water storage in the community to meet regulatory and fire prevention needs. As the construction of one large reservoir that would meet the total calculated need of 1.54 million gallons (as discussed earlier in this report) was deemed to be not preferred, this storage will be added to the system by constructing four separate water storage tanks, which will be split among the first four phases of improvements. From there, the pipeline-related potable water improvements were phased based on reasonable budgeting for each phase, with the improvements that would provide the most immediate benefits to available fire flows being performed first. Phasing determination also included consideration for grouping improvements into "zones" so that work would be isolated to one area of the community at a time to minimize mobilization costs and community disturbance. Improvements to the sanitary sewer system were included in the same phase as pipeline improvements within like areas to further minimize mobilization costs and in hopes that trenching for both potable water and sewer related improvements could occur concurrently.

For budgetary reasons, all recycled water improvements, road improvements, and CIPP lining of the sanitary sewer system were grouped into the final phase of work, Phase 5. While ideally repaving of roads would occur concurrently with trenching work needed for potable water pipeline improvement to minimize the amount of road repair due to trenching that must occur, saving the road improvement work for one final phase does provide a more feasible breakdown of budget between the phases and will likely reduce mobilization costs and total cost of the work due to increased scale of the proposed paving contract. Consideration must be made to the fact that depending on the actual timeline of Phases 1 through 4, the road conditions in the community may deteriorate to below acceptable levels prior to work beginning on Phase 5.

A detailed breakdown of the work included in each phase of work can be found in Figure 26. A brief summary of the work included in each phase can be found in Table 15, below.

Table 15 – Proposed Improvement Phasing Summary

Phase	Classification	Description of Work
1	Potable Water	• Construction of 400,000 gal water storage tank • Pipeline replacements and diameter increases from the reservoir to the intersection of Pico and Avonne, from the Jasper Ave cul-de-sac to Avonne, Avonne from Pico to Otter Way, Otter Way from Avonne to San Simeon Way (including line underneath SR 1), and on Pico from Avonne to Castillo • Construction of a new dedicated tank feed pipeline • Construction of a new pipeline connecting the Jasper Ave cul-de-sac and Pico • Construction of a new pipeline along Castillo from Pico to Otter Way • Misc. valve and fire hydrant replacements

Phase	Classification	Description of Work
1	Sanitary Sewer	• Pipeline replacement and diameter increase from MH #5 to MH #7 (along Castillo north of Otter Way) • Addition of a new manhole along Castillo
	Recycled Water	• No work performed this phase
	Road Improvements	• No work performed this phase
2	Potable Water	• Construction of 400,000 gal water storage tank • Pipeline replacements and diameter increases from Pico and Castillo underneath SR 1 to first hydrant along Hearst Dr • Misc. valve and fire hydrant replacements
	Sanitary Sewer	• No work performed this phase.
	Recycled Water	• No work performed this phase
	Road Improvements	• No work performed this phase
3	Potable Water	• Construction of 400,000 gal water storage tank • Pipeline replacements and diameter increases along Avonne south of Otter Way, and Castillo south of Otter Way • Construction of a new pipeline connecting Avonne and Castillo south of Otter Way • Misc. valve and fire hydrant replacements
	Sanitary Sewer	• Repair of a pipeline sag on Avonne
	Recycled Water	• No work performed this phase
	Road Improvements	• No work performed this phase
4	Potable Water	• Construction of 400,000 gal water storage tank • Pipeline replacements and diameter increases along Hearst north of San Simeon Ave, and from the interior of the Sea Gate community, along Balboa and Vista Del mar to Hearst • Pipeline replacements (from asbestos cement to PVC) from the Sea Gate community to San Simeon Ave, in the easement behind the Sea Breeze Inn, and between the District office and wellheads • Construction of a new pipeline connecting Castillo and Vista Del Mar (underneath SR 1). • Misc. valve and fire hydrant replacements
	Sanitary Sewer	• Pipeline replacements and diameter increases from MH #20 to MH #24 and from MH #24 to the headworks (all located adjacent to the WWTP)
	Recycled Water	• No work performed this phase
	Road Improvements	• No work performed this phase
5	Potable Water	• No work performed this phase
	Sanitary Sewer	• CIPP lining of the entirety of the sewer system

Phase	Classification	Description of Work
5	Recycled Water	• Repurposing of existing asbestos cement pipeline for recycled water use from the existing reservoir, along Pico, Avonne, Otter Way, and underneath SR1 to connect to San Simeon Ave • Construction of new pipelines along San Simeon Ave west of SR 1, Hearst, Vista Del Mar and Balboa • Construction of a new recycled water pump station • Conversion of the existing 150,000 gallon reservoir to recycled water use
	Road Improvements	• Road grinding and overlay, spot repairs, and/or slurry sealing of entire community • Sidewalk additions

Notes:

1. See Figure 26 for a detailed breakdown of the work to occur in each phase.

Capital Improvement Costs by Phase

The capital improvement cost for each phase is summarized in Table 16. These are budgetary values and are not design level costs. The values provided may not include unforeseen costs due to conditions encountered based on existing conditions or changes that may occur during the design phase. Detailed cost estimates for the individual projects are provided in Figures 27-31.

Table 16 – Summary of Estimated Costs

Phase	Estimated Cost
1	$3,626,900
2	$1,482,100
3	$2,194,800
4	$2,576,800
5	$2,729,600
SUM	**$12,610,200**

Notes:

1. Costs include overhead, contingency, design fees, etc. as shown in Figures 27-31.

This phasing maintains a somewhat uniform spread of costs, with the exception of a higher up front cost in Phase 1, followed by a smaller cost Phase 2. Phase 1 will focus on performing improvements to the backbone of the system to provide the maximum benefit in terms of immediate improvements in fire suppression capabilities and pressures. Minor wastewater system improvements would be constructed in overlapping areas (Castillo Drive) to minimize disruption to residents and to avoid having to excavate in the same road multiple times. The remainder of the system improvements are distributed into the remaining phases, including completion of recommended potable water system improvements, sanitary sewer system improvements, recycled water system improvements, and road improvements.

Figures

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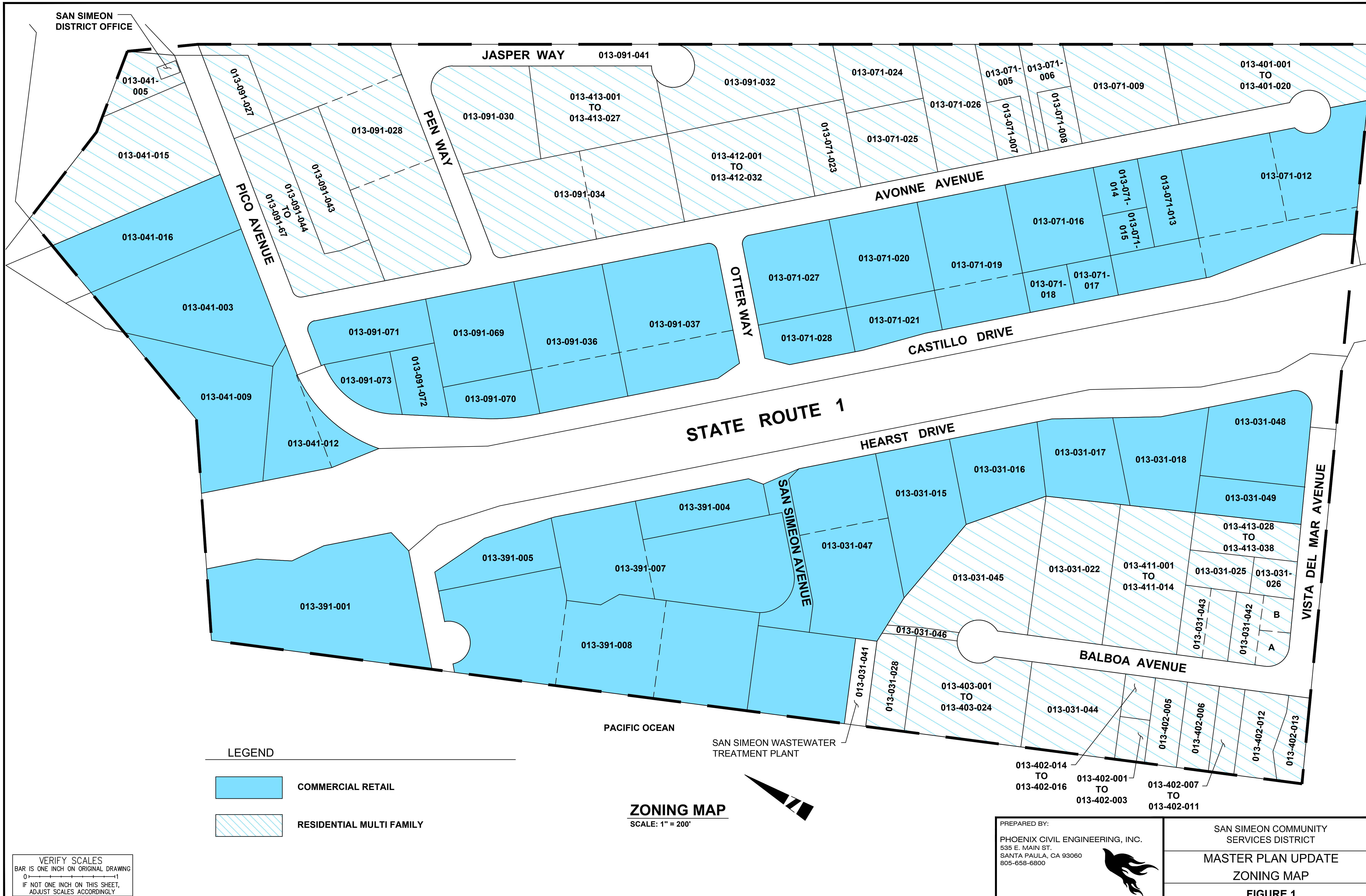
SAN SIMEON DISTRICT OFFICE
JASPER WAY
PEN WAY
PICO AVENUE
AVONNE AVENUE
OTTER WAY
CASTILLO DRIVE
STATE ROUTE 1
HEARST DRIVE
SAN SIMEON AVENUE
VISTA DEL MAR AVENUE
BALBOA AVENUE
PACIFIC OCEAN
SAN SIMEON WASTEWATER TREATMENT PLANT
013-041-005
013-041-015
013-041-016
013-041-003
013-041-009
013-041-012
013-091-027
013-091-028
013-091-043
013-091-044 TO 013-091-67
013-091-041
013-091-030
013-413-001 TO 013-413-027
013-091-034
013-091-032
013-412-001 TO 013-412-032
013-071-023
013-071-024
013-071-025
013-071-026
013-071-005
013-071-006
013-071-007
013-071-008
013-071-009
013-401-001 TO 013-401-020
013-071-012
013-071-013
013-071-014
013-071-015
013-071-016
013-071-017
013-071-018
013-071-019
013-071-020
013-071-021
013-071-027
013-071-028
013-091-071
013-091-069
013-091-036
013-091-037
013-091-073
013-091-072
013-091-070
013-031-048
013-031-049
013-031-017
013-031-018
013-031-016
013-031-015
013-031-047
013-391-004
013-391-005
013-391-007
013-391-001
013-391-008
013-031-045
013-031-022
013-411-001 TO 013-411-014
013-413-028 TO 013-413-038
013-031-025
013-031-026
013-031-043
013-031-042
B
A
013-031-046
013-031-041
013-031-028
013-403-001 TO 013-403-024
013-031-044
013-402-005
013-402-006
013-402-012
013-402-013
013-402-014 TO 013-402-016
013-402-001 TO 013-402-003
013-402-007 TO 013-402-011
LEGEND
COMMERCIAL RETAIL
RESIDENTIAL MULTI FAMILY
ZONING MAP
SCALE: 1" = 200'
N
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
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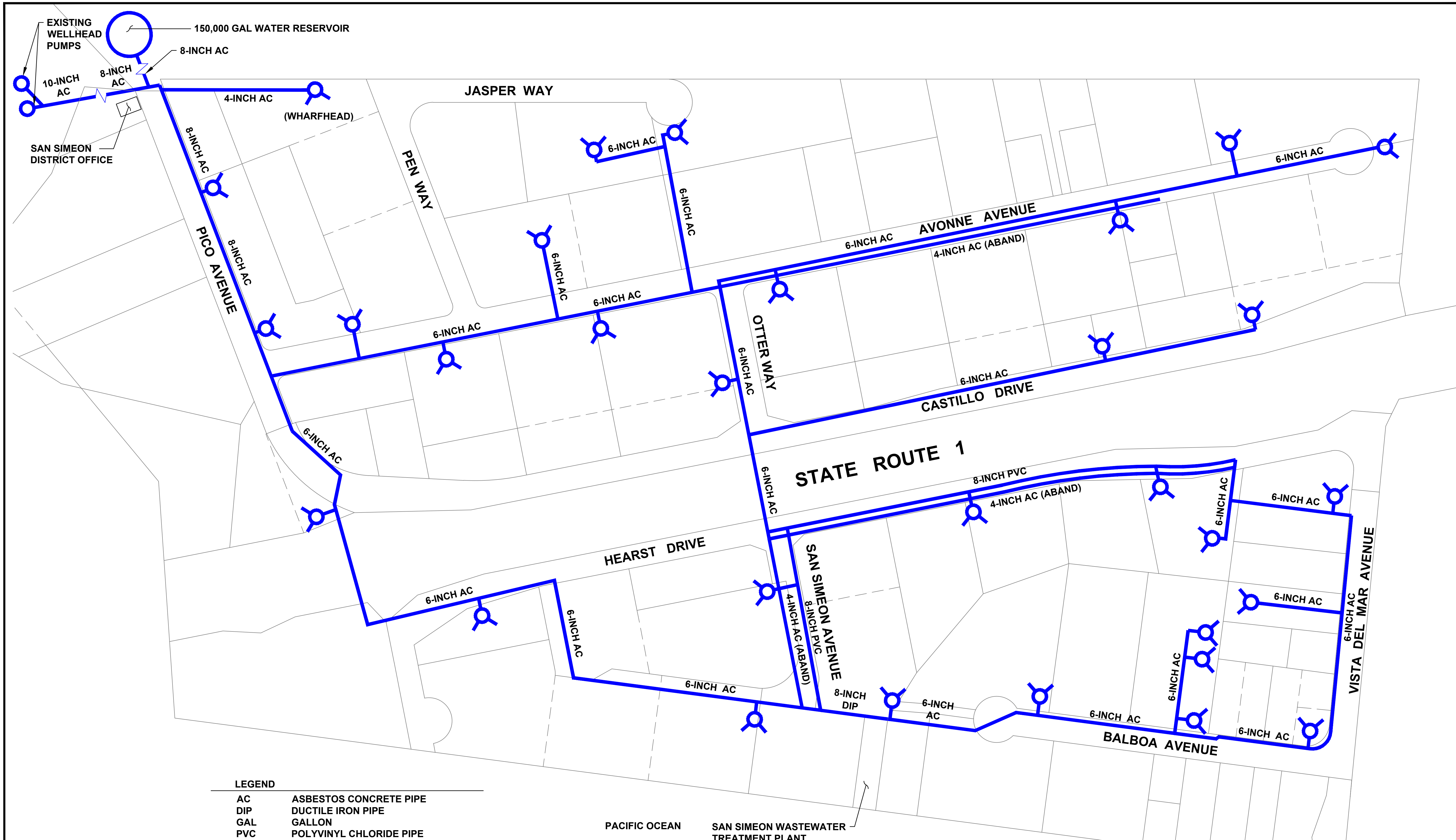
SAN SIMEON COMMUNITY SERVICES DISTRICT
MASTER PLAN UPDATE
ZONING MAP
FIGURE 1



LEGEND

AC	ASBESTOS CONCRETE PIPE
DIP	DUCTILE IRON PIPE
GAL	GALLON
PVC	POLYVINYL CHLORIDE PIPE
(blue line)	EXISTING WATER LINE
(hydrant symbol)	EXISTING FIRE HYDRANT (SHOWN NOT TO SCALE FOR CLARITY)

EXISTING WATER SYSTEM

SCALE: 1" = 200'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 — 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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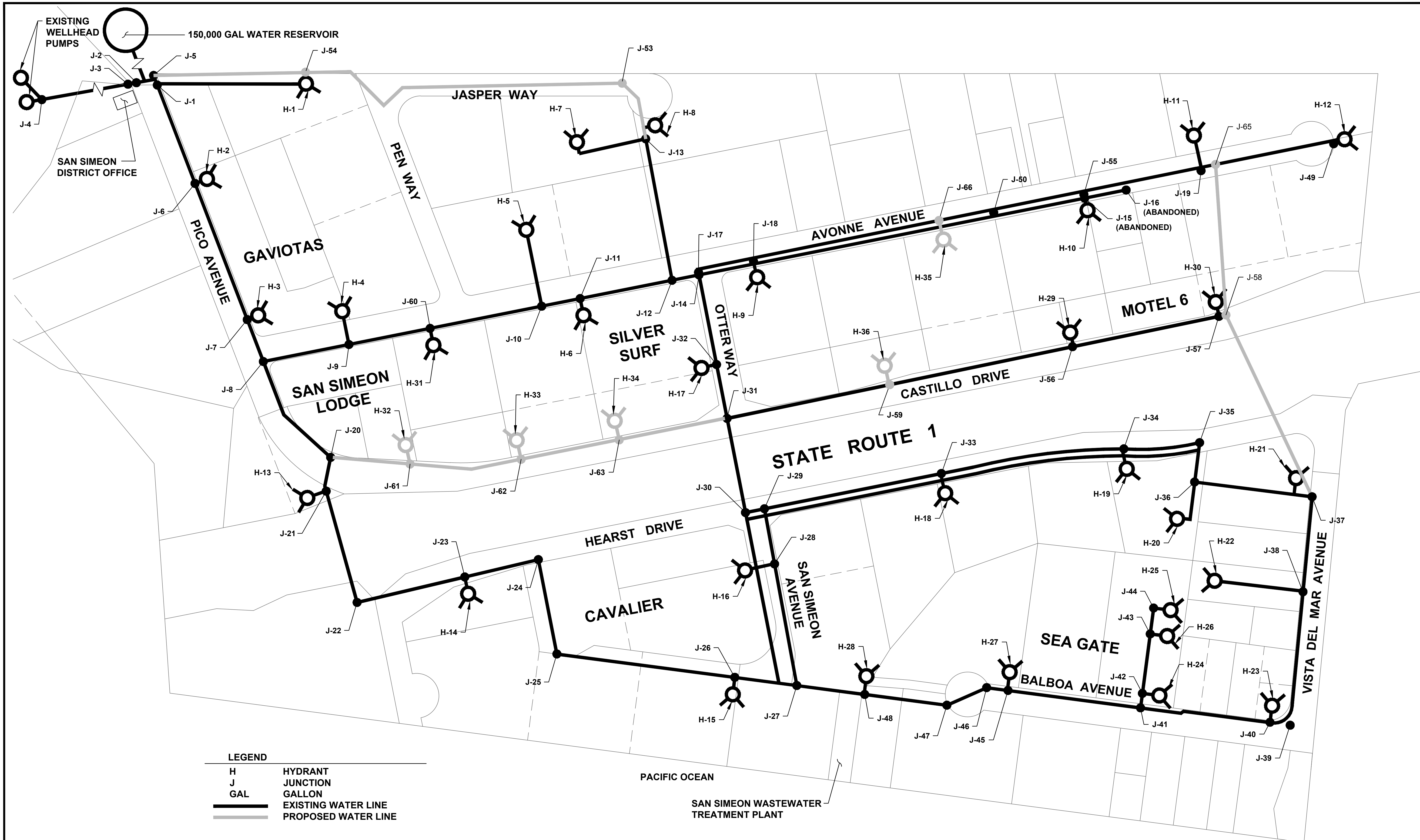
MASTER PLAN UPDATE
EXISTING WATER SYSTEM

FIGURE 2



WATER MODEL NODE LABELS

SCALE: 1" = 200'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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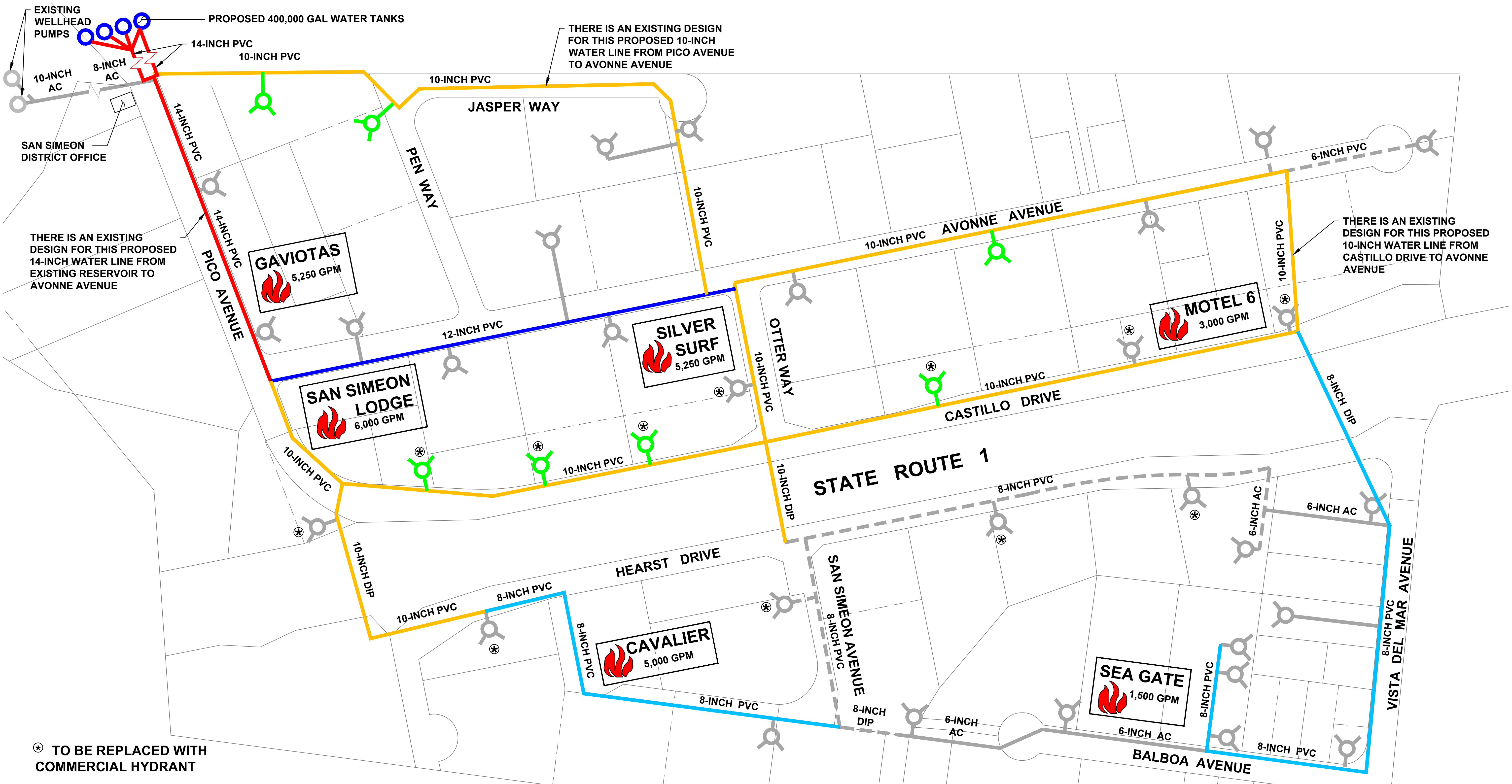
MASTER PLAN UPDATE
WATER MODEL NODE LABELS

FIGURE 3



LEGEND

AC	ASBESTOS CONCRETE PIPE
DIP	DUCTILE IRON PIPE
PVC	POLYVINYL CHLORIDE PIPE
(gray dashed line)	EXISTING WATER LINE
(gray line)	EXISTING WATER LINE TO BE REPLACED
(cyan line)	PROPOSED 8-INCH WATER LINE
(yellow line)	PROPOSED 10-INCH WATER LINE
(blue line)	PROPOSED 12-INCH WATER LINE
(red line)	PROPOSED 14-INCH WATER LINE
(gray hydrant symbol)	EXISTING FIRE HYDRANT TO BE REPLACED AS PART OF IMPROVEMENTS PROGRAM (SHOWN NOT TO SCALE FOR CLARITY)
(green hydrant symbol)	PROPOSED FIRE HYDRANT (SHOWN NOT TO SCALE FOR CLARITY)

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 — 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROPOSED WATER SYSTEM
SCALE: 1" = 200'

N

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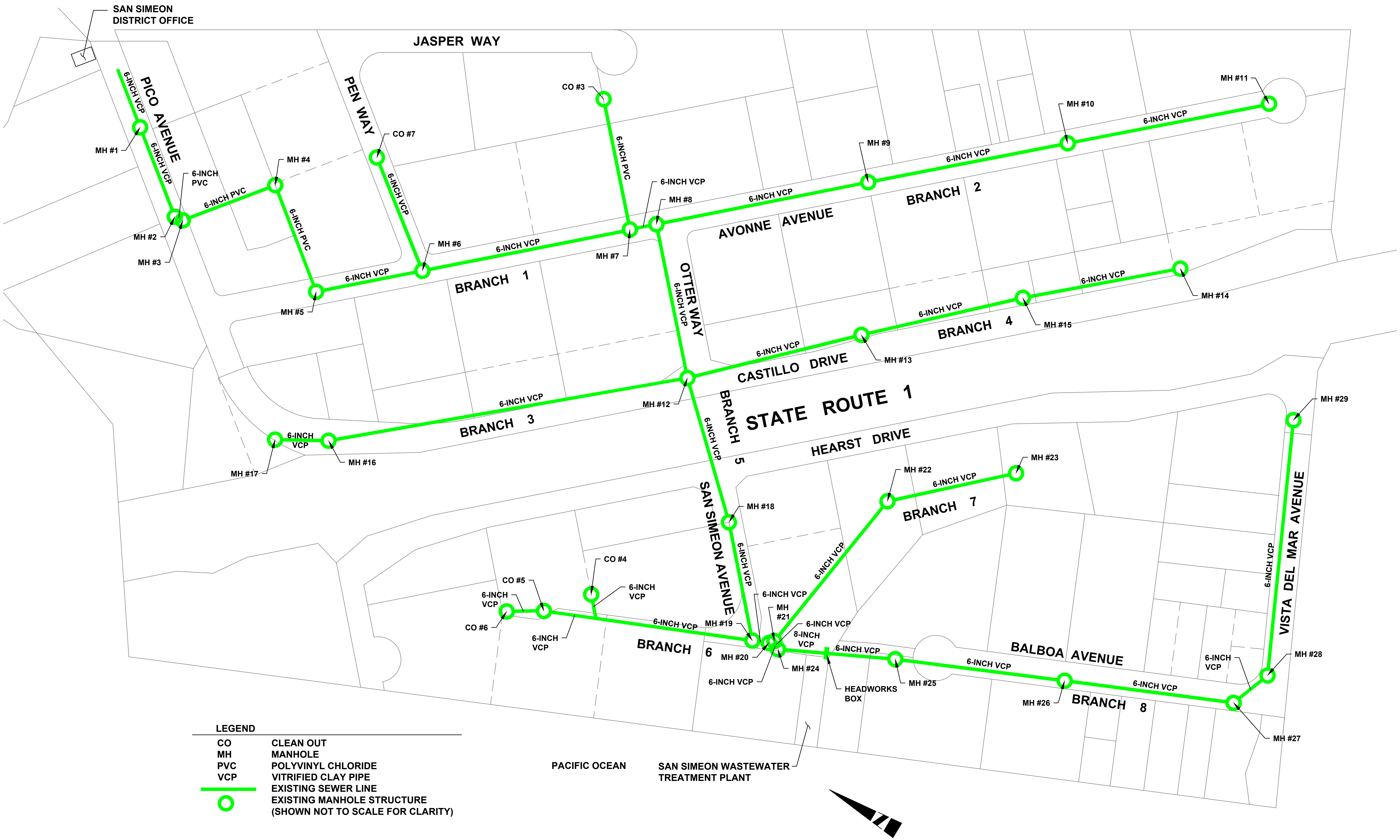
SAN SIMEON COMMUNITY SERVICES DISTRICT
MASTER PLAN UPDATE
PROPOSED WATER SYSTEM
FIGURE 4



LEGEND

CO	CLEAN OUT
MH	MANHOLE
PVC	POLYVINYL CHLORIDE
VCP	VITRIFIED CLAY PIPE
(green line)	EXISTING SEWER LINE
(green circle)	EXISTING MANHOLE STRUCTURE (SHOWN NOT TO SCALE FOR CLARITY)

EXISTING WASTEWATER SYSTEM

SCALE: 1" = 200'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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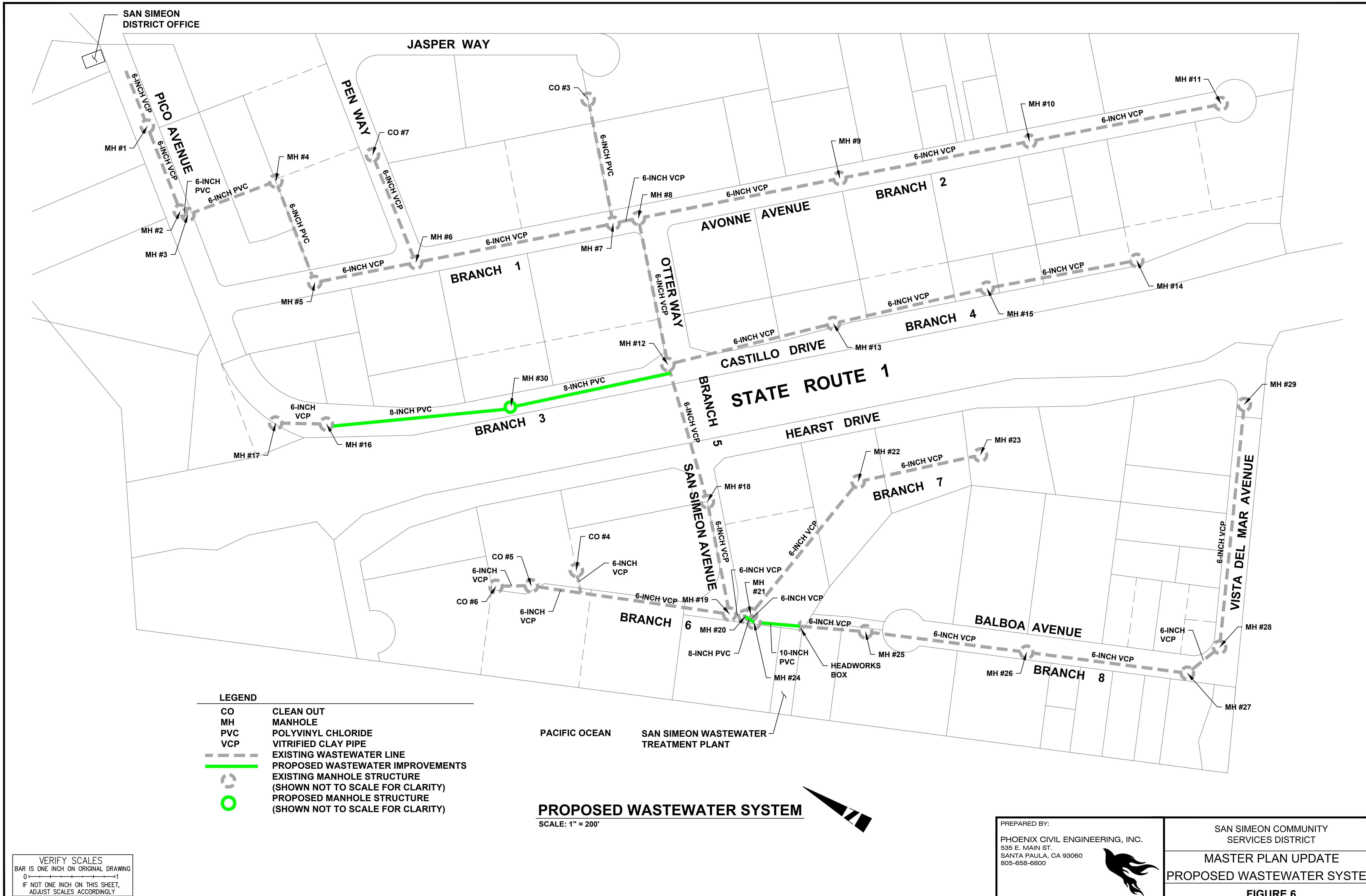
SAN SIMEON COMMUNITY SERVICES DISTRICT

MASTER PLAN UPDATE
EXISTING WASTEWATER SYSTEM

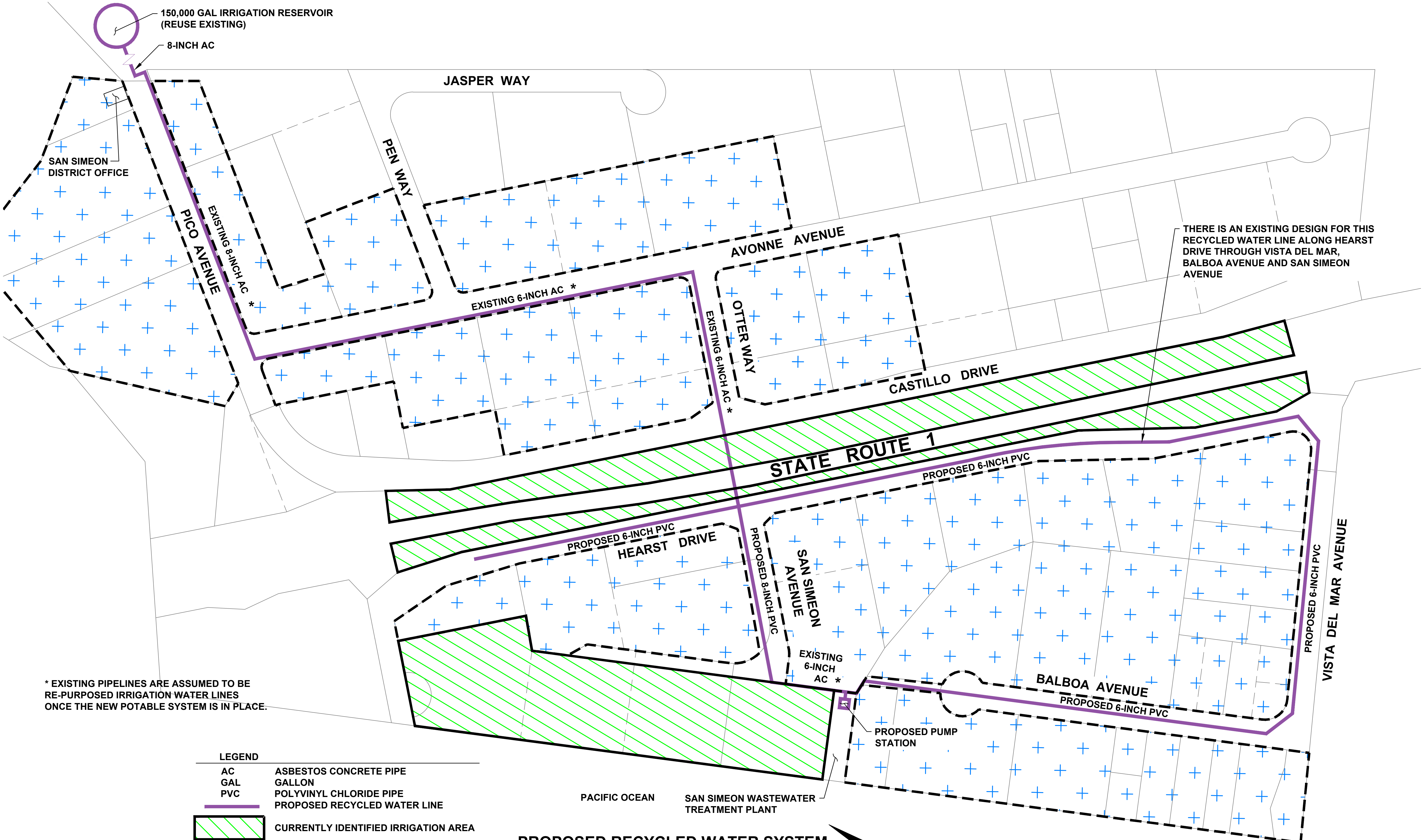
FIGURE 5



PROPOSED WASTEWATER SYSTEM

SCALE: 1" = 200'

FIGURE 6



LEGEND

AC	ASBESTOS CONCRETE PIPE
GAL	GALLON
PVC	POLYVINYL CHLORIDE PIPE
(purple line)	PROPOSED RECYCLED WATER LINE
(hatched area)	CURRENTLY IDENTIFIED IRRIGATION AREA
(dashed area)	POTENTIAL CUSTOMERS

PROPOSED RECYCLED WATER SYSTEM

SCALE: 1" = 200'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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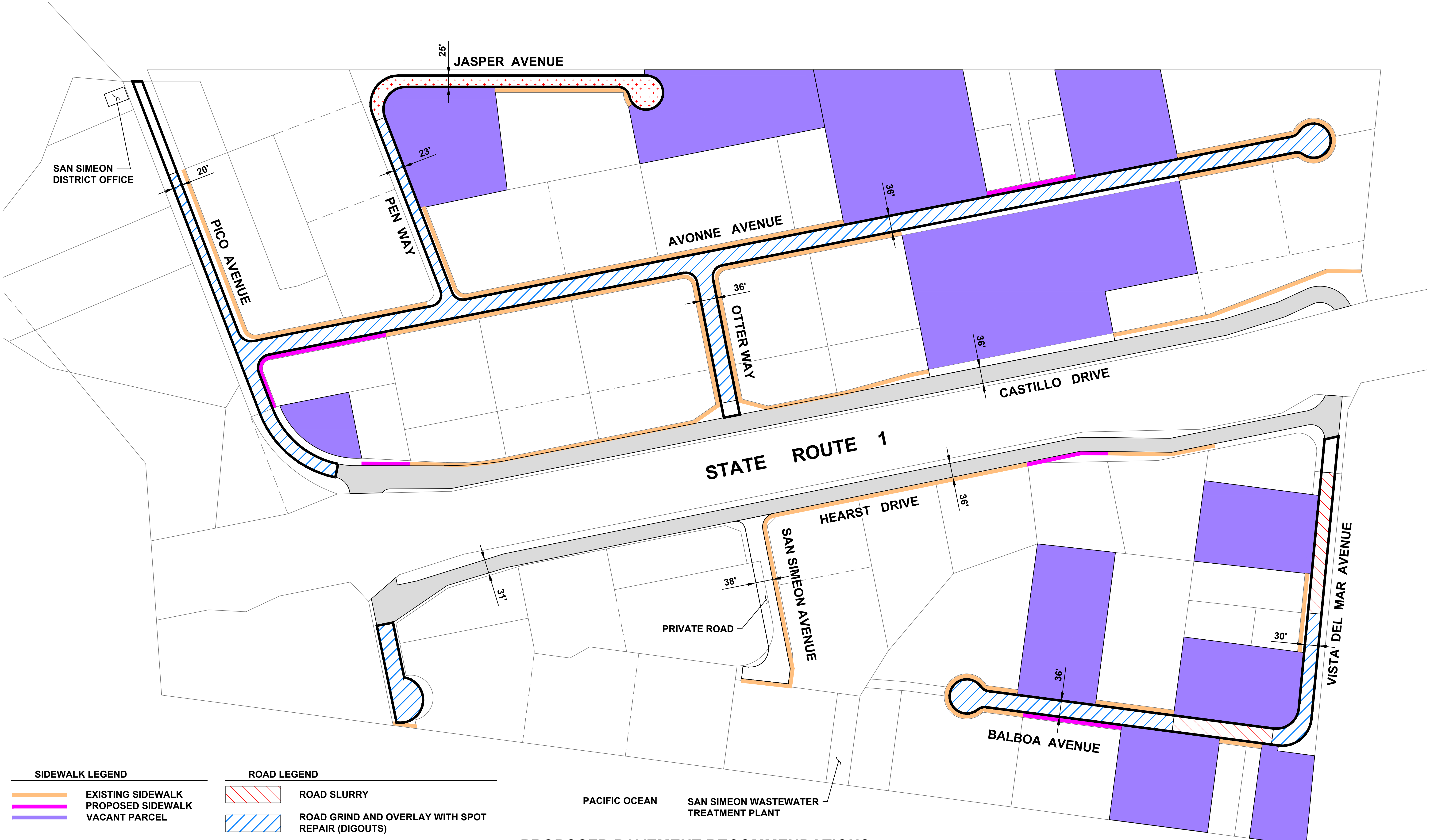
MASTER PLAN UPDATE
PROP RECYCLED WATER SYSTEM

FIGURE 7



SIDEWALK LEGEND

- EXISTING SIDEWALK
- PROPOSED SIDEWALK
- VACANT PARCEL

ROAD LEGEND

- ROAD SLURRY
- ROAD GRIND AND OVERLAY WITH SPOT REPAIR (DIGOUTS)
- DIGOUT REPAIRS AND SLURRY
- EXISTING PAVEMENT COUNTY RESPONSIBILITY
- EXISTING PAVEMENT DISTRICT RESPONSIBILITY

PROPOSED PAVEMENT RECOMMENDATIONS

SCALE: 1" = 200'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 — 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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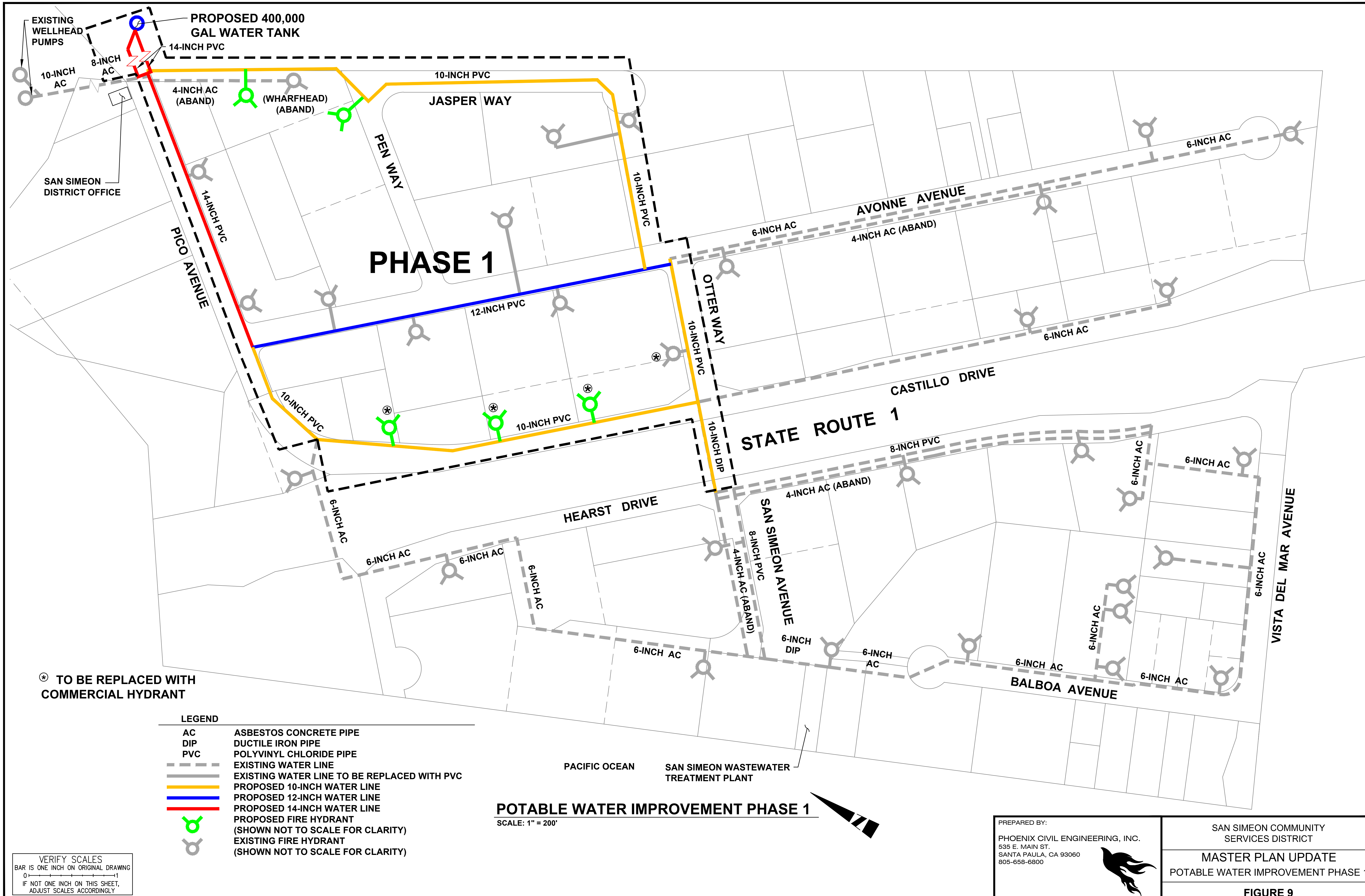
MASTER PLAN UPDATE

PROP PAVEMENT RECOMMENDATIONS

FIGURE 8


EXISTING WELLHEAD PUMPS
PROPOSED 400,000 GAL WATER TANK
14-INCH PVC
8-INCH AC
10-INCH AC
4-INCH AC (ABAND)
(WHARFHEAD) (ABAND)
10-INCH PVC
JASPER WAY
PEN WAY
SAN SIMEON DISTRICT OFFICE
14-INCH PVC
PICO AVENUE
PHASE 1
10-INCH PVC
6-INCH AC
AVONNE AVENUE
4-INCH AC (ABAND)
6-INCH AC
12-INCH PVC
OTTER WAY
10-INCH PVC
6-INCH AC
CASTILLO DRIVE
10-INCH PVC
10-INCH PVC
10-INCH DIP
STATE ROUTE 1
8-INCH PVC
6-INCH AC
6-INCH AC
4-INCH AC (ABAND)
HEARST DRIVE
6-INCH AC
6-INCH AC
6-INCH AC
6-INCH AC
SAN SIMEON AVENUE
8-INCH PVC
4-INCH AC (ABAND)
6-INCH AC
6-INCH AC
VISTA DEL MAR AVENUE
6-INCH AC
6-INCH DIP
6-INCH AC
6-INCH AC
6-INCH AC
BALBOA AVENUE
TO BE REPLACED WITH COMMERCIAL HYDRANT
LEGEND
AC ASBESTOS CONCRETE PIPE
DIP DUCTILE IRON PIPE
PVC POLYVINYL CHLORIDE PIPE
EXISTING WATER LINE
EXISTING WATER LINE TO BE REPLACED WITH PVC
PROPOSED 10-INCH WATER LINE
PROPOSED 12-INCH WATER LINE
PROPOSED 14-INCH WATER LINE
PROPOSED FIRE HYDRANT (SHOWN NOT TO SCALE FOR CLARITY)
EXISTING FIRE HYDRANT (SHOWN NOT TO SCALE FOR CLARITY)
PACIFIC OCEAN
SAN SIMEON WASTEWATER TREATMENT PLANT
POTABLE WATER IMPROVEMENT PHASE 1
SCALE: 1" = 200'
N
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY
PREPARED BY:
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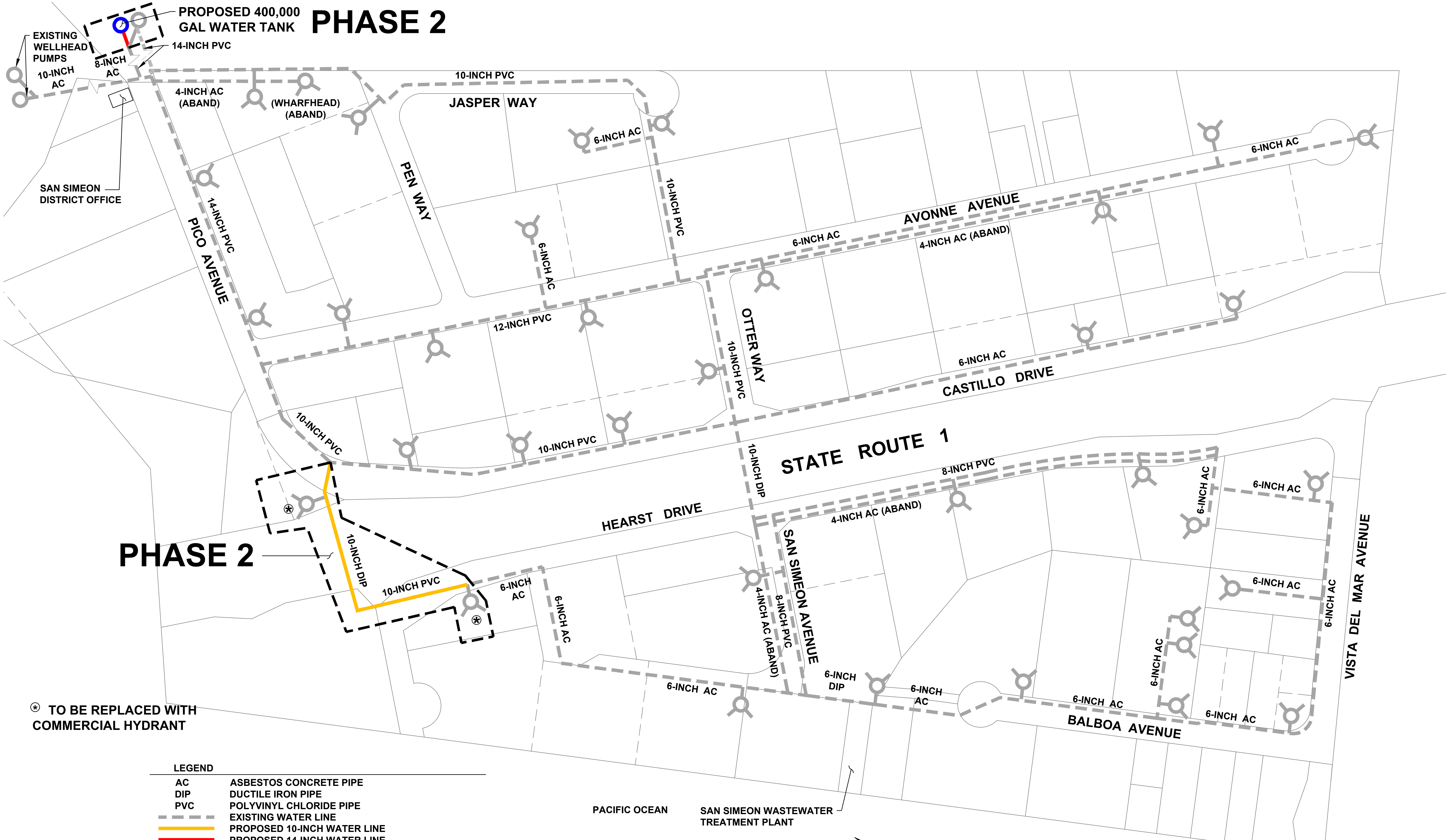
SAN SIMEON COMMUNITY SERVICES DISTRICT
MASTER PLAN UPDATE
POTABLE WATER IMPROVEMENT PHASE 1
FIGURE 9



POTABLE WATER IMPROVEMENT PHASE 2

SCALE: 1" = 200'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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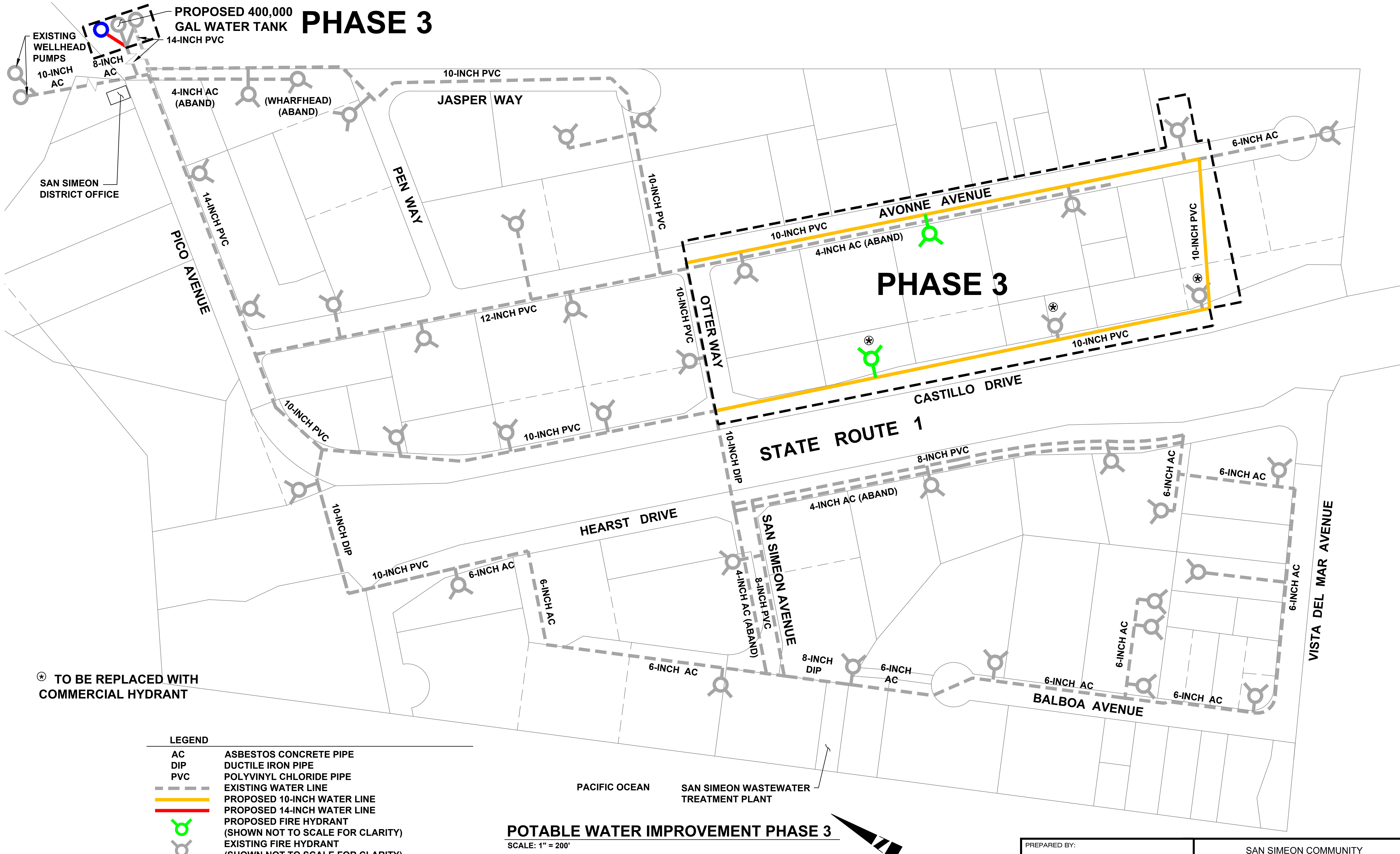
SAN SIMEON COMMUNITY SERVICES DISTRICT

MASTER PLAN UPDATE
POTABLE WATER IMPROVEMENT PHASE 2

FIGURE 10



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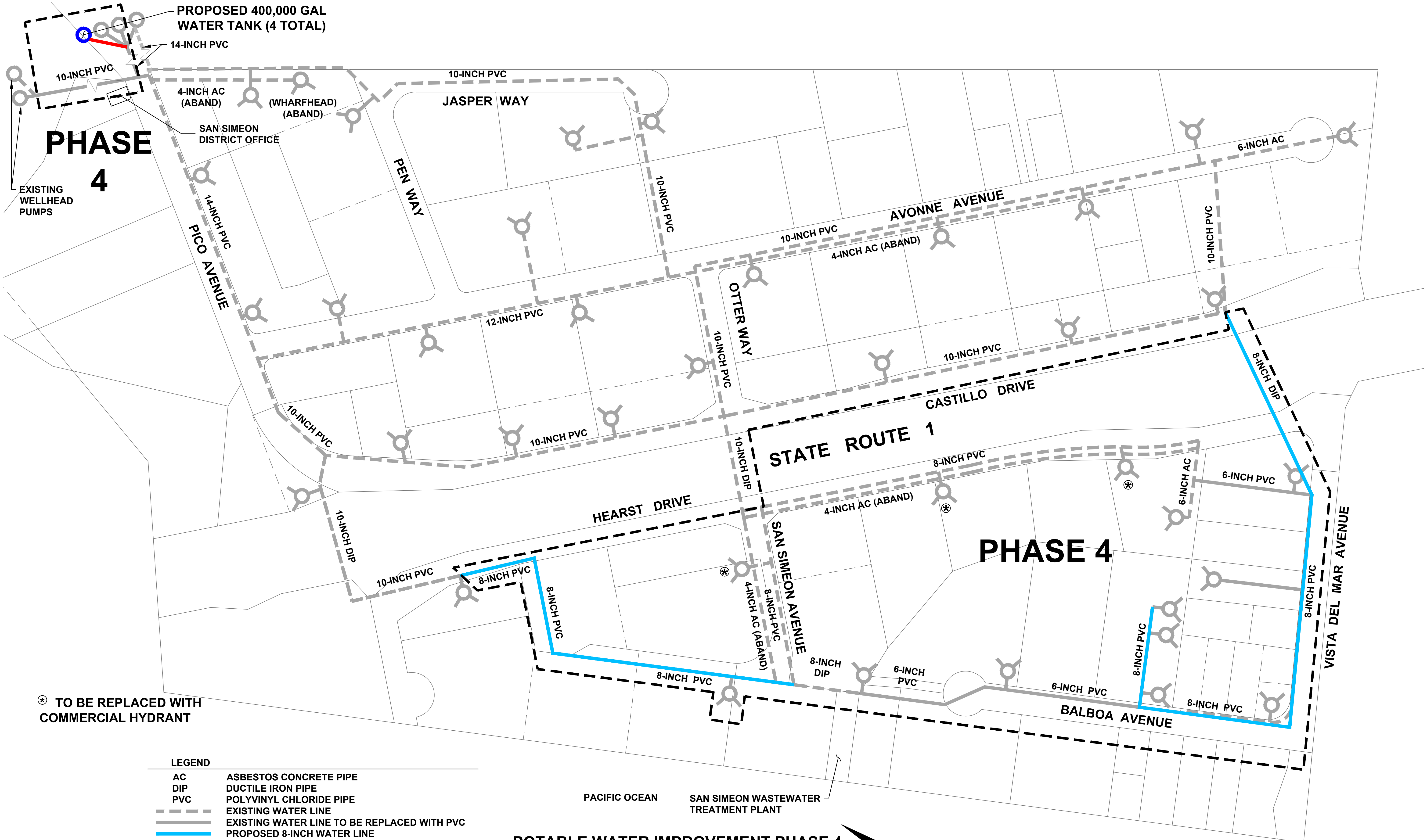
SAN SIMEON COMMUNITY SERVICES DISTRICT

MASTER PLAN UPDATE

POTABLE WATER IMPROVEMENT PHASE 3

FIGURE 11



LEGEND

AC	ASBESTOS CONCRETE PIPE
DIP	DUCTILE IRON PIPE
PVC	POLYVINYL CHLORIDE PIPE
(gray dashed line)	EXISTING WATER LINE
(gray solid line)	EXISTING WATER LINE TO BE REPLACED WITH PVC
(blue line)	PROPOSED 8-INCH WATER LINE
(hydrant symbol)	EXISTING FIRE HYDRANT (SHOWN NOT TO SCALE FOR CLARITY)

POTABLE WATER IMPROVEMENT PHASE 4

SCALE: 1" = 200'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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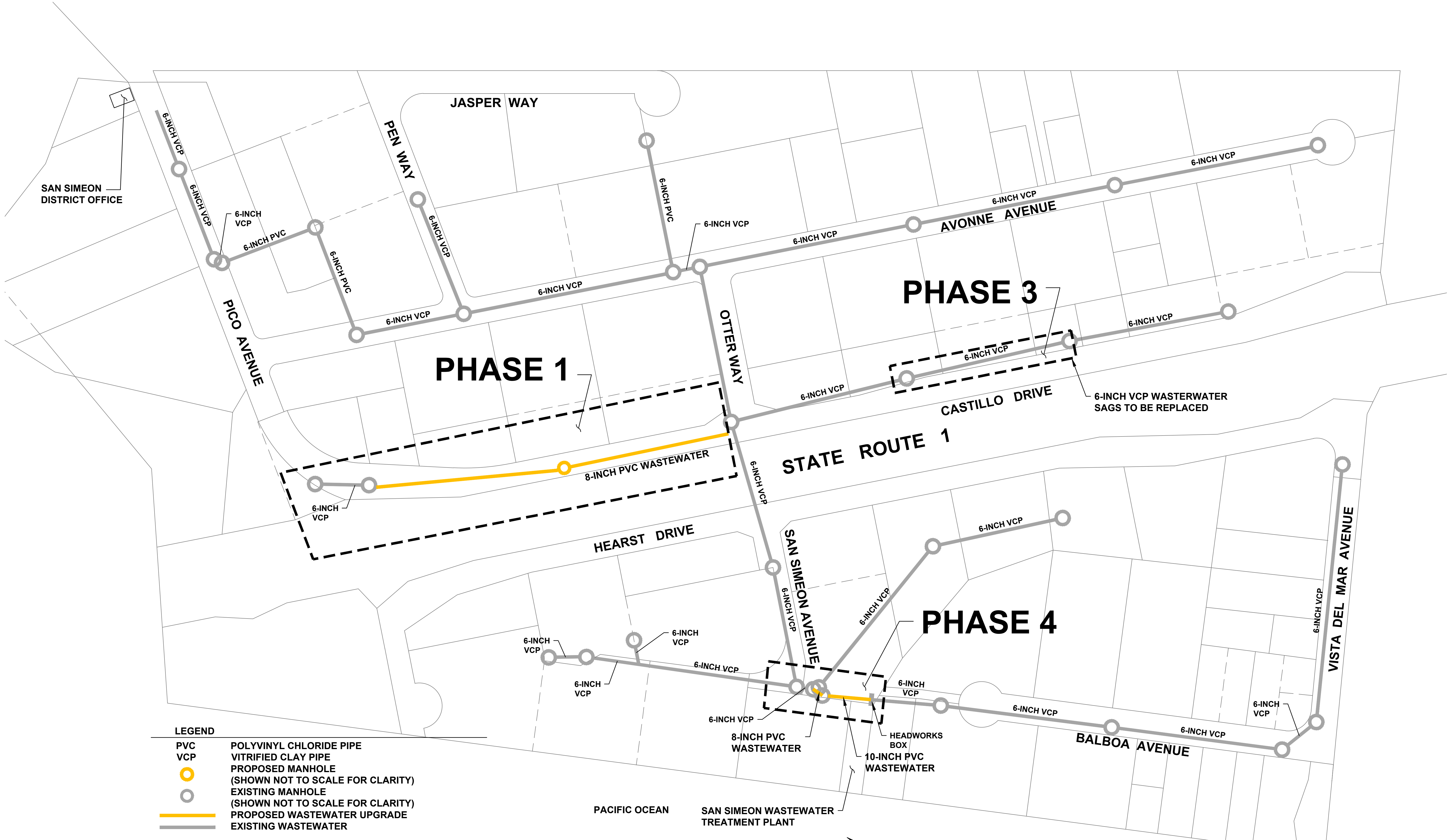
805-658-6800

SAN SIMEON COMMUNITY SERVICES DISTRICT

MASTER PLAN UPDATE
POTABLE WATER IMPROVEMENT PHASE 4

FIGURE 12



WASTEWATER IMPROVEMENT PHASING

SCALE: 1" = 200'

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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SANTA PAULA, CA 93060
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SAN SIMEON COMMUNITY SERVICES DISTRICT

MASTER PLAN UPDATE

WASTEWATER IMPROVEMENT PHASING

FIGURE 13

Figure 14

San Simeon Community Services District
Master Plan Update

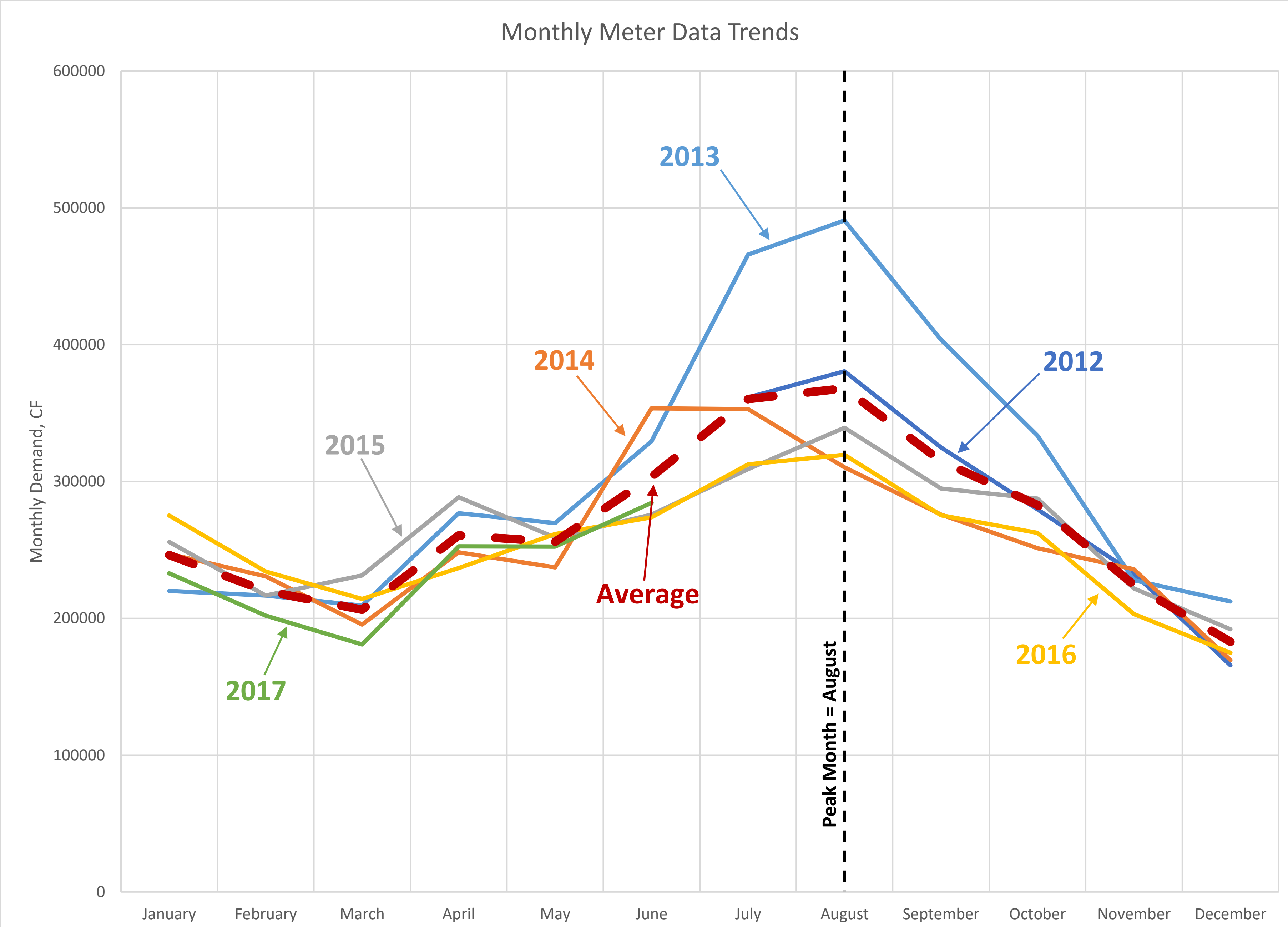
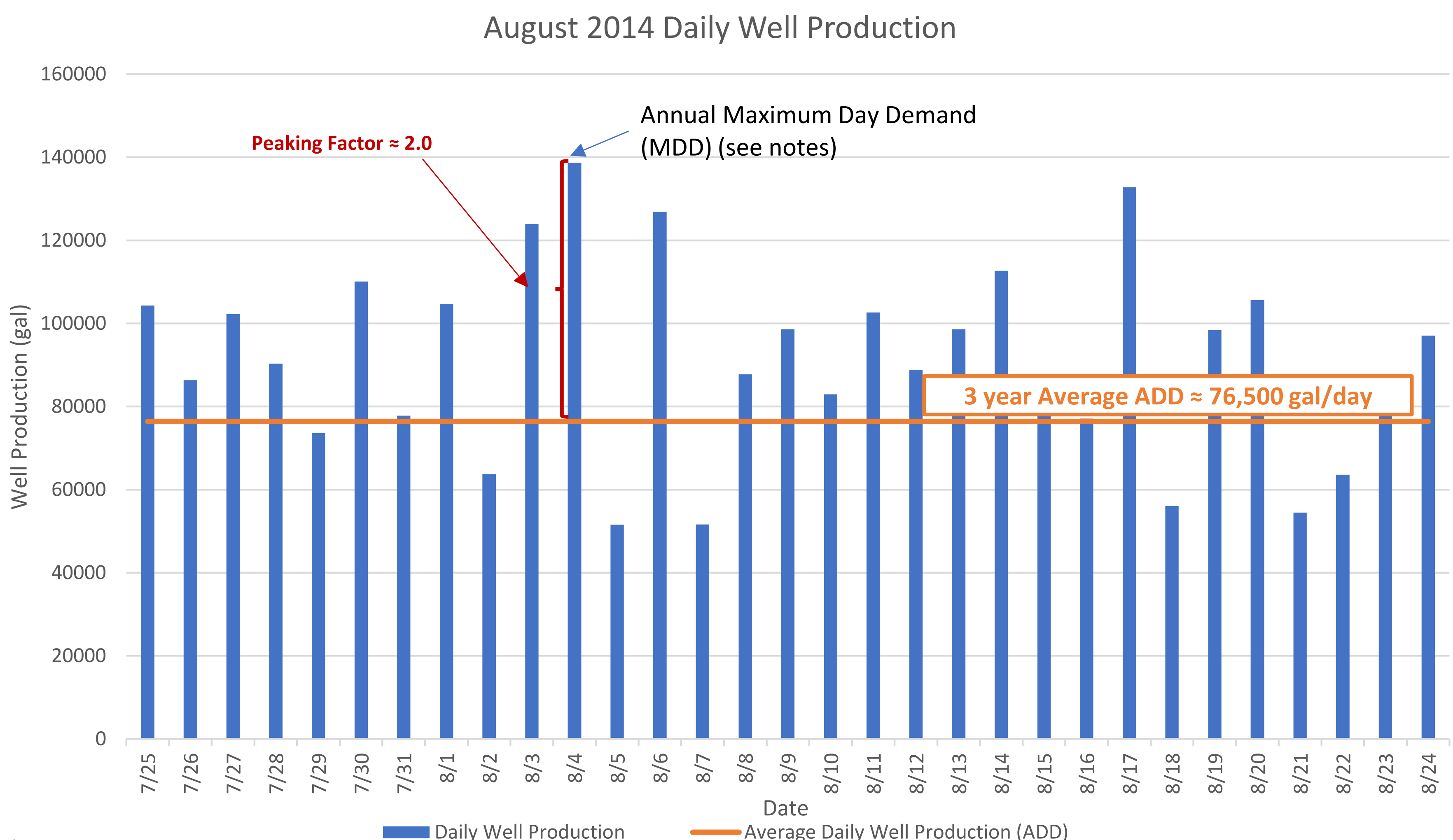


Figure 15

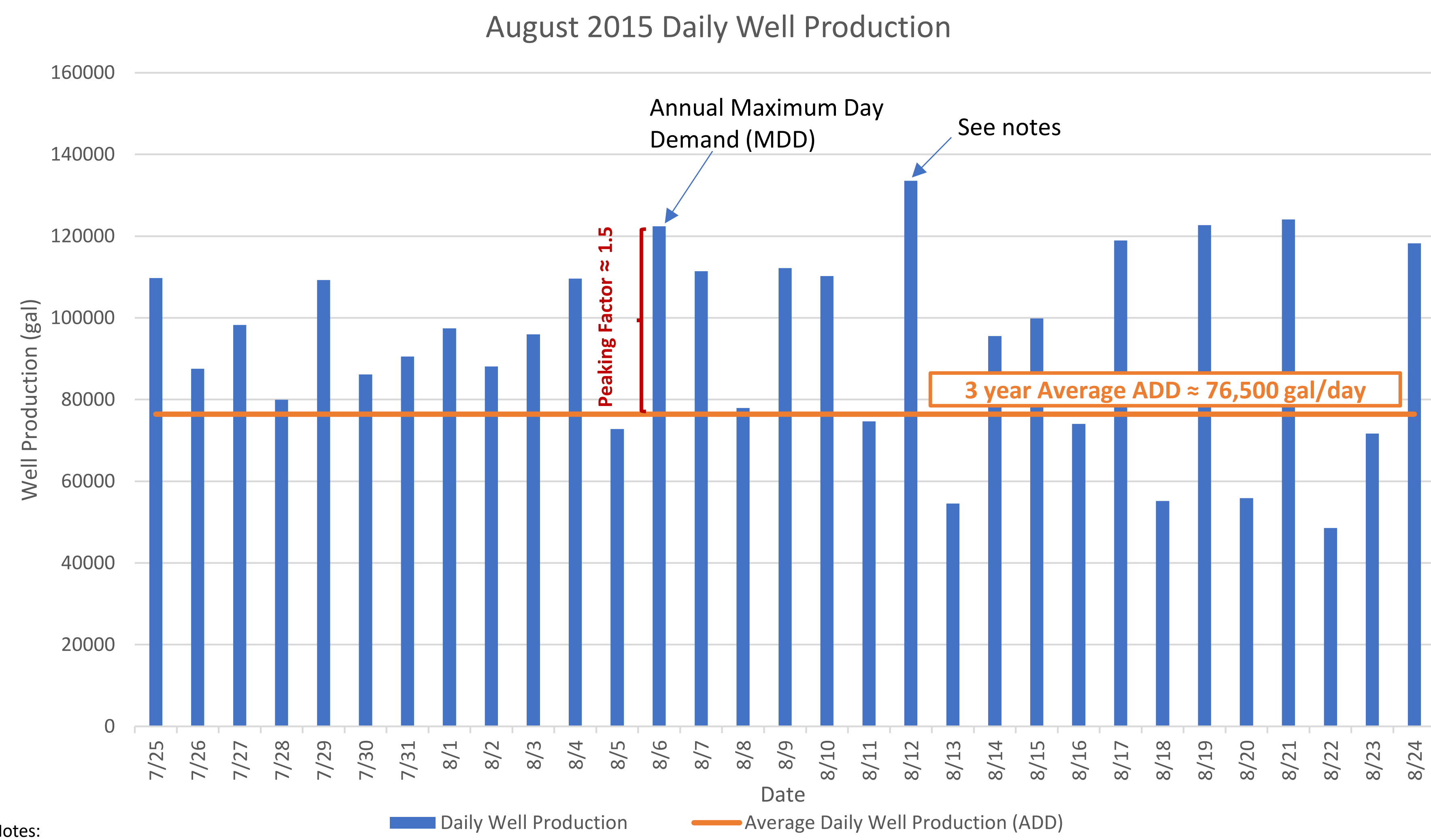
San Simeon Community Services District
Master Plan Update



Notes:
- The ADD shown is the average taken from all measurements taken between Jan-14 and Dec-16.
- Pumping sometimes crossing multiple day's records, with the consumption from a given day's pumping occurring over multiple days. Days of high pumping followed by notably low pumping days is considered to be indicative of this practice. These days are ignored when determining the maximum consuption day so as to not artificially inflate the MDD.
- The 2016 MDD was used in the modeling analysis.

Figure 16

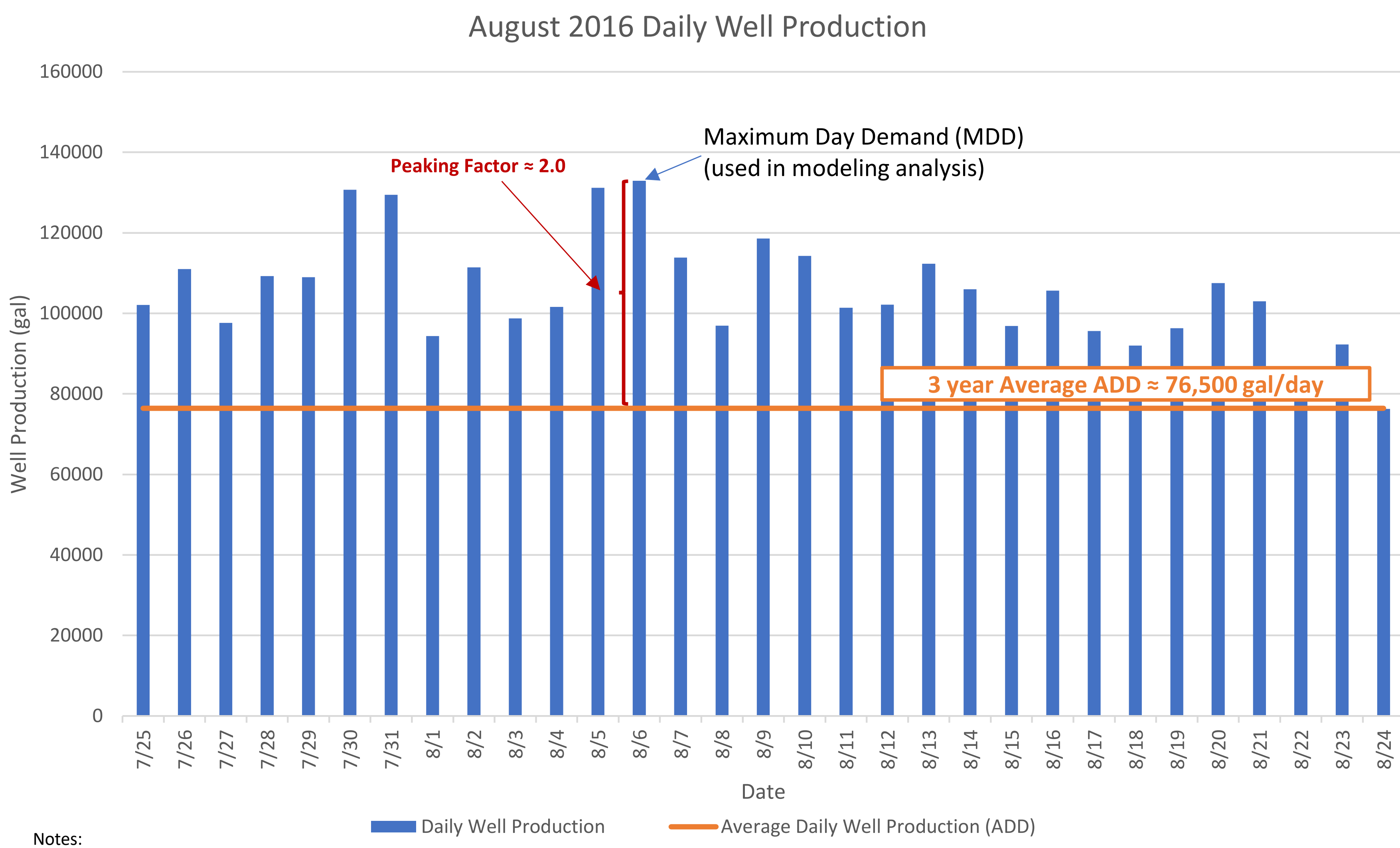
San Simeon Community Services District
Master Plan Update



Notes:
- The ADD shown is the average taken from all measurements taken between Jan-14 and Dec-16.
- Pumping sometimes crossing multiple day's records, with the consumption from a given day's pumping occurring over multiple da ys. Days of high pumping followed by notably low pumping days is considered to be indicative of this practice. These days are ignored when determining the maximum consuption day so as to not artificially inflate the MDD.
- The 2016 MDD was used in the modeling analysis.

Figure 17

San Simeon Community Services District
Master Plan Update



Notes:
- The ADD shown is the average taken from all measurements taken between Jan-14 and Dec-16.
- Pumping sometimes crossing multiple day's records, with the consumption from a given day's pumping occurring over multiple days. Days of high pumping followed by notably low pumping days is considered to be indicative of this practice. These days are ignored when determining the maximum consuption day so as to not artificially inflate the MDD

Figure 18

San Simeon Community Services District
Master Plan Update
System Demand Distribution

	Demand per Month (cf)															Existing Condition Demands (gpm)		Future Condition Demands (gpm)	
Node	**TOTAL**	**AVERAGE**	**Jul Avg**	**Aug Avg**	**Sep Avg**	**Oct Avg**	**Nov Avg**	**Dec Avg**	**Jan Avg**	**Feb Avg**	**Mar Avg**	**Apr Avg**	**May Avg**	**Jun Avg**	**Percent of Demand (%)**	**Average Demand**	**Maximum Demand**	**Average Demand**	**Maximum Demand**
J-6	12600	210	233	333	333	267	333	233	267	333	200	767	600	300	0.08%	0.04	0.07	0.07	0.12
J-7	318200	5303	10367	9733	9200	7533	8100	7067	9700	8267	7300	9667	9000	10133	1.97%	1.05	1.82	1.68	2.92
J-9	512400	8540	15900	14267	14367	13267	13933	12033	15233	13467	14067	14233	14300	15733	3.18%	1.69	2.93	2.70	4.69
J-10	1101100	18352	45800	46233	37967	34767	23833	19467	31867	22167	18967	26767	26300	32900	6.83%	3.63	6.31	5.80	10.09
J-12	2479500	41325	80433	84933	78700	74000	63500	54033	66233	61633	56533	68633	62233	75633	**15.37%**	8.17	14.20	13.07	22.72
J-13	202200	3370	6767	6800	6033	5133	5400	4667	5500	4900	5033	5667	5100	6400	1.25%	0.67	1.16	1.07	1.85
J-16	12600	210	433	333	400	400	233	367	267	567	200	233	333	433	0.08%	0.04	0.07	0.07	0.12
J-17	164000	2733	6033	5033	4767	4400	4367	3933	4633	4300	3800	4167	4133	5100	1.02%	0.54	0.94	0.86	1.50
J-18	1176140	19602	62476	62663	59270	43670	18142	15853	21186	20193	16885	23058	21856	26792	7.29%	3.87	6.74	6.20	10.78
J-19	211400	3523	6500	6667	6267	5367	5000	4533	4800	5600	5933	6033	6933	6833	1.31%	0.70	1.21	1.11	1.94
J-20	1629000	27150	63800	62667	54167	48867	34167	27033	39333	34433	33967	43433	49267	51867	**10.10%**	5.37	9.33	8.59	14.93
J-21	27200	453	933	933	833	833	733	600	667	633	600	700	733	867	0.17%	0.09	0.16	0.14	0.25
J-26	2652440	44207	85267	93267	78533	74067	67333	50800	65633	62013	59767	83167	77867	86433	**16.45%**	8.74	15.19	13.98	24.30
J-27	438000	7300	16267	15933	14633	12533	11500	8100	10667	9767	9167	11133	12267	14033	2.72%	1.44	2.51	2.31	4.01
J-33	1076500	17942	37033	38967	27700	28133	25000	19867	30133	29467	24733	32467	28600	36733	6.67%	3.55	6.16	5.67	9.86
J-34	153900	2565	5667	6100	4933	4200	3467	3533	4200	3500	3500	4233	3433	4533	0.95%	0.51	0.88	0.81	1.41
J-37	549800	9163	20033	19367	17900	15933	16633	10100	13800	12467	10700	14833	14533	16967	3.41%	1.81	3.15	2.90	5.04
J-38	30400	507	1267	900	900	867	600	267	900	533	867	1133	867	1033	0.19%	0.10	0.17	0.16	0.28
J-40	35100	585	1300	1567	1000	733	900	900	867	667	833	933	900	1100	0.22%	0.12	0.20	0.18	0.32
J-41	72000	1200	2433	2267	2233	2100	1967	1767	1833	1700	1700	1833	1800	2367	0.45%	0.24	0.41	0.38	0.66
J-42	57800	963	1933	1800	1567	1500	1500	1500	1733	1433	1400	1333	1700	1867	0.36%	0.19	0.33	0.30	0.53
J-43	60100	1002	1933	1967	1800	1600	1733	1467	1500	1600	1367	1467	1433	2167	0.37%	0.20	0.34	0.32	0.55
J-44	14600	243	500	433	367	233	400	433	300	300	433	400	533	533	0.09%	0.05	0.08	0.08	0.13
J-45	47200	787	1667	1433	1733	1067	1000	1100	1133	933	1033	1500	1333	1800	0.29%	0.16	0.27	0.25	0.43
J-46	77000	1283	2500	2367	2067	1600	1900	2067	2800	1767	2067	2100	2100	2333	0.48%	0.25	0.44	0.41	0.71
J-47	106400	1773	4567	4500	3067	5433	2533	1567	2633	2300	1867	2400	2167	2433	0.66%	0.35	0.61	0.56	0.97
J-49	73600	1227	2900	3100	1733	1900	1667	1433	2100	2367	1667	1867	1767	2033	0.46%	0.24	0.42	0.39	0.67
J-50	548500	9142	15400	15700	16167	15000	14833	13733	17033	15867	13567	14933	14967	15633	3.40%	1.81	3.14	2.89	5.03
J-56	14100	235	300	367	467	300	400	500	700	400	233	300	400	333	0.09%	0.05	0.08	0.07	0.13
J-57	1334300	22238	64333	66100	46867	37767	22633	20667	29900	24033	24733	26233	30100	51400	8.27%	4.39	7.64	7.03	12.23
J-59	940500	15675	35667	36800	28833	27967	20067	15133	22700	19133	20600	28633	29067	28900	5.83%	3.10	5.39	4.96	8.62

	Existing Conditions	**Future Conditions**
Average Daily Demand (gpd)	76500	122400
Average Daily Demand (gpm)	**53**	**85**
Maximum Daily Demand (gpd)	133000	212800
Maximum Daily Demand (gpm)	**92**	**148**

Multiplier used to determine future demands	1.6

Notes:

Total and average demands are determined based on customer meter data from Jul-12 to Jun-17 (with inconsistent data adjusted based on conversations with District staff). Customer addresses are used to assign each account to it's nearest node in the water model. Note that some nodes have no nearby accounts, so they are not shown in the list above.

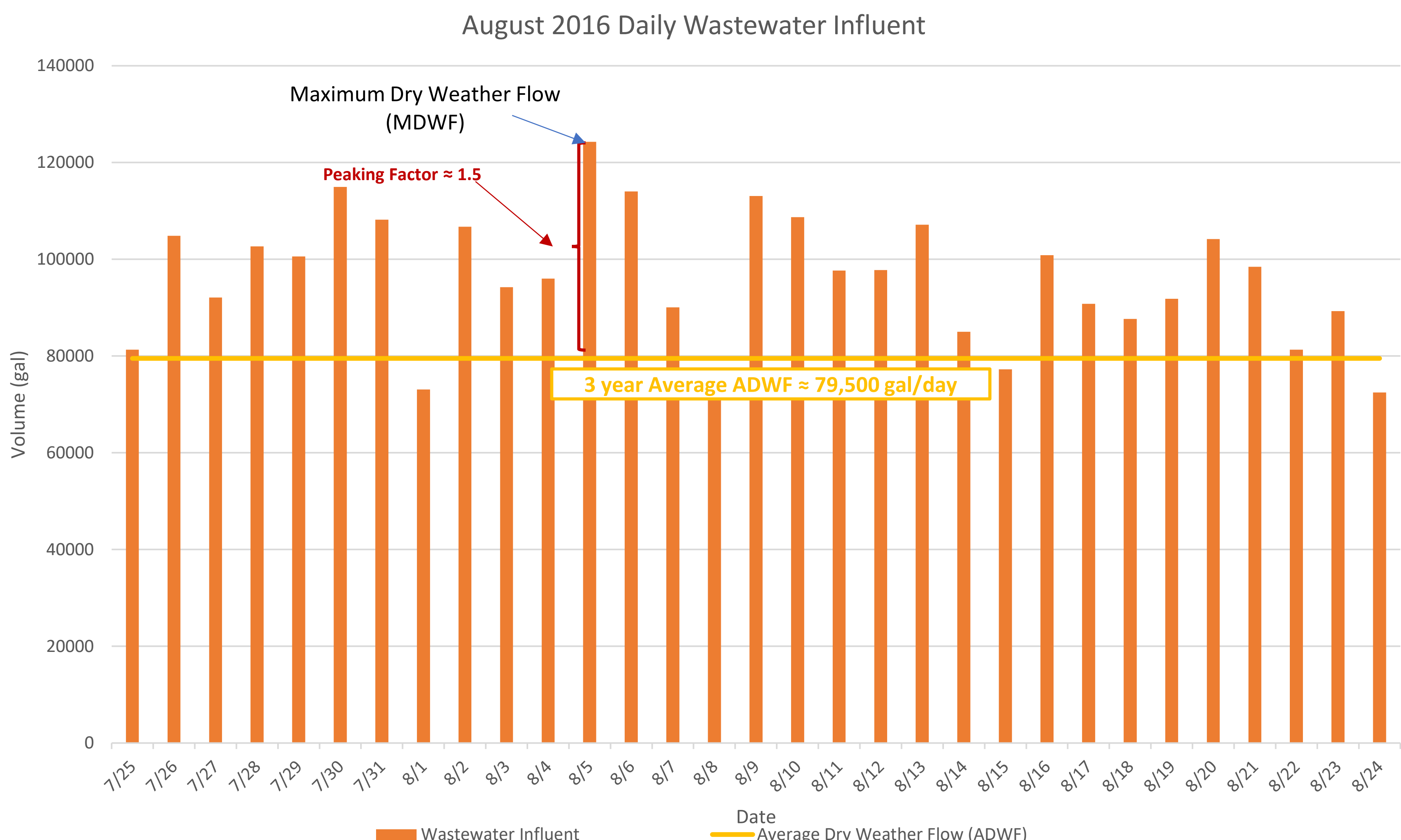
Nodes with notably high percents of demand are usually due to hotel demands. For example, the top three most demanding nodes (26, 12, and 20, bolded) have properties such as the Silver Surf Motel (node 12), the San Simeon Lodge (node 20), the Cavalier (node 26), and Sands by the Sea (node 26) assigned to them.

Average Daily Demand (ADD) and Maximum Daily Demand (MDD) are determined utilizing well production values from Superintendents Reports dated Jan-14 to Dec-16. See Well Production charts for more information on ADD and MDD determination.

Future Demands are detemined by multiplying existing ADD and MDD by a factor (1.60) which was determined utilizing the 2007 North Coast Area Plan. Per the North Coat Area Plan, there are anough available vacant lots that the number of dwelling units could increase by approximately 530 dwelling units (current number being approximately 320 as of the 2007 plan), resulting in a possible population of up to 740 people. Per the 2010 census, the current population is approximately 462 people. This yields a multiplier of approximately 1.6 to achieve the future condition.

Figure 19

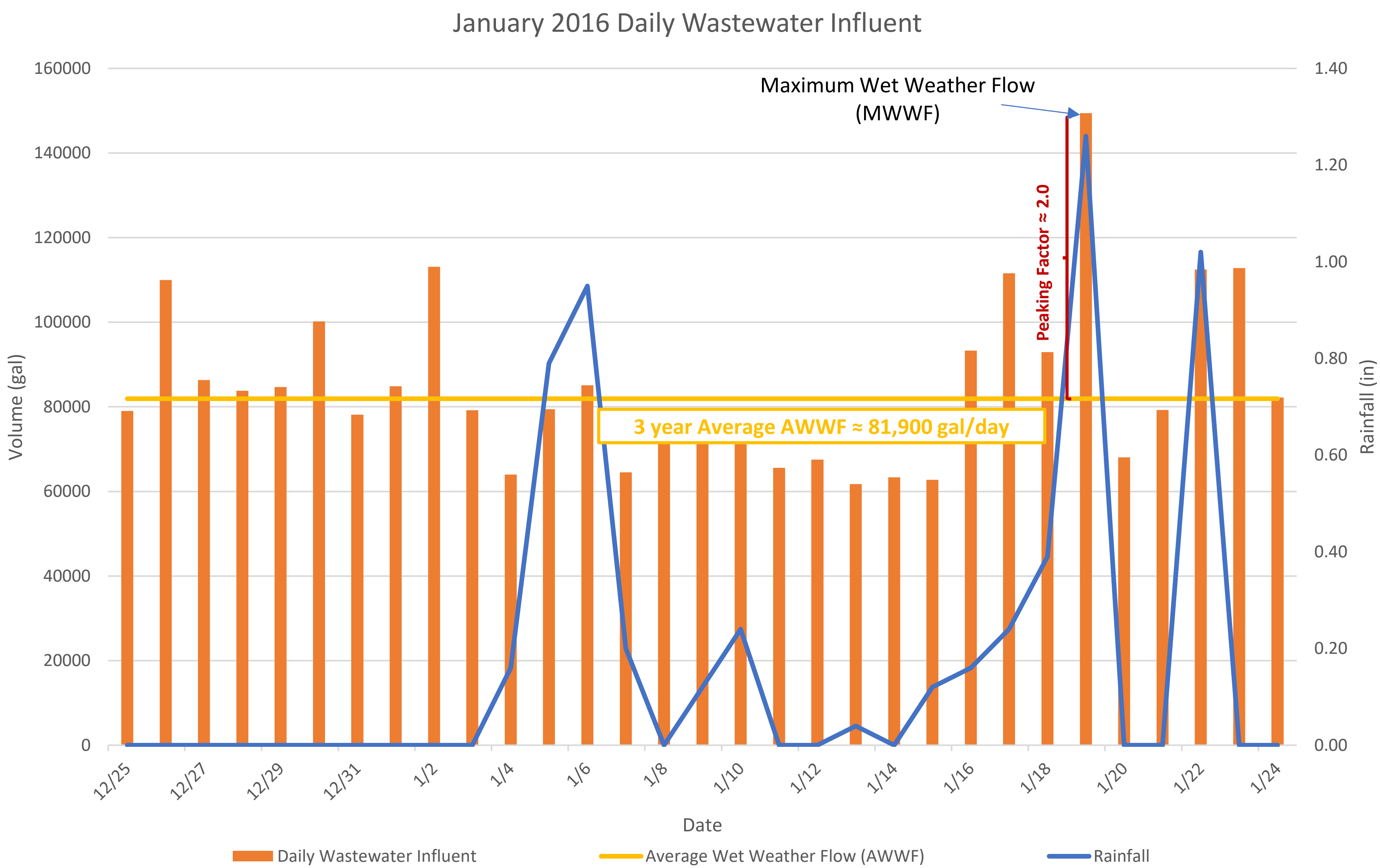
San Simeon Community Services District
Master Plan Update



Notes:
- The ADWF shown is the average taken from all measurements taken between Jan-14 and Dec-16 that coincide with days where no measureable amount of rainfall was recorded.
- The wastewater influent shown excludes State sewer contributions.

Figure 20

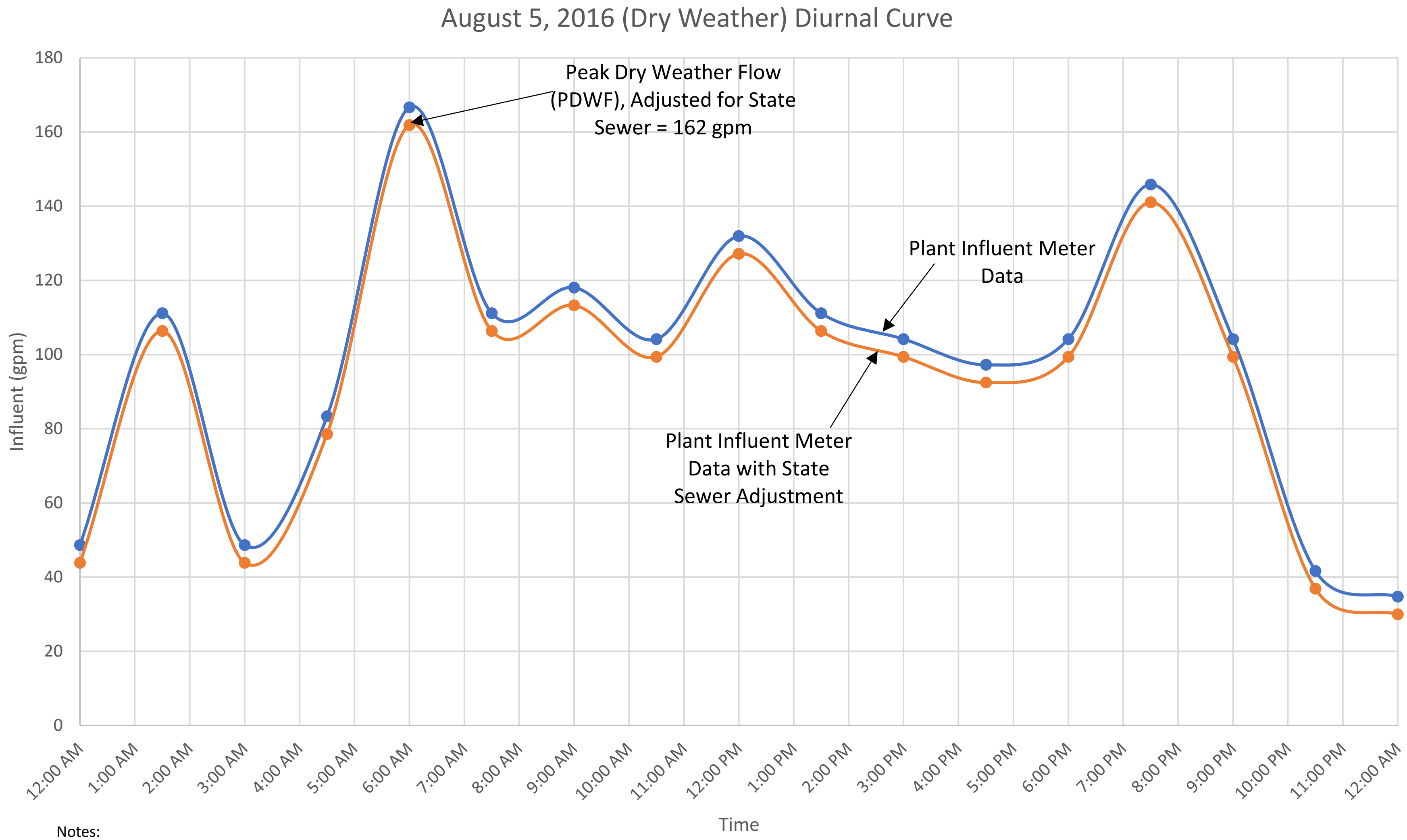
San Simeon Community Services District
Master Plan Update



Notes:
- The AWWF shown is the average taken from all measurements taken between Jan-14 and Dec-16 that coincide with days where any measureable amount of rainfall was recorded.
- The wastewater influent shown excludes State sewer contributions.

Figure 21

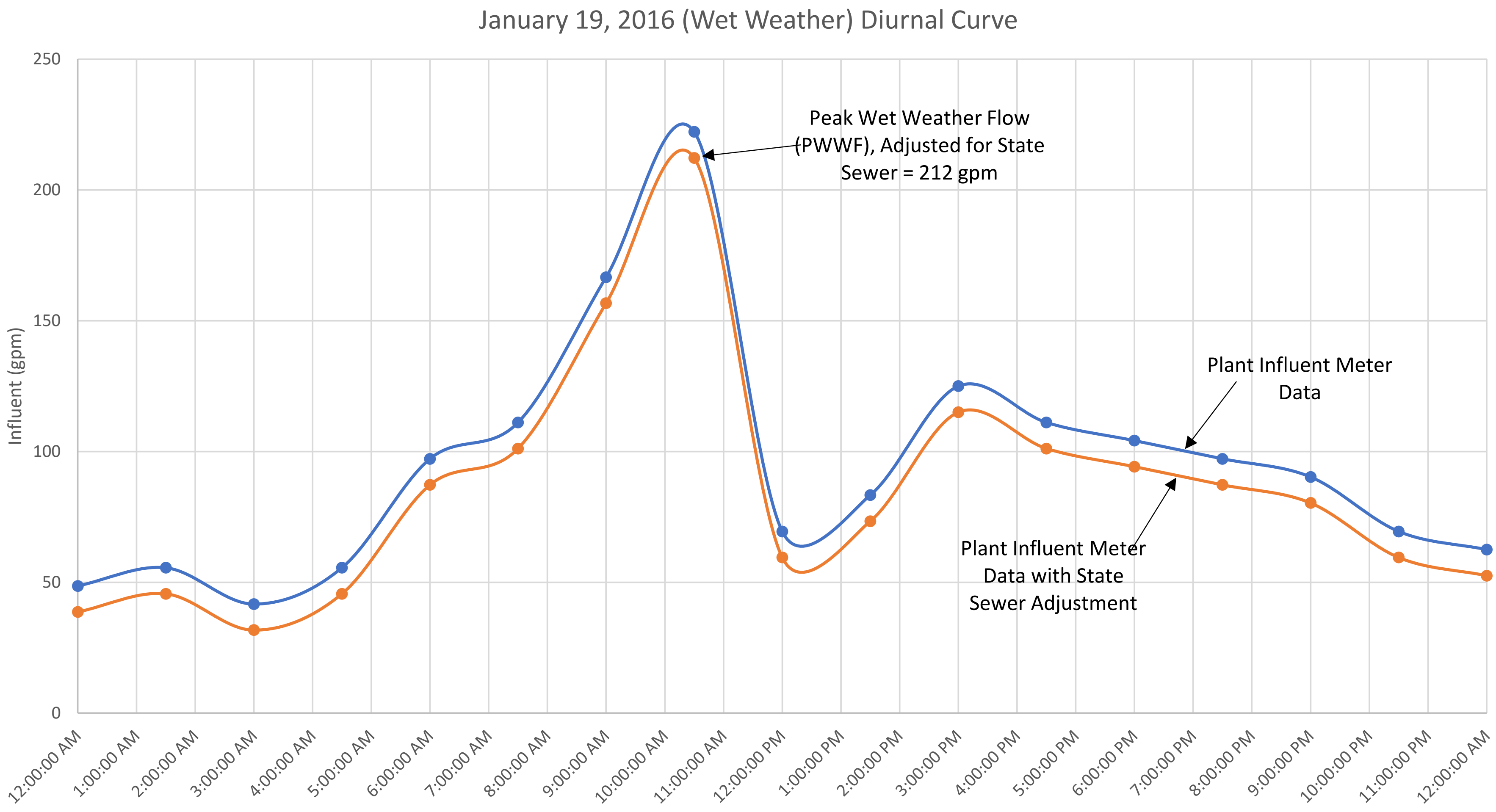
San Simeon Community Services District
Master Plan Update



Notes:
- Influent flows are determined utilizing metered data at the wastewater treatment plant intake prior to the equalization basin . These inflows include state sewer inflows from the nearby Hearst Castle historical site. To determine the PDWF within San Simeon's sanitary sewer system the state sewer flows must be excluded. The lower curve shows the reduced inflows, assuming the state sewer inflow is uniformly distributed throughout the day. This is not the case, but is likely the most conservative.

Figure 22

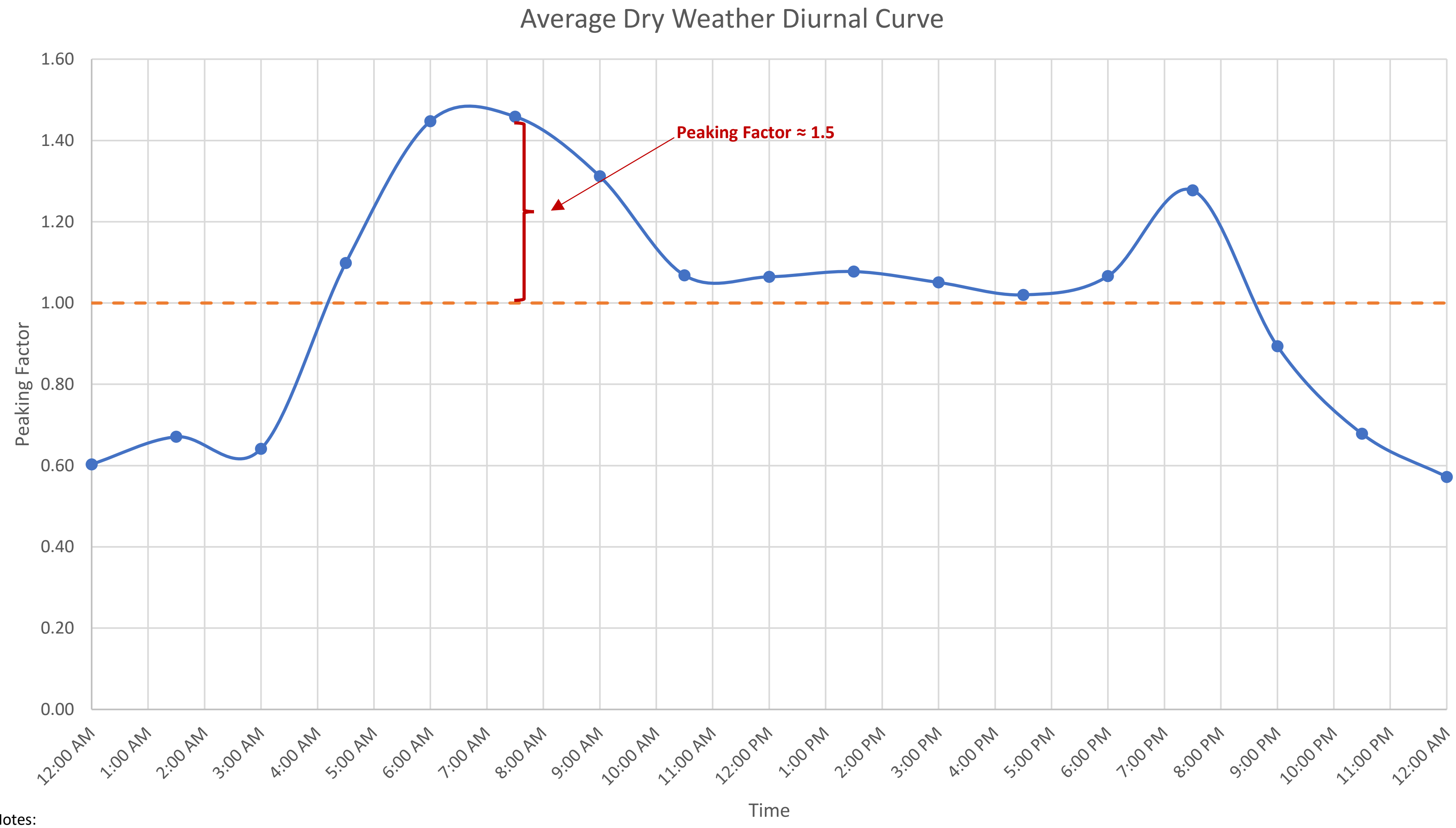
San Simeon Community Services District
Master Plan Update



Notes:
- Influent flows are determined utilizing metered data at the wastewater treatment plant intake prior to the equalization basin. These inflows include state sewer inflows from the nearby Hearst Castle historical site. To determine the PDWF within San Simeon's sanitary sewer system the state sewer flows must be excluded. The lower curve shows the reduced inflows, assuming the state sewer inflow is uniformly distributed throughout the day. This is not the case, but is likely the most conservative.

Figure 23

San Simeon Community Services District
Master Plan Update



Notes:
- This curve is an avergae fluctuation based on 2016 meter data from the wastewater treatment plant (measured before flow enter s the equalization basins). Dry weather days exhibiting close to average flow volumes were selected to build this curve.
- This curve includes State Sewer inflows.
- This curve is also used as an approximation of potable water demand fluctuation throughout the community, as it was the only hourly data available for analysis. In regards to potable water demands, this figure is for demonstration only and does not represent actual potable water flows.

Figure 24

San Simeon Community Services District
Master Plan Update
Sewer System Model - Existing System

Branch	Upstream	Downstream	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Length (ft)	Diameter (in)	Material	Peak Dry Weather Flow: 50% d/D Capacity (gpm)	Peak Dry Weather Flow: Existing Flow (gpm)	Peak Dry Weather Flow: Future Flow (gpm)	Peak Wet Weather Flow: 75% d/D Capacity (gpm)	Peak Wet Weather Flow: Existing Flow (gpm)	Peak Wet Weather Flow: Future Flow (gpm)
1	MH #1	MH #2	65.04	58.60	0.0288	224	6	VCP	214	3	5	390	4	7
1	MH #2	MH #3	58.60	58.41	0.0051	37	6	VCP	90	3	5	165	4	7
1	MH #3	MH #4	58.41	57.70	0.0035	203	6	VCP	75	3	5	136	4	7
1	MH #4	MH #5	57.70	56.13	0.0067	236	6	VCP	103	8	14	188	11	18
1	MH #5	MH #6	56.13	55.12	0.0043	237	6	VCP	82	8	14	150	11	18
1	CO #7	MH #6	79.56	55.12	0.0944	259	6	VCP	388	11	18	707	14	23
1	MH #6	MH #7	55.12	53.60	0.0032	470	6	VCP	72	44	71	131	58	93
1	CO #3	MH #7	79.00	53.60	0.0817	311	6	VCP	361	2	3	658	3	4
1	MH #7	MH #8	53.60	52.41	0.0225	53	6	VCP	189	46	74	345	61	97
2	MH #11	MH #10	64.88	58.95	0.0131	454	6	VCP	144	3	5	263	4	6
2	MH #10	MH #9	58.95	54.02	0.0109	451	6	VCP	132	9	14	241	11	18
2	MH #9	MH #8	54.02	52.41	0.0033	487	6	VCP	73	22	35	132	29	46
3	MH #17	MH #16	46.55	45.69	0.0054	159	6	VCP	93	17	27	169	22	35
3	MH #16	MH #12	45.69	42.10	0.0071	505	6	VCP	106	17	27	194	22	35
4	MH #14	MH #15	45.80	44.70	0.0030	368	6	VCP	69	13	21	126	18	28
4	MH #15	MH #13	44.70	43.20	0.0041	369	6	VCP	80	14	22	147	18	28
4	MH #13	MH #12	43.20	42.10	0.0030	368	6	VCP	69	23	37	126	30	48
5	MH #8	MH #12	52.41	42.10	0.0299	345	6	VCP	218	68	109	398	90	143
5	MH #12	MH #18	42.10	30.73	0.0344	331	6	VCP	234	108	173	426	141	226
5	MH #18	MH #19	30.73	20.80	0.0372	267	6	VCP	243	108	173	444	141	226
5	MH #19	MH #20	20.80	16.60	0.0977	43	6	VCP	394	139	223	719	182	291
5	MH #20	MH #24	16.60	16.43	0.0094	18	6	VCP	123	139	223	224	182	291
5	MH #24	Headworks	16.43	16.05	0.0036	107	8	VCP	162	150	240	295	196	314
6	CO #6	CO #5	37.00	35.50	0.0227	66	6	VCP	190	27	43	347	35	56
6	CO #5	MH #19	33.00	20.80	0.0338	361	6	VCP	232	31	50	423	41	65
7	MH #23	MH #22	32.97	21.47	0.0404	285	6	VCP	254	11	17	462	14	23
7	MH #22	MH #21	21.47	16.44	0.0126	400	6	VCP	142	11	17	258	14	23
7	MH #21	MH #24	16.44	16.43	0.0005	20	6	VCP	28	11	17	51	14	23
8	MH #29	MH #28	46.93	28.73	0.0356	511	6	VCP	238	7	12	434	10	15
8	MH #28	MH #27	28.73	25.80	0.0305	96	6	VCP	221	8	12	402	10	16
8	MH #27	MH #26	25.80	25.10	0.0019	377	6	VCP	54	10	16	99	13	20
8	MH #26	MH #25	25.10	24.10	0.0026	378	6	VCP	65	12	19	118	16	25
8	MH #25	Headworks	24.10	16.05	0.0523	154	6	VCP	289	12	19	526	16	25

Peak Dry Weather Flow (Existing) (gpm)	162
Peak Wet Weather Flow (Existing) (gpm)	212
Peak Dry Weather Flow (Future) (gpm)	259
Peak Wet Weather Flow (Future) (gpm)	339

Notes:

Pipeline capacities are calculated using Manning's equation. A Manning's roughness coefficient of 0.013 is assumed for all pipes, which is standard for vitrified clay pipes. PVC pipes typically have lower roughness coefficients, but use of 0.013 is conservative.

Existing peak dry weather flows and peak wet weather flows are determined utilizing daily wastewater influent values from 2014 to 2016, then by examining the peak days' circular charts for the meter readings at the wastewater treatment plant intake. From the circular charts, peak flows are determined. For future flows, both the wet and dry weather values are multiplied by 1.60, the Ultimate Buildout multiplier discussed earlier in the report, determined utilizing a foreseen maximum population of 740 residents per the North Coast Area Plan, divided by the current population (per the 2010 census) of 462 residents, yielding a multiplier of 1.60.

[yellow] = values within 90% of the available capacity of the pipe (50% flow depth for dry weather flows and 75% flow depth for wet weather flows).

[orange] = values which exceed the available capacity of the pipe (50% flow depth for dry weather flows and 75% flow depth for wet weather flows).

Flow rates within each pipeline are determined by distributing the peak flows throughout they system utilizing the same nodes and percents of demand used in the potable water modeling analysis. For example, if a node from the water model was found to demand 3% of the total water use of the system, it is assumed that it would also produce 3% of the wastewater entering the sewer system. So, 3% of the peak flow (wet or dry) is added to the system in the nearest sewer pipeline, with subsequent branches transporting that flow in addition to any additional flows added throughout the system.

Figure 25

San Simeon Community Services District
Master Plan Update
Sewer System Model - Proposed System

									Peak Dry Weather Flow			Peak Wet Weather Flow		
Branch	Upstream	Downstream	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Length (ft)	Diameter (in)	Material	50% d/D Capacity (gpm)	Existing Flow (gpm)	Future Flow (gpm)	75% d/D Capacity (gpm)	Existing Flow (gpm)	Future Flow (gpm)
1	MH #1	MH #2	65.04	58.60	0.0288	224	6	VCP	214	3	5	390	4	7
1	MH #2	MH #3	58.60	58.41	0.0051	37	6	VCP	90	3	5	165	4	7
1	MH #3	MH #4	58.41	57.70	0.0035	203	6	VCP	75	3	5	136	4	7
1	MH #4	MH #5	57.70	56.13	0.0067	236	6	VCP	103	8	14	188	11	18
1	MH #5	MH #6	56.13	55.12	0.0043	237	6	VCP	82	8	14	150	11	18
1	CO #7	MH #6	79.56	55.12	0.0944	259	6	VCP	388	11	18	707	14	23
1	MH #6	MH #7	55.12	53.60	0.0032	470	8	VCP	155	44	71	282	58	93
1	CO #3	MH #7	79.00	53.60	0.0817	311	6	VCP	361	2	3	658	3	4
1	MH #7	MH #8	53.60	52.41	0.0225	53	6	VCP	189	46	74	345	61	97
2	MH #11	MH #10	64.88	58.95	0.0131	454	6	VCP	144	3	5	263	4	6
2	MH #10	MH #9	58.95	54.02	0.0109	451	6	VCP	132	9	14	241	11	18
2	MH #9	MH #8	54.02	52.41	0.0033	487	6	VCP	73	22	35	132	29	46
3	MH #17	MH #16	46.55	45.69	0.0054	159	6	VCP	93	17	27	169	22	35
3	MH #16	MH #12	45.69	42.10	0.0071	505	6	VCP	106	17	27	194	22	35
4	MH #14	MH #15	45.80	44.70	0.0030	368	6	VCP	69	13	21	126	18	28
4	MH #15	MH #13	44.70	43.20	0.0041	369	6	VCP	80	14	22	147	18	28
4	MH #13	MH #12	43.20	42.10	0.0030	368	6	VCP	69	23	37	126	30	48
5	MH #8	MH #12	52.41	42.10	0.0299	345	6	VCP	218	68	109	398	90	143
5	MH #12	MH #18	42.10	30.73	0.0344	331	6	VCP	234	108	173	426	141	226
5	MH #18	MH #19	30.73	20.80	0.0372	267	6	VCP	243	108	173	444	141	226
5	MH #19	MH #20	20.80	16.60	0.0977	43	6	VCP	394	139	223	719	182	291
5	MH #20	MH #24	16.60	16.43	0.0094	18	8	VCP	264	139	223	482	182	291
5	MH #24	Headworks	16.43	16.05	0.0036	107	10	VCP	294	150	240	535	196	314
6	CO #6	CO #5	37.00	35.50	0.0227	66	6	VCP	190	27	43	347	35	56
6	JC-5	MH #19	33.00	20.80	0.0338	361	6	VCP	232	31	50	423	41	65
7	MH #23	MH #22	32.97	21.47	0.0404	285	6	VCP	254	11	17	462	14	23
7	MH #22	MH #21	21.47	16.44	0.0126	400	6	VCP	142	11	17	258	14	23
7	MH #21	MH #24	16.44	16.43	0.0005	20	6	VCP	28	11	17	51	14	23
8	MH #29	MH #28	46.93	28.73	0.0356	511	6	VCP	238	7	12	434	10	15
8	MH #28	MH #27	28.73	25.80	0.0305	96	6	VCP	221	8	12	402	10	16
8	MH #27	MH #26	25.80	25.10	0.0019	377	6	VCP	54	10	16	99	13	20
8	MH #26	MH #25	25.10	24.10	0.0026	378	6	VCP	65	12	19	118	16	25
8	MH #25	Headworks	24.10	16.05	0.0523	154	6	VCP	289	12	19	526	16	25

Peak Dry Weather Flow (Existing) (gpm)	162
Peak Wet Weather Flow (Existing) (gpm)	212
Peak Dry Weather Flow (Future) (gpm)	259
Peak Wet Weather Flow (Future) (gpm)	339

Notes:

Pipeline capacities are calculated using Manning's equation. A Manning's roughness coefficient of 0.013 is assumed for all pipes, which is standard for vitrified clay pipes. PVC pipes typically have lower roughness coefficients, but use of 0.013 is conservative.

Existing peak dry weather flows and peak wet weather flows are determined utilizing daily wastewater influent values from 2014 to 2016, then by examining the peak days' circular charts for the meter readings at the wastewater treatment plant intake. From the circular charts, peak flows are determined. For future flows, both the wet and dry weather values are multiplied by 1.60, the Ultimate Buildout multiplier discussed earlier in the report, determined utilizing a foreseen maximum population of 740 residents per the North Coast Area Plan, divided by the current population (per the 2010 census) of 462 residents, yielding a multiplier of 1.60.

= diameters increased as part of recommended improvements

= improved flow capacities

Flow rates within each pipeline are determined by distributing the peak flows throughout they system utilizing the same nodes and percents of demand used in the potable water modeling analysis. For example, if a node from the water model was found to demand 3% of the total water use of the system, it is assumed that it would also produce 3% of the wastewater entering the sewer system. So, 3% of the peak flow (wet or dry) is added to the system in the nearest sewer pipeline, with subsequent branches transporting that flow in addition to any additional flows added throughout the system.

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Figure 26

San Simeon Community Services District
Master Plan Update
Phasing Breakdown

Phase	Classification	Project Description	Existing Size	Proposed Size	Length (ft) or Area (sf)	Notes
1	Potable Water	Improve Existing Storage Volume	150,000 gallon	1,600,000 gal (over 4 phases)	N/A	400,000 gallon above ground steel tank to be added this phase.
		Pipeline from reservoir to intersection of Pico and Avonne	8" dia.	14" dia.	1,525 ft	Includes 5 gate valves
		New dedicated reservoir feed line	--	14" dia.	875 ft	Includes 2 gate valves
		New loop connecting Jasper Ave cul-de-sac to Pico	--	10" dia.	1,175 ft	Replace existing wharfhead with relocated hydrant, adandon existing wharfhead and associated pipeline, one new commercial hydrant, includes 5 gate valves
		Jasper Ave cul-de-sac to Avonne	6" dia.	10" dia.	350 ft	Includes 5 gate valves
		Avonne from Pico to Otter Way	6" dia.	12" dia.	1,025 ft	Includes 9 gate valves
		Otter Way from Avonne to Castillo	6" dia.	10" dia.	325 ft	Includes 2 gate valves
		Freeway pipeline connecting Otter Way and San Simeon Ave	6" dia.	10" dia.	250 ft	Pipeline underneath freeway to be ductile iron, includes 1 gate valve
		New loop along Castillo Dr from Pico to Otter Way	--	10" dia.	900 ft	Includes 7 gate valves and 3 new commercial hydrants
		Pico from Avonne to Castillo	6" dia.	10" dia.	300 ft	Includes 1 gate valve
	Sanitary Sewer	Pipeline between MH #5 and MH #7	6" dia.	8" dia.	475 ft	Add one new manhole structure
	Recycled Water	Not used	--	--	--	--
	Road Improvements	Not used	--	--	--	--
2	Potable Water	Improve Existing Storage Volume	150,000 gallon	1,600,000 gal (over 4 phases)	N/A	400,000 gallon above ground steel tank to be added this phase.
		Pipeline from the intersection of Pico and Castillo to first hydrant along Hearst Dr south of Pico	6" dia.	10" dia.	600 ft	Pipeline underneath freeway (approximately 200 ft) to be ductile iron, includes 4 gate valves, replace 2 existing hydrants with new commerical hydrants
	Sanitary Sewer	Not used	--	--	--	--
	Recycled Water	Not used	--	--	--	--
	Road Improvements	Not used	--	--	--	--
3	Potable Water	Improve Existing Storage Volume	150,000 gallon	1,600,000 gal (over 4 phases)	N/A	400,000 gallon above ground steel tank to be added this phase.
		Avonne south of Otter Way	6" dia.	10" dia.	1,175 ft	Includes 6 gate valves and 1 new residential hydrant
		Castillo south of Otter Way	6" dia.	10" dia.	1,150 ft	Includes 7 gate valves and 1 new commercial hydrant, replace 2 existing hydrants with commercial hydrants
		New loop connecting Avonne and Castillo	--	10" dia.	400 ft	--
	Sanitary Sewer	Repair sag on Avonne Avenue	6" dia.	6" dia.	375 ft	--
	Recycled Water	Not used	--	--	--	--
	Road Improvements	Not used	--	--	--	--
4	Potable Water	Improve Existing Storage Volume	150,000 gallon	1,600,000 gal (over 4 phases)	N/A	400,000 gallon above ground steel tank to be added this phase.
		Pipeline from first hydrant along Hearst Dr south of Pico to San Simeon Ave	6" dia.	8" dia.	950 ft	Includes 2 gate valves
		New loop connecting Castillo and Vista Del Mar	--	8" dia.	450 ft	Pipeline underneath freeway to be ductile iron, includes 2 gate valves
		Pipeline from furthest hydrant in Sea Gate community, along Balboa and Vista Del Mar to Hearst Dr.	6" dia.	8" dia.	1,550 ft	Includes 10 gate valves
		Replacement of existing 6 inch diameter potable asbestos cement pipeline between the Sea Gate Community and the the pipe bridge adjacent to San Simeon Avenue with PVC	6" dia.	6" dia.	450 ft	Includes 5 gate valves
		Replacement of existing 6 inch diameter potable asbestos cement pipeline in an easement behind the Sea Breeze Inn with PVC	6" dia.	6" dia.	375 ft	Includes 5 gate valves
		Replacement of existing 10 inch diameter asbestos cement pipeline between the District Office and the wellheads with PVC	10" dia.	10" dia.	400 ft	Includes 2 gate valves

Phase	Classification	Project Description	Existing Size	Proposed Size	Length (ft) or Area (sf)	Notes
4	Potable Water	Replace 3 existing hydrants with commercial hydrants along Hearst Drive and San Simeon Avenue	--	--	--	--
	Sanitary Sewer	Pipeline between MH #20 and MH #24	6" dia.	8" dia.	25 ft	--
		Pipeline between MH #24 and the headworks	8" dia.	10" dia.	125 ft	--
	Recycled Water	Not used	--	--	--	--
	Road Improvements	Not used	--	--	--	--
5	Potable Water	Not used	--	--	--	--
	Sanitary Sewer	CIPP lining of entirety of unimproved system	6" dia.	6" dia.	8,950 ft	--
	Recycled Water	Repurpose existing asbestos cement pipeline from reservoir to intersection of Pico and Avonne	8" dia.	8" dia.	1,525 ft	--
		Repurpose existing asbestos cement pipeline along Avonne from Pico to Otter Way	6" dia.	6" dia.	1,025 ft	--
		Repurpose existing asbestos cement pipeline along Otter Way from Avonne to Castillo	6" dia.	6" dia.	325 ft	--
		Repurpose existing asbestos cement pipeline connecting Otter Way and San Simeon Ave	6" dia.	6" dia.	250 ft	--
		New recycled water pipeline along San Simeon Ave west of State Route 1	--	8" dia.	450 ft	--
		New recycled water pipeline along Hearst Drive	--	6" dia.	1,450 ft	--
		New recycled water pipeline along Vista Del Mar and Balboa Ave	--	6" dia.	1,600 ft	--
		New recycled water pump station	--	--	--	--
		Conversion of existing 150,000 gallon potable water reservoir to irrigation service	--	--	--	--
	Road Improvements	Pico Avenue Road Grind and Overlay with Spot Repairs	--	--	16,000 sf	--
		Pen Way Road Grind and Overlay with Spot Repairs	--	--	10,925 sf	--
		Jasper Avenue Digout Repairs and Slurry	--	--	15,000 sf	--
		Avonne Avenue Road Grind and Overlay with Spot Repairs	--	--	88,200 sf	--
		Otter Way Road Grind and Overlay with Spot Repairs			12,060 sf	--
		Balboa Avenue Road Grind and Overlay with Spot Repairs	--	--	19,980 sf	--
		Balboa Avenue Slurry	--	--	7,920 sf	--
		Vista Del Mar Avenue Road Grind and Overlay with Spot Repairs	--	--	12,150 sf	--
		Vista Del Mar Avenue Slurry	--	--	9,300 sf	--
		Sidewalk Additions	--	--	4,025 sf	--

Notes:
Lengths and areas are to be finalized during design.
Sidewalk areas assume a standard 5 foot wide sidewalk.
Gate valve counts are determined assuming that gate valves on existing hydrant connections will be replaced, and that new valves will be placed on the new main lines at every hydrant location and at intersections, with exceptions made for intersections in close proximity to existing or proposed hydrants.
Replacements of existing residential hydrants are also included but are not stated in the notes; see Figures 27-31 for quantities.

Figure 27

San Simeon Community Services District
Master Plan Update
Phase 1 Opinion of Probable Construction Cost

Summary of Phase 1 Work:

See "Phasing Breakdown"

Item	Description	Unit	Unit Cost	Quantity	Total
1. General					
1a	Mobilization	LS	$111,800	1	$111,800
1b	Traffic Control	LS	$11,100	1	$11,100
1c	Record Drawings	LS	$3,000	1	$3,000
				Subtotal	*$125,900*
2. Potable Water					
2a	400,000 Gallon Aboveground Steel Tank	LS	$725,000	1	$725,000
2b	10 inch diameter Potable PVC Pipe	LF	$160	3,050	$488,000
2c	12 inch diameter Potable PVC Pipe	LF	$180	1,025	$184,500
2d	14 inch diameter Potable PVC Pipe	LF	$200	2,400	$480,000
2e	10 inch diameter Potable Ductile Iron Pipe	LF	$175	250	$43,800
2f	Gate Valves	EA	$2,500	37	$92,500
2g	Commercial Hydrants	EA	$9,000	4	$36,000
2h	Residential Hydrants	EA	$6,000	10	$60,000
2i	Temporary Water Service	LS	$12,000	1	$12,000
2j	Pressure Testing and Disinfection	LS	$9,000	1	$9,000
				Subtotal	*$2,130,800*
3. Sanitary Sewer					
3a	8 inch diameter Sewer PVC Pipe	LF	$140	475	$66,500
3b	Temporary Wastewater Bypassing	LS	$9,000	1	$9,000
3c	New Manhole Structure	LS	$16,500	1	$16,500
				Subtotal	*$92,000*
4. Recycled Water					
--	Not Used	--	--	--	--
				Subtotal	--
5. Road Improvements					
--	Not Used	--	--	--	--
				Subtotal	--
				Overall Subtotal	$2,348,700
	Overhead/Insurance/Bond/Profit		20%		$469,700
	Contingency		15%		$352,300
	Design*		15%		$268,300
	Construction Management		8%		$187,900
				ESTIMATED TOTAL	**$3,626,900**

Notes

1. General

Mobilization is 5% of the sum of the remaining bid items.

Design and Construction Management costs are based on industry averages and are not proposed fees. *Where applicable, the costs associated with items that have already been designed are removed from the design cost.

Traffic control is 0.5% of remaining bid items excluding mobilization.

2. Potable Water

The aboveground steel tank includes all labor, tank materials, erection, coatings, foundation, excavation, and associated piping and appurtenances needed to connect the tank to the potable water system.

The PVC pipeline items include sawcutting (if in paved areas), excavation, abandonment of existing pipeline in place (if replacing existing pipeline), PVC pipe, appurtenances, fittings, installation, backfill, and pavement replacement (if in paved areas).

All pipeline lengths are rounded.

Temporary water service include the efforts needed to provide temporary service to homes affected by the water line improvements during construction.

Pressure testing and disinfection include all materials and labor required to pressure test and disinfect the potable water lines prior to placing them back in service.

Gate valves are included at all pipeline intersections, along the main line at all hydrants, and on all hydrant feed lines. Valves on existing hydrants are assumed to be replaced as a part of the project. Subtractions from this value are made based on engineering judgement for valves located within close proximity to one another.

It is assumed that all hydrants will be replaced when their associated mains are replaced. The cost for each hydrant includes associated pipe and fittings. Hydrants on Castillo Drive and Hearst Drive will be replaced with commercial hydrants.

3. Sanitary Sewer

The PVC pipeline items include sawcutting, excavation, abandonment of existing pipeline in place, PVC pipe, appurtenances, fittings, installation, backfill, and pavement replacement.

All pipeline lengths are rounded.

The new manhole structure includes excavation, the precast manhole structure, connections to the new sewer line being installed, backfill, ring and cover, and pavement replacement.

4. Recycled Water

Not used

5. Road Improvements

Not used

Figure 28

San Simeon Community Services District
Master Plan Update
Phase 2 Opinion of Probable Construction Cost

Summary of Phase 2 Work:

See "Phasing Breakdown"

Item	Description	Unit	Unit Cost	Quantity	Total
1. General					
1a	Mobilization	LS	$44,700	1	$44,700
1b	Traffic Control	LS	$4,400	1	$4,400
1c	Record Drawings	LS	$3,000	1	$3,000
				Subtotal	*$52,100*
2. Potable Water					
2a	400,000 Gallon Aboveground Steel Tank	LS	$725,000	1	$725,000
2b	10 inch diameter Potable PVC Pipe	LF	$160	400	$64,000
2c	10 inch diameter Potable Ductile Iron Pipe	LF	$240	200	$48,000
2d	Gate Valves	EA	$2,500	4	$10,000
2e	Commercial Hydrants	EA	$9,000	2	$18,000
2f	Temporary Water Service	LS	$12,000	1	$12,000
2g	Pressure Testing and Disinfection	LS	$9,000	1	$9,000
				Subtotal	*$886,000*
3. Sanitary Sewer					
--	Not Used	--	--	--	--
				Subtotal	--
4. Recycled Water					
--	Not Used	--	--	--	--
				Subtotal	--
5. Road Improvements					
--	Not Used	--	--	--	--
				Subtotal	--
				Overall Subtotal	$938,100
	Overhead/Insurance/Bond/Profit		20%		$187,600
	Contingency		15%		$140,700
	Design		15%		$140,700
	Construction Management		8%		$75,000
				ESTIMATED TOTAL	**$1,482,100**

Notes

1. General

Mobilization is 5% of the sum of the remaining bid items.

Design and Construction Management costs are based on industry averages and are not proposed fees. *Where applicable, the costs associated with items that have already been designed are removed from the design cost.

Traffic control is 0.5% of remaining bid items excluding mobilization.

2. Potable Water

The aboveground steel tank includes all labor, tank materials, erection, coatings, foundation, excavation, and associated piping and appurtenances needed to connect the tank to the potable water system.

The PVC pipeline items include sawcutting (if in paved areas), excavation, abandonment of existing pipeline in place (if replacing existing pipeline), PVC pipe, appurtenances, fittings, installation, backfill, and pavement replacement (if in paved areas).

The ductile iron pipeline items include sawcutting (if in paved areas), excavation, abandonment of existing pipeline in place (if replacing existing pipeline), ductile iron pipe, appurtenances, fittings, installation, backfill, and pavement replacement (if in paved areas).

All pipeline lengths are rounded.

Temporary water service include the efforts needed to provide temporary service to homes affected by the water line improvements during construction.

Pressure testing and disinfection include all materials and labor required to pressure test and disinfect the potable water lines prior to placing them back in service.

Gate valves are included at all pipeline intersections, along the main line at all hydrants, and on all hydrant feed lines. Valves on existing hydrants are assumed to be replaced as a part of the project. Subtractions from this value are made based on engineering judgement for valves located within close proximity to one another.

It is assumed that all hydrants will be replaced when their associated mains are replaced. The cost for each hydrant includes associated pipe and fittings. Hydrants on Castillo Drive and Hearst Drive will be replaced with commercial hydrants.

3. Sanitary Sewer

Not used

4. Recycled Water

Not used

5. Road Improvements

Not used

Figure 29

San Simeon Community Services District
Master Plan Update
Phase 3 Opinion of Probable Construction Cost

Summary of Phase 3 Work:
See "Phasing Breakdown"

Item	Description	Unit	Unit Cost	Quantity	Total
1. General					
1a	Mobilization	LS	$66,500	1	$66,500
1b	Traffic Control	LS	$6,600	1	$6,600
1c	Record Drawings	LS	$3,000	1	$3,000
				Subtotal	*$76,100*
2. Potable Water					
2a	400,000 Gallon Aboveground Steel Tank	LS	$725,000	1	$725,000
2b	10 inch diameter Potable PVC Pipe	LF	$160	2,725	$436,000
2c	Commercial Hydrants	EA	$9,000	3	$27,000
2d	Residential Hydrants	EA	$6,000	4	$24,000
2e	Gate Valves	EA	$2,500	13	$32,500
2f	Temporary Water Service	LS	$12,000	1	$12,000
2g	Pressure Testing and Disinfection	LS	$9,000	1	$9,000
				Subtotal	*$1,265,500*
3. Sanitary Sewer					
3a	6 inch diameter Sewer PVC Pipe (sag repair)	LF	$120	375	$45,000
3b	Temporary Wastewater Bypassing	LS	$9,000	1	$9,000
				Subtotal	*$54,000*
4. Recycled Water					
--	Not Used	--	--	--	--
				Subtotal	--
5. Road Improvements					
--	Not Used	--	--	--	--
				Subtotal	--
				Overall Subtotal	$1,395,600
	Overhead/Insurance/Bond/Profit		20%		$279,100
	Contingency		15%		$209,300
	Design		15%		$199,200
	Construction Management		8%		$111,600
				ESTIMATED TOTAL	**$2,194,800**

Notes

1. General

Mobilization is 5% of the sum of the remaining bid items.

Design and Construction Management costs are based on industry averages and are not proposed fees. *Where applicable, the costs associated with items that have already been designed are removed from the design cost.

Traffic control is 0.5% of remaining bid items excluding mobilization.

2. Potable Water

The aboveground steel tank includes all labor, tank materials, erection, coatings, foundation, excavation, and associated piping and appurtenances needed to connect the tank to the potable water system.

The PVC pipeline items include sawcutting (if in paved areas), excavation, abandonment of existing pipeline in place (if replacing existing pipeline), PVC pipe, appurtenances, fittings, installation, backfill, and pavement replacement (if in paved areas).

The ductile iron pipeline items include sawcutting (if in paved areas), excavation, abandonment of existing pipeline in place (if replacing existing pipeline), ductile iron pipe, appurtenances, fittings, installation, backfill, and pavement replacement (if in paved areas).

All pipeline lengths are rounded.

Temporary water service include the efforts needed to provide temporary service to homes affected by the water line improvements during construction.

Pressure testing and disinfection include all materials and labor required to pressure test and disinfect the potable water lines prior to placing them back in service.

Gate valves are included at all pipeline intersections, along the main line at all hydrants, and on all hydrant feed lines. Valves on existing hydrants are assumed to be replaced as a part of the project. Subtractions from this value are made based on engineering judgement for valves located within close proximity to one another.

It is assumed that all hydrants will be replaced when their associated mains are replaced. The cost for each hydrant includes associated pipe and fittings. Hydrants on Castillo Drive and Hearst Drive will be replaced with commercial hydrants.

3. Sanitary Sewer

The PVC pipeline items include sawcutting, excavation, abandonment of existing pipeline in place, PVC pipe, appurtenances, fittings, installation, backfill, and pavement replacement.

All pipeline lengths are rounded.

4. Recycled Water

Not used

5. Road Improvements

Not used

Figure 30

San Simeon Community Services District
Master Plan Update
Phase 4 Opinion of Probable Construction Cost

Summary of Phase 4 Work:

See "Phasing Breakdown"

Item	Description	Unit	Unit Cost	Quantity	Total
1. General					
1a	Mobilization	LS	$77,700	1	$77,700
1b	Traffic Control	LS	$7,700	1	$7,700
1c	Record Drawings	LS	$3,000	1	$3,000
				Subtotal	*$88,400*
2. Potable Water					
2a	400,000 Gallon Aboveground Steel Tank	LS	$725,000	1	$725,000
2b	6 inch diameter Potable PVC Pipe	LF	$120	825	$99,000
2c	8 inch diameter Potable PVC Pipe	LF	$140	2500	$350,000
2d	10 inch diameter Potable PVC Pipe	LF	$160	400	$64,000
2e	8 inch diameter Potable Ductile Iron Pipe	LF	$220	450	$99,000
2f	Commercial Hydrants	EA	$9,000	3	$27,000
2g	Residential Hydrants	EA	$6,000	10	$60,000
2h	Gate Valves	EA	$2,500	26	$65,000
2i	Temporary Water Service	LS	$12,000	1	$12,000
2j	Pressure Testing and Disinfection	LS	$9,000	1	$9,000
				Subtotal	*$1,510,000*
3. Sanitary Sewer					
3a	8 inch diameter Sewer PVC Pipe	LF	$140	25	$3,500
3b	10 inch diameter Sewer PVC Pipe	LF	$160	125	$20,000
3c	Temporary Wastewater Bypassing	LS	$9,000	1	$9,000
				Subtotal	*$32,500*
4. Recycled Water					
--	Not Used	--	--	--	--
				Subtotal	--
5. Road Improvements					
--	Not Used	--	--	--	--
				Subtotal	--
				Overall Subtotal	$1,630,900
	Overhead/Insurance/Bond/Profit		20%		$326,200
	Contingency		15%		$244,600
	Design		15%		$244,600
	Construction Management		8%		$130,500
				ESTIMATED TOTAL	**$2,576,800**

Notes

1. General

Mobilization is 5% of the sum of the remaining bid items.

Design and Construction Management costs are based on industry averages and are not proposed fees. *Where applicable, the costs associated with items that have already been designed are removed from the design cost.

Traffic control is 0.5% of remaining bid items excluding mobilization.

2. Potable Water

The aboveground steel tank includes all labor, tank materials, erection, coatings, foundation, excavation, and associated piping and appurtenances needed to connect the tank to the potable water system.

The PVC pipeline items include sawcutting (if in paved areas), excavation, abandonment of existing pipeline in place (if replacing existing pipeline), PVC pipe, appurtenances, fittings, installation, backfill, and pavement replacement (if in paved areas).

The ductile iron pipeline items include sawcutting (if in paved areas), excavation, abandonment of existing pipeline in place (if replacing existing pipeline), ductile iron pipe, appurtenances, fittings, installation, backfill, and pavement replacement (if in paved areas).

All pipeline lengths are rounded.

Temporary water service include the efforts needed to provide temporary service to homes affected by the water line improvements during construction.

Pressure testing and disinfection include all materials and labor required to pressure test and disinfect the potable water lines prior to placing them back in service.

Gate valves are included at all pipeline intersections, along the main line at all hydrants, and on all hydrant feed lines. Valves on existing hydrants are assumed to be replaced as a part of the project. Subtractions from this value are made based on engineering judgement for valves located within close proximity to one another.

It is assumed that all hydrants will be replaced when their associated mains are replaced. The cost for each hydrant includes associated pipe and fittings. Hydrants on Castillo Drive and Hearst Drive will be replaced with commercial hydrants.

3. Sanitary Sewer

The PVC pipeline items include sawcutting, excavation, abandonment of existing pipeline in place, PVC pipe, appurtenances, fittings, installation, backfill, and pavement replacement.

All pipeline lengths are rounded.

4. Recycled Water

Not used

5. Road Improvements

Not used

Figure 31

San Simeon Community Services District
Master Plan Update
Phase 5 Opinion of Probable Construction Cost

Summary of Phase 5 Work:

See "Phasing Breakdown"

Item	Description	Unit	Unit Cost	Quantity	Total
1. General					
1a	Mobilization	LS	$84,000	1	$84,000
1b	Traffic Control	LS	$8,300	1	$8,300
1c	Record Drawings	LS	$3,000	1	$3,000
				Subtotal	*$95,300*
2. Potable Water					
--	Not Used	--	--	--	--
				Subtotal	--
3. Sanitary Sewer					
3a	6 inch Diameter CIPP Lining	LF	$40	8,950	$358,000
				Subtotal	*$358,000*
4. Recycled Water					
4a	Conversion of Existing 6 inch Diameter AC Pipe to Recycled Water	LF	$20	1,600	$32,000
4b	Conversion of Existing 8 inch Diameter AC Pipe to Recycled Water	LF	$20	1,525	$30,500
4c	6 inch Diameter Recycled Water PVC Pipe	LF	$120	3,050	$366,000
4d	8 inch Diameter Recycled Water PVC Pipe	LF	$140	450	$63,000
4e	Pressure Testing	LF	$10,000	1	$10,000
4f	Recycled Water Pump Station	LS	$200,000	1	$200,000
4g	Conversion of Existing 150,000 gallon Reservoir to Irrigation Service	LS	$25,000	1	$25,000
4h	Title 22 Report	LS	$35,000	1	$35,000
				Subtotal	$761,500
5. Road Improvements					
5a	Pico Avenue Road Grind and Overlay with Spot Repairs	SF	$3.00	16,000	$48,000
5b	Pen Way Road Grind and Overlay with Spot Repairs	SF	$3.00	10,925	$32,800
5c	Jasper Avenue Digout Repairs and Slurry	SF	$1.50	15,000	$22,500
5d	Avonne Avenue Road Grind and Overlay with Spot Repairs	SF	$3.00	88,200	$264,600
5e	Otter Way Road Grind and Overlay with Spot Repairs	SF	$3.00	12,060	$36,200
5f	Balboa Avenue Road Grind and Overlay with Spot Repairs	SF	$3.00	19,980	$59,900
5g	Balboa Avenue Slurry	SF	$0.50	7,920	$4,000
5h	Vista Del Mar Avenue Road Grind and Overlay with Spot Repairs	SF	$3.00	12,150	$36,500
5i	Vista Del Mar Avenue Slurry	SF	$0.50	9,300	$4,700
5j	Sidewalk Additions	SF	$10	4,025	$40,300
				Subtotal	$549,500
				Overall Subtotal	$1,764,300
	Overhead/Insurance/Bond/Profit		20%		$352,900
	Contingency		15%		$264,600
	Design		15%		$206,700
	Construction Management		8%		$141,100
				ESTIMATED TOTAL	**$2,729,600**

Notes

1. General

Mobilization is 5% of the sum of the remaining bid items.

Design and Construction Management costs are based on industry averages and are not proposed fees. *Where applicable, the costs associated with items that have already been designed are removed from the design cost.

Traffic control is 0.5% of remaining bid items excluding mobilization.

2. Potable Water

Not used

3. Sanitary Sewer

The CIPP lining item includes CCTV inspection, pipeline cleaning, installation of CIPP liner, reestablishment of laterals, post lining cleaning, and post lining inspection.

All pipeline lengths are rounded.

4. Recycled Water

Conversion of existing AC pipe to recycled includes revising and disconnecting connections, and in cases where it will be preserved for future use, plugging and preserving the pipeline in place.

The PVC pipeline items include sawcutting (if in paved areas), excavation, abandonment of existing pipeline in place (if replacing existing pipeline), PVC pipe, appurtenances, fittings, installation, backfill, and pavement replacement (if in paved areas).

All pipeline lengths are rounded.

The recycled water pump station is an estimate and will be dependent on the pumps selected during design. No structure to house the pump station is included.

Conversion of the existing 150,000 gallon reservoir to irrigation service includes revised connections and fittings as needed.

5. Road Improvements

Road grind and overlay with spot repair includes grinding of the full road width, repairs of exceptionally damaged areas (to be identified during the design process) by removal of the full cross section of existing asphalt concrete and replacement in kind, and asphalt concrete overlay of the full road width (depth of overlay to be determined during design).

Slurry sealing includes asphalt emulsion sealing of the entirety of the road width.

All road projects are assumed to occur at the end of the phase, after all pipeline improvements have been completed.

Sidewalk additions include all labor and materials, including concrete, reinforcing mesh, etc.

Appendices

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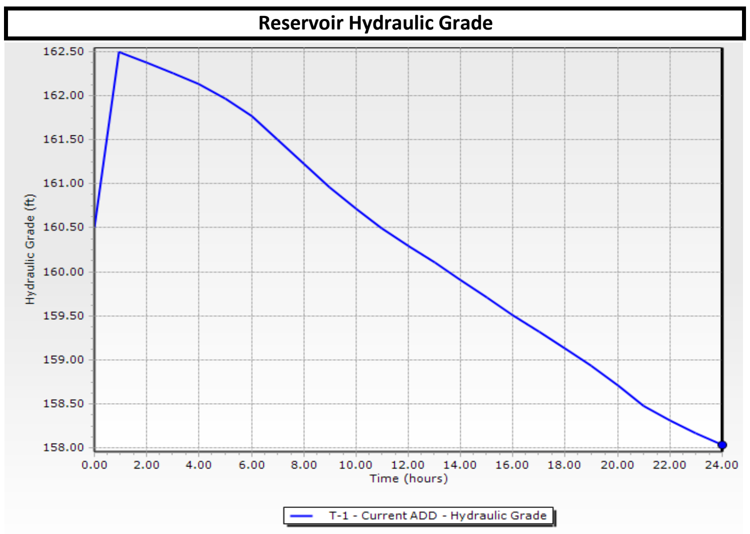
Appendix 1

San Simeon Community Services District
Master Plan Update
Existing ADD Run Summary

Junction	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	77	0	161.38	37
J-2	76	0	161.38	37
J-3	75.84	0	161.38	37
J-4	18	0	161.38	62
J-5	77.67	0	161.39	36
J-6	69.29	0	161.35	40
J-7	56.68	2	161.31	45
J-8	54.17	0	161.29	46
J-9	62	2	161.25	43
J-10	61	5	161.19	43
J-11	63	0	161.18	42
J-12	61	12	161.15	43
J-13	68.59	1	161.15	40
J-14	62.5	0	161.15	43
J-17	62.8	1	161.15	43
J-18	62	6	161.15	43
J-19	70.89	1	161.15	39
J-20	59	8	161.26	44
J-21	58	0	161.24	45
J-22	47	0	161.23	49
J-23	49.44	0	161.21	48
J-24	47.69	0	161.2	49
J-25	41	0	161.18	52
J-26	33.6	13	161.15	55
J-27	34	2	161.15	55
J-28	39.5	0	161.15	53
J-29	47.04	0	161.15	49
J-30	47.29	0	161.15	49
J-31	50	0	161.15	48
J-32	56	0	161.15	45
J-33	44.5	5	161.14	50
J-34	49.5	1	161.14	48
J-35	54	0	161.14	46
J-36	52	0	161.14	47
J-37	55	3	161.14	46
J-38	50.27	0	161.14	48
J-39	37.59	0	161.14	53
J-40	37.35	0	161.14	54
J-41	39.81	0	161.14	52
J-42	43	0	161.14	51
J-43	48	0	161.14	49
J-44	48	0	161.14	49
J-45	37.93	0	161.15	53
J-46	38.48	0	161.15	53
J-47	39.61	1	161.15	53
J-48	20.28	0	161.15	61
J-49	73	0	161.15	38
J-50	65	3	161.15	42
J-55	67	0	161.15	41
J-56	53	0	161.14	47
J-57	58	6	161.14	45
J-59	49	4	161.14	49
J-60	61.58	0	161.23	43
J-65	71.1	0	161.15	39

Reservoir Hydraulic Grade



Pipeline	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Flow (gpm)	Velocity (ft/s)
P-8	34	J-1	J-5	8	Asbestos Cement	77	0.49
P-9	829	J-5	T-1	8	Asbestos Cement	77	0.49
P-11	224	J-1	J-6	8	Asbestos Cement	77	0.49
P-13	309	J-6	J-7	8	Asbestos Cement	77	0.49
P-15	106	J-7	J-8	8	Asbestos Cement	76	0.48
P-16	210	J-8	J-9	6	Asbestos Cement	42	0.47
P-18	371	J-9	J-10	6	Asbestos Cement	39	0.44
P-20	141	J-10	J-11	6	Asbestos Cement	34	0.38
P-22	188	J-11	J-12	6	Asbestos Cement	34	0.38
P-23	331	J-12	J-13	6	Asbestos Cement	1	0.01
P-26	95	J-12	J-14	6	Asbestos Cement	21	0.24
P-30	19	J-14	J-17	6	Asbestos Cement	11	0.12
P-31	110	J-17	J-18	6	Asbestos Cement	10	0.11
P-36	290	J-8	J-20	6	Asbestos Cement	34	0.39
P-37	146	J-20	J-21	6	Asbestos Cement	26	0.3
P-39	198	J-21	J-22	6	Asbestos Cement	26	0.3
P-40	256	J-22	J-23	6	Asbestos Cement	26	0.3
P-42	181	J-23	J-24	6	Asbestos Cement	26	0.3
P-43	201	J-24	J-25	6	Asbestos Cement	26	0.3
P-44	431	J-25	J-26	6	Asbestos Cement	26	0.3
P-46	122	J-26	J-27	6	Asbestos Cement	13	0.15
P-47	282	J-27	J-28	8	PVC	8	0.05
P-48	122	J-28	J-29	8	PVC	8	0.05
P-52	119	J-31	J-32	6	Asbestos Cement	11	0.12
P-54	206	J-32	J-14	6	Asbestos Cement	11	0.12
P-55	397	J-29	J-33	8	PVC	7	0.05
P-57	407	J-33	J-34	8	PVC	2	0.01
P-58	44	J-34	H-19	6	PVC	0	0
P-59	172	J-34	J-35	8	PVC	1	0.01
P-60	85	J-35	J-36	6	Asbestos Cement	1	0.01
P-62	279	J-36	J-37	6	Asbestos Cement	1	0.01
P-64	213	J-37	J-38	6	Asbestos Cement	1	0.02
P-66	311	J-38	J-39	6	Asbestos Cement	2	0.02
P-67	45	J-39	J-40	6	Asbestos Cement	2	0.02
P-69	290	J-40	J-41	6	Asbestos Cement	2	0.02
P-70	32	J-41	J-42	6	Asbestos Cement	1	0.01
P-76	310	J-41	J-45	6	Asbestos Cement	3	0.03
P-78	42	J-45	J-46	6	Asbestos Cement	3	0.03
P-79	91	J-46	J-47	6	Asbestos Cement	3	0.04
P-80	191	J-47	J-48	6	Asbestos Cement	4	0.04
P-82	156	J-48	J-27	8	Ductile Iron	4	0.02
P-87	556	J-18	J-50	6	Asbestos Cement	4	0.05
P-99	218	J-50	J-55	6	Asbestos Cement	1	0.02
P-100	239	J-55	J-19	6	Asbestos Cement	1	0.02
P-103	343	J-56	J-57	6	Asbestos Cement	6	0.07
P-109	364	J-31	J-59	6	Asbestos Cement	11	0.12
P-110	418	J-59	J-56	6	Asbestos Cement	6	0.07
P-111	156	J-9	J-60	6	Asbestos Cement	39	0.44
P-112	214	J-60	J-10	6	Asbestos Cement	39	0.44

Notes:

The tank is assumed to have an initial water level of 160.50, with pumps starting at midnight and filling the tank until it is full.

Zero demand junctions consist of junctions used to navigate bends in the system, junctions needed to allow for hydrant connections, junctions located away from customers, etc.

Zero flow pipelines have been eliminated from the table above, and are often pipelines connecting hydrants to the system or pipelines that aren't always used (i.e. pipelines connecting the wellheads to the system, RO system piping, etc.).

Appendix 2

San Simeon Community Services District
Master Plan Update
Existing MDD Run Summary

Junction	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	77	0	160.44	36
J-2	76	0	160.44	37
J-3	75.84	0	160.44	37
J-4	18	0	160.44	62
J-5	77.67	0	160.45	36
J-6	69.29	0	160.35	39
J-7	56.68	3	160.23	45
J-8	54.17	0	160.19	46
J-9	62	4	160.09	42
J-10	61	9	159.92	43
J-11	63	0	159.87	42
J-12	61	21	159.81	43
J-13	68.59	2	159.81	39
J-14	62.5	0	159.8	42
J-17	62.8	1	159.79	42
J-18	62	10	159.79	42
J-19	70.89	2	159.79	38
J-20	59	14	160.09	44
J-21	58	0	160.06	44
J-22	47	0	160.02	49
J-23	49.44	0	159.96	48
J-24	47.69	0	159.93	49
J-25	41	0	159.88	51
J-26	33.6	22	159.79	55
J-27	34	4	159.78	54
J-28	39.5	0	159.78	52
J-29	47.04	0	159.78	49
J-30	47.29	0	159.78	49
J-31	50	0	159.78	47
J-32	56	0	159.79	45
J-33	44.5	9	159.78	50
J-34	49.5	1	159.78	48
J-35	54	0	159.78	46
J-36	52	0	159.78	47
J-37	55	5	159.78	45
J-38	50.27	0	159.78	47
J-39	37.59	0	159.78	53
J-40	37.35	0	159.78	53
J-41	39.81	1	159.78	52
J-42	43	0	159.78	51
J-43	48	0	159.78	48
J-44	48	0	159.78	48
J-45	37.93	0	159.78	53
J-46	38.48	1	159.78	52
J-47	39.61	1	159.78	52
J-48	20.28	0	159.78	60
J-49	73	1	159.79	38
J-50	65	5	159.79	41
J-55	67	0	159.79	40
J-56	53	0	159.76	46
J-57	58	11	159.76	44
J-59	49	8	159.77	48
J-60	61.58	0	160.02	43
J-65	71.1	0	159.79	38
J-66	64.12	0	159.79	41

Pipeline	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Flow (gpm)	Velocity (ft/s)
P-8	34	J-1	J-5	8	Asbestos Cement	134	0.86
P-9	829	J-5	T-1	8	Asbestos Cement	134	0.86
P-11	224	J-1	J-6	8	Asbestos Cement	134	0.86
P-13	309	J-6	J-7	8	Asbestos Cement	134	0.86
P-15	106	J-7	J-8	8	Asbestos Cement	132	0.84
P-16	210	J-8	J-9	6	Asbestos Cement	72	0.82
P-20	141	J-10	J-11	6	Asbestos Cement	59	0.67
P-22	188	J-11	J-12	6	Asbestos Cement	59	0.67
P-23	331	J-12	J-13	6	Asbestos Cement	2	0.02
P-26	95	J-12	J-14	6	Asbestos Cement	36	0.41
P-30	19	J-14	J-17	6	Asbestos Cement	18	0.21
P-31	110	J-17	J-18	6	Asbestos Cement	17	0.19
P-36	290	J-8	J-20	6	Asbestos Cement	59	0.67
P-37	146	J-20	J-21	6	Asbestos Cement	46	0.52
P-39	198	J-21	J-22	6	Asbestos Cement	45	0.52
P-40	256	J-22	J-23	6	Asbestos Cement	45	0.52
P-42	181	J-23	J-24	6	Asbestos Cement	45	0.52
P-43	201	J-24	J-25	6	Asbestos Cement	45	0.52
P-44	431	J-25	J-26	6	Asbestos Cement	45	0.52
P-46	122	J-26	J-27	6	Asbestos Cement	23	0.26
P-47	282	J-27	J-28	8	PVC	13	0.08
P-48	122	J-28	J-29	8	PVC	13	0.08
P-51	205	J-30	J-31	6	Asbestos Cement	1	0.01
P-52	119	J-31	J-32	6	Asbestos Cement	18	0.21
P-54	206	J-32	J-14	6	Asbestos Cement	18	0.21
P-55	397	J-29	J-33	8	PVC	12	0.08
P-57	407	J-33	J-34	8	PVC	3	0.02
P-59	172	J-34	J-35	8	PVC	2	0.01
P-60	85	J-35	J-36	6	Asbestos Cement	2	0.02
P-62	279	J-36	J-37	6	Asbestos Cement	2	0.02
P-64	213	J-37	J-38	6	Asbestos Cement	2	0.03
P-66	311	J-38	J-39	6	Asbestos Cement	3	0.03
P-67	45	J-39	J-40	6	Asbestos Cement	3	0.03
P-69	290	J-40	J-41	6	Asbestos Cement	3	0.03
P-70	32	J-41	J-42	6	Asbestos Cement	1	0.01
P-72	136	J-42	J-43	6	Asbestos Cement	1	0.01
P-76	310	J-41	J-45	6	Asbestos Cement	5	0.05
P-78	42	J-45	J-46	6	Asbestos Cement	5	0.06
P-79	91	J-46	J-47	6	Asbestos Cement	6	0.06
P-80	191	J-47	J-48	6	Asbestos Cement	7	0.07
P-82	156	J-48	J-27	8	Ductile Iron	7	0.04
P-99	218	J-50	J-55	6	Asbestos Cement	2	0.03
P-100	239	J-55	J-19	6	Asbestos Cement	2	0.03
P-103	343	J-56	J-57	6	Asbestos Cement	11	0.13
P-109	364	J-31	J-59	6	Asbestos Cement	19	0.22
P-110	418	J-59	J-56	6	Asbestos Cement	11	0.13
P-111	156	J-9	J-60	6	Asbestos Cement	68	0.77
P-112	214	J-60	J-10	6	Asbestos Cement	68	0.77
P-121	28	J-19	J-65	6	Asbestos Cement	1	0.01
P-122	269	J-65	J-49	6	Asbestos Cement	1	0.01
P-123	353	J-18	J-66	6	Asbestos Cement	7	0.08
P-124	204	J-66	J-50	6	Asbestos Cement	7	0.08

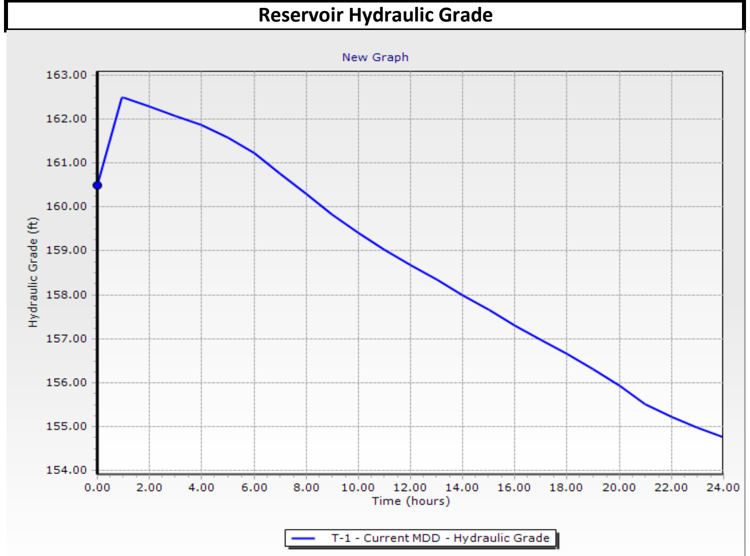
Notes:

The tank is assumed to have an initial water level of 160.50, with pumps starting at midnight and filling the tank until it is full.

Zero demand junctions consist of junctions used to navigate bends in the system, junctions needed to allow for hydrant connections, junctions located away from customers, etc.

Zero flow pipelines have been eliminated from the table above, and are often pipelines connecting hydrants to the system or pipelines that aren't always used (i.e. pipelines connecting the wellheads to the system, RO system piping, etc.).

Reservoir Hydraulic Grade



Appendix 3

San Simeon Community Services District
Master Plan Update
Existing MDD + Fire Run Summary

Node	Satisfies Fire Flow Req?	Fire Flow Requirement (gpm)	Achieveable Fire Flow w/20 psi Min Pressure	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (ft/s)
H-1	FALSE	1,500	516	20	20	13.17
H-2	FALSE	1,750	1,476	20	20	16.75
H-3	FALSE	1,750	1,300	20	25	14.76
H-4	FALSE	1,750	1,067	20	22	12.11
H-5	FALSE	1,500	907	20	20	10.29
H-6	FALSE	1,750	880	20	23	9.99
H-7	FALSE	1,500	676	20	20	7.69
H-8	FALSE	1,500	686	20	20	7.8
H-9	FALSE	1,500	757	20	24	8.73
H-10	FALSE	1,500	552	20	22	6.41
H-11	FALSE	1,500	516	20	21	5.99
H-12	FALSE	1,500	476	20	20	5.54
H-13	FALSE	1,500	1,052	20	20	11.94
H-14	FALSE	1,667	1,008	20	23	11.44
H-15	FALSE	1,667	901	20	32	10.22
H-16	FALSE	1,667	882	20	29	10.01
H-17	FALSE	1,750	842	20	25	9.56
H-18	FALSE	1,500	881	20	27	10
H-19	FALSE	1,500	882	20	21	10
H-20	FALSE	1,500	861	20	20	9.76
H-21	FALSE	1,500	846	20	20	9.61
H-22	FALSE	1,500	789	20	20	8.95
H-23	FALSE	1,500	883	20	24	10.02
H-24	FALSE	1,500	883.00	20	22	10.03
H-25	FALSE	1,500	816	20	20	9.27
H-26	FALSE	1,500	836	20	20	9.49
H-27	FALSE	1,500	884	20	27	10.03
H-28	FALSE	1,500	886	20	37	10.05
H-29	FALSE	1,500	673	20	22	7.78
H-30	FALSE	1,500	602	20	20	6.98
H-31	FALSE	1,500	992	20	49	11.26
J-1	TRUE	1,500	1,555	20	21	10.52
J-2	TRUE	1,500	1,555	20	21	10.52
J-3	TRUE	1,500	1,555	20	21	10.52
J-5	TRUE	1,500	1,555	20	21	10.52
J-6	TRUE	1,500	1,501	20	22	10.17
J-7	FALSE	1,500	1,300	20	27	8.89
J-8	FALSE	1,500	1,247	20	28	8.55
J-9	FALSE	1,500	1,067	20	24	10.39
J-10	FALSE	1,500	918	20	24	7.84
J-11	FALSE	1,500	880	20	24	7.23
J-12	FALSE	1,500	837	20	25	6.55
J-13	FALSE	1,500	711	20	21	8.08
J-14	FALSE	1,500	818	20	25	6.26
J-17	FALSE	1,500	809	20	24	9.32
J-18	FALSE	1,500	757	20	25	8.73
J-19	FALSE	1,500	516	20	21	5.99
J-20	FALSE	1,500	1,127	20	22	10.4
J-21	FALSE	1,500	1,091	20	21	9.53
J-22	FALSE	1,500	1,051	20	25	8.61
J-23	FALSE	1,500	1,008	20	24	7.68
J-24	FALSE	1,500	981	20	25	7.13
J-25	FALSE	1,500	953	20	28	6.67
J-26	FALSE	1,500	901	20	32	6.34
J-27	FALSE	1,500	887	20	33	6.25
J-28	FALSE	1,500	882	20	31	6.22
J-29	FALSE	1,500	880	20	27	6.2
J-30	FALSE	1,500	879	20	27	6.2
J-31	FALSE	1,500	856	20	27	6.05
J-32	FALSE	1,500	842	20	26	6.11
J-33	FALSE	1,500	881	20	27	6.21
J-34	FALSE	1,500	882	20	24	6.22
J-35	FALSE	1,500	882	20	22	6.22
J-36	FALSE	1,500	882	20	22	7.27
J-37	FALSE	1,500	855	20	20	6.13
J-38	FALSE	1,500	859	20	21	6.07
J-39	FALSE	1,500	883	20	25	6.22
J-40	FALSE	1,500	883	20	25	6.23
J-41	FALSE	1,500	883	20	25	6.23
J-42	FALSE	1,500	883	20	23	10.03
J-43	FALSE	1,500	841	20	20	9.55
J-44	FALSE	1,500	820	20	20	9.32
J-45	FALSE	1,500	884	20	27	7.01
J-46	FALSE	1,500	884	20	27	7.17
J-47	FALSE	1,500	885	20	27	7.56
J-48	FALSE	1,500	886	20	38	6.24
J-49	FALSE	1,500	479	20	20	5.58
J-50	FALSE	1,500	593	20	23	6.87
J-55	FALSE	1,500	552	20	23	6.41
J-56	FALSE	1,500	673	20	22	7.78
J-57	FALSE	1,500	608	20	20	7.04
J-59	FALSE	1,500	787	20	24	9.07
J-60	FALSE	1,500	992	20	24	9.07
J-65	FALSE	1,500	512	20	21	5.95
J-66	FALSE	1,500	640	20	24	7.41

Notes:

Fire flow requirements are calculated based on large properties (such as select hotels) in the community. Where one hydrant serves multiple identified large properties, the largest required fire flow is used. All properties aside from the identified hotels assume a minimum required fire flow of 1,500 gpm.

Fire flow analyses assume that the wellhead pumps are not running.

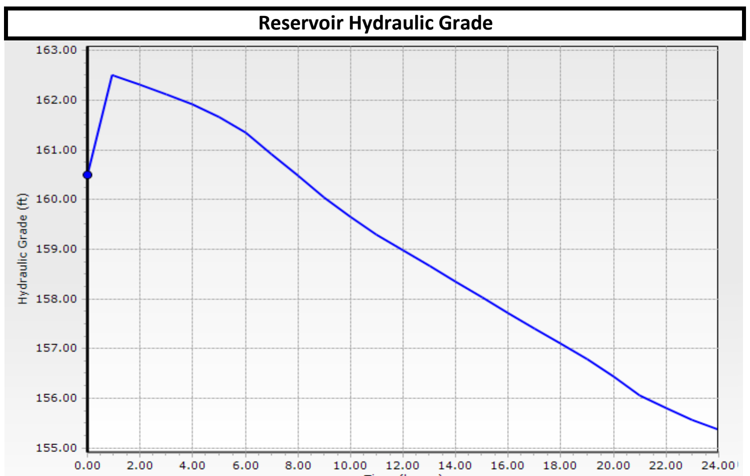
Available storage has been ignored, refer to the discussion in the report reguarding required storage increases.

Appendix 4

San Simeon Community Services District
Master Plan Update
Future ADD Run Summary

Junction	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	77	0	160.62	36
J-2	76	0	160.62	37
J-3	75.84	0	160.62	37
J-4	18	0	160.62	62
J-5	77.67	0	160.63	36
J-6	69.29	0	160.54	39
J-7	56.68	2	160.44	45
J-8	54.17	0	160.41	46
J-9	62	4	160.32	43
J-10	61	8	160.18	43
J-11	63	0	160.14	42
J-12	61	19	160.08	43
J-13	68.59	2	160.08	40
J-14	62.5	0	160.07	42
J-17	62.8	1	160.07	42
J-18	62	9	160.07	42
J-19	70.89	2	160.06	39
J-20	59	12	160.32	44
J-21	58	0	160.30	44
J-22	47	0	160.26	49
J-23	49.44	0	160.21	48
J-24	47.69	0	160.18	49
J-25	41	0	160.14	52
J-26	33.6	20	160.07	55
J-27	34	3	160.06	55
J-28	39.5	0	160.06	52
J-29	47.04	0	160.06	49
J-30	47.29	0	160.06	49
J-31	50	0	160.06	48
J-32	56	0	160.06	45
J-33	44.5	8	160.06	50
J-34	49.5	1	160.06	48
J-35	54	0	160.06	46
J-36	52	0	160.06	47
J-37	55	4	160.06	45
J-38	50.27	0	160.06	47
J-39	37.59	0	160.06	53
J-40	37.35	0	160.06	53
J-41	39.81	1	160.06	52
J-42	43	0	160.06	51
J-43	48	0	160.06	48
J-44	48	0	160.06	48
J-45	37.93	0	160.06	53
J-46	38.48	1	160.06	53
J-47	39.61	1	160.06	52
J-48	20.28	0	160.06	60
J-49	73	1	160.06	38
J-50	65	4	160.06	41
J-55	67	0	160.06	40
J-56	53	0	160.04	46
J-57	58	10	160.03	44
J-59	49	7	160.04	48
J-60	61.58	0	160.26	43
J-65	71.1	0	160.06	38

Reservoir Hydraulic Grade



Pipeline	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Flow (gpm)	Velocity (ft/s)
P-8	34	J-1	J-5	8	Asbestos Cement	124	0.79
P-9	829	J-5	T-1	8	Asbestos Cement	124	0.79
P-11	224	J-1	J-6	8	Asbestos Cement	124	0.79
P-13	309	J-6	J-7	8	Asbestos Cement	124	0.79
P-15	106	J-7	J-8	8	Asbestos Cement	121	0.77
P-16	210	J-8	J-9	6	Asbestos Cement	67	0.76
P-18	371	J-9	J-10	6	Asbestos Cement	63	0.71
P-20	141	J-10	J-11	6	Asbestos Cement	54	0.62
P-22	188	J-11	J-12	6	Asbestos Cement	54	0.62
P-23	331	J-12	J-13	6	Asbestos Cement	2	0.02
P-26	95	J-12	J-14	6	Asbestos Cement	34	0.38
P-30	19	J-14	J-17	6	Asbestos Cement	17	0.19
P-31	110	J-17	J-18	6	Asbestos Cement	16	0.18
P-36	290	J-8	J-20	6	Asbestos Cement	55	0.62
P-37	146	J-20	J-21	6	Asbestos Cement	42	0.48
P-39	198	J-21	J-22	6	Asbestos Cement	42	0.48
P-40	256	J-22	J-23	6	Asbestos Cement	42	0.48
P-42	181	J-23	J-24	6	Asbestos Cement	42	0.48
P-43	201	J-24	J-25	6	Asbestos Cement	42	0.48
P-44	431	J-25	J-26	6	Asbestos Cement	42	0.48
P-46	122	J-26	J-27	6	Asbestos Cement	22	0.24
P-47	282	J-27	J-28	8	PVC	12	0.08
P-48	122	J-28	J-29	8	PVC	12	0.08
P-51	205	J-30	J-31	6	Asbestos Cement	1	0.01
P-52	119	J-31	J-32	6	Asbestos Cement	17	0.19
P-54	206	J-32	J-14	6	Asbestos Cement	17	0.19
P-55	397	J-29	J-33	8	PVC	11	0.07
P-57	407	J-33	J-34	8	PVC	3	0.02
P-59	172	J-34	J-35	8	PVC	2	0.01
P-60	85	J-35	J-36	6	Asbestos Cement	2	0.02
P-62	279	J-36	J-37	6	Asbestos Cement	2	0.02
P-64	213	J-37	J-38	6	Asbestos Cement	2	0.03
P-66	311	J-38	J-39	6	Asbestos Cement	2	0.03
P-67	45	J-39	J-40	6	Asbestos Cement	2	0.03
P-69	290	J-40	J-41	6	Asbestos Cement	3	0.03
P-70	32	J-41	J-42	6	Asbestos Cement	1	0.01
P-72	136	J-42	J-43	6	Asbestos Cement	1	0.01
P-76	310	J-41	J-45	6	Asbestos Cement	4	0.05
P-78	42	J-45	J-46	6	Asbestos Cement	5	0.05
P-79	91	J-46	J-47	6	Asbestos Cement	5	0.06
P-80	191	J-47	J-48	6	Asbestos Cement	6	0.07
P-82	156	J-48	J-27	8	Ductile Iron	6	0.04
P-85	301	J-19	J-49	6	Asbestos Cement	1	0.01
P-87	556	J-18	J-50	6	Asbestos Cement	6	0.07
P-99	218	J-50	J-55	6	Asbestos Cement	2	0.03
P-100	239	J-55	J-19	6	Asbestos Cement	2	0.03
P-103	343	J-56	J-57	6	Asbestos Cement	10	0.12
P-109	364	J-31	J-59	6	Asbestos Cement	18	0.2
P-110	418	J-59	J-56	6	Asbestos Cement	10	0.12
P-111	156	J-9	J-60	6	Asbestos Cement	63	0.71
P-112	214	J-60	J-10	6	Asbestos Cement	63	0.71
P-121	28	J-19	J-65	6	Asbestos Cement	1	0.01
P-122	269	J-65	J-49	6	Asbestos Cement	1	0.01

Notes:

The tank is assumed to have an initial water level of 160.50, with pumps starting at midnight and filling the tank until it is full.

Zero demand junctions consist of junctions used to navigate bends in the system, junctions needed to allow for hydrant connections, junctions located away from customers, etc.

Zero flow pipelines have been eliminated from the table above, and are often pipelines connecting hydrants to the system or pipelines that aren't always used (i.e. pipelines connecting the wellheads to the system, RO system piping, etc.).

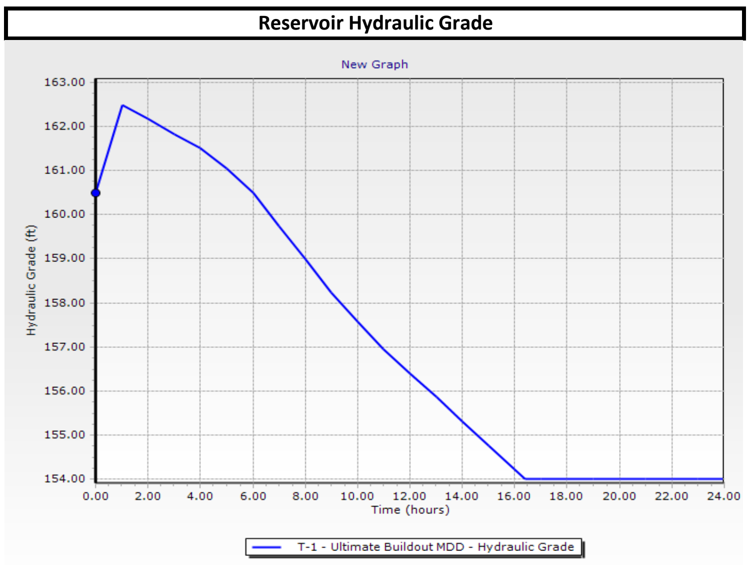
Appendix 5

San Simeon Community Services District
Master Plan Update
Future MDD Run Summary

Junction	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	77	0	158.95	35
J-2	76	0	158.95	36
J-3	75.84	0	158.95	36
J-4	18	0	158.95	61
J-5	77.67	0	158.98	35
J-6	69.29	0	158.74	39
J-7	56.68	4	158.46	44
J-8	54.17	0	158.36	45
J-9	62	7	158.11	42
J-10	61	15	157.72	42
J-11	63	0	157.6	41
J-12	61	33	157.45	42
J-13	68.59	3	157.45	38
J-14	62.5	0	157.42	41
J-17	62.8	2	157.42	41
J-18	62	16	157.41	41
J-19	70.89	3	157.40	37
J-20	59	22	158.12	43
J-21	58	0	158.05	43
J-22	47	0	157.95	48
J-23	49.44	0	157.82	47
J-24	47.69	0	157.73	48
J-25	41	0	157.63	50
J-26	33.6	35	157.41	54
J-27	34	6	157.39	53
J-28	39.5	0	157.39	51
J-29	47.04	0	157.39	48
J-30	47.29	0	157.39	48
J-31	50	0	157.39	46
J-32	56	0	157.4	44
J-33	44.5	14	157.38	49
J-34	49.5	2	157.38	47
J-35	54	0	157.38	45
J-36	52	0	157.38	46
J-37	55	7	157.38	44
J-38	50.27	0	157.38	46
J-39	37.59	0	157.38	52
J-40	37.35	0	157.38	52
J-41	39.81	1	157.39	51
J-42	43	1	157.39	49
J-43	48	1	157.39	47
J-44	48	0	157.39	47
J-45	37.93	1	157.39	52
J-46	38.48	1	157.39	51
J-47	39.61	1	157.39	51
J-48	20.28	0	157.39	59
J-49	73	1	157.4	37
J-50	65	7	157.4	40
J-55	67	0	157.4	39
J-56	53	0	157.34	45
J-57	58	18	157.32	43
J-59	49	13	157.35	47
J-60	61.58	0	157.95	42
J-65	71.1	0	157.4	37
J-66	64.12	0	157.4	40

Pipeline	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Flow (gpm)	Velocity (ft/s)
P-8	34	J-1	J-5	8	Asbestos Cement	215	1.37
P-9	829	J-5	T-1	8	Asbestos Cement	215	1.37
P-11	224	J-1	J-6	8	Asbestos Cement	215	1.37
P-13	309	J-6	J-7	8	Asbestos Cement	215	1.37
P-15	106	J-7	J-8	8	Asbestos Cement	210	1.34
P-16	210	J-8	J-9	6	Asbestos Cement	116	1.31
P-20	141	J-10	J-11	6	Asbestos Cement	94	1.07
P-22	188	J-11	J-12	6	Asbestos Cement	94	1.07
P-23	331	J-12	J-13	6	Asbestos Cement	3	0.03
P-26	95	J-12	J-14	6	Asbestos Cement	58	0.66
P-30	19	J-14	J-17	6	Asbestos Cement	29	0.33
P-31	110	J-17	J-18	6	Asbestos Cement	27	0.3
P-36	290	J-8	J-20	6	Asbestos Cement	95	1.08
P-37	146	J-20	J-21	6	Asbestos Cement	73	0.83
P-39	198	J-21	J-22	6	Asbestos Cement	73	0.83
P-40	256	J-22	J-23	6	Asbestos Cement	73	0.83
P-42	181	J-23	J-24	6	Asbestos Cement	73	0.83
P-43	201	J-24	J-25	6	Asbestos Cement	73	0.83
P-44	431	J-25	J-26	6	Asbestos Cement	73	0.83
P-46	122	J-26	J-27	6	Asbestos Cement	37	0.42
P-47	282	J-27	J-28	8	PVC	21	0.13
P-48	122	J-28	J-29	8	PVC	21	0.13
P-50	41	J-29	J-30	8	PVC	1	0.01
P-51	205	J-30	J-31	6	Asbestos Cement	1	0.01
P-52	119	J-31	J-32	6	Asbestos Cement	29	0.33
P-54	206	J-32	J-14	6	Asbestos Cement	29	0.33
P-55	397	J-29	J-33	8	PVC	20	0.13
P-57	407	J-33	J-34	8	PVC	5	0.03
P-59	172	J-34	J-35	8	PVC	3	0.02
P-60	85	J-35	J-36	6	Asbestos Cement	3	0.04
P-62	279	J-36	J-37	6	Asbestos Cement	3	0.04
P-64	213	J-37	J-38	6	Asbestos Cement	4	0.04
P-66	311	J-38	J-39	6	Asbestos Cement	4	0.05
P-67	45	J-39	J-40	6	Asbestos Cement	4	0.05
P-69	290	J-40	J-41	6	Asbestos Cement	5	0.05
P-70	32	J-41	J-42	6	Asbestos Cement	2	0.02
P-72	136	J-42	J-43	6	Asbestos Cement	1	0.01
P-76	310	J-41	J-45	6	Asbestos Cement	8	0.09
P-78	42	J-45	J-46	6	Asbestos Cement	8	0.09
P-79	91	J-46	J-47	6	Asbestos Cement	9	0.1
P-80	191	J-47	J-48	6	Asbestos Cement	11	0.12
P-82	156	J-48	J-27	8	Ductile Iron	11	0.07
P-99	218	J-50	J-55	6	Asbestos Cement	4	0.04
P-100	239	J-55	J-19	6	Asbestos Cement	4	0.04
P-103	343	J-56	J-57	6	Asbestos Cement	18	0.2
P-109	364	J-31	J-59	6	Asbestos Cement	31	0.35
P-110	418	J-59	J-56	6	Asbestos Cement	18	0.2
P-111	156	J-9	J-60	6	Asbestos Cement	109	1.23
P-112	214	J-60	J-10	6	Asbestos Cement	109	1.23
P-121	28	J-19	J-65	6	Asbestos Cement	1	0.01
P-122	269	J-65	J-49	6	Asbestos Cement	1	0.01
P-123	353	J-18	J-66	6	Asbestos Cement	11	0.13
P-124	204	J-66	J-50	6	Asbestos Cement	11	0.13

Reservoir Hydraulic Grade



Notes:

The tank is assumed to have an initial water level of 160.50, with pumps starting at midnight and filling the tank until it is full.

Zero demand junctions consist of junctions used to navigate bends in the system, junctions needed to allow for hydrant connections, junctions located away from customers, etc.

Zero flow pipelines have been eliminated from the table above, and are often pipelines connecting hydrants to the system or pipelines that aren't always used (i.e. pipelines connecting the wellheads to the system, RO system piping, etc.).

San Simeon Community Services District
Master Plan Update
Future MDD + Fire Run Summary

Node	Satisfies Fire Flow Req?	Fire Flow Requirement (gpm)	Achieveable Fire Flow w/20 psi Min Pressure	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (ft/s)
H-1	FALSE	1,500	508	20	20	12.96
H-2	FALSE	1,750	1,424	20	20	16.16
H-3	FALSE	1,750	1,239	20	25	14.06
H-4	FALSE	1,750	1,007	20	23	11.43
H-5	FALSE	1,500	864	20	20	9.8
H-6	FALSE	1,750	828	20	23	9.4
H-7	FALSE	1,500	645	20	20	7.33
H-8	FALSE	1,500	654	20	20	7.44
H-9	FALSE	1,500	715	20	24	8.33
H-10	FALSE	1,500	527	20	22	6.21
H-11	FALSE	1,500	493	20	21	5.82
H-12	FALSE	1,500	456	20	20	5.4
H-13	FALSE	1,500	1,013	20	20	11.5
H-14	FALSE	1,667	945	20	24	10.72
H-15	FALSE	1,667	845	20	33	9.59
H-16	FALSE	1,667	828	20	30	9.4
H-17	FALSE	1,750	792	20	25	8.99
H-18	FALSE	1,500	827	20	27	9.39
H-19	FALSE	1,500	828	20	22	9.4
H-20	FALSE	1,500	826	20	20	9.37
H-21	FALSE	1,500	811	20	20	9.2
H-22	FALSE	1,500	759	20	20	8.61
H-23	FALSE	1,500	829	20	25	9.41
H-24	FALSE	1,500	830	20	23	9.43
H-25	FALSE	1,500	786	20	20	8.93
H-26	FALSE	1,500	805	20	20	9.15
H-27	FALSE	1,500	830	20	27	9.42
H-28	FALSE	1,500	832	20	38	9.44
H-29	FALSE	1,500	645	20	22	7.55
H-30	FALSE	1,500	578	20	20	6.8
H-31	FALSE	1,500	935	20	50	10.61
J-1	TRUE	1,500	1,500	20	21	10.51
J-2	TRUE	1,500	1,500	20	21	10.51
J-3	TRUE	1,500	1,500	20	21	10.51
J-5	FALSE	1,500	1,500	20	21	10.51
J-6	FALSE	1,500	1,437	20	22	10.11
J-7	FALSE	1,500	1,239	20	27	8.85
J-8	FALSE	1,500	1,186	20	28	8.52
J-9	FALSE	1,500	1,007	20	24	10.18
J-10	FALSE	1,500	864	20	25	7.73
J-11	FALSE	1,500	828	20	24	7.15
J-12	FALSE	1,500	788	20	25	6.52
J-13	FALSE	1,500	676	20	21	7.69
J-14	FALSE	1,500	771	20	25	6.26
J-17	FALSE	1,500	762	20	24	8.87
J-18	FALSE	1,500	715	20	25	8.33
J-19	FALSE	1,500	493	20	21	5.82
J-20	FALSE	1,500	1,060	20	23	10.05
J-21	FALSE	1,500	1,025	20	22	9.21
J-22	FALSE	1,500	986	20	26	8.34
J-23	FALSE	1,500	945	20	25	7.46
J-24	FALSE	1,500	919	20	25	6.95
J-25	FALSE	1,500	894	20	29	6.65
J-26	FALSE	1,500	845	20	33	6.34
J-27	FALSE	1,500	833	20	33	6.26
J-28	FALSE	1,500	828	20	31	6.23
J-29	FALSE	1,500	826	20	28	6.21
J-30	FALSE	1,500	825	20	28	6.21
J-31	FALSE	1,500	804	20	28	6.08
J-32	FALSE	1,500	792	20	26	6.11
J-33	FALSE	1,500	827	20	28	6.22
J-34	FALSE	1,500	828	20	25	6.23
J-35	FALSE	1,500	828	20	22	6.23
J-36	FALSE	1,500	828	20	22	6.84
J-37	FALSE	1,500	819	20	20	6.17
J-38	FALSE	1,500	823	20	21	6.2
J-39	FALSE	1,500	829	20	26	6.24
J-40	FALSE	1,500	829	20	26	6.24
J-41	FALSE	1,500	830	20	26	6.24
J-42	FALSE	1,500	830	20	24	9.43
J-43	FALSE	1,500	809	20	20	9.2
J-44	FALSE	1,500	790	20	20	8.98
J-45	FALSE	1,500	830	20	28	6.61
J-46	FALSE	1,500	830	20	28	6.76
J-47	FALSE	1,500	831	20	28	7.12
J-48	FALSE	1,500	832	20	38	6.25
J-49	FALSE	1,500	459	20	20	5.44
J-50	FALSE	1,500	564	20	23	6.63
J-55	FALSE	1,500	527	20	23	6.21
J-56	FALSE	1,500	645	20	22	7.55
J-57	FALSE	1,500	584	20	20	6.86
J-59	FALSE	1,500	751	20	24	8.76
J-60	FALSE	1,500	935	20	24	8.9
J-65	FALSE	1,500	490	20	21	5.78
J-66	FALSE	1,500	608	20	24	7.13

Notes:
Fire flow requirements are calculated based on large properties (such as select hotels) in the community. Where one hydrant serves multiple identified large properties, the largest required fire flow is used. All properties aside from the identified hotels assume a minimum required fire flow of 1,500 gpm.
Fire flow analyses assume that the wellhead pumps are not running.
Available storage has been ignored, refer to the discussion in the report reguarding required storage increases.

Appendix 7

San Simeon Community Services District
Master Plan Update
Future MDD Run Summary - Improved System

Junction	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	77	0	199.39	53
J-2	76	0	199.39	53
J-3	75.84	0	199.39	53
J-4	18	0	199.39	78
J-5	77.67	0	199.4	53
J-6	69.29	0	199.39	56
J-7	56.68	4	199.38	62
J-8	54.17	0	199.37	63
J-9	62	7	199.37	59
J-10	61	15	199.37	60
J-11	63	0	199.36	59
J-12	61	33	199.36	60
J-13	68.59	3	199.37	57
J-14	62.5	0	199.36	59
J-17	62.8	2	199.36	59
J-18	62	16	199.36	59
J-19	70.89	3	199.35	56
J-20	59	22	199.36	61
J-21	58	0	199.36	61
J-22	47	0	199.36	66
J-23	49.44	0	199.36	65
J-24	47.69	0	199.36	66
J-25	41	0	199.36	69
J-26	33.6	35	199.35	72
J-27	34	6	199.35	72
J-28	39.5	0	199.35	69
J-29	47.04	0	199.35	66
J-30	47.29	0	199.35	66
J-31	50	0	199.36	65
J-32	56	0	199.36	62
J-33	44.5	14	199.35	67
J-34	49.5	2	199.35	65
J-35	54	0	199.35	63
J-36	52	0	199.35	64
J-37	55	7	199.35	62
J-38	50.27	0	199.35	65
J-39	37.59	0	199.35	70
J-40	37.35	0	199.35	70
J-41	39.81	1	199.35	69
J-42	43	1	199.35	68
J-43	48	1	199.35	65
J-44	48	0	199.35	65
J-45	37.93	1	199.35	70
J-46	38.48	1	199.35	70
J-47	39.61	1	199.35	69
J-48	20.28	0	199.35	77
J-49	73	1	199.35	55
J-50	65	7	199.36	58
J-53	73	0	199.37	55
J-54	81	0	199.39	51
J-55	67	0	199.35	57
J-56	53	0	199.35	63
J-57	58	18	199.35	61
J-58	65.33	0	199.35	58
J-59	49	13	199.36	65
J-60	61.58	0	199.37	60
J-61	60	0	199.36	60
J-62	57	0	199.36	62
J-63	54	0	199.36	63
J-65	71.1	0	199.35	55
J-66	64.12	0	199.36	59

Pipeline	Length (ft)	Start Node	Stop Node	Diameter (in)	Material	Flow (gpm)	Velocity (ft/s)
P-8	34	J-1	J-5	14	PVC	210	0.44
P-11	224	J-1	J-6	14	PVC	159	0.33
P-13	309	J-6	J-7	14	PVC	159	0.33
P-15	106	J-7	J-8	14	PVC	155	0.32
P-16	210	J-8	J-9	12	PVC	80	0.23
P-20	141	J-10	J-11	12	PVC	58	0.17
P-22	188	J-11	J-12	12	PVC	58	0.17
P-23	331	J-12	J-13	10	PVC	53	0.22
P-26	95	J-12	J-14	12	PVC	78	0.22
P-30	19	J-14	J-17	10	PVC	44	0.18
P-31	110	J-17	J-18	10	PVC	42	0.17
P-36	290	J-8	J-20	10	PVC	75	0.31
P-37	146	J-20	J-21	10	PVC	24	0.1
P-39	198	J-21	J-22	10	Ductile Iron	23	0.1
P-40	256	J-22	J-23	10	PVC	23	0.1
P-42	181	J-23	J-24	8	PVC	23	0.15
P-43	201	J-24	J-25	8	PVC	23	0.15
P-44	431	J-25	J-26	8	PVC	23	0.15
P-46	122	J-26	J-27	8	PVC	12	0.08
P-47	282	J-27	J-28	8	PVC	19	0.12
P-48	122	J-28	J-29	8	PVC	19	0.12
P-50	41	J-29	J-30	8	PVC	35	0.22
P-51	205	J-30	J-31	10	Ductile Iron	35	0.14
P-52	119	J-31	J-32	10	PVC	34	0.14
P-54	206	J-32	J-14	10	PVC	34	0.14
P-55	397	J-29	J-33	8	PVC	16	0.1
P-57	407	J-33	J-34	8	PVC	2	0.01
P-64	213	J-37	J-38	8	PVC	6	0.04
P-66	311	J-38	J-39	8	PVC	5	0.03
P-67	45	J-39	J-40	8	PVC	5	0.03
P-69	290	J-40	J-41	8	PVC	5	0.03
P-70	32	J-41	J-42	8	PVC	2	0.01
P-72	136	J-42	J-43	8	PVC	1	0.01
P-76	310	J-41	J-45	6	PVC	2	0.02
P-78	42	J-45	J-46	6	PVC	1	0.02
P-80	191	J-47	J-48	6	PVC	1	0.01
P-82	156	J-48	J-27	8	Ductile Iron	1	0.01
P-94	145	J-13	J-53	10	PVC	55	0.23
P-96	818	J-53	J-54	10	PVC	55	0.23
P-97	212	J-54	J-1	10	PVC	50	0.21
P-98	32	H-1	J-54	6	PVC	5	0.06
P-99	218	J-50	J-55	10	PVC	19	0.08
P-100	239	J-55	J-19	10	PVC	19	0.08
P-103	343	J-56	J-57	10	PVC	16	0.06
P-106	429	J-37	J-58	8	Ductile Iron	13	0.08
P-107	337	J-58	J-65	10	PVC	15	0.06
P-108	41	J-57	J-58	10	PVC	2	0.01
P-109	364	J-31	J-59	10	PVC	28	0.12
P-110	418	J-59	J-56	10	PVC	16	0.06
P-111	156	J-9	J-60	12	PVC	73	0.21
P-112	214	J-60	J-10	12	PVC	73	0.21
P-114	192	J-20	J-61	10	PVC	29	0.12
P-115	230	J-61	J-62	10	PVC	29	0.12
P-116	219	J-62	J-63	10	PVC	29	0.12
P-117	239	J-63	J-31	10	PVC	29	0.12
P-121	28	J-19	J-65	10	PVC	16	0.07
P-123	353	J-18	J-66	10	PVC	26	0.11
P-124	204	J-66	J-50	10	PVC	26	0.11
P-127	1,385	T-2	J-5	14	PVC	215	0.45

Notes:
Zero demand junctions consist of junctions used to navigate bends in the system, junctions needed to allow for hydrant connections, junctions located away from customers, etc.
Zero flow pipelines have been eliminated from the table above, and are often pipelines connecting hydrants to the system or pipelines that aren't always used (i.e. pipelines connecting the wellheads to the system, RO system piping, etc.).

Appendix 8

San Simeon Community Services District
Master Plan Update
Improved System Future MDD + Fire Run Summary

Node	Satisfies Fire Flow Req?	Fire Flow Requirement (gpm)	Achieveable Fire Flow w/20 psi Min Pressure	Pressure (Residual Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Velocity of Maximum Pipe (ft/s)
H-1	TRUE	1,500	2,007	20	47	20
H-2	TRUE	1,750	1,763	20	52	20
H-3	TRUE	1,750	1,763	20	57	20
H-4	TRUE	1,750	1,763	20	53	20
H-5	TRUE	1,500	1,763	20	44	20
H-6	TRUE	1,750	1,763	20	55	20
H-7	TRUE	1,500	1,763	20	44	20
H-8	TRUE	1,500	1,763	20	47	20
H-9	TRUE	1,500	1,763	20	54	20
H-10	TRUE	1,500	1,763	20	49	20
H-11	TRUE	1,500	1,763	20	49	20
H-12	TRUE	1,500	1,762	20	27	20
H-13	TRUE	1,500	1,763	20	51	20
H-14	TRUE	1,667	1,763	20	58	20
H-15	TRUE	1,667	1,763	20	65	20
H-16	TRUE	1,667	1,763	20	61	20
H-17	TRUE	1,750	1,763	20	58	20
H-18	TRUE	1,500	1,763	20	58	20
H-19	TRUE	1,500	1,763	20	51	20
H-20	TRUE	1,500	1,763	20	44	20
H-21	TRUE	1,500	1,763	20	55	20
H-22	TRUE	1,500	1,763	20	40	20
H-23	TRUE	1,500	1,763	20	58	20
H-24	TRUE	1,500	1763	20	55	20
H-25	TRUE	1,500	1,763	20	49	20
H-26	TRUE	1,500	1,763	20	50	20
H-27	TRUE	1,500	1,763	20	56	20
H-28	TRUE	1,500	1,763	20	69	20
H-29	TRUE	1,500	1,763	20	56	20
H-30	TRUE	1,500	1,763	20	55	20
H-31	TRUE	1,500	1,763	20	80	20
H-32	TRUE	1,500	1,763	20	56	20
H-33	TRUE	1,500	1,763	20	57	20
H-34	TRUE	1,750	1,763	20	58	20
H-35	TRUE	1,500	1,763	20	78	20
H-36	TRUE	1,500	1,763	20	79	20
J-1	TRUE	1,500	3,500	20	48	6.38
J-2	TRUE	1,500	3,500	20	48	11.88
J-3	TRUE	1,500	3,500	20	48	11.87
J-4	TRUE	1,500	3,500	20	70	11.76
J-5	TRUE	1,500	3,500	20	48	6.38
J-6	TRUE	1,500	3,500	20	51	6.65
J-7	TRUE	1,500	3,500	20	56	6.38
J-8	TRUE	1,500	3,500	20	56	6.38
J-9	TRUE	1,500	3,500	20	52	6.96
J-10	TRUE	1,500	3,500	20	52	6.38
J-11	TRUE	1,500	3,500	20	51	6.38
J-12	TRUE	1,500	3,500	20	52	6.38
J-13	TRUE	1,500	3,500	20	47	8.25
J-14	TRUE	1,500	3,500	20	51	7.14
J-17	TRUE	1,500	3,500	20	51	12.89
J-18	TRUE	1,500	3,500	20	49	11.6
J-19	TRUE	1,500	3,500	20	42	7.47
J-20	TRUE	1,500	3,500	20	52	9.08
J-21	TRUE	1,500	3,500	20	50	11.89
J-22	TRUE	1,500	3,500	20	52	10.9
J-23	TRUE	1,500	3,500	20	49	10.17
J-24	TRUE	1,500	3,500	20	47	14.03
J-25	TRUE	1,500	3,500	20	48	12.3
J-26	TRUE	1,500	3,500	20	52	13.74
J-27	TRUE	1,500	3,500	20	54	11.37
J-28	TRUE	1,500	3,500	20	54	14.92
J-29	TRUE	1,500	3,500	20	53	14.72
J-30	TRUE	1,500	3,500	20	54	10.08
J-31	TRUE	1,500	3,500	20	55	6.49
J-32	TRUE	1,500	3,500	20	53	7.76
J-33	TRUE	1,500	3,500	20	42	15.88
J-34	TRUE	1,500	3,500	20	34	15.53
J-35	TRUE	1,500	3,500	20	30	16.93
J-36	TRUE	1,500	3,474	20	30	20
J-37	TRUE	1,500	3,500	20	41	12.08
J-38	TRUE	1,500	3,500	20	37	16.52
J-39	TRUE	1,500	3,500	20	36	15.14
J-40	TRUE	1,500	3,500	20	35	14.97
J-41	TRUE	1,500	3,500	20	30	15
J-42	TRUE	1,500	3,132	20	34	20
J-43	TRUE	1,500	3,132	20	25	20
J-44	TRUE	1,500	3,132	20	22	20
J-45	TRUE	1,500	3,219	20	32	20
J-46	TRUE	1,500	3,088	20	36	20
J-47	TRUE	1,500	2,826	20	43	20
J-48	TRUE	1,500	3,500	20	53	17.27
J-49	TRUE	1,500	1,762	20	29	20
J-50	TRUE	1,500	3,500	20	45	8.58
J-53	TRUE	1,500	3,500	20	45	7.6
J-54	TRUE	1,500	3,500	20	44	10.1
J-55	TRUE	1,500	3,500	20	43	7.76
J-56	TRUE	1,500	3,500	20	50	7.54
J-57	TRUE	1,500	3,500	20	48	8.25
J-58	TRUE	1,500	3,500	20	45	6.54
J-59	TRUE	1,500	3,500	20	53	9.43
J-60	TRUE	1,500	3,500	20	52	6.38
J-61	TRUE	1,500	3,500	20	50	9.01
J-62	TRUE	1,500	3,500	20	51	7.56
J-63	TRUE	1,500	3,500	20	52	8.4
J-65	TRUE	1,500	3,500	20	41	7.57
J-66	TRUE	1,500	3,500	20	46	9.44

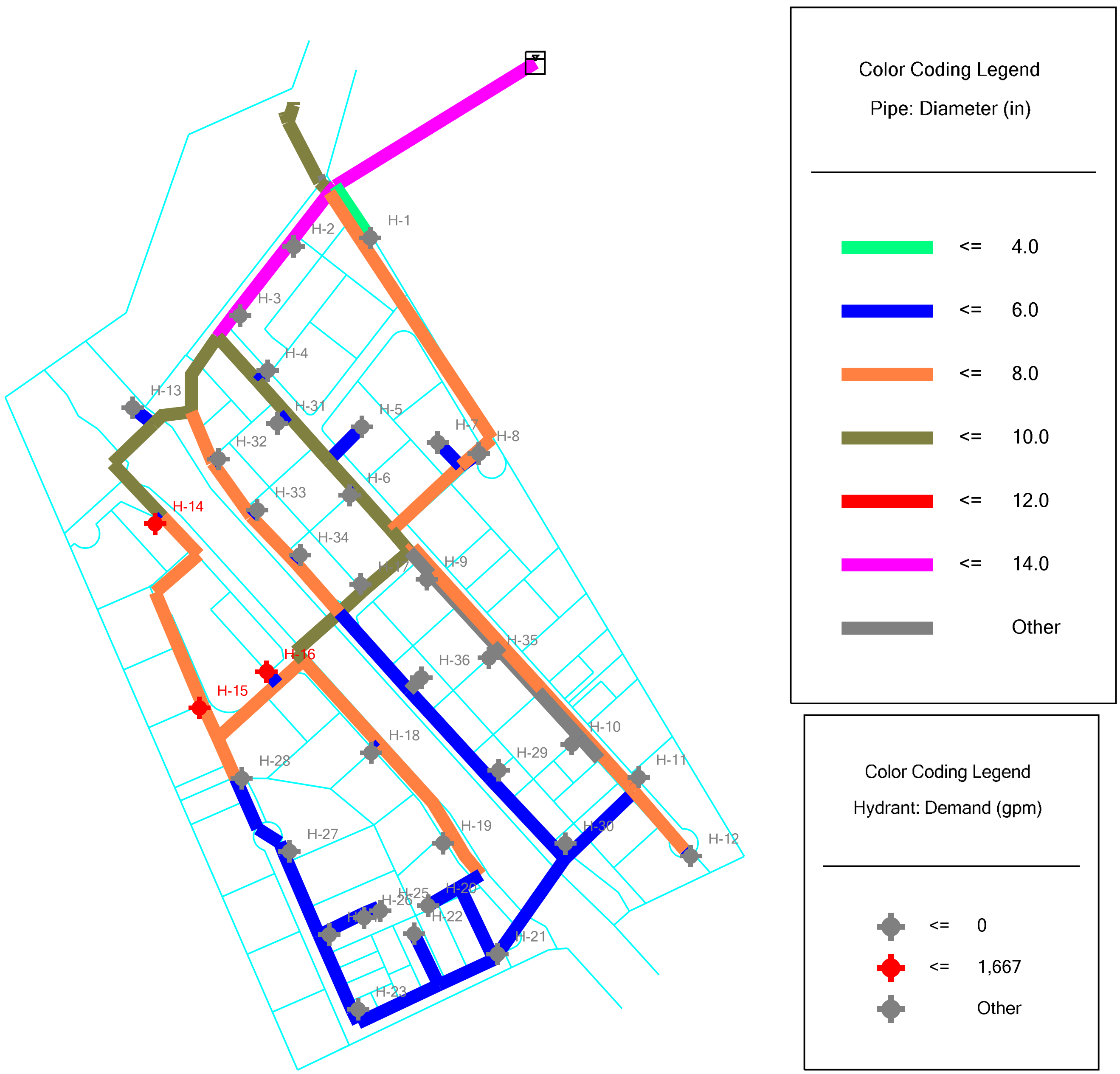
Notes:

Fire flow requirements are calculated based on large properties in the community. Where one hydrant serves multiple large properties, the largest required fire flow is used. All other properties assume a minimum required fire flow of 1,500 gpm.

Fire flow analyses assume that the wellhead pumps are not running but that the tank has adequate current storage to supply flow for the duration of the fire event.

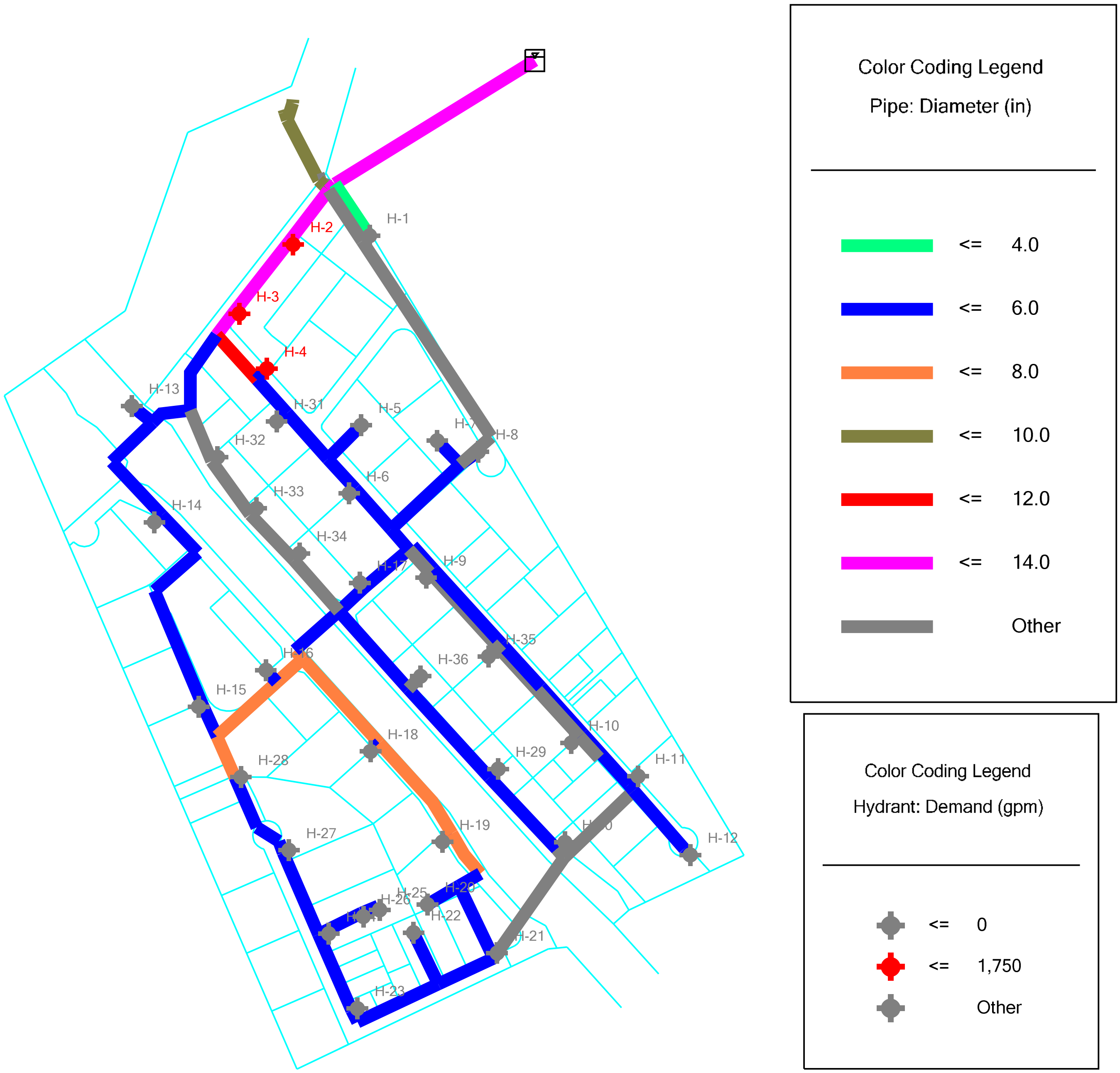
Appendix 9

Scenario: Cavalier Trial



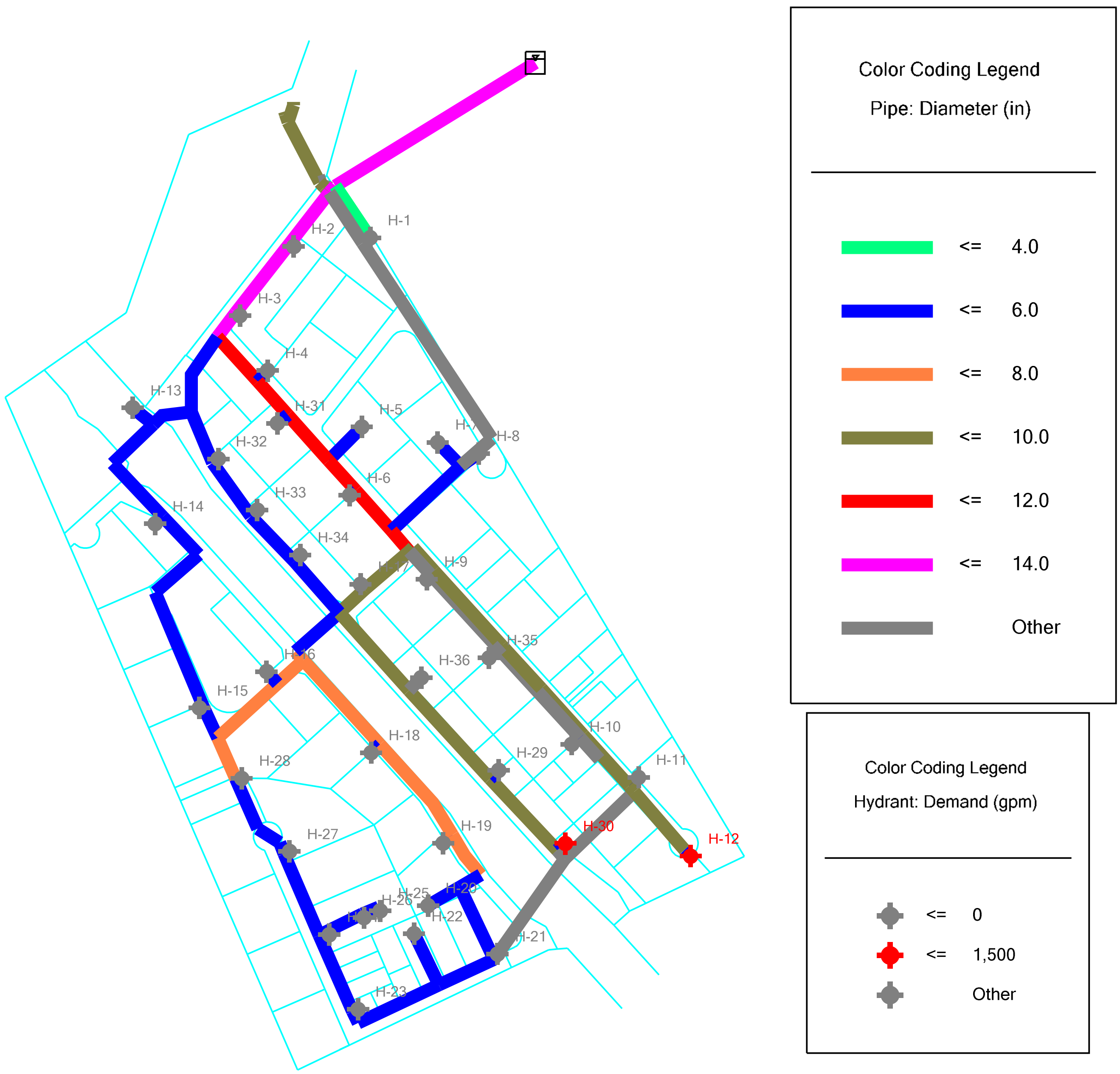
Appendix 10

Scenario: Gaviotas Trial



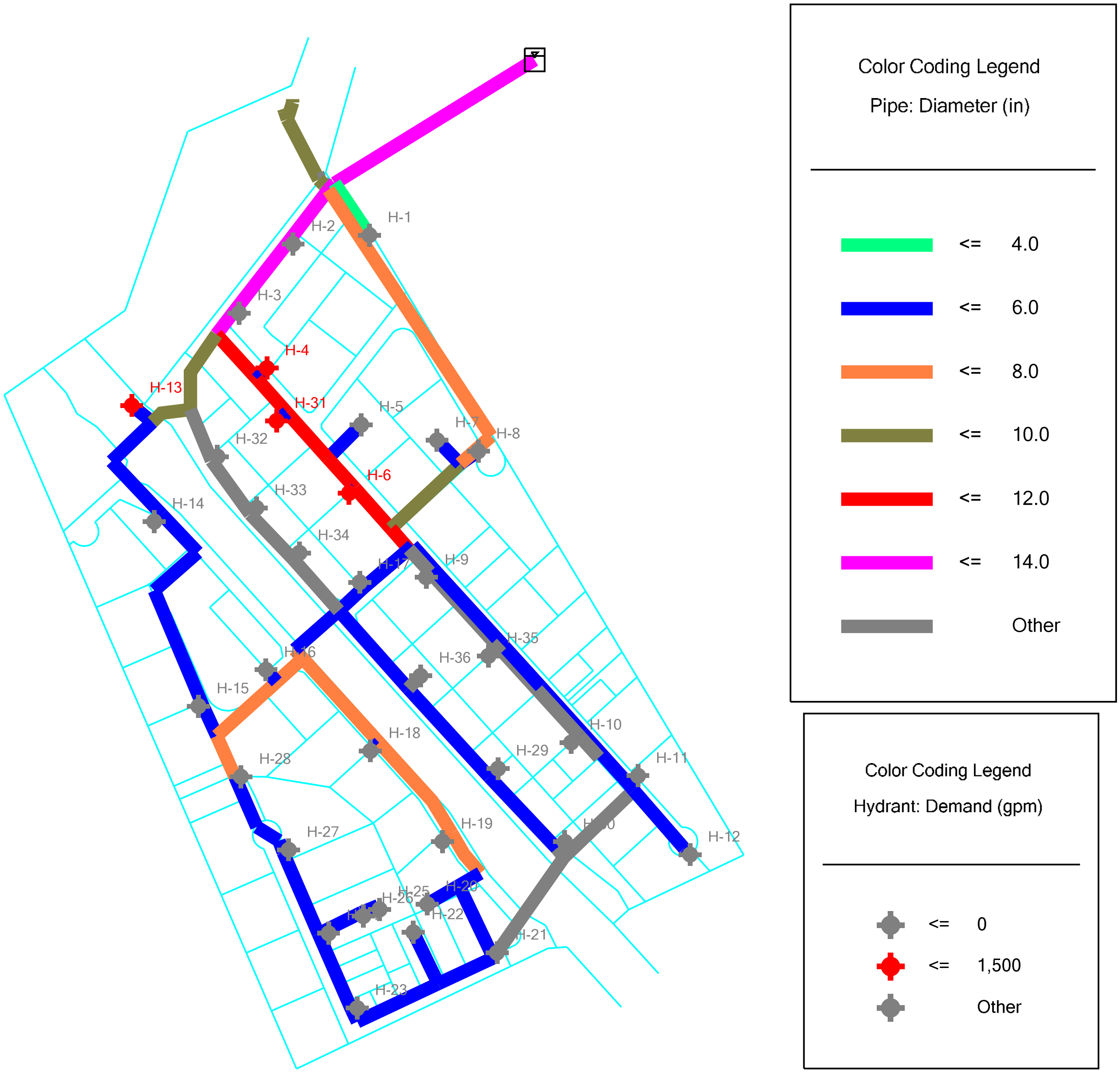
Appendix 11

Scenario: Motel 6 Trial



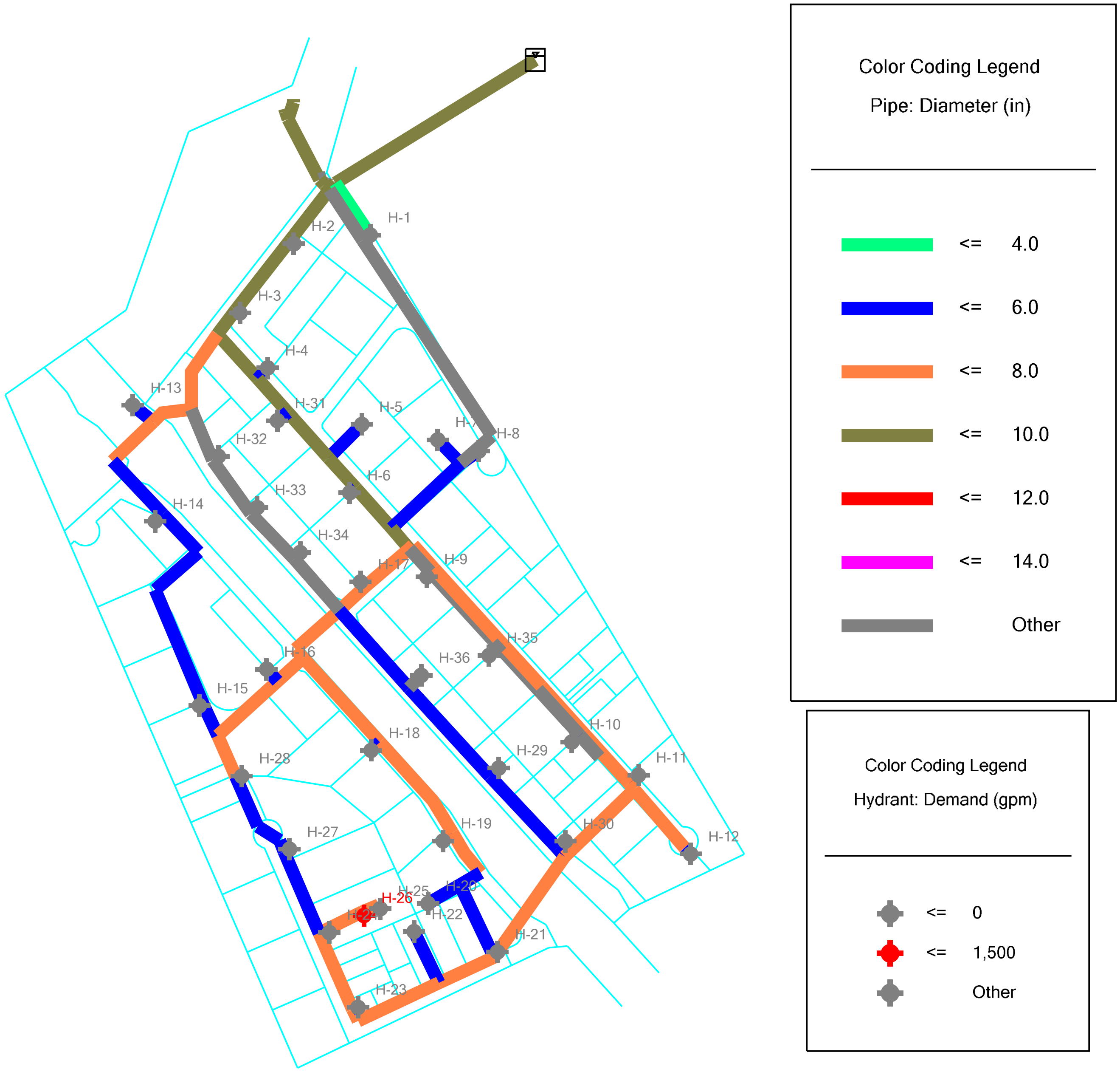
Appendix 12

Scenario: San Simeon Lodge Trial



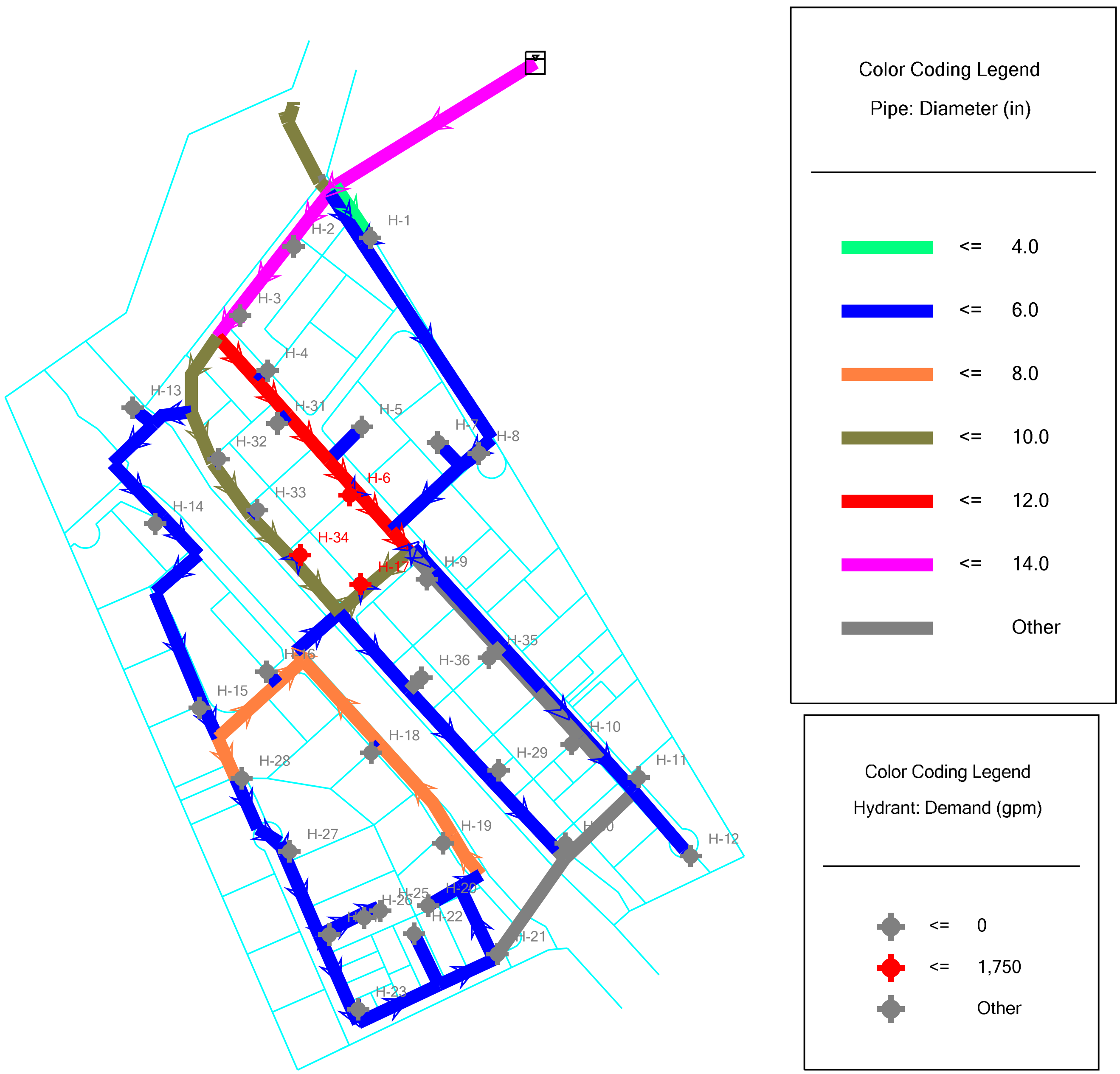
Appendix 13

Scenario: Sea Gate Court (H-26) Trial



Appendix 14

Scenario: Silver Surf Trial



Circular Channel Hydraulics

The flow rates of liquids through circular channels due to gravity are generally determined utilizing Manning's equation. This is the formula used to determine the amount of flow that can be transported through pipes. As a part of this analysis, flow rates will be determined assuming 50%, 67%, 75%, 85%, and 95% full pipes at a variety of slopes. All pipes within San Simeon's sewer system (with the exception of a single 8 inch diameter pipe) are 6 inches in diameter and constructed of vitrified clay, with a few sections of PVC.

Manning's Equation

$$Q = \frac{c_1}{n} A R^{\frac{2}{3}} \sqrt{S}$$

$where:$

$$Q = flow \left(\frac{ft^3}{s}\right)$$

$$c_1 = 1.49\ for\ english\ units$$

$$n = 0.013\ for\ sewer\ pipe\ (conservative\ for\ PVC)$$

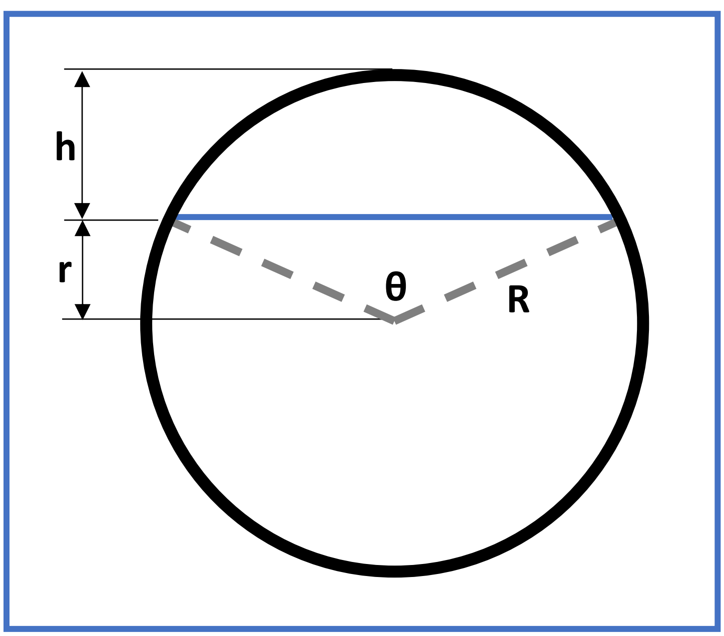
$$A = cross\ sectional\ area\ of\ flow\ (ft^2)$$

$$R = \frac{A}{P} = hydraulic\ radius\ (ft)$$

$$P = wetted\ perimeter\ (ft)$$

$$S = slope \left(\frac{ft}{ft}\right)$$

$AR^{2/3}$ Determination



$$Where:$$
$$R = 0.25\ ft$$
$$h = (1 - \%)(0.5) ft$$
$$r = R - h\ ft$$
$$\theta = 2\cos^{-1}\left(\frac{r}{R}\right)\ radians$$
$$P = 2\pi R - R\theta\ ft$$
$$A = \pi R^2 - \frac{\theta - \sin\theta}{2}R^2$$

Depth of Flow = 50%

$$As\ this\ is\ a\ half\ circle:$$
$$P = \frac{1}{2}2\pi R = \frac{1}{2}2\pi(0.25) = 0.7854\ ft$$
$$A = \frac{1}{2}\pi(0.25)^2 = 0.0982\ ft^2$$
$$R = \frac{A}{P} = 0.1250\ ft$$
$$AR^{\frac{2}{3}} = (0.0982)(0.1250)^{\frac{2}{3}} = \mathbf{0.02455}$$

Depth of Flow = 67%

$$h = (1 - 0.67)(0.5) = 0.165\ ft$$
$$r = 0.25 - 0.165 = 0.085\ ft$$
$$\theta = 2\cos^{-1}\left(\frac{0.085}{0.25}\right) = 2.448\ radians$$
$$P = 2\pi(0.25) - (0.25)(2.448) = 0.9588\ ft$$
$$A = \pi(0.25)^2 - \frac{2.488 - \sin 2.488}{2}(0.25)^2 = 0.1376\ ft^2$$
$$R = \frac{A}{P} = 0.1435\ ft$$
$$AR^{\frac{2}{3}} = (0.1376)(0.1435)^{\frac{2}{3}} = \mathbf{0.03772}$$

Depth of Flow = 75%

$$h = (1 - 0.75)(0.5) = 0.125\ ft$$
$$r = 0.25 - 0.125 = 0.125\ ft$$
$$\theta = 2\cos^{-1}\left(\frac{0.125}{0.25}\right) = 2.094\ radians$$
$$P = 2\pi(0.25) - (0.25)(2.094) = 1.0473\ ft$$
$$A = \pi(0.25)^2 - \frac{2.094 - \sin 2.094}{2}(0.25)^2 = 0.1580\ ft^2$$
$$R = \frac{A}{P} = 0.1509\ ft$$
$$AR^{\frac{2}{3}} = (0.1580)(0.1509)^{\frac{2}{3}} = \mathbf{0.04478}$$

Depth of Flow = 85%

$$h = (1 - 0.85)(0.5) = 0.075\ ft$$
$$r = 0.25 - 0.075 = 0.175\ ft$$
$$\theta = 2\cos^{-1}\left(\frac{0.175}{0.25}\right) = 1.591\ radians$$
$$P = 2\pi(0.25) - (0.25)(1.591) = 1.1731\ ft$$
$$A = \pi(0.25)^2 - \frac{1.591 - \sin 1.591}{2}(0.25)^2 = 0.1779 ft^2$$
$$R = \frac{A}{P} = 0.1516\ ft$$
$$AR^{\frac{2}{3}} = (0.1779)(0.1516)^{\frac{2}{3}} = \mathbf{0.05058}$$

Depth of Flow = 95%

$$h = (1 - 0.95)(0.5) = 0.025\ ft$$
$$r = 0.25 - 0.025 = 0.225\ ft$$
$$\theta = 2\cos^{-1}\left(\frac{0.225}{0.25}\right) = 0.902\ radians$$
$$P = 2\pi(0.25) - (0.25)(0.902) = 1.3453\ ft$$
$$A = \pi(0.25)^2 - \frac{0.902 - \sin 0.902}{2}(0.25)^2 = 0.1927\ ft^2$$
$$R = \frac{A}{P} = 0.1432\ ft$$
$$AR^{\frac{2}{3}} = (0.1927)(0.1432)^{\frac{2}{3}} = \mathbf{0.05274}$$

Flow Rates at Various Slopes

The following tables use the $AR^{2/3}$ values calculated above to show flow rates (in both cfs and gpm) at various slopes.

Cubic Feet Per Second

	Percent of Available Flow Depth				
Slope	**50%**	**67%**	**75%**	**85%**	**95%**
0.005	0.199	0.306	0.363	0.410	0.427
0.01	0.281	0.432	0.513	0.580	0.604
0.015	0.345	0.529	0.629	0.710	0.740
0.02	0.398	0.611	0.726	0.820	0.855
0.025	0.445	0.684	0.812	0.917	0.956
0.03	0.487	0.749	0.889	1.004	1.047
0.035	0.526	0.809	0.960	1.085	1.131
0.04	0.563	0.865	1.026	1.159	1.209
0.045	0.597	0.917	1.089	1.230	1.282
0.05	0.629	0.967	1.148	1.296	1.352

	Percent of Available Flow Depth				
Slope	**50%**	**67%**	**75%**	**85%**	**95%**
0.055	0.660	1.014	1.204	1.360	1.418
0.06	0.689	1.059	1.257	1.420	1.481
0.065	0.717	1.102	1.309	1.478	1.541
0.07	0.744	1.144	1.358	1.534	1.599
0.075	0.771	1.184	1.406	1.588	1.655
0.08	0.796	1.223	1.452	1.640	1.710
0.085	0.820	1.260	1.496	1.690	1.762
0.09	0.844	1.297	1.540	1.739	1.813
0.095	0.867	1.333	1.582	1.787	1.863
0.1	0.890	1.367	1.623	1.833	1.912

Gallons Per Minute

	Percent of Available Flow Depth				
Slope	**50%**	**67%**	**75%**	**85%**	**95%**
0.005	89	137	163	184	192
0.01	126	194	230	260	271
0.015	155	238	282	319	332
0.02	179	274	326	368	384
0.025	200	307	364	411	429
0.03	219	336	399	451	470
0.035	236	363	431	487	508
0.04	253	388	461	520	543
0.045	268	412	489	552	575
0.05	282	434	515	582	607
0.055	296	455	540	610	636
0.06	309	475	564	637	665
0.065	322	495	587	663	692
0.07	334	513	609	688	718
0.075	346	531	631	713	743
0.08	357	549	652	736	767
0.085	368	566	672	759	791
0.09	379	582	691	781	814
0.095	389	598	710	802	836
0.1	399	614	728	823	858