Chapter 8: Evaluation of the 2025 Water System

Chapter Contents:

Chapter Highlights:

This chapter presents an evaluation of the District's 2025 retail water system and its ability to meet the District's recommended performance and planning criteria under 2025 demand conditions.

The evaluation includes an analysis of water storage capacity, pumping capacity and the existing distribution system's ability to meet recommended operational and design criteria under peak hour and maximum day plus fire flow demands in 2025.

The 2025 evaluation was conducted using the updated hydraulic model and assuming that all of the existing system improvements recommended in Chapter 7 had been completed.

The recommended improvements are summarized below.

Pipelines

- Pipeline improvements to meet buildout peak hour and maximum day demand plus fire flow demand conditions (pipeline locations, lengths and sizes are listed in Table 8-19).

Pump Stations

- New Lower Granite Bay Pump Station: 6,993 gpm (10.1 mgd).
- Expand Upper Granite Bay Pump Station: 1,553 gpm (2.24 mgd).

Pressure Zone Boundary

- To meet pressure requirement during peak hour condition at Peerless Avenue in the Gravity Pressure Zone it is recommended to move the pressure zone boundary to the south end of Peerless Avenue.

Storage

- New, 3.0 MG Kokila Reservoir (replacement) .

Miscellaneous

- New pressure reducing station at the intersection of Auburn-Folsom Road and Eureka Road.
- Construction of a standby generator (200 KW) for ARC-South Pump Station.
- Move Gravity Pressure Zone break to the south end of Peerless Avenue .

CHAPTER 8. EVALUATION OF THE 2025 WATER SYSTEM

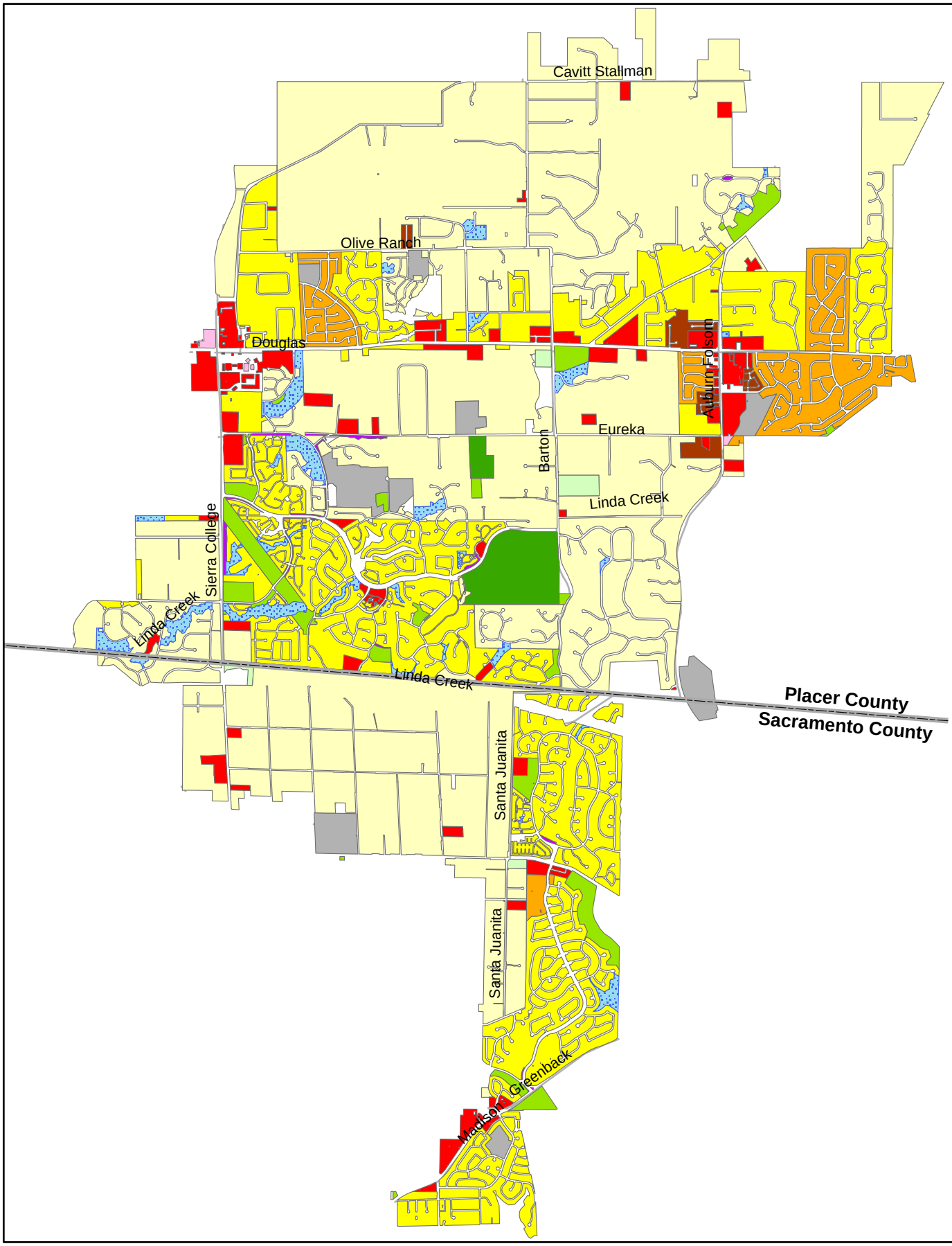
This chapter summarizes an evaluation of the District's retail water system and identifies the improvements to the water system infrastructure that will be required to support the increased water demands generated by 2025 buildout of the retail system. The evaluation includes an analysis of water storage capacity, pumping capacity and the buildout distribution system's ability to meet recommended operational and design criteria under peak hour and maximum day plus fire flow demands.

The 2025 system analysis was conducted using a model developed after the existing system deficiencies were identified and improvements needed to eliminate these deficiencies were incorporated into the model. After the improvements to serve the growth area were integrated into the existing system model, deficiencies were identified that would result from increased demands related to future development within the District's retail service area.

The evaluations, findings and recommendations for addressing the identified buildout water system deficiencies are organized by pressure zone. A description of the recommended Capital Improvement Program (CIP), including an estimate of probable construction costs, is provided in Chapter 9.

2025 RETAIL WATER DEMANDS

The retail water demands at 2025 were estimated based on the projected 2025 buildout land use information (see Figure 8-1) provided by the District and estimated water demand factors described in Chapter 5. These projected demands were entered into the model using H_2OMAP Demand Allocation/Pro^{TM}. Table 8-1 summarizes the 2025 demands for each of the District's pressure zones.



LEGEND

- County Line
- Rural Estate
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Business Park
- Commercial
- Institutional
- Parks & Recreation
- Golf Course
- Agricultural
- Median
- Wetlands
- Major Streets

N

0 0.2 0.4 0.8
Miles

FIGURE 8-1

San Juan Water District
Water Master Plan

PROJECTED LAND USE IN YEAR 2025

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Table 8-1. 2025 Water Demand in Retail Service Area

Pressure Zone	Demand [mgd][a]		
	Average Day	Maximum Day[b]	Peak Hour[c]
Bacon	7.02	14.03	21.75
Upper Granite Bay (UGB)	0.54	1.36	2.07
Lower Granite Bay (LGB)	2.44	4.39	6.59
Subtotal	**10.00**	**19.78**	**30.41**
American River Canyon North (ARC-North)	1.36	2.03	4.20
American River Canyon South (ARC-South)	1.36	1.64	3.14
Crown Point[d]	1.15	1.84	2.76
Gravity	3.04	7.53	12.04
Sierra	3.16	6.01	12.66
Subtotal	**10.07**	**19.05**	**34.80**
Total	**20.07**	**38.83**	**65.21**

(a) Average day estimates based on average day demand presented in Table 7-1 plus the incremental increase in demands from Table 5-12.
(b) Maximum day demand based on average day to maximum day peaking factors presented in Table 5-5.
(c) Peak hour demand based on the average day to peak hour peaking factors presented in Table 5-5.
(d) Includes actual demands for Beals Point and at the Sidney N. Peterson Water Treatment Plant. Demand was added to the maximum day and peak hour demands.

2025 SYSTEM EVALUATION METHODOLOGY

Water Storage Capacity Evaluation

Storage facilities were evaluated to determine whether there is sufficient capacity to provide the total required operational, fire flow and emergency storage using the District's current design criteria. The volumes required for each of these three storage components are detailed below:

- Operational Storage: 25 percent of the maximum day demand,
- Emergency Storage: Equal to the average day demand, and
- Fire Flow Storage: The required fire flow times the fire flow duration period, as required by the California Fire Code.

This results in an overall retail storage requirement of 34.2 MG (9.7 MG – operational, 20.1 MG emergency, and 4.4 MG for fire flow).

As previously described in Chapter 7, the 62 MG nominal storage volume of the Hinkle Reservoir is shared between the District's retail and wholesale customers. Only 11.42 MG (27 percent of usable storage of 42.3 MG) of the total Hinkle Reservoir capacity is assumed to be available for

the District's retail system, and the total storage capacity for the District's retail system after addressing existing system deficiencies is 20.3 MG, as shown on Table 8-2.

Table 8-2. Treated Water Storage Facilities in 2025[a]

Storage Facility	Pressure Zone Served	Total Capacity, MG	Capacity Available for Retail System, MG
Hinkle Reservoir	Gravity	62	11.42[b]
Kokila Reservoir	Bacon	4.56	4.56
Los Lagos Tank	Lower Granite Bay	1.65	1.65
JWSF	Sierra	2.6	2.6
Mooney Ridge Tank	Upper Granite Bay	0.05	0.05
Total Capacity		**70.9**	**20.3**

(a) Facilities identified include those recommended in Chapter 7 to address existing deficiencies within each pressure zone.

(b) The capacity of Hinkle Reservoir available for the retail system is based on the average annual flow supplied to the retail system (12.7 mgd average from 1990 to 2003) divided by the total flow to the retail and wholesale system (47.0 mgd average from 1990 to 2003), or approximately 27 percent. See Table 5-1 for historic retail and wholesale water production. In addition, the actual usable storage is approximately equal to 42.3 MG.

In addition to the storage capacity available at the Hinkle Reservoir, with the emergency storage criteria described in Chapter 3, it is assumed that the District's WTP could provide 100 percent of the retail system maximum day demands for 12 hours (approximately an average day demand, or 20.1 MG), and 50 percent of the average day demand for an extended period. This results in an overall retail distribution system storage requirement of 14.1 MG (total storage requirement – reliable supply from the WTP [34.2 MG - 20.1 MG = 14.1 MG]). As presented in Table 8-2, this is below the capacity available to the retail system (20.3 MG).

Pumping Capacity Evaluation

The District's pumping capacity has been evaluated to assess its ability to deliver a firm, reliable capacity to the retail service area. The firm capacity is defined as the total pump station installed capacity with the largest pump out of service. To ensure pumping capacity reliability, each pump station should have at least two pumps, a lead pump and a standby pump to use in the event of a mechanical failure. Another consideration in pumping capacity reliability is the presence of backup power at each pumping facility in the event of a power outage.

For the evaluation of future pumping capacity requirements, it has been assumed that the recommendations for pump station upgrades to meet existing system needs (discussed in Chapter 7) have been made. Therefore, the pumping capacity requirements described in this chapter are the recommended ultimate sizes required to serve future needs and are in addition to the requirements discussed in Chapter 7. Table 8-3 provides a summary of the incremental capacity requirements for each of the pump stations based on the evaluation criteria. Discussion

Table 8-3. Summary of Pumping Facilities Capacity Requirements at 2025 Condition

Pump Station	Service Area	Firm Capacity with Existing System Improvements [gpm, TDH][k]	Average Day Demand [gpm] [a]	Maximum Day Demand [gpm][b] [c]	Max Day Plus Fire Flow Demand [gpm]	Peak Hour Demand [gpm][b] [d]	Storage Supply	Existing Backup Power	Required Additional Pumping Capacity Based on Max Day plus Fire Flow [gpm]	Required Additional Pumping Capacity Based on Peak Hour [gpm]	Required Additional Pumping Capacity [gpm]
ARC North [h]	ARC North	3,600 , 175	942	1,413	2,913	2,920	NA	YES	-	-	-
ARC South [i]	ARC South	3,567 , 115	947	1,136	3,636	2,177	NA	YES [e]	69	-	69
Bacon [i]	Bacon	15,000 , 170	6,944	13,738	17,738	21,113	Kokila Reservoir	YES	2,738	6,113	94 [q]
Hinkle-Crown Point [j]	Crown Point	2,880 , 250	798 [f]	1,276	2,776	1,915	NA	YES	-	-	-
Douglas	Lower GB	600 , 160	-	-		-	NA	NO	-	-	- [g]
Lower Granite Bay [i]	Lower GB	3,690 , 160 [l]	1,694	3,049	6,049	4,573	Los Lagos Reservoir	YES	2,359	883	2,359 [m]
Upper Granite Bay [i]	Upper GB	1,892 , 190	378	945	3,445	1,437	NA	YES	1,553	-	1,553 [n]
Sierra	Sierra	7,372 , 80	2,198	4,176	8,176	8,792	JWSF	YES	804	1,420	1,420

[a] Based on projected average day demands, see Table 8-1.

[b] Based on the maximum day demand (or peak hour demand) required in the pressure zone and any pressure zone located above that pressure zone.

[c] Maximum day demand based on average day to maximum day peaking factor as presented in Table 5-5.

[d] Peak hour demand based on average day to peak hour peaking factor as presented in Table 5-5.

[e] Portable generator on-site, however will be replaced in the future.

[f] Includes demands for Beals Point and the Treatment Plant

[g] Douglas Pump Station provides supplemental supply to Lower Granite Bay Pressure Zone.

[h] Pump Station should be sized to meet peak hour demand due to no in-zone storage.

[i] Pump Station should be sized to meet fire flow demand due to no in-zone storage.

[j] Based on a new design pumping capacity received from the District on March 3, 2005.

[k] Includes current pumping capacity plus additional capacity recommended to serve existing system needs (see Chapter 7).

[l] Includes firm capacity of Douglas Pump Station as these two pump stations work together to serve the Lower Granite Bay Pressure Zone.

[m] See Table 8-8

[n] See Table 8-10

[o] See Table 8-6

NA - Not Applicable

of each pump station is provided below based on the pressure zone which the pump station serves.

Water Distribution System Evaluation

The 2025 water distribution system was evaluated under the following demand scenarios:

- Peak Hour Demand. The 2025 peak hour flow condition was simulated to evaluate the distribution facilities capability to meet this peak hour demand condition. Peak hour demands are met by the combined flows from the pump stations and storage reservoirs.
- Maximum Day Demand Plus Fire Flow. The 2025 system was evaluated under a maximum day plus fire flow condition in a two-step analysis. In the first step, the H_2ONET "Available Fire Flow Analysis" was used to determine if the minimum pressure and required fire flow could be met with existing District facilities. If the analysis indicated that the system failed to meet the minimum requirements for pressure and flow, a second analysis was performed. The second analysis involved running the model with pipeline improvements/system modifications added to the distribution system to eliminate previously identified deficiencies.

As shown in Table 8-1 above, the District's 2025 retail service area total peak hour demand was calculated to be 65.21 mgd. As discussed in Chapter 3, during a peak hour demand condition, a minimum pressure of 35 psi must be maintained throughout the system. Maximum head loss per thousand feet of distribution main should not exceed 10 feet per thousand feet (ft/kft) and maximum velocities should not exceed 7 feet per second (fps). The peak hour demand analyses involved a steady state simulation to identify areas of the District's system in which minimum pressure, velocity and/or head loss could not be maintained.

Available fire flow demands were simulated for each node which is located in the existing development in the model to determine whether or not the minimum residual pressure criterion of 20 psi could be met concurrently with a maximum day demand. For all the new development areas, fire flows by land use type were obtained using the recommendations described in Chapter 3, and were simulated to determine whether or not the minimum residual pressure criteria of 20 psi could be met. Maximum head loss through distribution mains should not exceed 10 ft/kft and maximum velocities should not exceed 10 fps.

The locations failing to meet the criteria were located and are described in the text below.

Pipelines are typically designed to deliver peak hour flows and maximum day demands plus fire flows within acceptable pressure, velocity and head loss ranges as stated in Chapter 3. Improvements needed to comply with operation and design criteria were added to the system and these are also presented herein.

EVALUATION RESULTS

Gravity Pressure Zone

Water Storage Capacity

Table 8-4 presents a summary of the 2025 operational, fire flow and emergency storage requirements for the Gravity Pressure Zone.

As previously described in Chapter 7, there is not a dedicated tank supplying the Gravity Pressure Zone. The Gravity Pressure Zone maintains its operational, fire flow and emergency storage within the retail portion of the Hinkle Reservoir. As shown in Table 8-4, with up to 11.42 MG available from Hinkle Reservoir, the Gravity Pressure Zone has adequate storage to meet its operational, fire flow and emergency storage needs. In addition, the intertie with the Citrus Heights Water District is capable of providing emergency supply (up to 2.7 MG) to the Gravity Pressure Zone.

Table 8-4. Gravity Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	1.88
Fire Flow	4,000 gpm for 4 hours	0.96
Emergency[(a)]	average day demand	3.04
	Total Storage Requirement	5.88
Existing Storage Available	Hinkle Reservoir	11.42
	Current Storage Surplus (Deficiency)	5.54

[(a)] Emergency storage based on assumption in Chapter 3.

Pumping Capacity

No pump stations are required to serve this pressure zone as it is served by gravity.

Water Distribution System

The District currently has no way to meter the flow supplied to the Gravity Zone. It is recommended that the District construct a metering station on the gravity line leaving Hinkle Reservoir to provide a method for measuring the supply provided to the Gravity system (see Recommended Water System Improvements Chapter 7). However, since there is currently no accurate way to estimate the average to maximum day or average day to peak hour peaking factors for this zone, to be conservative, peaking factors of 2.5 (maximum day) and 4.0 (peak hour) were used. These represent the highest ratio of each as presented in Table 5-5.

Peak Hour

During a peak hour demand condition, the Gravity Pressure Zone could meet the minimum pressure of 35 psi in all areas except for the Peerless Avenue and Mountain Avenue areas (see Figure 8-2). The system pressures in the Gravity Pressure Zone range from 27 to 82 psi. As illustrated on Figure 8-2, pressures during peak hour in areas near Peerless Avenue and Mountain Avenue are 28 and 27 psi, respectively. These pressures are less than the required minimum of 35 psi.

To increase pressure near Peerless Avenue during a peak hour demand, the District should consider the following improvements:

- Option 1: Do Nothing. Per discussion with District staff, these areas are located in the higher service elevations for the Gravity Pressure Zone, and most of the residential homes in these areas have individual in-line booster pumps.
- Option 2: Adjust the pressure zone boundary for the Gravity Pressure Zone. Because these areas are near the boundary of the Sierra Pressure Zone, connecting the area along Peerless Avenue, north of Cherry Avenue, into the Sierra Pressure Zone is feasible. With this pressure zone reconfiguration, pressure near Peerless Avenue, south of Hadleigh Drive, increases to 48 psi. However, the system pressure at Mountain Avenue area is still below the minimum required pressure criteria.

Option 2 is recommended. This proposed configuration change is illustrated on Figure 8-3. Although Mountain Avenue is still below the minimum residual by 6 psi, it only affects fifteen services. Option 2 will add approximately 101 gpm (peak hour flow) of demand to the Sierra Pressure Zone. This demand is not considered significant enough to cause a capacity increase at the Sierra Pump Station.

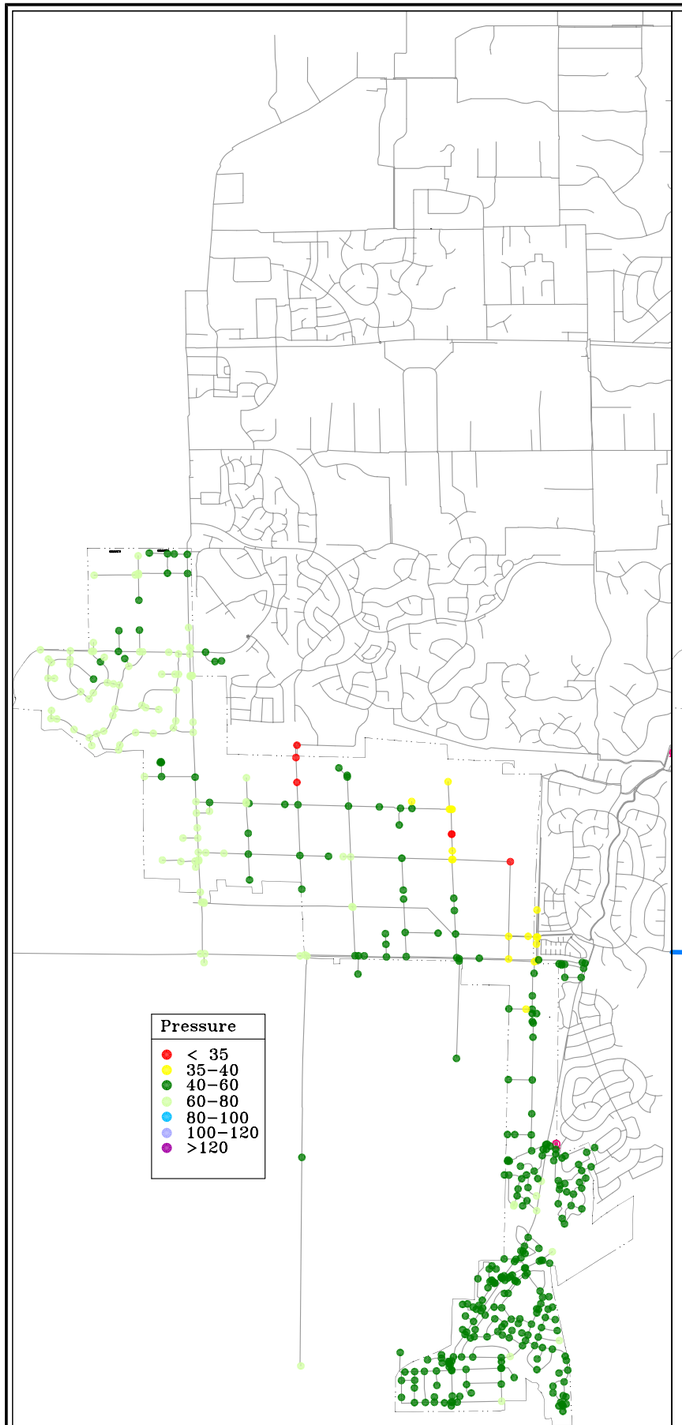
Results also indicate that all of the pipeline velocities in the Gravity Pressure Zone meet maximum required criteria as shown on Figure 8-2. The majority of pipelines in the Gravity Pressure Zone meet the maximum criteria for head loss, except for some areas where high head losses due to undersized pipelines occur, as illustrated on Figure 8-2. These areas are located at Hazel Avenue (between Golden Gate Avenue and Eden Oaks Avenue) where head loss is 12 ft/kft, and at Telegraph Avenue (north of Eden Oaks Avenue) where head loss is 22 ft/kft. No pipeline improvements are recommended to eliminate these high head loss conditions.

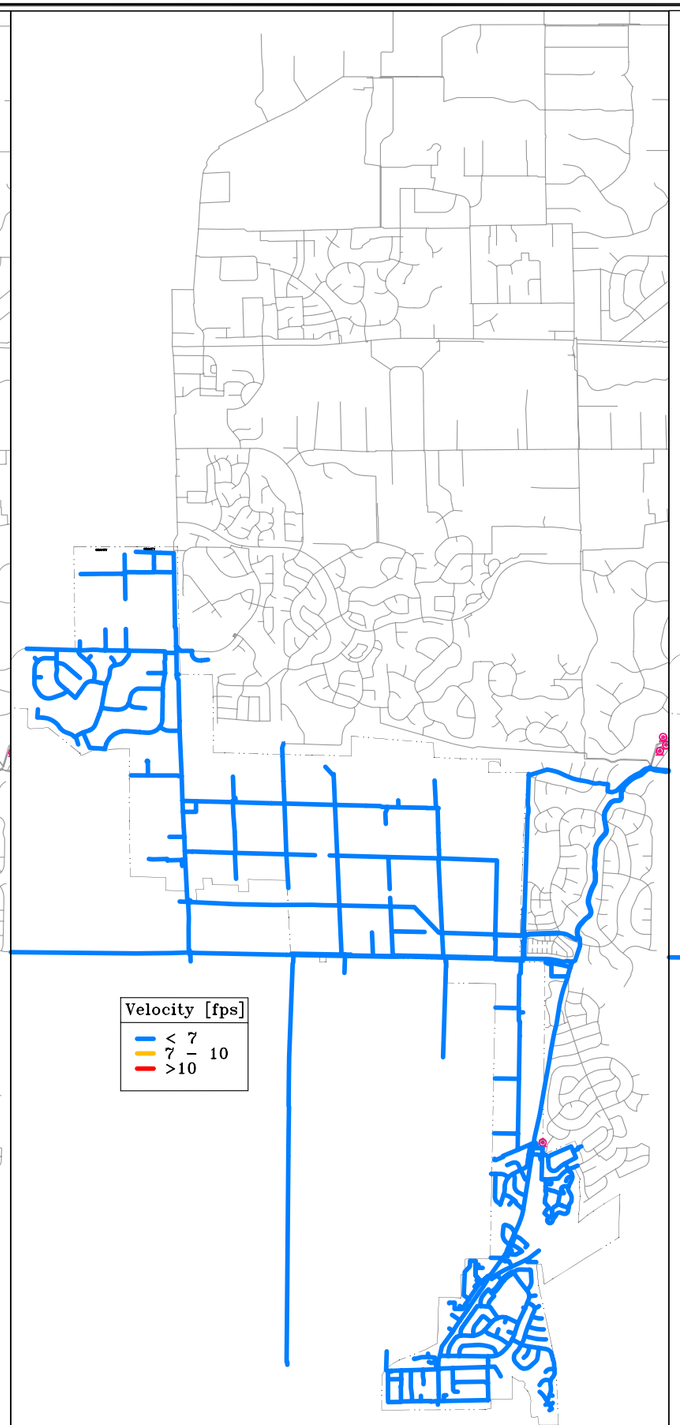
Maximum Day Plus Fire Flow

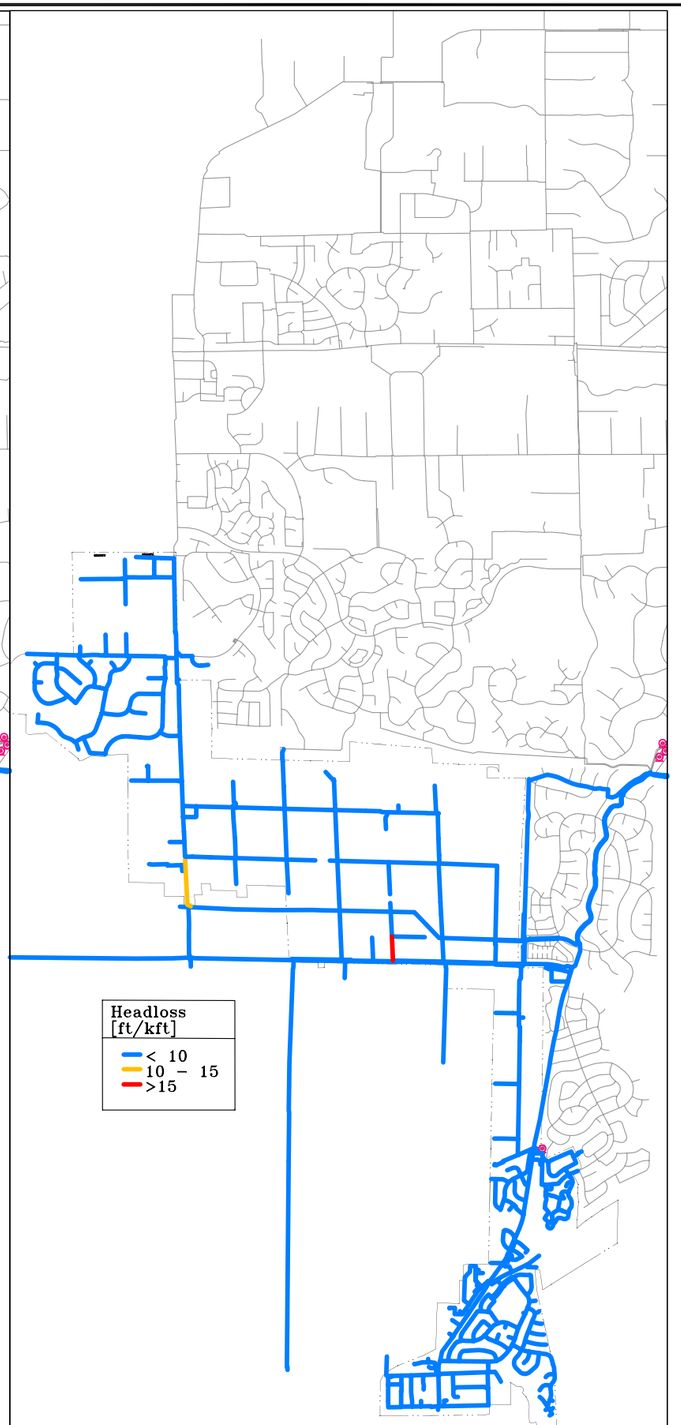
Fire flows of 1,500, 3,000 and 4,000 gpm were simulated in the Gravity Pressure Zone. Modeling results indicate the buildout distribution system was able to supply fire flow demand while maintaining the required minimum pressure of 20 psi.

Figure 8-2

San Juan Water District
Retail Water Master Plan
2025 RETAIL SYSTEM
GRAVITY PRESSURE ZONE
PEAK HOUR ANALYSIS







LEGEND:

- RESERVOIR OR TANK
- BOOSTER PUMP STATION
- PRESSURE ZONE

NOTES:

N

0 2000 4000
SCALE IN FEET

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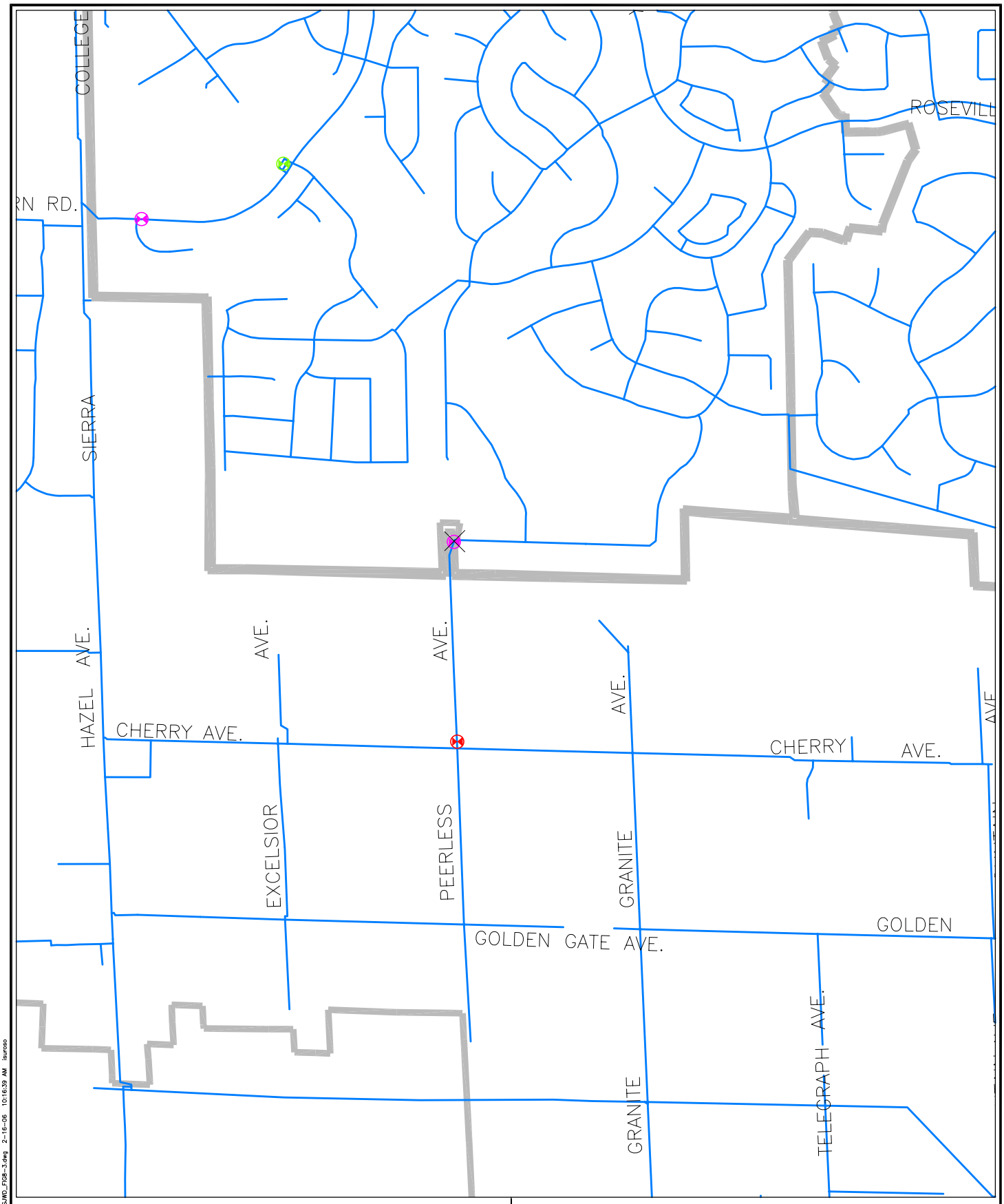

LEGEND

- EXISTING PIPELINE
- EXISTING ISOLATION VALVE
- EXISTING PRESSURE REDUCING VALVE
- RECOMMENDED ISOLATION VALVE
- REMOVED EXISTING ISOLATION VALVE

N

0 125 250

SCALE IN FEET

Figure 8-3

San Juan Water District

Retail Water Master Plan

GRAVITY PRESSURE ZONE OPTION 2 RECOMMENDED IMPROVEMENTS

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Consulting Engineers

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Bacon Pressure Zone

Water Storage Capacity

Historically, the District has not been able to maximize the operational storage in the Kokila Reservoir because the District needed to operate the Bacon Pump Station at a high discharge head to maintain minimum pressure in high elevation pockets throughout the pressure zone. As presented in Table 7-5, the operational volume from the existing Kokila Reservoir is only 1.77 MG.

In a previous evaluation (Evaluation of the San Juan Water District's Bacon Pressure Zone, December 2002), it was recommended that the Kokila Reservoir be replaced with a reservoir at a higher base elevation of 505 feet. This new Kokila Reservoir would provide up to 3.0 MG of usable storage volume for the Bacon Pressure Zone. Using this criterion, an extended period simulation for one week was modeled to analyze the operation of the new Kokila Reservoir at 505 feet while maintaining the required pressure during peak hour demands.

Figure 8-4 illustrates the performance of the Kokila Reservoir during an extended period simulation. As presented, the results indicate that the District will be able to turn over fifty percent of the reservoir volume multiple times during a one week period and still maintain adequate pressures throughout the zone.

The current lack of turnover in the existing Kokila Reservoir could present a water quality problem for the District. In addition, since this reservoir serves the largest zone in the District's retail system and is relied on to provide fire flow water to the Sierra and Lower and Upper Granite Bay Pressures Zones, it is recommended to replace this reservoir with a new 3.0 MG reservoir at the higher base elevation of 505 feet.

Table 8-5 presents a summary of the 2025 operational, fire flow and emergency storage requirements and available storage for the Bacon Pressure Zone assuming the reconfigured Kokila Reservoir.

As shown in Table 8-5, with only the new Kokila Reservoir serving the Bacon Pressure Zone, there is a storage deficiency of 8.48 MG. Per discussions with the District, the emergency storage required for the Bacon Pressure Zone can be provided by the Hinkle Reservoir and PCWA as described in Chapter 7.

Figure 8-4. Simulated Level Trends In Kokila Reservoir with Base Elevation Raised to 505 feet

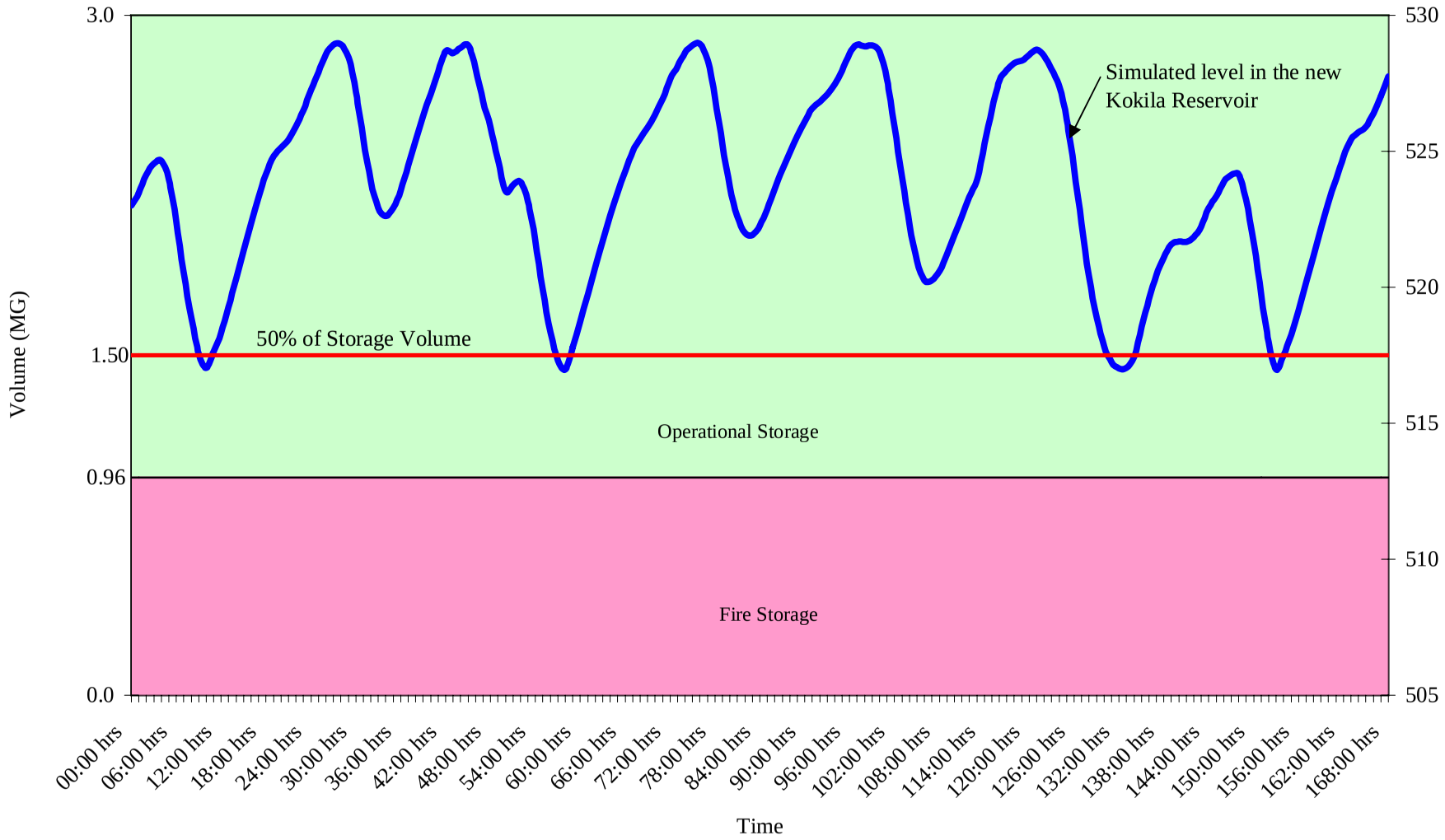


Table 8-5. Bacon Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	3.51
Fire Flow	4,000 gpm for 4 hours	0.96
Emergency	average day demand	7.02
	Total Storage Requirement	11.48
Existing Storage Available	Kokila Reservoir	3.00[(a)]
	Current Storage Surplus (Deficiency)	(8.48)
Emergency Supply Available	Hinkle & PCWA[(b)]	13.42
	Projected Storage Surplus (Deficiency)	(4.94)

(a) Capacity of Kokila Reservoir reduced from 4.56 MG to 3.0 MG based on recommended construction of a new Kokila Reservoir at a higher base elevation (505 feet) (Bacon Pressure Zone Evaluation, by WYA, December 2002).

(b) Per recommendations in Chapter 7, it is assumed that an emergency intertie has been constructed between PCWA and the Kokila Reservoir and is capable of providing up to 2.0 mgd.

Pumping Capacity

Table 8-6 provides a summary of the evaluation of the pump station serving the Bacon Pressure Zone.

As shown in Table 8-6, additional pumping capacity of 94 gpm (0.13 mgd) is required to meet the 2025 peak hour pumping requirements within the Bacon Pressure Zone. This additional pumping capacity could be met by allowing the four pumps to operate a little lower on their pump curves and operating each of the pumps above their design flows by less than 1 percent. In addition, the new pump station for the Upper and Lower Granite Bay Pressure Zone (see subsequent section) will also provide redundancy to the Bacon Pressure Zone through a pressure reducing valve near Auburn-Folsom Road and Eureka Road. This station can also be used to provide the supplemental flow (94 gpm) required during these high demand periods.

Table 8-6. Evaluation of the Bacon Pump Station[a]

Pump Station Serving Pressure Zone	Bacon Pump Station
Firm pumping capacity	15,000 gpm
Average day demand in pressure zone	6,944 gpm
Maximum day demand in pressure zone	13,738 gpm
Fire flow demand to be met by gravity in pressure zone	4,000 gpm
Total maximum day plus fire flow requirement in pressure zone	13,738 gpm[b]
Peak hour demand pumping requirement in pressure zone[c]	15,094 gpm
Reliability: At least two pumps (a lead pump and a standby pump) to use in the event of mechanical failure	Yes
Backup power provided?	Yes
Adequate capacity during maximum day demand plus fire flow?	Yes[b]
Adequate capacity during peak hour demand?	No[c]
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Peak hour demand
Additional capacity required (gpm)	94 gpm (0.13 mgd)

(a) The Bacon Pump Station must be sized to deliver the Bacon Pressure Zone, Lower Granite Bay Pressure Zone and Upper Granite Bay Pressure demands.

(b) The results from the District hydraulic model indicate that approximately 4,000 gpm will be supplied by Kokila Reservoir during a maximum day plus fire flow demand condition. Therefore, per Table 8-3, of the required 17,738 gpm required during a maximum day plus fire flow, only 13,788 gpm (17,738 gpm – 4,000 (Kokila)) is required from Bacon Pump Station.

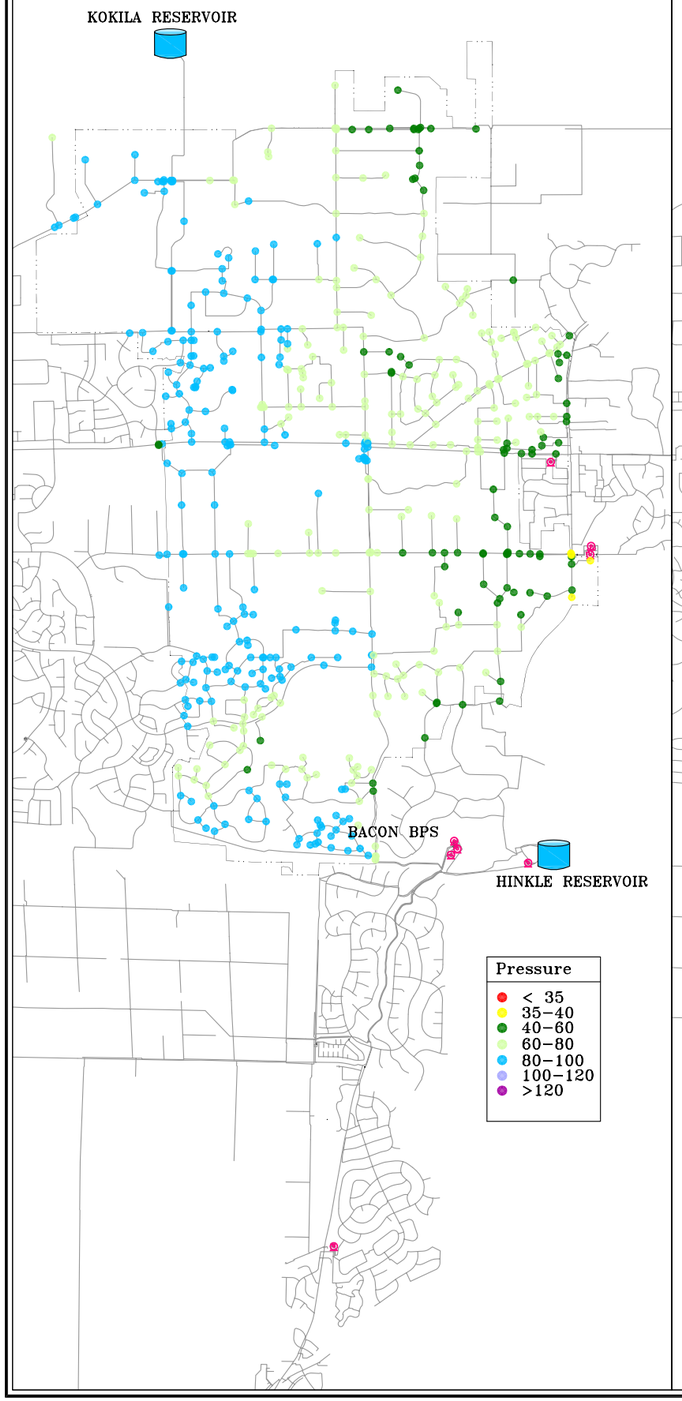
(c) Per Table 8-3, the peak hour demand for Bacon Pressure Zone is 21,113 gpm, however, the results from the District's hydraulic model indicate that approximately 4,850 gpm will be provided from the Kokila reservoir and from the Los Lagos Tank. However, the firm pumping capacity is still short by 94 gpm. This is assumed to be made up by the existing pumps operating slightly lower on their pump curves.

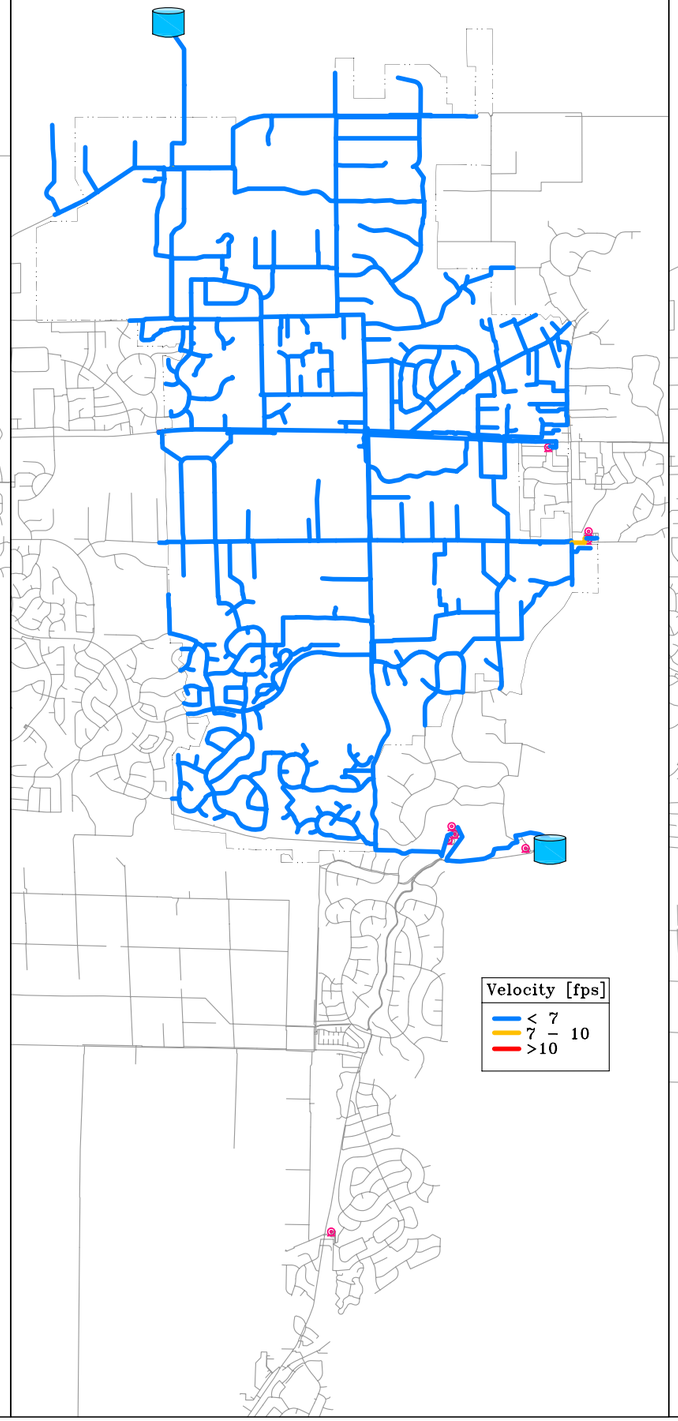
Water Distribution System

Peak Hour

Results indicate that the 2025 water system in the Bacon Pressure Zone is able to meet the peak hour demand at the minimum pressure criterion of 35 psi. The system pressures in Bacon Pressure Zone range from 36 to 114 psi during peak hour as illustrated in Figure 8-5.

Figure 8-5 also shows that nearly all of the pipelines meet the 10 ft/kft maximum head loss criterion, except two locations downstream of the Kokila Reservoir along Cavitt-Stallman Road that have head losses greater than 10 ft/kft (between 11 to 30 ft/kft).





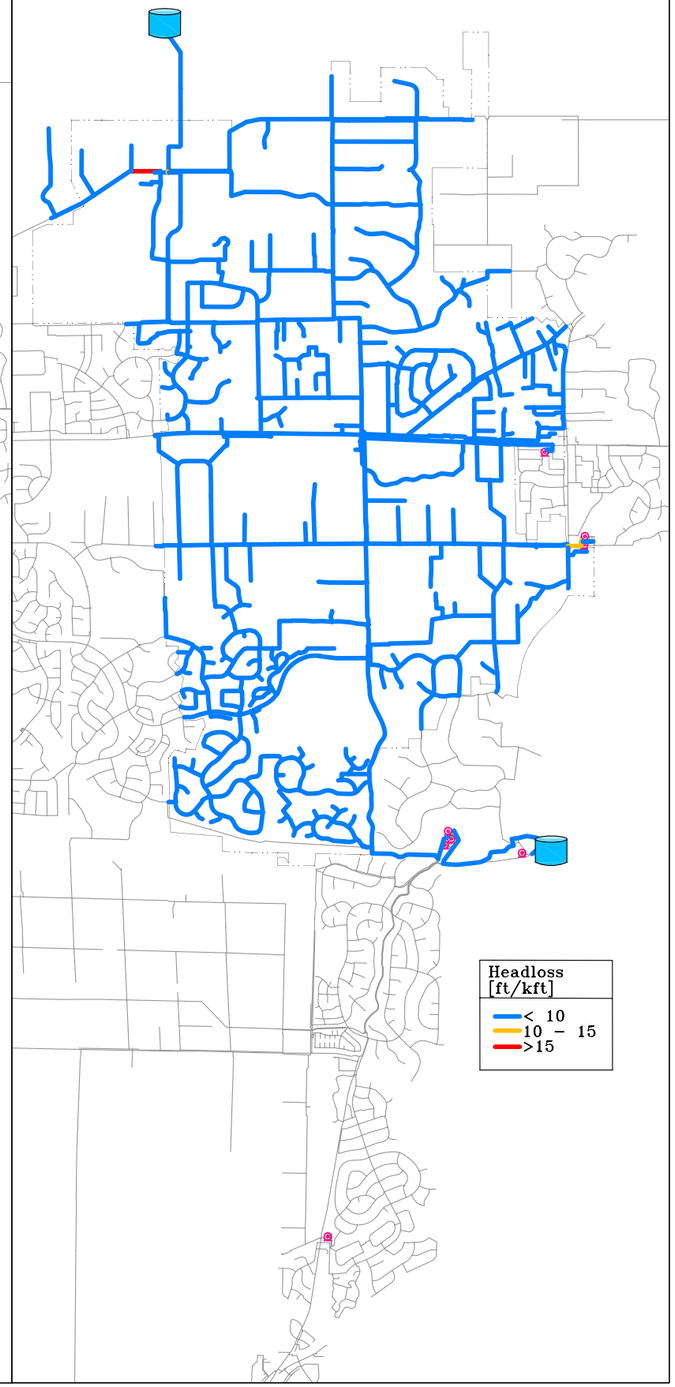


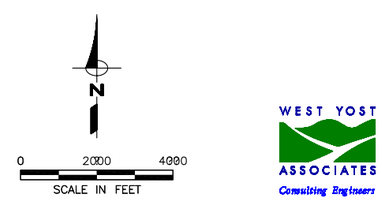
Figure 8-5

San Juan Water District
Retail Water Master
2025 RETAIL SYSTEM
BACON PRESSURE ZONE
PEAK HOUR ANALYSIS

LEGEND:

- RESERVOIR OR TANK
- BOOSTER PUMP STATION
- PRESSURE ZONE

NOTES:



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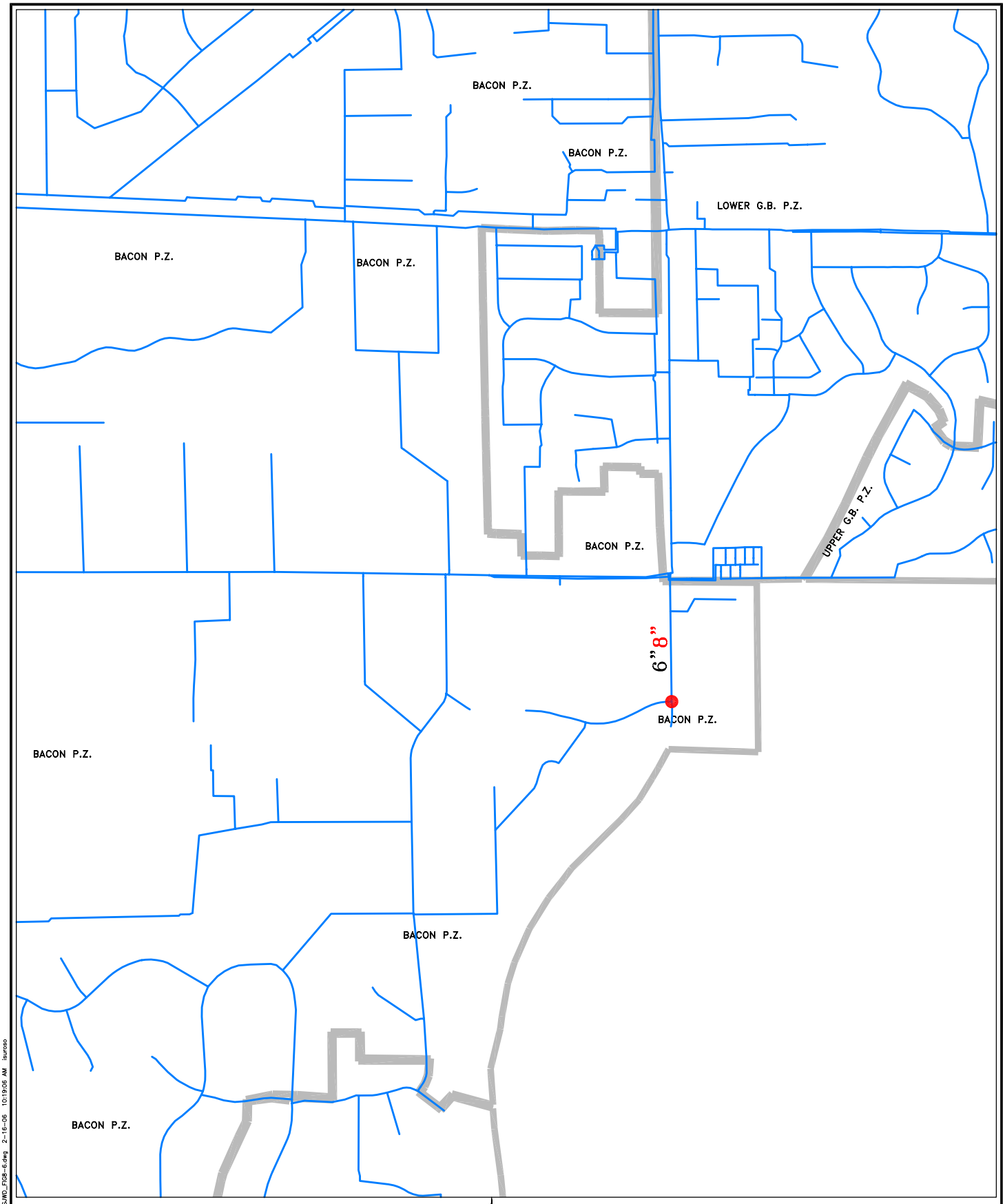
Nearly all velocities were less than 7 fps, except on a 12-inch diameter pipeline downstream of Kokila Reservoir at the intersection of Cavitt-Stallman Road and Crestview Lane. Velocity in this pipeline is 8.2 fps. No pipeline improvements are recommended to eliminate these concerns.

Maximum Day Plus Fire Flow

Fire flows of 1,500, 2,500, 3,000 and 4,000 gpm (based on land use designation) were simulated in several new development areas in the Bacon Pressure Zone to be in compliance with the 2001 CFC Fire Flow requirements. Simulation results indicate that the area located near the intersection of Eureka Road and Country Court, as illustrated on Figure 8-6, was unable to meet the 1,500 gpm fire flow during 2025 maximum day demand conditions due to high pipeline head losses.

The recommended improvements in the Bacon Pressure Zone are shown on Figure 8-6, and include:

- Upsize/parallel 920 lf of the existing 6-inch diameter pipeline along Auburn-Folsom Road, as illustrated on Figure 8-6, with an 8-inch diameter pipeline from Country Court to Eureka Road.



LEGEND

- NODE NOT MEETING FIRE FLOW
- 8"8" EXISTING PIPELINE
- RECOMMENDED UPSIZED PIPELINES

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SCALE IN FEET

Figure 8-6

San Juan Water District

Retail Water Master Plan

2025 MAX DAY PLUS FIRE FLOW DEMAND

RECOMMENDED IMPROVEMENTS IN BACON PRESSURE ZONE

WEST YOST ASSOCIATES

Consulting Engineers

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Lower Granite Bay Pressure Zone

Water Storage Capacity

Table 8-7 presents a summary of the 2025 operational, fire flow and emergency storage requirements for the Lower Granite Bay Pressure Zone.

As previously discussed in Chapter 7, not all of the 1.65 MG Los Lagos storage volume is usable storage. As recommended in Chapter 7, the entire volume of the Los Lagos Tank could be utilized during an emergency condition if the 16-inch diameter pipeline along Twin Rocks Road and along Cavitt-Stallman Road, from Sierra Ponds Lane to Oak Pine Lane are constructed. For the 2025 demand condition, it is assumed this pipeline has been constructed.

As shown in Table 8-7, the 1.65 MG Los Lagos Tank serving the Lower Granite Bay Pressure Zone is capable of meeting the operational storage requirements within the Lower Granite Bay Pressure Zone. The two emergency interties with PCWA (2.7 MG and 4.7 MG, see Chapter 4) and the available storage at the Hinkle Reservoir (11.42 MG) are capable of providing up to 18.82 MG of emergency supply to the Lower Granite Bay Pressure Zone.

Table 8-7. Lower Granite Bay Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	1.10
Fire Flow	3,000 gpm for 3 hours	0.00[(a)]
Emergency	average day demand	2.44
	Total Storage Requirement	3.54
Existing Storage Available	Los Lagos Tank	1.65[(b)]
	Current Storage Surplus (Deficiency)	(1.89)
Emergency Supply Available	Hinkle Reservoir & PCWA	18.82[(c)]
	Projected Storage Surplus (Deficiency)	16.93

(a) Because demands within the Lower Granite Bay Pressure Zone are provided by water pumped from the Bacon Pressure Zone, the fire flow storage requirement for Lower Granite Bay has been assumed to be met from storage within the Bacon Pressure Zone.

(b) As recommended in Chapter 7, the entire volume of the Los Lagos Tank could be utilized during an emergency condition if the 16-inch diameter pipeline along Twin Rocks Road and along Cavitt-Stallman Road, from Sierra Ponds Lane to Oak Pine Lane are constructed. For the 2025 demand condition, it is assumed this pipeline has been constructed.

(c) Total potential emergency supply available is 11.42 MG from Hinkle Reservoir, 2.7 MG and 4.7 MG from the PCWA interties at Boulder Road and Twin Rocks Road (see Chapter 4).

Pumping Capacity

Table 8-7 provides a summary of the evaluation of the pump stations serving the Lower Granite Bay Pressure Zone. The pressure zone is served mainly by the Lower Granite Bay Pump Station with supplemental supply from the Douglas Pump Station.

As shown in Table 8-8, additional pumping capacity of 2,359 gpm (3.40 mgd) is required at the Lower Granite Bay Pump Station to meet the 2025 maximum day plus fire flow pumping requirements within the Lower Granite Bay Pressure Zone.

In recent discussions with District Staff, the recommended upgrade to the Lower Granite Bay pump station was evaluated to determine if it could serve two purposes:

- Provide the 2025 maximum day plus fire flow demands for both the Lower and Upper Granite Bay Pressure Zones; and
- Provide the needed reliability/redundancy to the Bacon Pressure Zone.

In combining these two operations, the District will only need to build a single pump station instead of two at separate sites. This would also free up additional capacity at the Bacon Pump Station because it would take the Upper and Lower Granite Bay demands off of the Bacon Pressure Zone and serve them directly from the Hinkle Reservoir.

Based on our hydraulic evaluation and the needed redundancy it provides to the District, it is recommended that the District proceed with the construction of:

- 10.1 mgd pump station near the Hinkle Reservoir site. The size of this pump station is based on serving the larger of the two demands. Either 2025 average day demands for Bacon, Lower Granite Bay and Upper Granite Bay (10.1 mgd) or the maximum day demands for Upper and Lower Granite Bay plus the largest fire flow requirement in either of these two zones (10.1 mgd).
- Approximately 8,400 lf of 24-inch pipeline along Auburn-Folsom Road from the Hinkle Reservoir to the Upper Granite Bay Pump Station.
- A pressure reducing/sustaining station capable of supplying up to 7 mgd to the Bacon Pressure Zone (2025 average day demands for the Bacon Pressure Zone).

Table 8-8. Evaluation of Lower Granite Bay Pressure Zone Pump Stations

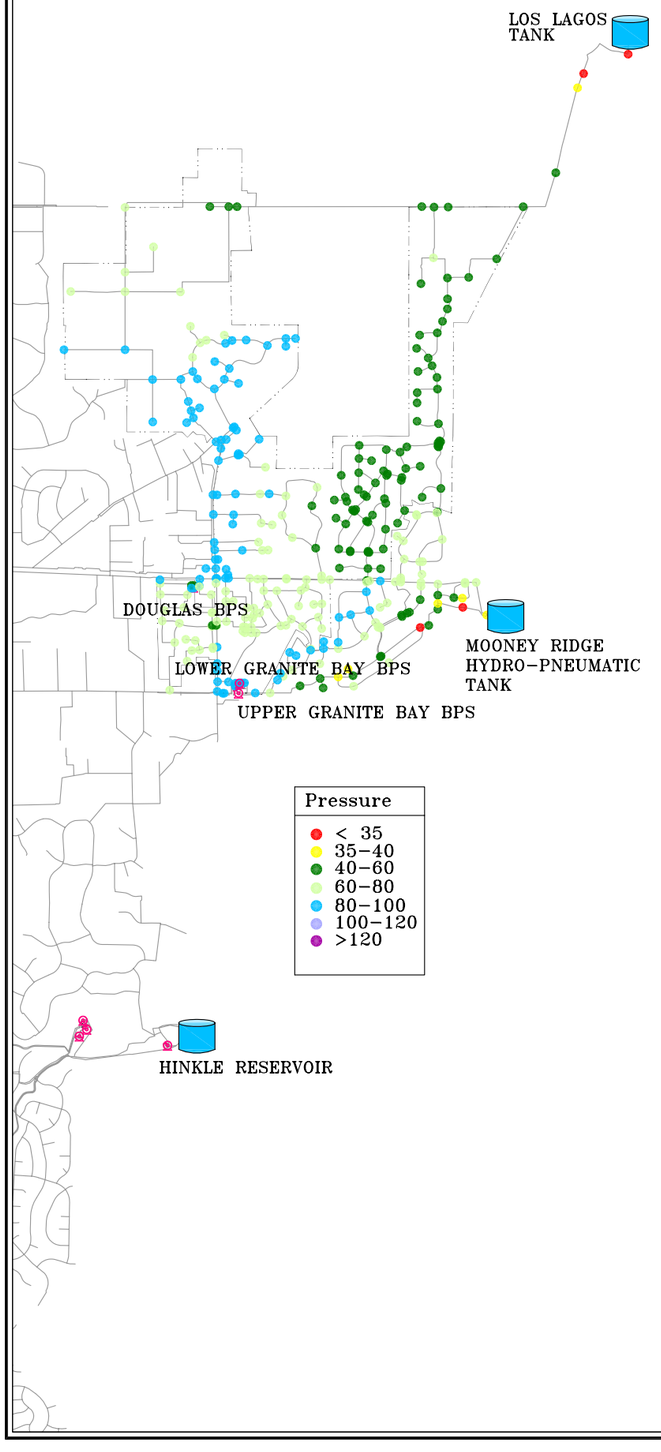
Pump Stations Serving Pressure Zone	Lower Granite Bay Pump Station	Douglas Pump Station[a]
Firm pumping capacity	3,090 gpm[e]	600 gpm
Average day demand in pressure zone	1,694 gpm	
Maximum day demand in pressure zone[b]	3,049 gpm	
Fire flow demand to be met by pumping in pressure zone[c]	3,000 gpm	
Total maximum day plus fire flow pumping requirement in pressure zone	6,049 gpm	
Peak hour demand pumping requirement in pressure zone[d]	3,280 gpm (1,293 gpm available via gravity from Los Lagos Tank)	
Reliability: At least two pumps (a lead pump and a standby pump) to use in the event of mechanical failure	Yes	Yes
Backup power provided?	Yes	No
Adequate capacity during maximum day demand plus fire flow?	No, additional 2,359 gpm required[f]	
Adequate capacity during peak hour demand?	Yes	
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Maximum day plus fire flow	
Additional capacity required (gpm)[e]	2,359 gpm (3.40 mgd)	

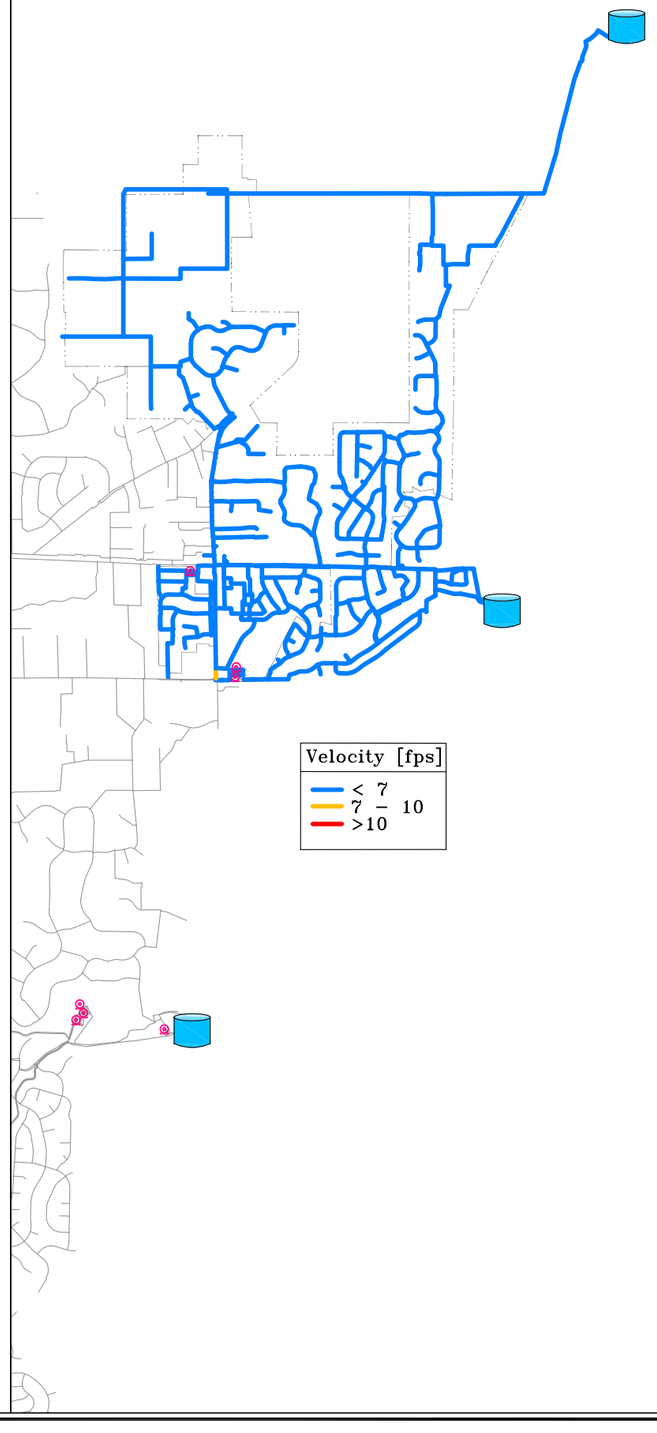
[a] Douglas Pump Station is only operated during high demand periods to assist in meeting peak demands within the Lower Granite Bay Pressure Zone.
[b] Maximum day demand equals 1.8 times average day demand.
[c] Fire flow which cannot be met from storage via gravity.
[d] Peak hour demand equals 2.7 times average day demand.
[e] Could convert Douglas Pump Station from a standby to a dedicated pump station to Lower Granite Bay Pressure Zone, to provide some of the additional capacity requirements, however with the current age of the pump station, this is not recommended.
[f] The District's hydraulic model indicates that the Lower Granite Bay Pump Station (which does not include Douglas Pump Station) can pump up to 3,690 gpm while maintaining the minimum required pressures.

Water Distribution System

Peak Hour

During the 2025 peak hour analysis, the recommended 12-inch and 16-inch diameter pipelines along Twin Rocks Road and Cavitt-Stallman Road are assumed to be constructed (see Chapter 7). The 2025 distribution system in the Lower Granite Bay Pressure Zone is able to meet the minimum criterion of 35 psi during a peak hour demand. Figure 8-7 illustrates system pressures in Lower Granite Bay Pressure Zone which range from 32 to 98 psi. The low pressure (32 psi) is located along Boulder Road, downstream of Los Lagos Tank. There are no customers located in this area. Therefore, no improvements are required. High head losses were observed in the pipelines in the following locations:





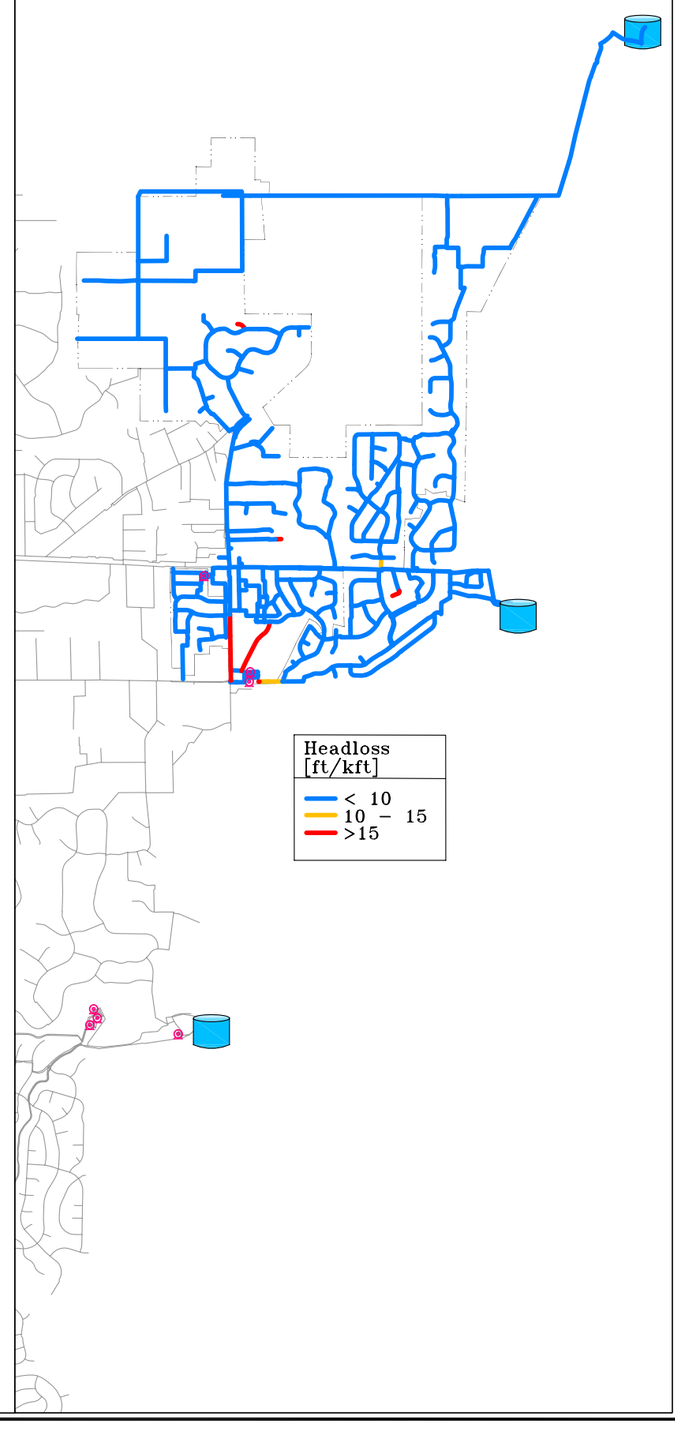


Figure 8-7

San Juan Water District
Retail Water Master Plan
2025 RETAIL SYSTEM LOWER AND UPPER GRANITE BAY PRESSURE ZONE PEAK HOUR ANALYSIS

LEGEND:

- RESERVOIR OR TANK
- BOOSTER PUMP STATION
- PRESSURE ZONE

NOTES:

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SCALE IN FEET

WEST YOST ASSOCIATES
Consulting Engineers

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- Along Lake Land Drive, between Douglas Boulevard and Linda Court. Head loss in the existing 8-inch diameter pipeline was 11 ft/kft.

- Along Auburn-Folsom Road, downstream of Lower Granite Bay Pump Station, from Eureka Road to Park Place. Head losses of 11 ft/kft to 23 ft/kft were observed in the existing 10-inch and 12-inch diameter pipelines.

- From Auburn-Folsom Road to Fuller Drive. The head loss in the existing 10-inch diameter pipeline was 15 ft/kft.

- Along Wilcox Place. The head loss in the existing 2-inch diameter pipeline (domestic pipeline) was 36 ft/kft.

- North of Shelborne Drive. The head loss in the existing 2-inch diameter pipeline (domestic pipeline) was 121 ft/kft.

Because the system pressures in the Lower Granite Bay Pressure Zone meet the minimum required pressure for the peak hour condition, no improvements are required to alleviate this head loss deficiency.

Also shown on Figure 8-7, all of velocities in the pipelines are less than the maximum criterion of 7 fps.

Maximum Day Plus Fire Flow

WYA simulated fire flows of 1,500, 2,500 and 3,000 gpm in the new development area in the Lower Granite Bay Pressure Zone. Modeling results indicate the 2025 distribution system is able to supply fire flow demand while maintaining the required minimum pressure of 20 psi.

Upper Granite Bay Pressure Zone

Water Storage Capacity

Table 8-8 presents a summary of the 2025 operational, fire flow and emergency storage requirements for the Upper Granite Bay Pressure Zone.

As shown in Table 8-9, the Mooney Ridge Hydropneumatic Tank is only adequate to provide 0.05 MG operational storage in the Upper Granite Bay Pressure Zone. Therefore, the Upper Granite Bay Pump Station shall supplement the operational storage required. The emergency storage will be supplied from the District's Hinkle Reservoir via the Lower Granite Bay Pump Station.

Table 8-9. Upper Granite Bay Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	0.34
Fire Flow	2,500 gpm for 2 hours	0.00[(a)]
Emergency	average day demand	0.54
	Total Storage Requirement	0.88
Existing Storage Available	Mooney Ridge Hydropneumatic Tank	0.05
	Current Storage Surplus (Deficiency)	(0.83)
Emergency Supply Available	Hinkle Reservoir	11.42
	Projected Storage Surplus (Deficiency)	10.59

(a) Because water demands within the Upper Granite Bay Pressure Zone will be provided by water pumped from the Hinkle Reservoir (see previous section) via the Lower Granite Bay Pressure Zone, the fire flow storage requirement for Upper Granite Bay has been assumed to be met from storage within the retail portion of the Hinkle Reservoir.

Pumping Capacity

Table 8-10 provides a summary of the evaluation of the pump station serving the Upper Granite Bay Pressure Zone.

As shown in Table 8-10, in addition to the 2.72 mgd replacement recommended in Chapter 7, an additional pumping capacity of 1,553 gpm (2.24 mgd) is required at the Upper Granite Bay Pump Station to meet the 2025 maximum day demand plus fire flow pumping requirement within the Upper Granite Bay Pressure Zone. Therefore, the Upper Granite Bay Pump Station will be replaced with a new 4.96 mgd pump station.

Table 8-10. Evaluation of the Upper Granite Bay Pump Station

Pump Station Serving Pressure Zone	Upper Granite Bay Pump Station
Firm pumping capacity	1,892 gpm [(d)]
Average day demand in pressure zone	378 gpm
Maximum day demand in pressure zone[(a)]	945 gpm
Fire flow demand to be met by pumping in pressure zone[(b)]	2,500 gpm
Total maximum day plus fire flow pumping requirement in pressure zone	3,445 gpm
Peak hour demand pumping requirement in pressure zone[(c)]	1,437 gpm
Reliability: At least two pumps (a lead pump and a standby pump) to use in the event of mechanical failure	Yes
Backup power provided?	Yes[(e)]
Adequate capacity during maximum day demand plus fire flow?	No, additional 1,553 gpm required
Adequate capacity during peak hour demand?	Yes
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Maximum day demand plus fire flow
Additional capacity required (gpm)	1,553 gpm (2.24 mgd)

(a) Maximum day demand equals 2.5 times average day demand.
(b) Fire flow which cannot be met from storage via gravity.
(c) Peak hour demand equals 3.8 times average day demand.
(d) Includes current capacity (740 gpm) plus additional capacity (1,152 gpm) recommended to meet existing pressure zone needs (see Chapter 7).
(e) Current capacity is not adequate for future pump station.

Water Distribution System

Peak Hour

The 2025 water system in the Upper Granite Bay Pressure Zone is not able to meet the peak hour demand at the minimum pressure criterion of 35 psi. System pressures during the peak hour demand range from 38 to 107 psi (see Figure 8-7). Low pressures are observed in two areas downstream of the Mooney Ridge Hydropneumatic Tank. When the tank is near empty, areas located within service elevations greater than 543 feet will experience pressures below the minimum criterion.

In addition, results indicate that head losses exceeding the 10 ft/kft maximum criterion were observed in these areas:

- In the existing 2-inch diameter pipeline along Vance Court. Head loss was 16 ft/kft.
- In the existing 10-inch diameter pipeline located downstream of Upper Granite Bay Pump Station. Head losses were between 13 and 20 ft/kft.

As shown on Figure 8-7, all velocities in the Upper Granite Bay Pressure Zone met the maximum criterion.

Maximum Day Plus Fire Flow

WYA simulated fire flows of 2,500 gpm in the new development in the Upper Granite Bay Pressure Zone. Modeling results indicate the 2025 distribution system was able to supply fire flow demand while maintaining the required minimum pressure of 20 psi.

Sierra Pressure Zone

Water Storage Capacity

Table 8-11 presents a summary of the 2025 operational, fire flow and emergency storage requirements for the Sierra Pressure Zone. Per recommendations made in Chapter 7, it was assumed that the District will have constructed the JWSF project prior to 2025.

As shown in Table 8-11, the proposed 2.6 MG JWSF is adequate to meet the operational and fire flow storage requirements within the Sierra Pressure Zone, but not all the emergency storage requirement. However, the emergency storage component was always assumed to be provided by the City of Roseville through the emergency intertie with the City of Roseville (2.9 MG and 4.0 MG, see Chapter 4) and the emergency intertie at the JWSF between the two tanks at the site. These interties are capable of meeting 100 percent of the emergency storage requirement in the Sierra Pressure Zone.

Table 8-11. Sierra Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	1.50
Fire Flow	4,000 gpm for 4 hours	0.96
Emergency	average day demand	3.16
	Total Storage Requirement	5.62
Existing Storage Available	Joint Water Storage Facility	2.60[(a)]
	Current Storage Surplus (Deficiency)	(3.02)
Emergency Supply Available	City of Roseville[(b)]	10.1
	Projected Storage Surplus (Deficiency)	7.1

(a) The Joint Water Storage Facility Project (JWSF) is a joint project between the District and the City of Roseville. The Project would include up to 2.6 MG of storage capacity for use in the District's Sierra Pressure Zone.

(b) Assume emergency supply available through 10-inch intertie at Cavitt-Stallman Road and 12-inch intertie at Eureka Road (2.9 and 4.0 MG, respectively, see Chapter 4) and an additional intertie at the site of the JWSF between the City of Roseville's tank and the District's capable of providing 3.2 MG.

Pumping Capacity

Table 8-12 provides a summary of the evaluation of the pump station serving the Sierra Pressure Zone.

As shown in Table 8-12, the additional capacity recommended in Chapter 7 for the Sierra Pump Station is adequate to meet 2025 maximum day and peak hour demand pumping requirements within the Sierra Pressure Zone.

Table 8-12. Evaluation of Sierra Pump Station

Pump Station Serving Pressure Zone	Sierra Pump Station
Firm pumping capacity	7,372 gpm[(d)]
Average day demand in pressure zone	2,198 gpm
Maximum day demand in pressure zone[(a)]	4,176 gpm
Fire flow demand to be met by gravity in pressure zone	4,000 gpm
Total maximum day plus fire flow pumping requirement in pressure zone	4,176 gpm[(b)]
Peak hour demand pumping requirement in pressure zone[(c)]	6,940 gpm[(e)] (1,952 gpm from JWSF Tank)
Reliability: At least two pumps (a lead pump and a standby pump) to use in the event of mechanical failure	Yes
Backup power provided?	Yes
Adequate capacity during maximum day demand plus fire flow?	Yes
Adequate capacity during peak hour?	Yes
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Peak Hour Demand
Additional capacity required (gpm)	None

(a) Maximum day demand equals 1.9 times average day demand.

(b) Fire flow demand of 4,000 gpm will be supplied by JWSF. Therefore, per Table 8-3, only 4,176 gpm of the total maximum day plus fire flow demand (8,176 gpm – 4,000 gpm (JWSF)) is required to be pumped at the Sierra Pump Station.

(c) Peak hour demand equals 4.0 times average day demand.

(d) Includes current capacity (5,250 gpm) plus additional (2,122 gpm) recommended to meet existing system needs (see Chapter 7). However, if the JWSF Project is constructed, total firm capacity may be reduced.

(e) The results from the District's hydraulic model indicate that approximately 1,952 gpm will be supplied by the JWSF during a peak hour demand condition (8,792 – 1,952 gpm = 6,840).

Water Distribution System

Peak Hour

As illustrated on Figure 8-8, the 2025 distribution system in the Sierra Pressure Zone is able to meet the minimum pressure criterion during peak hour demand. System pressures range from 52 to 95 psi. Results indicate that the head losses in the distribution pipelines are less than the maximum criterion of 10 ft/kft except in the existing 2-inch diameter domestic pipeline along Eureka Road, west of Quail Lane. There is no velocity deficiency in the Sierra Pressure Zone; all velocities were less than 7 fps.

Maximum Day Plus Fire Flow

WYA simulated fire flows (based on land use designation) of 1,500, 2,500, 3,000 and 4,000 gpm in the new development areas in the Sierra Pressure Zone. Modeling results indicate the 2025 distribution system was able to supply fire flow demand while maintaining the required minimum pressure of 20 psi.

KOKILA RESERVOIR

JOINT WATER
STORAGE FACILITY

SIERRA BPS

Pressure
- < 35
- 35–40
- 40–60
- 60–80
- 80–100
- 100–120
- >120

Velocity [fps]
- < 7
- 7 – 10
- >10

Headloss [ft/kft]
- < 10
- 10 – 15
- >15

Figure 8-8
San Juan Water District
Retail Water Master Plan
2025 RETAIL SYSTEM
SIERRA PRESSURE ZONE
PEAK HOUR ANALYSIS

LEGEND:
- RESERVOIR OR TANK
- BOOSTER PUMP STATION
- PRESSURE ZONE

NOTES:

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American River Canyon North Pressure Zone

Water Storage Capacity

Table 8-13 presents a summary of the 2025 operational, fire flow and emergency storage requirements for the ARC-North Pressure Zone.

As previously discussed in Chapter 7, there is no dedicated tank supplying the ARC-North Pressure Zone. As recommended for the existing system in Chapter 7, it is recommended that the 2025 storage requirement also be served from the District's retail portion (11.42 MG) of the Hinkle Reservoir. As shown in Table 8-13, the total 2025 storage requirement is 2.05 MG in the ARC-North Pressure Zone.

Table 8-13 American River Canyon North Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	0.51
Fire Flow	1,500 gpm for 2 hours	0.18
Emergency	average day demand	1.36
	Total Storage Requirement	2.05
Existing Storage Available		0.00
	Current Storage Surplus (Deficiency)	(2.05)
Emergency Supply Available	Hinkle Reservoir[(a)]	11.42
	Projected Storage Surplus (Deficiency)	9.37

(a) Assume the operational and fire flow storage requirements are provided by the Hinkle Reservoir.

Pumping Capacity

Table 8-14 provides a summary of the evaluation of the pump station serving the ARC-North Pressure Zone.

As shown in Table 8-14, there is no additional pumping capacity required at the ARC-North Pump Station to meet either the 2025 maximum day demand plus fire flow or peak hour demand pumping requirements within the ARC-North Pressure Zone.

Table 8-14. Evaluation of ARC-North Pump Station

Pump Station Serving Pressure Zone	ARC-North Pump Station
Firm pumping capacity	3,600 gpm[(d)]
Average day demand in pressure zone	942 gpm
Maximum day demand in pressure zone[(a)]	1,413 gpm
Fire flow demand to be met by pumping in pressure zone[(b)]	1,500 gpm
Total maximum day plus fire flow pumping requirement in pressure zone	2,913 gpm
Peak hour demand pumping requirement in pressure zone[(c)]	2,920 gpm
Reliability: At least two pumps (a lead pump and a standby pump) to use in the event of mechanical failure	Yes
Backup power provided?	Yes
Adequate capacity during maximum day demand plus fire flow?	Yes
Adequate capacity during peak hour?	Yes
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Peak hour demand
Additional capacity required (gpm)	None

(a) Maximum day demand equals 1.5 times average day demand.
(b) Fire flow which cannot be met from storage via gravity.
(c) Peak hour demand equals 3.1 times average day demand.
(d) Based on current capacity of 3,600 gpm. No additional capacity was recommended to meet existing system needs in Chapter 7.

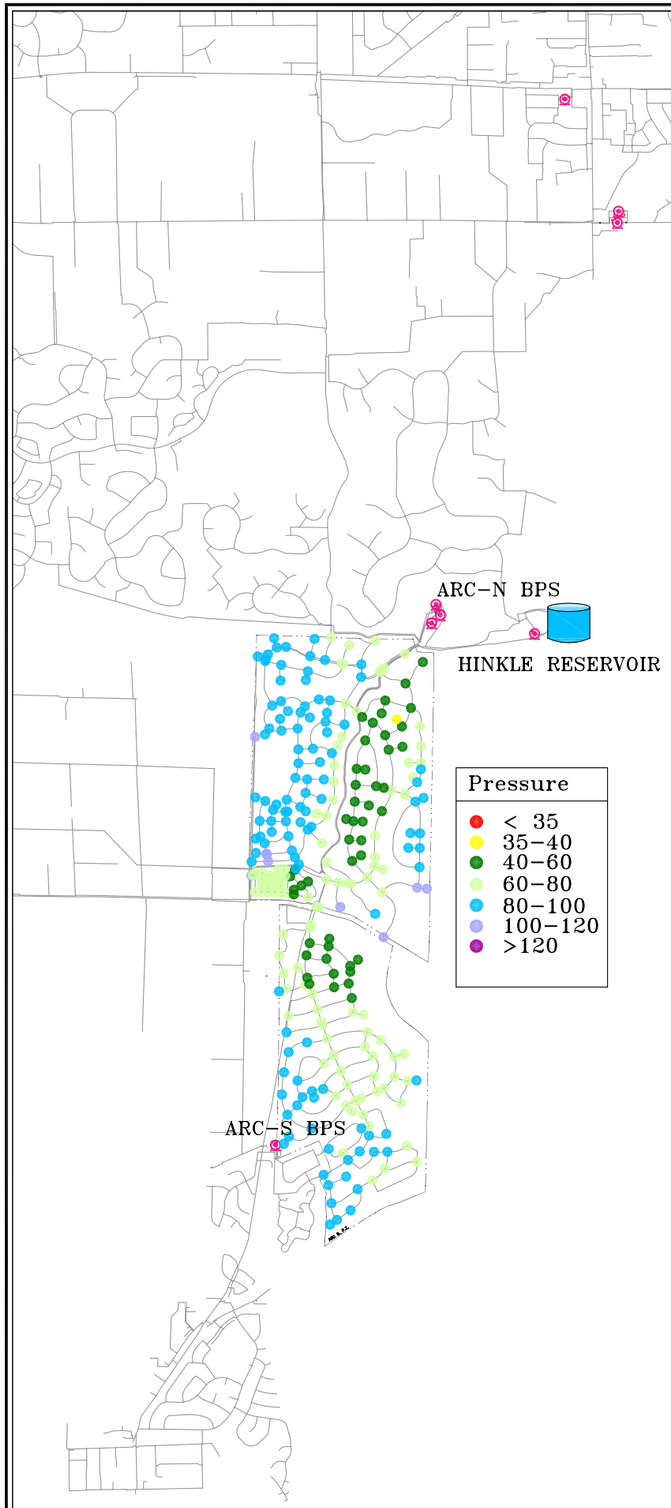
Water Distribution System

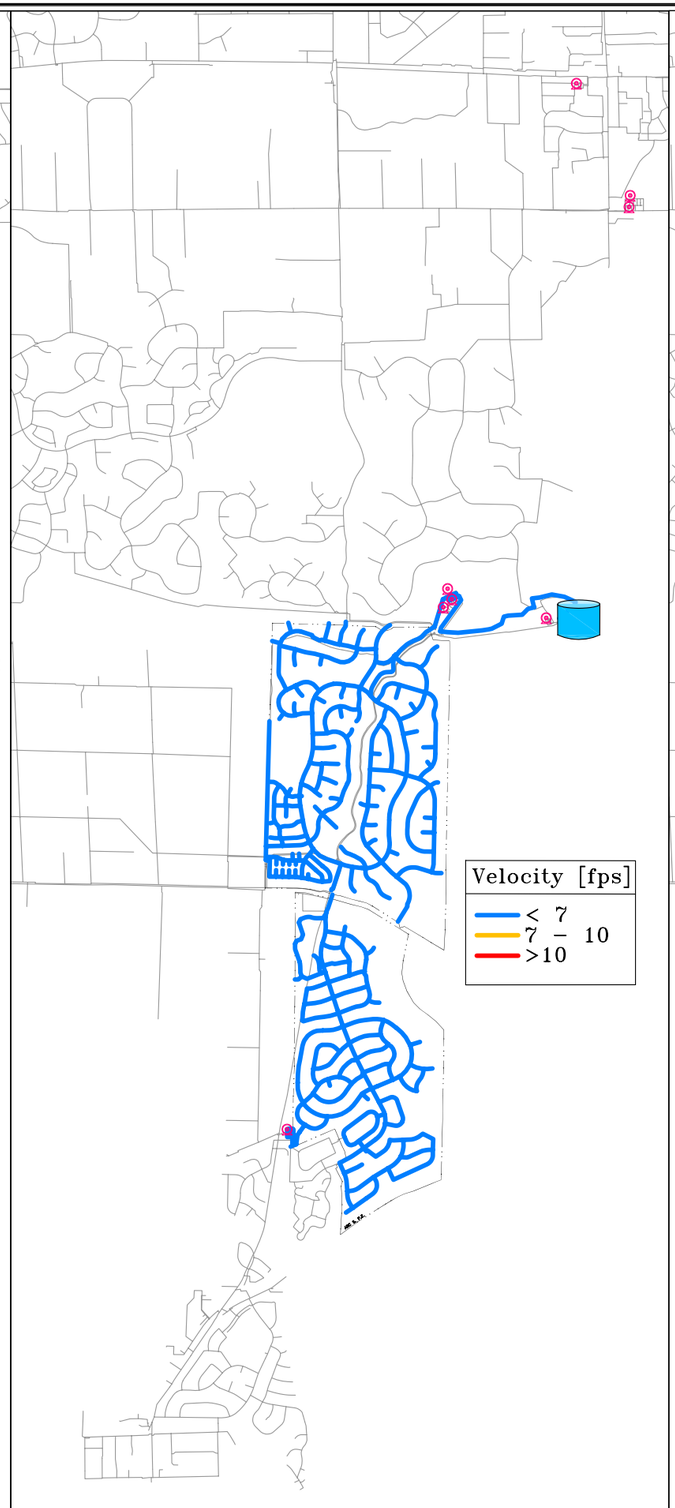
Peak Hour

During the 2025 peak hour demand condition, there are no pressure or head loss deficiencies in the ARC-North Pressure Zone. Pressures in this pressure zone range from 39 to 114 psi, as shown in Figure 8-9. The head loss and velocities in the pipelines also meet the recommended performance criteria.

Maximum Day Plus Fire Flow

Fire flows of 1,500 gpm were simulated in the ARC-North Pressure Zone. Simulation results indicate that the 2025 system of the ARC-North Pressure Zone is adequate to meet the minimum required residual pressure of 20 psi.





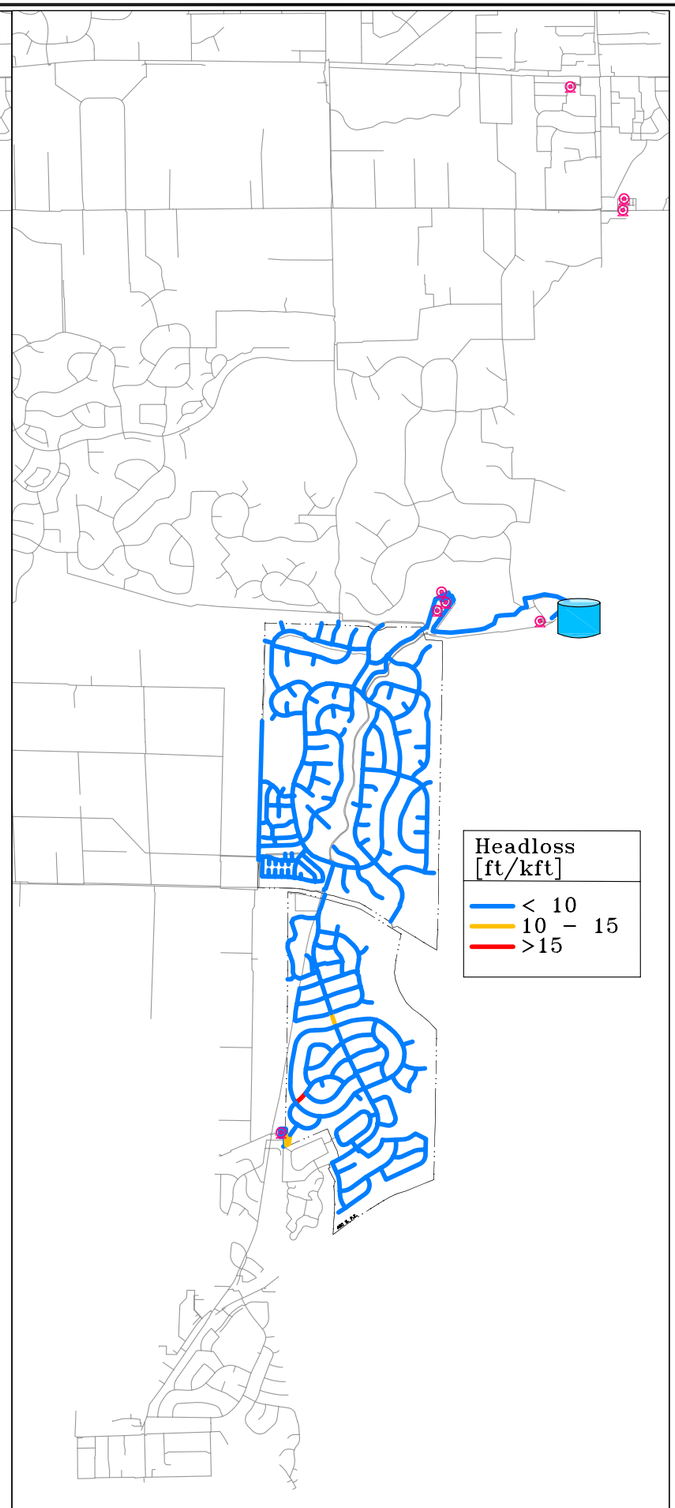


Figure 8-9
San Juan Water District
Retail Water Master Plan
2025 RETAIL SYSTEM
AMERICAN RIVER CANYON NORTH AND SOUTH PRESSURE ZONES
PEAK HOUR ANALYSIS

LEGEND:

- RESERVOIR OR TANK
- BOOSTER PUMP STATION
- PRESSURE ZONE

NOTES:

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Consulting Engineers

American River Canyon South Pressure Zone

Water Storage Capacity

Table 8-15 presents a summary of the 2025 operational, fire flow and emergency storage requirements for the ARC-South Pressure Zone.

As shown in Table 8-15, the total storage requirement is 2.07 MG in the ARC-South Pressure Zone. As recommended for the existing system in Chapter 7, it is also recommended that the 2025 storage requirement be provided from Hinkle Reservoir through reliable pumping capacity from both the ARC-South and ARC-North Pump Stations.

Table 8-15. American River Canyon South Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	0.41
Fire Flow	2,500 gpm for 2 hours	0.30
Emergency	average day demand	1.36
	Total Storage Requirement	2.07
Existing Storage Available		0.00
	Current Storage Surplus (Deficiency)	(2.07)
Emergency Supply Available	ARC-North & Hinkle Reservoir[(a)]	11.42
	Projected Storage Surplus (Deficiency)	9.35

(a) Assume the operational and fire flow storage requirements are provided by the Hinkle Reservoir.

Pumping Capacity

Table 8-16 provides a summary of the evaluation of the pump station serving the ARC-South Pressure Zone.

As shown in Table 8-16, an additional 69 gpm (0.1 mgd) of pumping capacity is required at the ARC-South Pump Station to meet the 2025 maximum day demand plus fire flow pumping requirements in the ARC-South Pressure Zone. However, with the installation of the pressure reducing station, as described in Chapter 7, between ARC-North and ARC-South Pressure Zones, this required 69 gpm could be supplied from ARC-North during these high demand periods.

Table 8-16. Evaluation of ARC-South Pump Station

Pump Station Serving Pressure Zone	ARC-South Pump Station
Firm pumping capacity	3,567 gpm[(d)]
Average day demand in pressure zone	947 gpm
Maximum day demand in pressure zone[(a)]	1,136 gpm
Fire flow demand to be met by pumping in pressure zone[(b)]	2,500 gpm
Total maximum day plus fire flow pumping requirement in pressure zone	3,636 gpm
Peak hour demand pumping requirement in pressure zone[(c)]	2,177 gpm
Reliability: At least two pumps (a lead pump and a standby pump) to use in the event of mechanical failure	Yes
Backup power provided?	Yes
Adequate capacity during maximum day demand plus fire flow?	No, additional 69 gpm required
Adequate capacity during peak hour demand?	Yes
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Maximum day demand plus fire flow
Additional capacity required (gpm)	69 gpm (0.1 mgd)[(e)]

(a) Maximum day demand equals 2.5 times average day demand.
(b) Fire flow which cannot be met from storage via gravity.
(c) Peak hour demand equals 4.0 times average day demand.
(d) Includes current capacity (3,000 gpm) plus additional capacity (567 gpm supplied from ARC-North) recommended to meet existing system needs (see Chapter 7).
(e) To be supplied by ARC-North through the previously recommended PRV between ARC-North and ARC-South Pressure Zones.

Water Distribution System

Peak Hour

Figure 8-9 presents the pressures in the ARC-South Pressure Zone during a 2025 peak hour condition, and it shows that the 2025 system does meet the minimum pressure criterion of 35 psi. Pressures range from 44 to 94 psi. Head losses were within the design criteria of 10 ft/kft and 7 fps, except for:

- The 14-inch diameter pipeline along Horn Court (head loss is 11 ft/kft);
- The 8-inch diameter pipe along Spring Water Way between Crow Canyon Drive and South Fork Way (head loss is 19 ft/kft); and
- The 8-inch diameter pipeline along American River Canyon Drive between Oak Canyon Way and Crow Canyon Drive (head loss is 14 ft/kft).

No pipeline improvements are recommended to eliminate these concerns.

Maximum Day Plus Fire Flow

Fire flows of 1,500 and 2,500 gpm were simulated, and results indicate that the 2025 system could meet the minimum residual pressure requirement of 20 psi.

Crown Point Pressure Zone

Water Storage Capacity

Table 8-17 presents a summary of the 2025 operational, fire flow and emergency storage requirements for the Crown Point Pressure Zone.

As shown in Table 8-17, the total storage requirement is 1.78 MG in the Crown Point Pressure Zone. As recommended for the existing system in Chapter 7, it is also recommended that this storage requirement be provided from the Hinkle Reservoir.

Table 8-17. Crown Point Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	0.45
Fire Flow	1,500 gpm for 2 hours	0.18
Emergency	average day demand	1.15
	Total Storage Requirement	1.78
Existing Storage Available		0.00
	Current Storage Surplus (Deficiency)	(1.78)
Emergency Supply Available	Hinkle Reservoir[(a)]	11.42
	Projected Storage Surplus (Deficiency)	9.64

(a) Based on emergency conditions assumed in Chapter 3 and available capacity from WTP.

Pumping Capacity

Table 8-18 provides a summary of the evaluation of the pump station serving the Crown Point Pressure Zone. It is assumed that the new Hinkle-Crown Point Pump Station is constructed and operational (anticipated to be online in June 2006).

As shown in Table 8-18, the Hinkle-Crown Point Pump Station is adequate to meet both the 2025 maximum day demand plus fire flow and peak hour demand pumping requirements in the Crown Point Pressure Zone.

Table 8-18. Evaluation of Crown Point Pump Station

Pump Station Serving Pressure Zone	Hinkle-Crown Point Pump Station
Firm pumping capacity[(a)]	2,880 gpm
Average day demand in pressure zone[(b)]	798 gpm
Maximum day demand in pressure zone	1,276 gpm
Fire flow demand to be met by pumping in pressure zone[(c)]	1,500 gpm
Total maximum day plus fire flow pumping requirement in pressure zone	2,776 gpm
Peak hour demand pumping requirement in pressure zone[(d)]	1,915 gpm
Reliability: At least two pumps (a lead pump and a standby pump) to use in the event of mechanical failure	Yes
Backup power provided?	Yes
Adequate capacity during maximum day demand plus fire flow?	Yes
Adequate capacity during peak hour demand?	Yes
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Maximum day demand plus fire flow
Additional capacity required (gpm)	None

(a) Based on new design pumping capacity of recently constructed Hinkle-Crown Point Pump Station received from the District on March 3, 2005.
(b) Includes demands for Beals Point and the Sidney N. Peterson Water Treatment Plant, therefore, maximum day and peak hour peaking factors do not apply.
(c) Fire flow which cannot be met from storage via gravity.
(d) Peak hour demand equals 2.4 times average day demand.

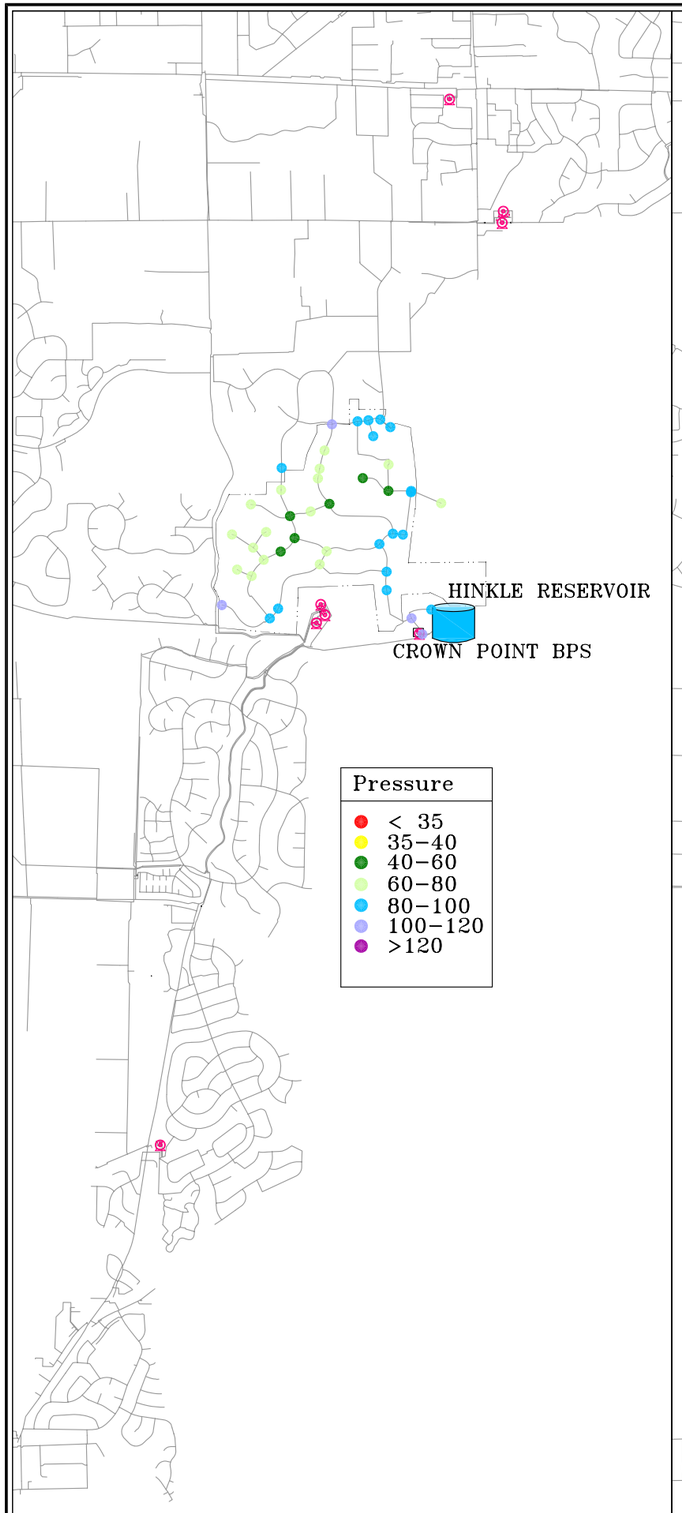
Water Distribution System

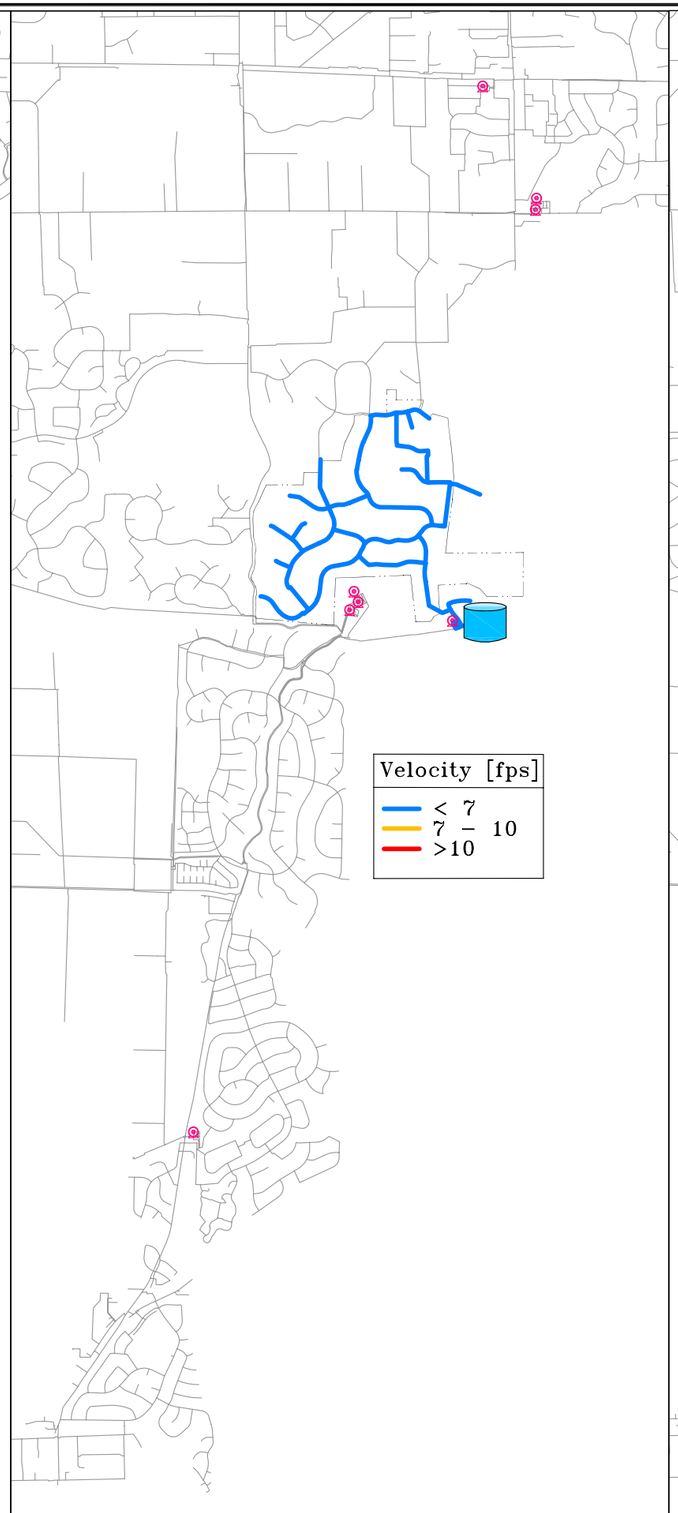
Peak Hour

Under a peak hour demand condition, the 2025 system in the Crown Point Pressure Zone is able to meet the minimum pressure of 35 psi. System pressures during peak hour range from 54 to 105 psi. There are no head loss or velocity deficiencies in this pressure zone (see Figure 8-10).

Maximum Day Plus Fire Flow

Fire flows of 1,500 gpm were simulated, and results indicate that the 2025 system could meet the minimum residual pressure requirement of 20 psi.





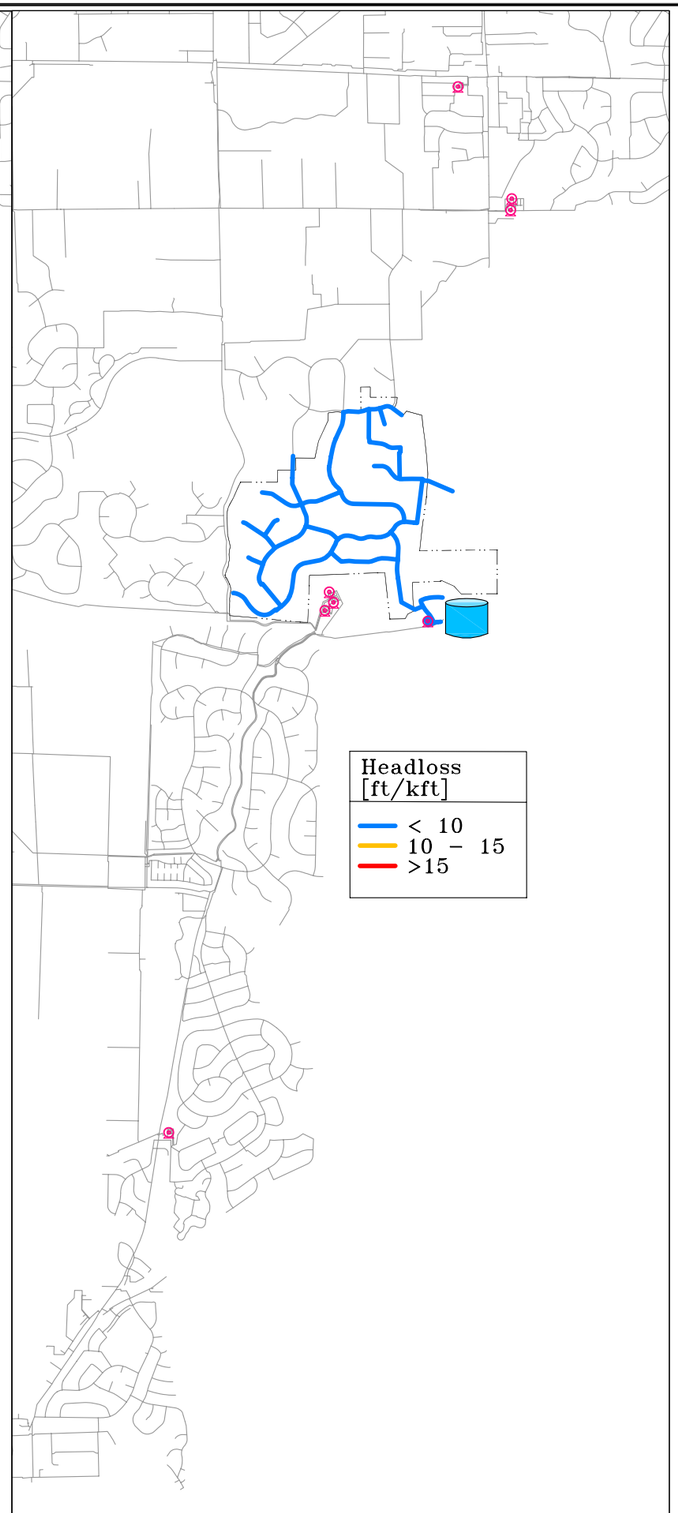


Figure 8-10

San Juan Water District
Retail Water Master Plan
2025 RETAIL SYSTEM CROWN POINT PRESSURE ZONE PEAK HOUR ANALYSIS

LEGEND:

- RESERVOIR OR TANK
- BOOSTER PUMP STATION
- PRESSURE ZONE

NOTES:

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SCALE IN FEET

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Consulting Engineers

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SUMMARY OF RECOMMENDED IMPROVEMENTS FOR BUILDOUT WATER SYSTEM

The recommended improvements needed to eliminate deficiencies identified in the analysis of the 2025 distribution systems are summarized below.

Pipelines

- Pipeline improvements to meet existing peak hour and maximum day demand plus fire flow demand conditions (pipeline locations, lengths and sizes are listed in Table 8-19). The CIP ID refers to whether the improvement for buildout demand condition was generated by fire flow (BFF) requirements or peak hour (BPH) requirements.
- Approximately 8,400 lf of new, 24-inch diameter pipeline from the new Lower Granite Bay Pump Station near the Hinkle Reservoir site along Auburn-Folsom Road to Eureka Road.

Table 8-19. Recommended Pipelines to be Upsized[(a)]

CIP ID[(b)]	Pressure Zone	Description	Diameter, inches	
			Existing	Recommended
BFF01	Bacon	Along Auburn-Folsom Road, from Country Court to Eureka Road (920 lf)	6	8
BPH03	Lower Granite Bay	From proposed pump station near Hinkle Reservoir to Auburn-Folsom Road, and along Auburn-Folsom Road to Eureka Road (8,400 lf)	NA	24

(a) See Figure 9-1 for location.
(b) BFF – Required to meet minimum buildout fire flow criteria
BPH – Required to meet minimum buildout peak hour criteria.

Pump Stations

- In addition to the recommended pump station upgrades discussed in Chapter 7, the following new or upgraded pump stations are required:
  - New Lower Granite Bay Pump Station: 6,993 gpm (10.1 mgd)
  - Expand the Upper Granite Bay Pump Station: 1,553 gpm (2.24 mgd) for a total firm capacity of 3,444 gpm (4.96 mgd)
- The additional pumping capacities, which are required at each of the pump stations to meet future needs, are summarized in Table 8-20.

Table 8-20. Recommended Pump Station Capacity Upgrades

Pump Station	Current Firm Capacity[a]	Additional Recommended Capacity to Serve Existing System[b]	Additional Recommended Capacity to Serve Future System[c]	Total Recommended Capacity Upgrades	2025 Recommended Firm Capacity[d]
ARC-North Pump Station	3,600 gpm 5.18 mgd	0 gpm 0 mgd	0 gpm 0 mgd	0 gpm 0 mgd	3,600 gpm 5.18 mgd
ARC-South Pump Station	3,000 gpm 4.32 mgd	567 gpm 0.82 mgd	0 gpm 0 mgd	0 gpm[g] 0 mgd	3,000 gpm 4.32 mgd
Bacon Pump Station	15,000 gpm 21.60 mgd	0 gpm 0 mgd	0 gpm 0 mgd	0 gpm[f] 0 mgd	15,000 gpm 21.60 mgd
Douglas	600 gpm 0.86 mgd	0 gpm 0 mgd	0 gpm 0 mgd	0 gpm 0 mgd	600 gpm 0.86 mgd
Hinkle-Crown Point Pump Station	2,880 gpm 4.15 mgd	0 gpm 0 mgd	0 gpm 0 mgd	0 gpm 0 mgd	2,880 gpm[e] 4.15 mgd
Lower Granite Bay Pump Station	3,090 gpm 4.45 mgd	0 gpm 0 mgd	2,359 gpm 3.40 mgd	3,903 gpm[h] 5.65 mgd	6,993 gpm 10.1 mgd
Upper Granite Bay Pump Station	740 gpm 1.07 mgd	1,152 gpm 1.66 mgd	1,553 gpm 2.24 mgd	2,705 gpm 3.90 mgd	3,445 gpm 4.96 mgd
Sierra Pump Station	5,250 gpm 7.56 mgd	2,122 gpm 3.06 mgd	0 gpm 0 mgd	2,122 gpm 3.06 mgd	7,372 gpm 10.62 mgd

[a] See Table 7-3.
[b] Per recommendations described in Chapter 7.
[c] Per recommendations described in Chapter 8.
[d] The 2025 capacity equals current capacity plus additional recommended capacity to serve existing system plus additional recommended capacity to serve future system.
[e] Per discussion described in Chapter 2. The current design capacity (2,880 gpm) was provided by the District and is assumed for pumping capacity evaluation in Chapters 7 and 8.
[f] The additional capacity of 94 gpm (0.14 mgd) is only a 1 percent increase in capacity. It is not recommended to upsize the Bacon Pump Station by 1 percent. It is assumed that pressures may drop slightly during a peak demand to account for this increased supply.
[g] The additional supply requirement of 567 gpm (0.82 mgd) would be met by the construction of the new pressure reducing station between ARC-North and ARC-South Pressure Zones.
[h] The additional pumping capacity required for the Lower Granite Bay Pump Station at 2025 demand condition would be met by the construction of the new 10.1 mgd Lower Granite Bay Pump Station near the Hinkle Reservoir site. This new pump station would provide either 2025 average day demands for Bacon, Upper Granite Bay and Lower Granite Bay or the maximum day demands for Upper and Lower Granite Bay plus the largest fire flow requirement in either of these two zones (3,000 gpm).

Pressure Zone Boundary

- To meet pressure requirement during peak hour condition at Peerless Avenue in the Gravity Pressure Zone, it is recommended to move the pressure zone break to the south end of Peerless Avenue.

Storage

- New, 3.0 MG Kokila Reservoir (replacement)

Miscellaneous

- Construction of a pressure reducing station at the intersection of Auburn-Folsom Road and Eureka Road. This pressure reducing station would provide up to 7 mgd during an emergency to the Bacon Pressure Zone by conveying water from the Hinkle Reservoir through the Lower Granite Bay Pressure Zone.
- Construction of a standby generator (200 KW) for ARC-South Pump Station.