Chapter 7: Evaluation of Existing Water System

Chapter Contents:

Chapter Highlights:

This chapter presents an evaluation of the District's existing retail water system and its ability to meet the District's recommended performance and planning criteria under existing demand conditions.
The evaluation was conducted using the updated hydraulic model.
The recommended improvements needed to eliminate deficiencies identified in the analysis of the existing 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 7-19.

Pump Stations

- New Upper Granite Bay Pump Station: 1,892 gpm (2.72 mgd).
- New standby generator:
  - Bacon Pump Station
  - Sierra and ARC-North Pump Station (separate from Bacon)

Storage

- New 2.6 MG Joint Water Storage Facility.

Miscellaneous

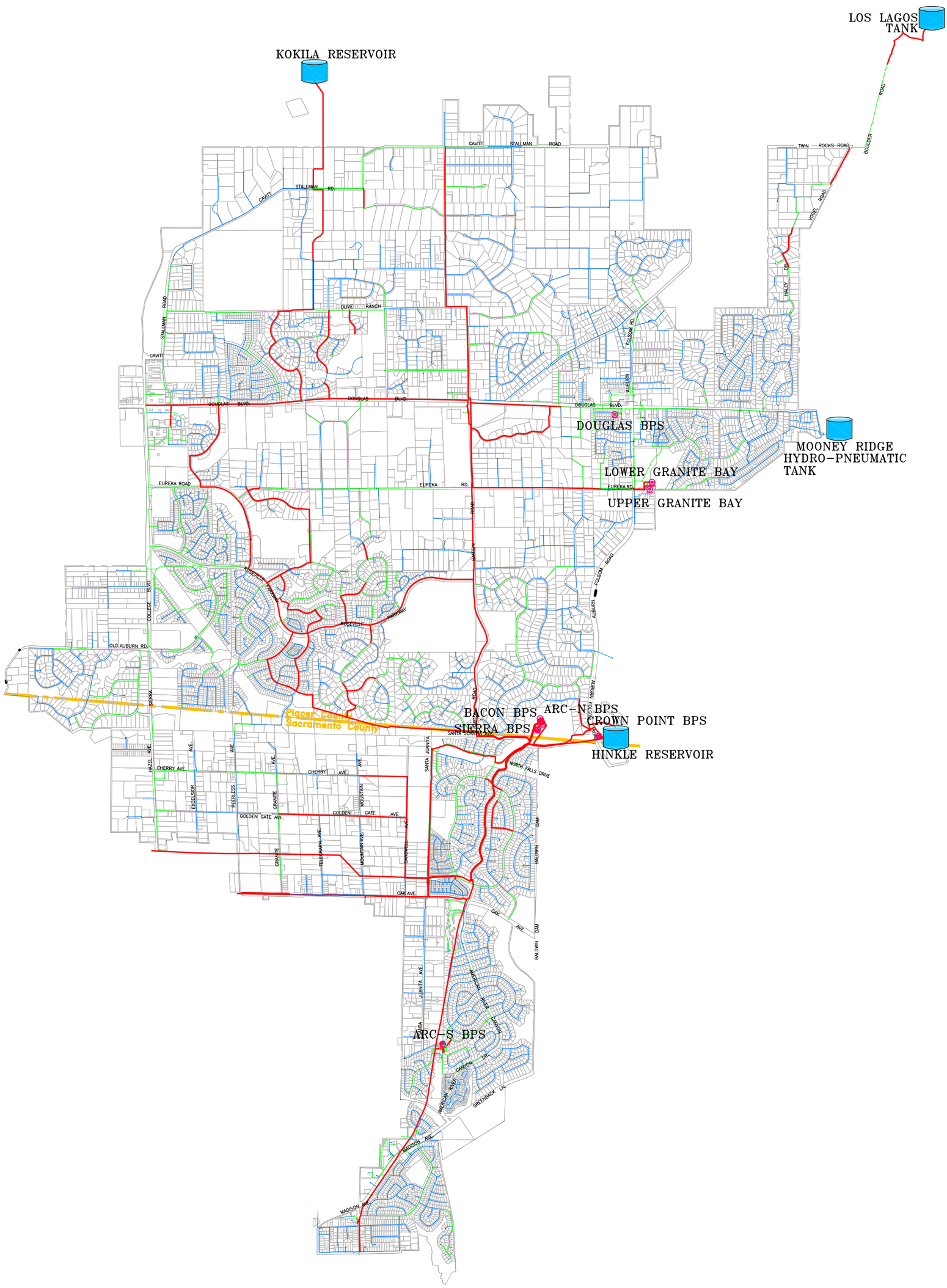
- Electrical improvements (Bacon Pump Station).
- New ARC-North to ARC-South pressure reducing station.
- New emergency intertie from the PCWA water system into the Kokila Reservoir.
- Replacement of existing pumps (4) and upgrades to electrical system at the Sierra Pump Station.
- New meter station on gravity line leaving Hinkle Reservoir.

CHAPTER 7. EVALUATION OF EXISTING WATER SYSTEM

This chapter presents the results of the evaluation of the District's existing retail water system (see Figure 7-1) to meet the recommended performance and planning criteria under existing demand conditions. As discussed in Chapter 3, pressure will be the primary performance criteria used to evaluate renewal or replacement of distribution and transmission facilities. The head loss and velocity criteria will be used as indicators where system improvements may be needed. 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 demands and maximum day plus fire flow demands. The evaluation was conducted using the updated hydraulic model (described in Chapter 6). The evaluations, findings and recommendations for addressing the identified existing water system deficiencies are organized by pressure zone. A description of the recommended Capital Improvement Program (CIP) to implement the recommended improvements, including an estimate of probable construction costs, is provided in Chapter 9.

EXISTING RETAIL WATER DEMANDS

The existing retail water demands for the District were estimated based on the actual 2004 pump flow data from the District's SCADA system, as described in Chapter 5. This data was used to estimate existing 2004 demands, because it represents the most accurate estimate available by pressure zone. Table 7-1 summarizes the existing demands by each of the District's pressure zones.



LEGEND

- RESERVOIR OR TANK
- BOOSTER PUMP STATION
- RETAIL SERVICE AREA LIMITS
- DISTRIBUTION PIPELINE (8" AND SMALLER)
- DISTRIBUTION PIPELINE (10' TO 12')
- DISTRIBUTION PIPELINE (14" AND GREATER)

N

0 1500 3000

SCALE IN FEET

Figure 7-1

San Juan Water District
Retail Water Master Plan
EXISTING RETAIL WATER DISTRIBUTION SYSTEM

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Table 7-1. Existing Retail Water Demand for San Juan Water District (2004)

Pressure Zone	Demand [mgd][a]		
	Average Day	Maximum Day[b]	Peak Hour[c]
Bacon	5.41	10.83	16.78
Upper Granite Bay	0.51	1.28	1.95
Lower Granite Bay	2.06	3.70	5.55
Subtotal	**7.98**	**15.81**	**24.28**
American River Canyon North (ARC-North)	1.18	1.78	3.67
American River Canyon South (ARC-South)	1.28	1.54	2.95
Crown Point[d]	1.13	1.81	2.68
Gravity	2.37	5.91	9.46
Sierra	2.65	5.04	10.61
Subtotal	**8.61**	**16.08**	**29.37**
Total	**16.59**	**31.89**	**53.65**

(a) Data based on 2004 SCADA Information provided by the District.
(b) Maximum day demand based on peaking factors for the District's retail service area presented in Table 5-5.
(c) Peak hour demand based on peaking factors for the District's retail service area 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.

EXISTING SYSTEM EVALUATION METHODOLOGY

Water Storage Capacity Evaluation

The existing storage facilities were evaluated to determine whether they have 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.

This results in a total retail storage requirement of 27.2 MG (8.0 MG operational, 16.6 emergency, and 2.6 fire flow).

As presented in Table 7-2, the total storage capacity available for the District's retail water system is 17.7 MG.

Table 7-2. Existing Treated Water Storage Facilities

Storage Facility	Pressure Zone Served	Total Capacity, MG	Capacity Available for Retail System, MG
Hinkle Reservoir	Gravity	62[(a)]	11.42[(b)]
Kokila Reservoir	Bacon	4.56	4.56
Los Lagos Tank	Lower Granite Bay	1.65	1.65
Mooney Ridge Hydropneumatic Tank	Upper Granite Bay	0.05	0.05
Total Capacity		**68.3**	**17.7**

(a) Useable storage capacity is approximately 42.3 MG.

(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.

As shown, the 62 MG nominal storage volume of the Hinkle Reservoir is shared between the District's retail and wholesale customers. As presented in Chapter 5, the historical production of the retail service area makes up, on average, 27 percent of the District's total production. Thus, 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 is 17.7 MG, as shown on Table 7-2. Discussion of storage capacity by pressure zone is provided below. In addition to the storage capacity available from the Hinkle Reservoir, the Emergency Storage Criteria in Chapter 3 states that supply reliability and redundancy will be provided at the District's WTP. It is assumed that 100 percent of maximum day supply for up to 12 hours (approximately an average day demand or 16.6 MG), and 50 percent of average day supply for an extended outage will be available from the Hinkle Reservoir. This results in an overall retail distribution system storage requirement of 10.6 MG (total storage requirement – reliable supply from the WTP [27.2 - 16.6 MG = 10.6 MG]). As presented in Table 7-2, this is below the capacity available to the retail system (17.7 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 duty 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.

A summary of the District's existing pumping facilities is shown in Table 2-5. Table 7-3 provides a summary of the capacity requirements for each of the pump stations based on the evaluation criteria. Discussion of each pump station is provided below based on the pressure zone which the pump station serves.

Table 7-3. Summary of Capacity Requirements of Existing Pumping Facilities

Pump Station	Service Area	Firm Capacity (gpm, TDH)	Existing Average Day Demand, gpm[a]	Existing Maximum Day Demand, gpm[b] [c]	Max Day Plus Fire Flow Demand, gpm	Existing Peak Hour Demand, gpm[b] [d]	Storage Supply	Existing Backup Power	Additional Pumping Capacity Required Based on Max Day plus Fire Flow,[n] gpm	Required Additional Capacity Based on Peak Hour,[n] gpm	Required Additional Capacity,[n] gpm
ARC North [h]	ARC North	3,600 , 175	823	1,234	2,734	2,550	None	YES	-	-	-
ARC South [h,i]	ARC South	3,000 , 115	889	1,067	3,567	2,045	None	YES [e]	567	-	567
Bacon	Bacon	15,000 , 170	5,544	10,980	13,980	16,864	Kokila Reservoir	YES	-	1,864	0[l]
Hinkle-Crown Point [h,j]	Crown Point	2,880 , 250	781 [f]	1,257	2,257	1,861	None	YES	-	-	-
Douglas [g]	Lower GB	600 , 160	-	-		-	None	NO	- [g]	- [g]	- [g]
Lower Granite Bay [i]	Lower GB	3,690 , 160 [k]	1,428	2,571	5,571	3,856	Los Lagos Reservoir	YES	1,881	166	0[m]
Upper Granite Bay [i]	Upper GB	740 , 190	357	892	1,892	1,356	None	YES	1,152	616	1,152
Sierra [h]	Sierra	5,250 , 45	1,843	3,501	6,501	7,370	None	YES	1,251	2120	2,120

[a] Based on pump station delivery data received from the District.

[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 factors established in Table 5-5.

[d] Peak hour demand based on average day to peak hour peaking factors established in Table 5-5.

[e] Portable generator on-site.

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

[g] Douglas Pump Station is designated to supply Lower Granite Bay Pressure Zone and is typically only used to meet summertime demand.

[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] Pump Station has recently been designed and constructed at a larger capacity (4 pumps with total capacity of 2,880 gpm at 100 brake horsepower).

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

[l] See Table 7-6, additional capacity is assumed to be met from Kokila Reservoir.

[m] See Table 7-8, additional capacity is assumed to be met from Los Lagos Tank.

[n] This additional pump capacity does not account for the existing pumps operating lower on their pump curves at a lower TDH. This additional capacity could be reduced based on the analysis performed in the sections that follow this Table.

Water Distribution System Evaluation

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

- Peak Hour Demand. The peak hour flow condition that occurred in 2004 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 existing 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 utilized 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 7-1, the District's existing retail service area total peak hour demand was calculated to be 53.7 mgd. As discussed in Chapter 3, a minimum pressure of 35 psi must be maintained throughout the system during a peak hour demand condition. 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 focused on two simulation runs. The first simulation run 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. The second run included an extended period simulation to maximize "turnover" of the Kokila Reservoir and the Los Lagos Tank.

Fire flow demands were simulated for each node in the model to determine whether or not the minimum residual pressure criterion of 20 psi could be met during a maximum day demand. Fire flows by land use type were obtained using the recommendations described in Chapter 3. However, since most of the existing system was constructed under lesser fire flow standards than the 2001 CFC, the existing system was evaluated on its ability to supply 1,000 gpm for 2 hours during a maximum day demand for all land use types, except for schools. For schools, a fire flow demand of 3,000 gpm for 3 hours was used to evaluate the system. Pressures, head losses, and velocities are not mapped as they were in the peak hour scenarios, but rather the locations failing to meet the criteria are described in the text below.

As described in Chapter 3, a minimum pressure of 20 psi must be met at the fire node during a maximum day plus fire flow scenario. Maximum head loss through distribution mains should not exceed 10 ft/kft and maximum velocities should not exceed 10 fps.

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 7-4 presents a summary of the operational, fire flow and emergency storage requirements for the Gravity Pressure Zone.

There is not a dedicated storage tank supplying the Gravity Pressure Zone. The Gravity Pressure Zone maintains its operational, fire flow and emergency storage in the Hinkle Reservoir. As shown in Table 7-4, with the 11.4 MG available from Hinkle Reservoir to the District's Retail System, adequate storage is available to meet the operational, fire flow and emergency storage needs within the Gravity Pressure Zone. In addition, there are two emergency interties with the Citrus Heights Water District (Table 4-1), capable of providing localized emergency supply (up to 2.7 MG each) to the Gravity Pressure Zone, if needed.

Table 7-4. Gravity Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	1.48
Fire Flow	3,000 gpm for 3 hours	0.54
Emergency[(a)]	average day demand	2.37
	Total Storage Requirement	4.39
Existing Storage Available	Hinkle Reservoir	11.42[(b)]
	Current Storage Surplus (Deficiency)	7.03

(a) Emergency storage based on assumptions in Chapter 3.

(b) Based on the assumption that the total capacity of the Hinkle Reservoir dedicated to the Retail System (11.42 MG) is available for the Gravity Pressure Zone use.

Pumping Capacity

As the name implies, the Gravity Pressure Zone is served by gravity. Therefore, no pump stations are required to serve this pressure zone

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. 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, 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 northeast area of the Gravity Pressure Zone could not meet the minimum pressure of 35 psi (see Figure 7-2). The system pressures in the Gravity Pressure Zone range from 34 to 84 psi. As illustrated on Figure 7-2, pressure during peak hour in the area near Mountain Avenue is 34 psi. Although a Pressure Sustaining Station (PSS) located at Canyon Falls Road (near Mountain Avenue) was evaluated to increase system pressure at Mountain Avenue, it appears that adjusting the PSS pressure setpoint could not increase the system pressure at Mountain Avenue. However, because the pressure is within 1 psi of the 35 psi criteria, no improvements are recommended.

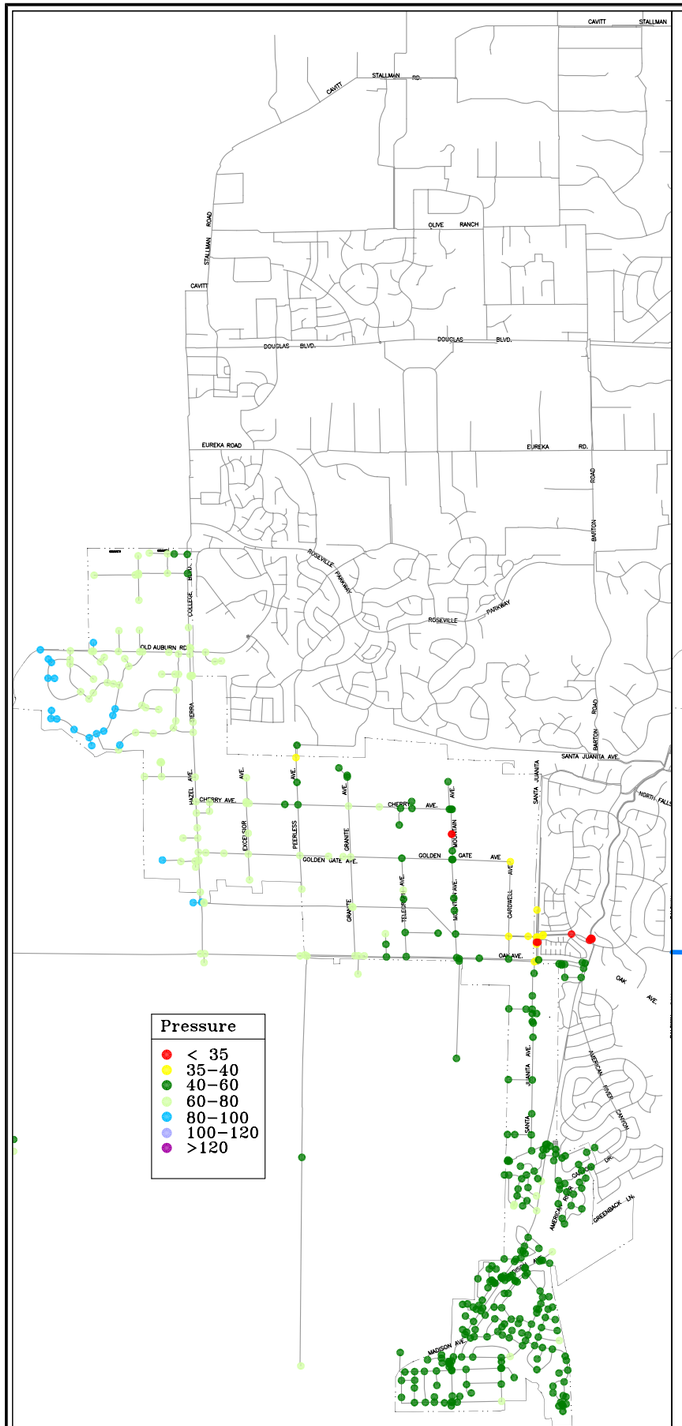
Results also indicate that all pipelines in the Gravity Pressure Zone meet the head loss and velocity criteria as shown on Figure 7-2.

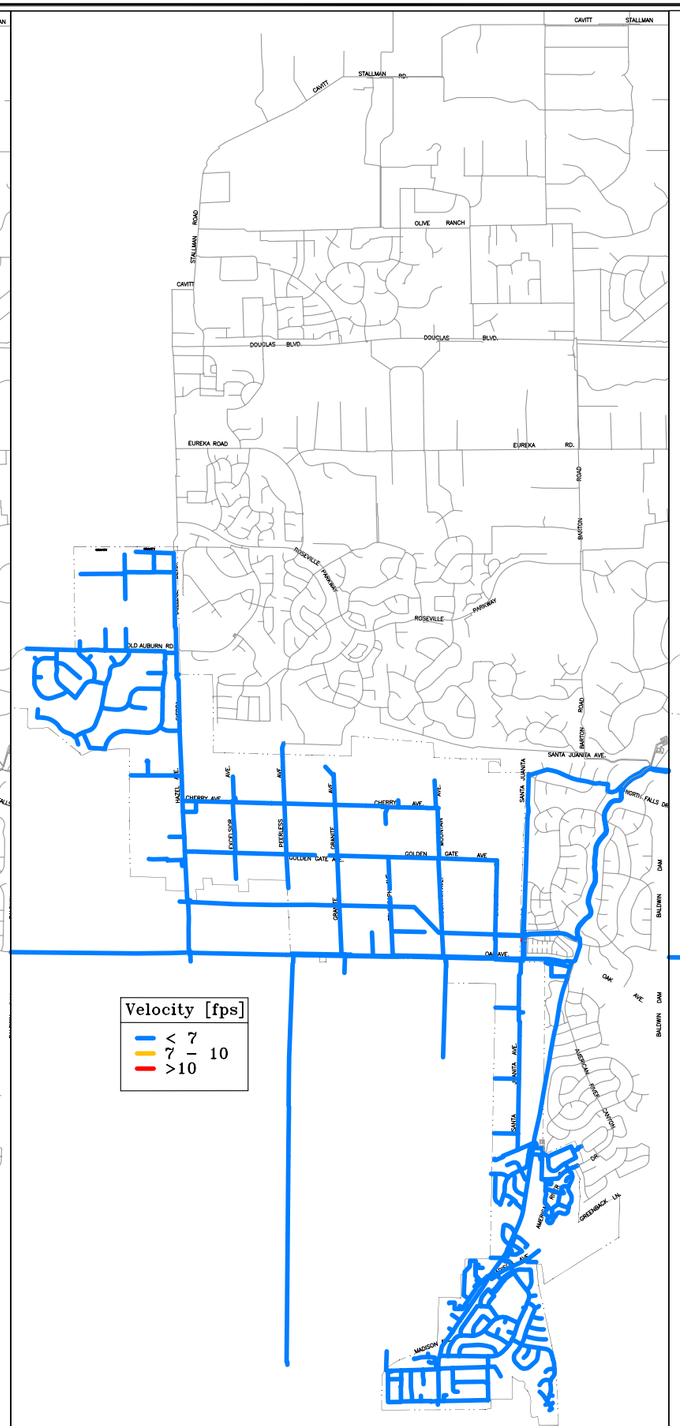
Maximum Day Plus Fire Flow

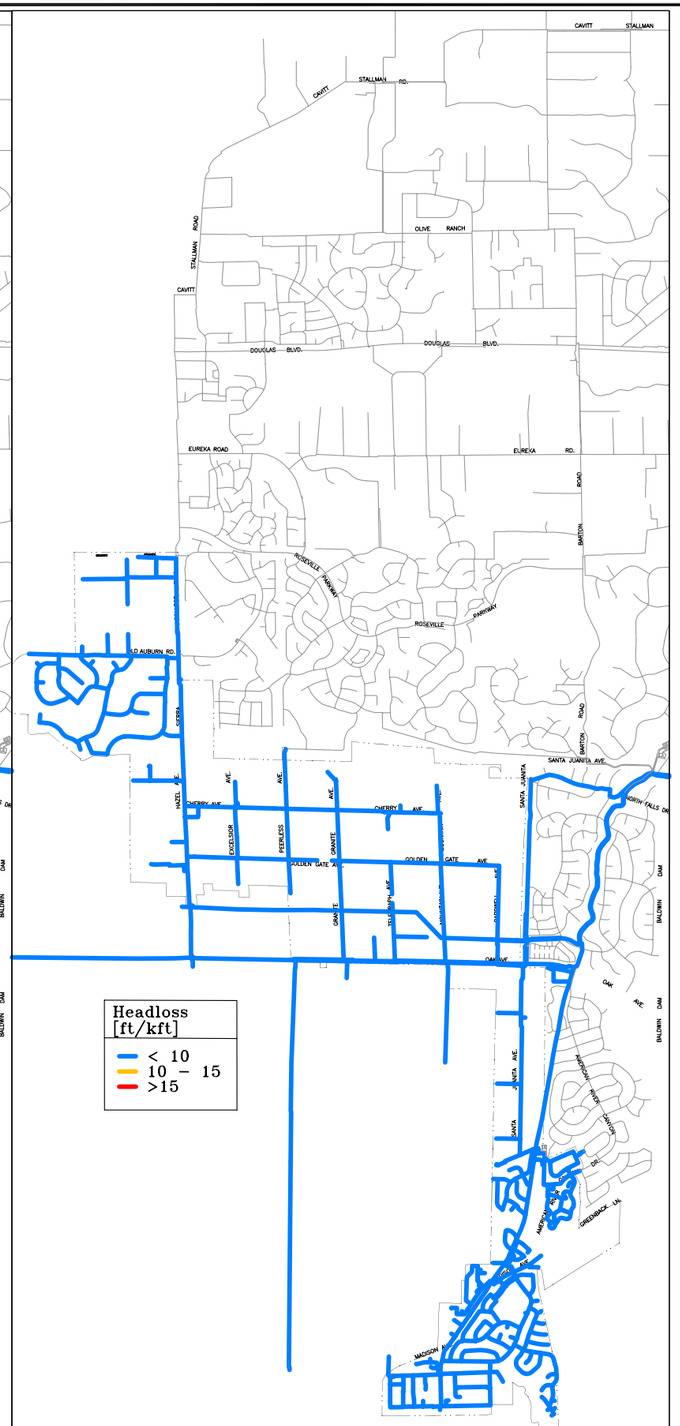
Available fire flow at a residual pressure of 20 psi was simulated in the Gravity system. Results indicate that the Gravity system can maintain a minimum residential fire flow requirement of 1,000 gpm at single hydrant or a total of 1,000 gpm fire flow demand at two adjacent hydrants (500 gpm at each hydrant). Results also indicate that the existing Gravity system can meet the existing fire flow requirement of 3,000 gpm for schools in the pressure zone. It should be noted that there are areas for which the 2001 CFC would require a higher fire flow, however, since most of the Gravity system was constructed over 20 years ago, only new development in this area will be held to the 2001 CFC fire flow requirements.

Figure 7-2

San Juan Water District
Retail Water Master Plan
EXISTING RETAIL SYSTEM GRAVITY 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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Bacon Pressure Zone

Water Storage Capacity

Table 7-5 presents a summary of the operational, fire flow and emergency storage requirements for the Bacon Pressure Zone.

There is currently one dedicated storage facility supplying the Bacon Pressure Zone, the Kokila Reservoir. Although the total capacity of the Kokila Reservoir is 4.56 MG, the base elevation of the reservoir is too low and does not allow all of this storage to be used while maintaining adequate pressures. Therefore, the usable volume of Kokila Reservoir, during emergency conditions when Bacon Pump Station is out of service, is 1.77 MG. As shown in Table 7-5, with only the Kokila Reservoir serving the Bacon Pressure Zone, there is a storage deficiency of 6.47 MG. Per discussions with the District, the emergency storage required for the Bacon Pressure Zone can be provided by the Hinkle Reservoir. The steps the District is currently implementing to increase the redundancy/reliability of the District's water treatment plant (see Chapter 3) will result in the ability to use the retail storage at the District's Hinkle Reservoir (11.42 MG) as a reliable emergency supply source. For added redundancy to the Bacon supply, we also recommend constructing an emergency intertie into the Kokila Reservoir from Placer County Water System (PCWA). This will require approximately 1,500 feet of 12-inch diameter main and a pressure sustaining station. It is anticipated that the District could receive up to 2.0 mgd through this connection. No additional storage for the Bacon Pressure Zone is required at this time.

Table 7-5. Bacon Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	2.71
Fire Flow	3,000 gpm for 3 hours	0.54
Emergency[(a)]	average day demand	5.41
	Total Storage Requirement	8.66
Existing Storage Available	Kokila Reservoir	1.77[(b)]
	Current Storage Surplus (Deficiency)	(6.89)
Emergency Supply Available	Hinkle Reservoir	11.42
	Projected Storage Surplus (Deficiency)	4.53

(a) Emergency storage based on criteria in Chapter 3.

(b) Although the total capacity of the Kokila Reservoir is 4.56 MG, the base elevation of the reservoir is too low and does not allow all of this storage to be used. Therefore, the usable volume of Kokila Reservoir, during emergency conditions when Bacon Pump Station is out of service, is 1.77 MG. At this volume, minimum system pressure of 10 psi could be maintained in the highest area of the Bacon Pressure Zone.

Pumping Capacity

Table 7-6 provides a summary of the evaluation of the pump station serving the Bacon Pressure Zone. In discussions with District operational staff, it is not currently possible to run all five pumps at the Bacon Pump Station simultaneously, due to electrical constraints. The District is currently working with the Sacramento Municipal Utility District to obtain a new 1,000/1,500 kVA transformer. Once installed and with some additional electrical work at the pump station, the District should be able to pump all five pumps simultaneously. However, operating all five pumps at the Bacon Pump Station is not consistent with the District "Firm Capacity" policy. This would be an interim operation until more of the operational storage can be utilized from Kokila Reservoir. Since this is an ongoing project and the scope and budget have not been developed; an assumed cost of $152,000 (includes contingency and other project costs) is included in the existing system CIP (Chapter 9) for budgetary purposes.

Table 7-6. Summary of Bacon Pressure Zone Pumping Capacity[a]

Pump Station(s) Serving Pressure Zone	Bacon Pump Station
Firm pumping capacity	15,000 gpm
Average day demand in pressure zone	5,544 gpm
Maximum day demand in pressure zone	10,980 gpm
Fire flow demand to be met by gravity in pressure zone	1,828 gpm
Total maximum day plus fire flow pumping requirement in pressure zone	12,152 gpm[b]
Peak hour demand pumping requirement in pressure zone	14,272 gpm[c]
Reliability: At least two pumps (1 duty pump and 1 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?	Yes[c]
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Peak hour demand
Additional capacity required (gpm)	No

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

(b) This number represents the pumping requirement for the Bacon Pump Station during a maximum day demand plus fire flow. Per Table 7-3, the maximum day plus fire flow demand is 13,980 gpm (10,980 maximum day demand plus 3,000 gpm fire flow). Fire flow demand of 1,828 gpm will be supplied by gravity from the Kokila Reservoir which leaves 12,152 gpm (13,980 – 1,828 gpm) to be supplied by the Bacon Pump Station.

(c) The District's hydraulic model indicates that approximately 2,234 gpm can be supplied from Kokila Reservoir during a peak hour demand condition. Per Table 7-3, the peak hour demand for the Bacon Pressure Zone is 16,864 gpm. Therefore, this would require approximately 14,630 gpm (16,864 gpm – 2,234 gpm (Kokila)) from the Bacon Pump Station, which is still within the available firm capacity of 15,000 gpm.

Water Distribution System

Peak Hour

Results indicate that the existing water system in the Bacon Pressure Zone is not able to meet the peak hour demand at the minimum pressure criterion of 35 psi. The system pressures in the Bacon Pressure Zone range from 30 to 114 psi during peak hour. The low pressures, as illustrated on

Figure 7-3, were observed near the intersection of Auburn-Folsom Road and Eureka Road, close to the suction side of the Lower Granite Bay and Upper Granite Bay Pump Stations.

Figure 7-3 also shows that a majority of the pipelines meet the 10 ft/kft maximum head loss, however, there are two pipelines in the Bacon Pressure Zone that were greater than 10 ft/kft:

- The 16-inch diameter pipelines along Eureka Road which are located east of Barton Road and east of Palomino Court (14 and 15 ft/kft).
- The 10-inch diameter pipeline along Palomino Court to Arabian Circle (11 ft/kft).

All velocities were less than 7 fps.

To increase the low pressures in the Eureka Road and Auburn-Folsom Road area, the construction of a new 18-inch diameter pipeline along Eureka Road (from Barton Road to east of Palomino Court) is required. This new pipeline is also required to replace the aged, existing 16-inch diameter steel pipeline which currently experiences high head loss. This new pipeline will assist in conveying water to the Lower Granite Bay and Upper Granite Bay Pump Stations.

The feasibility of constructing a new pump station to provide increased pressure to the Bacon Pressure Zone, and to add some needed redundancy to the District's largest pressure zone was also evaluated. Since it is not economically feasible to construct a fully redundant pump station, its is recommended that a new pump station that is capable of providing average day demands for the Bacon, Lower and Upper Granite Bay Pressure Zones be constructed. This pump station would provide approximately 8 mgd or 5,500 gpm. There are two feasible sites which could potentially be used to provide some redundancy to the Bacon Pressure Zone if, for any reason, the Bacon Pump Station is out of service for maintenance or repair.

The first site is located at the City of Roseville Water Treatment Plant (WTP) along Barton Road, and the second site is located near the Hinkle Reservoir site. The evaluation of each site is presented below:

- Option 1: New pump station at the City of Roseville WTP. Three 3,000 gpm pumps (2-duty, 1-standby) were modeled and simulated for a peak hour demand condition. These pumps were connected to the existing 33-inch diameter pipeline along Barton Road. This option requires the District to reroute the current Bacon Pump Station flow to the east and then north. A new 18-inch diameter pipeline would need to be constructed from the discharge side of the existing Bacon Pump Station to Auburn-Folsom Road (approximately 2,160 feet), and along Auburn-Folsom Road to Eureka Road (approximately 8,320 feet).
- Option 2: New pump station at the Hinkle Reservoir site. Three 3,000 gpm pumps (2-duty, 1-standby) were simulated for a peak hour demand condition. A new 24-inch pipeline along Auburn-Folsom Road (as required for Option 1) would need to be constructed along Auburn-Folsom Road from west of the Hinkle-Crown Point Pump Station to Eureka Road (approximately 8,320 feet)

KOKILA RESERVOIR

BACON BPS

HINKLE RESERVOIR

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 7-3

San Juan Water District
Retail Water Master Plan
EXISTING RETAIL SYSTEM
BACON 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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Results indicate that either of these new facilities, as described in Options 1 and 2, could provide a minimum pressure of 35 psi during average day demand in the District's Bacon Pressure Zone. The estimated costs (include contingencies, see Chapter 9) for each alternative are provided below:

- New 18-inch diameter pipeline along Eureka Road and electrical fixes to Bacon Pump Station: $1,593,000
- Option 1: Includes 8,320 ft of 18-inch diameter pipeline up Auburn-Folsom Road, new pump station at City of Roseville WTP: $7,324,000
- Option 2: Includes 8,230 ft of 24-inch diameter pipeline up Auburn-Folsom Road, new pump station at Hinkle Reservoir Site: $6,856,000

After discussions with District staff, it was decided to move forward with Option 2 and the new, 18-inch diameter pipeline along Eureka Road; therefore, Option 2 and the Eureka pipeline will be included in the District's CIP. In addition, the District has combined the Option 2 recommendation with the requirement of a new Lower Granite Bay Pump Station in the future. This combined facility will be discussed further in Chapter 8.

Maximum Day Plus Fire Flow

Under the maximum day plus fire flow demand condition, available fire flow at a residual pressure of 20 psi was simulated in the Bacon system. Results indicate that the Bacon system can maintain a minimum residential fire flow requirement of 1,000 gpm at a single hydrant or a total of 1,000 gpm fire flow demand at two adjacent hydrants (500 gpm at each hydrant). Results also indicate that the existing Bacon system can meet the existing fire flow requirement for schools of a 3,000 gpm in the pressure zone. It should be noted that there are areas for which the 2001 CFC would require a higher fire flow, however, since most of the Bacon system was constructed under lesser fire flow standards, only new development in this area will be held to the 2001 CFC fire flow requirements.

Lower Granite Bay Pressure Zone

Water Storage Capacity

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

There is currently one dedicated storage facility supplying the Lower Granite Bay Pressure Zone, the 1.65 MG Los Lagos Tank. However, just like the Kokila Reservoir, not all of the 1.65 MG is usable storage. The entire volume of the Los Lagos Tank could be utilized during emergency conditions if the 16-inch diameter pipeline along Twin Rocks Road, and along Cavitt-Stallman Road (connected to Turner Drive and Sierra Ponds Lane), and the 12-inch diameter pipeline along Cavitt-Stallman Road, from Sierra Ponds Lane to Oak Pine Lane, are constructed, as recommended in the water distribution system section. As shown in Table 7-7, if the recommended improvements are made, the 1.65 MG Los Lagos Tank serving the Lower Granite Bay Pressure Zone is capable of meeting the operational storage requirement within the Lower Granite Bay Pressure Zone. The emergency interties with the Placer County Water Agency (estimated to provide between 2.7 and 4.7 MG) and the storage available from the Hinkle Reservoir (11.42 MG), is capable of providing emergency supply to the Lower Granite Bay Pressure Zone.

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

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	0.93
Fire Flow	3,000 gpm for 3 hours	0.0[(a)]
Emergency	average day desmand	2.06
	Total Storage Requirement	2.99
Existing Storage Available	Los Lagos Tank	1.65[(b)]
	Current Storage Surplus (Deficiency)	(1.34)
Emergency Supply Available	Hinkle Reservoir and PCWA[(c)]	16.12
	Projected Storage Surplus (Deficiency)	14.78

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

(b) The entire volume of the Los Lagos Tank could be utilized during emergency conditions, if the 16-inch diameter pipeline along Twin Rocks Road and along Cavitt-Stallman Road (connected to Turner Drive and Sierra Ponds Lane), and the 12-inch diameter pipeline along Cavitt-Stallman Road, from Sierra Ponds Lane to Oak Pine Lane, are constructed, as recommended in the water distribution system section.

(c) Total potential emergency supply available is 11.42 MG from Hinkle Reservoir plus 4.7 MG from PCWA, or 16.12 MG.

Pumping Capacity

Table 7-8 provides a summary of the evaluation of the pump station(s) serving the Lower Granite Bay Pressure Zone.

As shown in Table 7-8, the Lower Granite Bay Pump Station is not adequate to meet the existing maximum day plus fire flow and peak hour demand pumping requirements within the Lower Granite Bay Pressure Zone, without the use of the Douglas Pump Station.

Table 7-8. Summary of Lower Granite Bay Pressure Zone Pumping Capacity

Pump Station(s) Serving Pressure Zone	Lower Granite Bay Pump Station	Douglas Pump Station[a]
Firm pumping capacity	3,090 gpm	600 gpm
Average day demand in pressure zone	1,428 gpm	
Maximum day demand in pressure zone	2,571 gpm	
Fire flow demand to be met by pumping in pressure zone[c]	1,103 gpm	
Total maximum day plus fire flow pumping requirement in pressure zone	3,673 gpm[c]	
Peak hour demand pumping requirement in pressure zone	2,873 gpm[d]	
Reliability: At least two pumps (1 lead pump and 1 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?	Yes	
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)	None	

(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) Fire flow which cannot be met from storage via gravity delivered from Bacon Pressure Zone through the Lower Granite Bay/Douglas Pump Station.

(c) Per Table 7-3, the Lower Granite Bay Pump Station is required to pump 37 percent of the needed fire flow (1,103 gpm) and maximum day demand (2,571 gpm) because a portion of the fire flow storage for the pressure zone is located in the Kokila reservoir.

(d) The results from the District's hydraulic model indicate that approximately 988 gpm can be supplied from the Los Lagos Tank during a peak hour demand condition. Per Table 7-3, this would require that approximately 2,868 gpm (3,856 gpm – 988 gpm (Los Lagos)) from the Lower Granite Bay Pump Station which is within the available firm capacity of 3,090 gpm.

Water Distribution System

Peak Hour

The existing distribution system in the Lower Granite Bay Pressure Zone is not able to meet the minimum criterion of 35 psi during a peak hour demand. System pressures in Lower Granite Bay Pressure Zone range from 32 to 100 psi. As illustrated on Figure 7-4, the area located south of the Los Lagos Tank has pressure less than 35 psi. Because there are no customer connections at this location, no improvements are recommended to increase pressure from 32 to 35 psi. Excessive head losses were observed in the pipes located downstream of the Lower Granite Bay Pump Station (head losses range from 11 to 22 ft/kft) (see Figure 7-4).

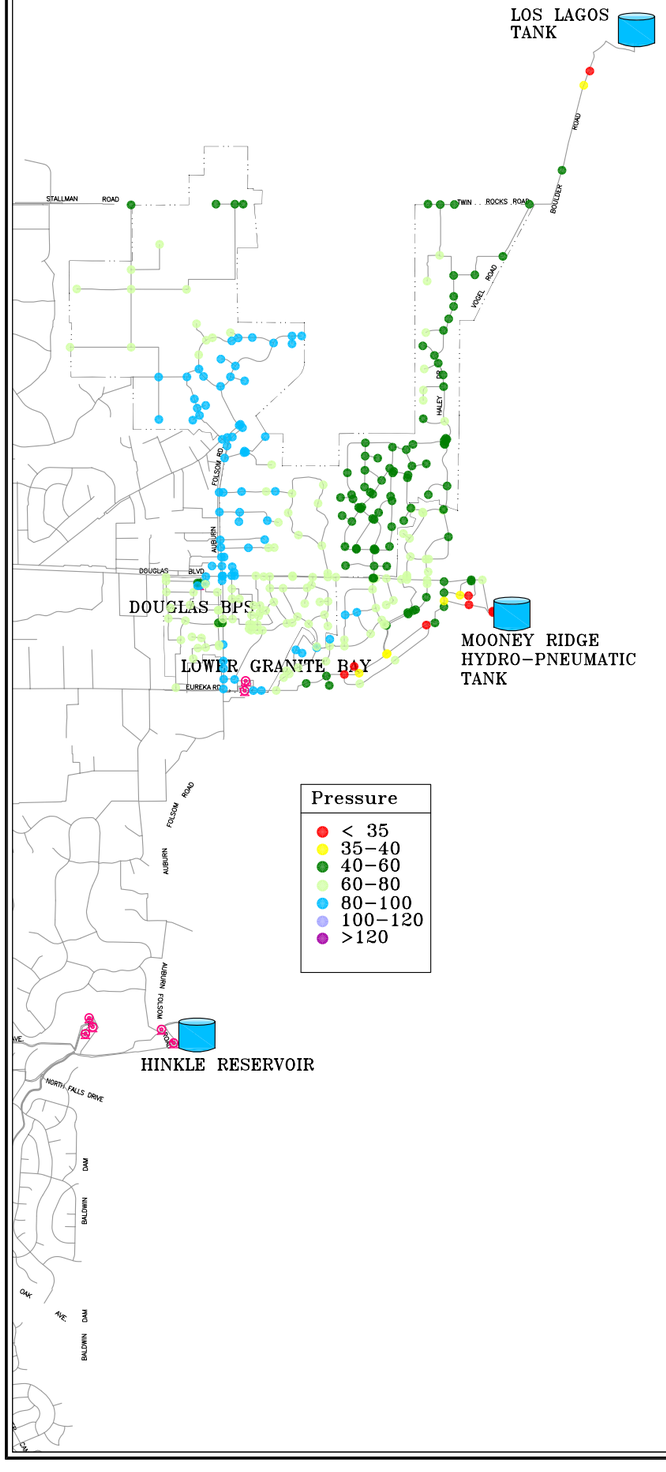
Also shown on Figure 7-4, the majority of velocities in the pipelines are less than the maximum criterion of 7 fps, except for the pipeline located along Auburn-Folsom Road, and Eureka Road (downstream of the Lower Granite Bay Pump Station). Velocities in this pipeline are 9 fps.

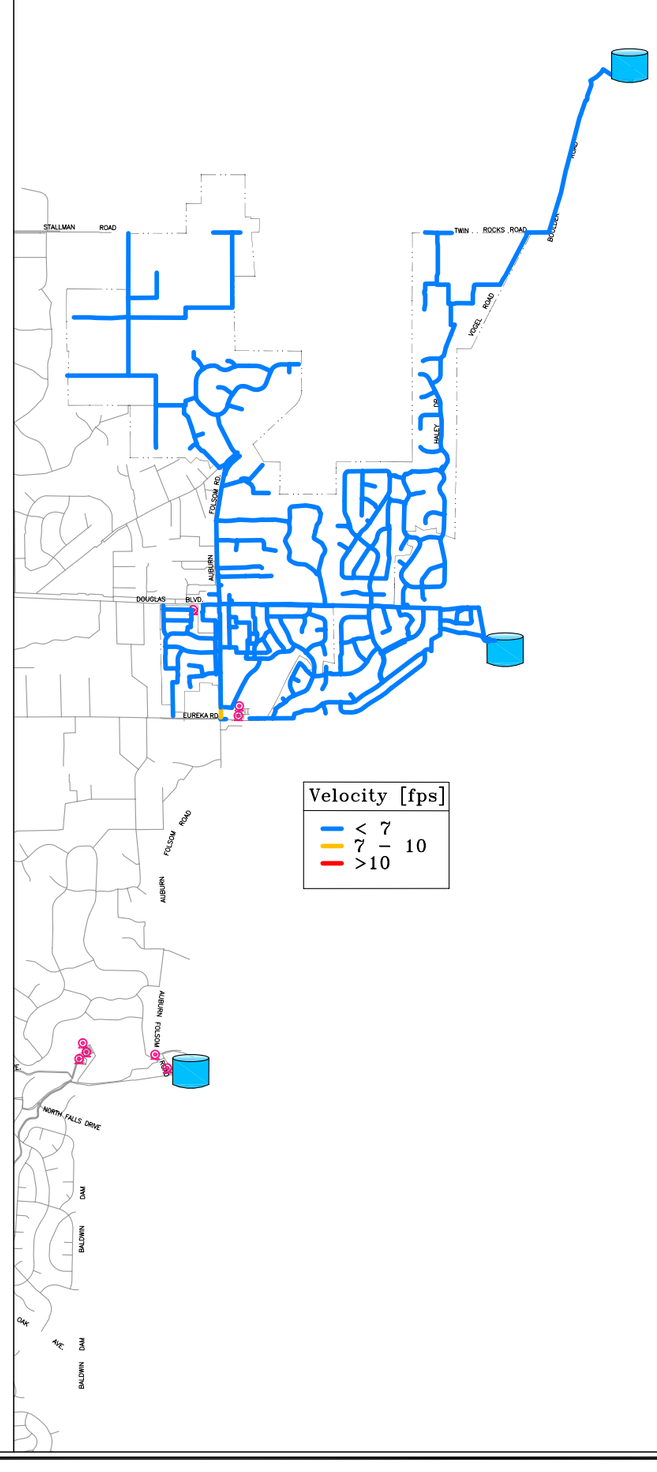
Although high head losses and velocities are observed in the pipelines downstream of the Lower Granite Pump Station, the Lower Granite Bay system pressures during peak hour are above the required minimum pressure. Therefore, no improvements are recommended.

The operation of the Los Lagos Tank was also evaluated. Similar to the Kokila Reservoir, the District has not been able to maximize the turnover in the operational storage of the Los Lagos Tank. Results indicate that construction of a 16-inch diameter pipeline along Twin Rocks Road (connected to Cavitt-Stallman Road) and a 12-inch diameter pipeline along Cavitt-Stallman Road, from Sierra Ponds Lane to Oak Pine Lane will maximize the turnover in the upper third of the Los Lagos Tank. Figure 7-5 illustrates the level trends in the Los Lagos Tank during a one-week period. The turnover in the Los Lagos Tank (which is approximately one-third of the volume) has been improved. The construction of this pipeline will also provide the District added reliability/redundancy in the northwestern part of the Lower Granite Bay Pressure Zone.

Maximum Day Plus Fire Flow

Under maximum day plus fire flow demand conditions, available fire flow at a residual pressure of 20 psi was simulated in the Lower Granite Bay Pressure Zone. Results indicate that the Lower Granite Bay system can maintain a minimum residential fire flow requirement of 1,000 gpm at a single hydrant or a total of 1,000 gpm fire flow demand at two adjacent hydrants (500 gpm at each hydrant). Results also indicate that the existing Lower Granite Bay system can meet the existing fire flow requirement for schools of a 3,000 gpm in the pressure zone. It should be noted that there are areas for which the 2001 CFC would require a higher fire flow, however, since most of the Lower Granite Bay system was constructed under lesser fire flow standards, only new development in this area will be held to the 2001 CFC fire flow requirements.





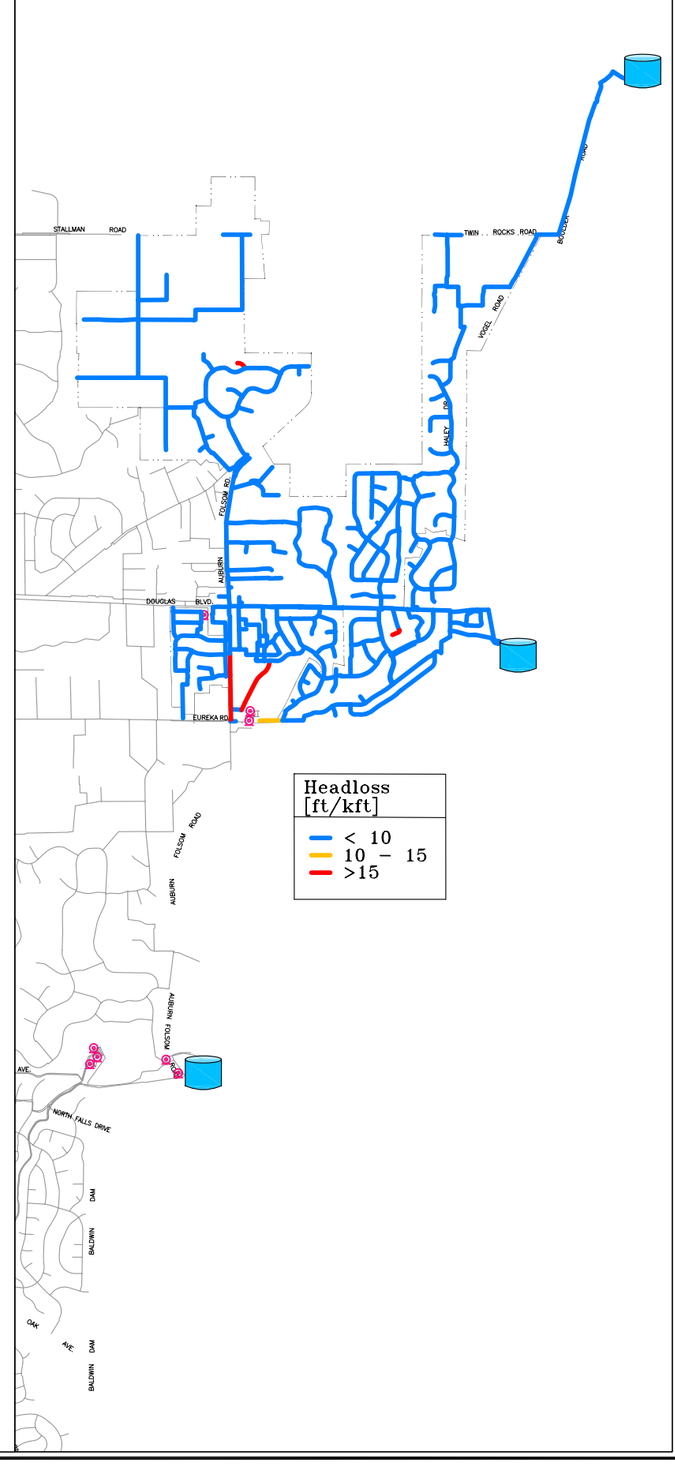


Figure 7-4

San Juan Water District
Retail Water Master Plan
EXISTING 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

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Consulting Engineers

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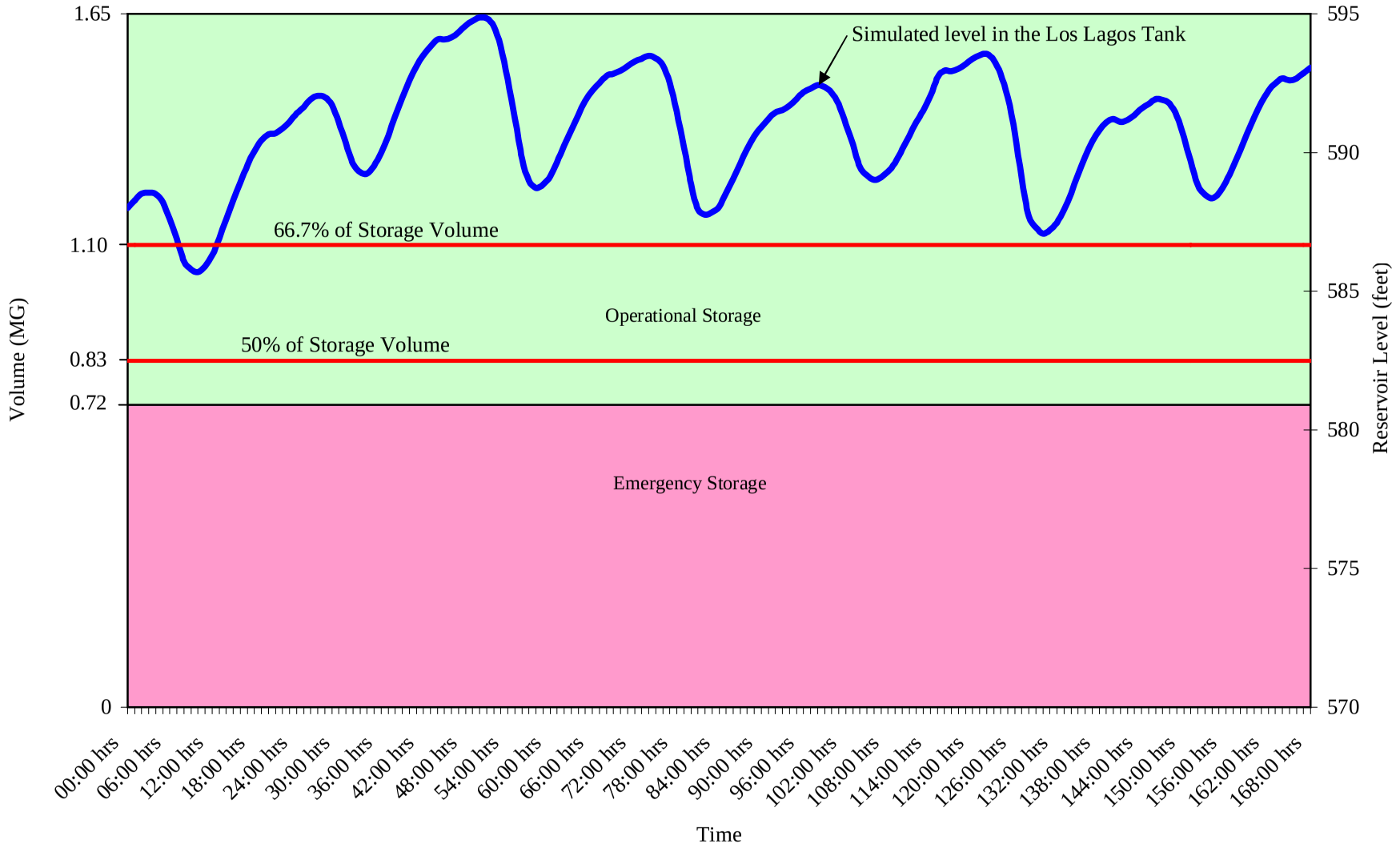
Figure 7-5. Simulated Level Trends In Los Lagos Tank



Upper Granite Bay Pressure Zone

Water Storage Capacity

Table 7-9 presents a summary of the operational, fire flow and emergency storage requirements for the Upper Granite Bay Pressure Zone.

The 0.05 MG Mooney Ridge Hydropneumatic Tank is the only dedicated tank in the Upper Granite Bay Pressure Zone. As shown in Table 7-9, the existing 0.05 MG Mooney Ridge Hydropneumatic Tank is not capable of meeting the operational storage requirement within the Upper Granite Bay Pressure Zone. All the required storage will be supplied from the District's Retail portion of the Hinkle Reservoir and the Bacon Pressure Zone's Kokila Reservoir via the Bacon and Upper Granite Bay Pump Stations.

Table 7-9. Upper Granite Bay Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	0.32
Fire Flow	1,000 gpm for 2 hours	0.0[(a)]
Emergency	average day demand	0.51
	Total Storage Requirement	0.83
Existing Storage Available	Mooney Ridge Hydropneumatic Tank	0.05
	Current Storage Surplus (Deficiency)	(0.78)
Emergency Operational Supply Available	Hinkle Reservoir	11.42
	Projected Storage Surplus (Deficiency)	10.64

(a) Because water demands within the Upper Granite Bay Pressure Zone are provided by water from the Bacon Pressure Zone, the fire flow storage requirement for the Upper Granite Bay Pressure Zone has been assumed to be provided within the Bacon Pressure Zone's Kokila Reservoir.

Pumping Capacity

Table 7-10 provides a summary of the evaluation of the pump station serving the Upper Granite Bay Pressure Zone.

As shown in Table 7-10, an additional pumping capacity of 1,152 gpm (1.66 mgd) is required at the Upper Granite Bay Pump Station to meet the existing maximum day demand plus fire flow pumping requirement within the Upper Granite Bay Pressure Zone.

Table 7-10. Summary of Upper Granite Bay Pressure Zone Pumping Capacity

Pump Station(s) Serving Pressure Zone	Upper Granite Bay Pump Station
Firm pumping capacity	740 gpm
Average day demand in pressure zone	357 gpm
Maximum day demand in pressure zone[(a)]	892 gpm
Fire flow demand to be met by pumping in pressure zone[(b)]	1,000 gpm
Total maximum day plus fire flow pumping requirement in pressure zone	1,892 gpm
Peak hour demand pumping requirement in pressure zone[(c)]	1,356 gpm
Reliability: At least two pumps (1 duty pump and 1 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 1,152 gpm required
Adequate capacity during peak hour demand?	No, additional 616 gpm required
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Maximum day demand plus fire flow
Additional replacement capacity required (gpm)	1,892 gpm (2.72 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.

Water Distribution System

Peak Hour

The existing 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 peak hour demand range from 20 to 98 psi (see Figure 7-4). Low pressures are observed in four subdivisions including Lake Oak Estates No. 1, Lake Ridge Subdivision No. 1, and Granite Bay Vista No. 1 and 2. These subdivisions are located along Sierra Drive and in areas located downstream of the Mooney Ridge Hydropneumatic Tank. When the tank is near empty, areas with service elevations greater than 543 feet will experience pressures below the minimum criterion. As described above, it is recommended that the Upper Granite Bay Pump Station be replaced with a larger capacity pump station. Complete replacement of this facility is recommended due to the physical condition of the pump station and because it is currently an uncovered facility that does not provide adequate security for a District facility. This new pump station will serve customers located at

service elevations below 543 feet, and the existing hydropneumatic tank will serve customers located above this service elevation.

In addition, results indicate that head loss exceeding the 10 ft/kft maximum criterion was observed along the 10-inch diameter pipeline located downstream of the Upper Granite Bay Pump Station. Though head loss of 12 ft/kft was observed on this pipeline, the pipeline velocity is less than the 7 fps maximum criterion. Therefore, no pipeline improvements are recommended.

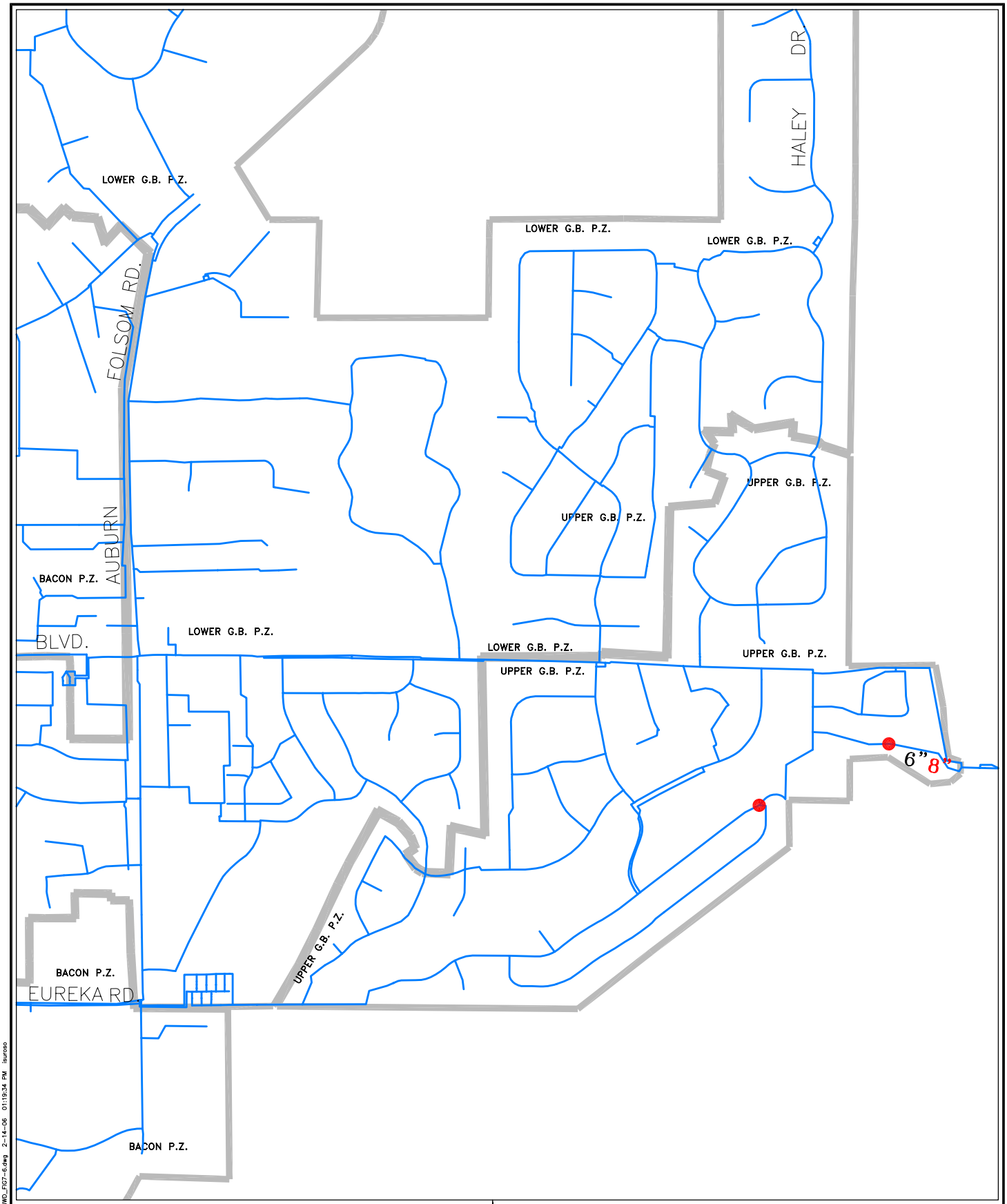
Maximum Day Plus Fire Flow

Available fire flow at a residual pressure of 20 psi was simulated in the Upper Granite Bay System. Figure 7-6 presents areas where the available fire flows are below the minimum residential fire flow requirement of 1,000 gpm at a single hydrant or a total of 1,000 gpm at two hydrants (500 gpm each). These residential areas are located near Mooney Ridge Tank site and served by an undersized existing 6-inch diameter pipeline.

It should be noted that there are areas for which the 2001 CFC would require a higher fire flow, however, since a majority of the Upper Granite Bay Pressure Zone was constructed under lesser fire flow standards, only new development in this area will be held to the 2001 CFC fire flow requirements.

The recommended improvements are shown on Figure 7-6, and include:

- Upsize the existing 6-inch diameter pipeline along Skyway Lane from 8032 Skyway Lane to the Mooney Ridge Tank site to an 8-inch diameter pipeline.



LEGEND

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

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SCALE IN FEET

Figure 7-6

San Juan Water District

Retail Water Master Plan

MAX DAY PLUS FIRE FLOW DEMAND

RECOMMENDED IMPROVEMENTS IN UPPER GRANITE BAY PRESSURE ZONE

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Sierra Pressure Zone

Water Storage Capacity

Table 7-11 presents a summary of the operational, fire flow and emergency storage requirements for the Sierra Pressure Zone.

There is not a dedicated tank supplying the Sierra Pressure Zone. As shown in Table 7-11, there is not adequate storage to meet the operational and fire flow storage requirements within the Sierra Pressure Zone. This storage component can interimly be supplied by the Hinkle Reservoir, if the Sierra Pump Station capacity is increased. However, the long term solution is the Joint Water Storage Facility (JWSF) Project, which the District is currently moving forward with. This Project is a joint project between the District and the City of Roseville. The Project includes a 2.6 MG storage tank for use in the District's Sierra Pressure Zone. In addition, the District does have two emergency interties with the City of Roseville (2.9 and 4.0 mgd, see Chapter 4) that can be used to meet the demand requirements in the Sierra Pressure Zone.

Table 7-11. Sierra Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	1.26
Fire Flow	3,000 gpm for 3 hours	0.54
Emergency	average day demand	2.65
	Total Storage Requirement	4.45
Existing Storage Available		0[(a)]
	Current Storage Surplus (Deficiency)	(4.45)[(a)]
Emergency Supply Available	City of Roseville and Hinkle Reservoir	15.42[(b)]
	Projected Storage Surplus (Deficiency)	10.97

(a) This storage component can interimly be supplied by the Hinkle Reservoir, if the Sierra Pump Station capacity is increased. However, the long term solution is the JWSF Project which the District is currently moving forward with. This Project is a joint project between the District and the City of Roseville. The Project includes a 2.6 MG storage tank for use in the District's Sierra Pressure Zone.

(b) Total potential emergency supply available is 11.42 MG from Hinkle Reservoir plus 4.0 MG from the City of Roseville, or 15.42 MG.

Pumping Capacity

Table 7-12 provides a summary of the evaluation of the pump station serving the Sierra Pressure Zone.

As shown in Table 7-12, the current capacity at the Sierra Pump Station is not adequate to meet existing peak hour demand pumping requirements within the Sierra Pressure Zone. An additional pumping capacity of 2,122 gpm (3.06 mgd) is required at the Sierra Pump Station.

Table 7-12. Summary of Sierra Pressure Zone Pumping Capacity

Pump Station Serving Pressure Zone	Sierra Pump Station
Firm pumping capacity	5,250 gpm
Average day demand in pressure zone	1,843 gpm
Maximum day demand in pressure zone[(a)]	3,501 gpm
Fire flow demand to be met by pumping in pressure zone	3,000 gpm
Total maximum day plus fire flow pumping requirement in pressure zone	6,501 gpm
Peak hour demand pumping requirement in pressure zone[(b)]	7,372 gpm
Reliability: At least two pumps (1 duty pump and 1 standby pump) to use in the event of mechanical failure	No[(c)]
Backup power provided?	Yes
Adequate capacity during maximum day demand plus fire flow?	Yes
Adequate capacity during peak hour?	No, additional 2,122 gpm required
Controlling demand condition (maximum day demand plus fire flow or peak hour demand)?	Peak hour demand
Additional capacity required (gpm)	Yes, 2,122 gpm (3.06 mgd)

(a) Maximum day demand equals 1.9 times average day demand.
(b) Peak hour demand equals 4.0 times average day demand.
(c) All four pumps must operate to meet peak hour demands.

In a previous study for the District (Evaluation of a Joint Water Storage Facility, July 2002), it was recommended that the total dynamic head of the Sierra Pump Station be increased so that it could fill the proposed Joint Water Storage Facility (JWSF). This would allow the peak hour demand of the Sierra Pressure Zone to be provided from operational storage in the JWSF. Based on the preliminary review of the Sierra Pump Station, it was identified that the existing electrical power supply is inadequate unless the number of operating pumps is limited. Only one Sacramento Municipal Utility District electrical utility service provides power to both the ARC-North Pump Station and the Sierra Pump Station. In the past, there have been no restrictions on use of the standby pumps and the District has been able to operate all ARC-North pumps and all Sierra pumps without restriction. However, increasing the capacity of the Sierra Pump Station will overload the existing electrical utility service and the diesel-fueled standby generator. The electrical utility service must be upgraded, and would require major reconstruction of the pump station. Additional restrictions on increasing the size of the Sierra Pump Station include the pump barrel sizes and suction piping sizes. The preliminary review, based on the JWSF Study, indicates that there is no reliable information on the size of the existing pump barrels, and the existing records are conflicting and appear inaccurate. Therefore, it is recommended that one of the pumps be pulled and the barrel inspected and measured before proceeding with Sierra Pump Station modifications. The District is currently working on a scope and budget to address this issue, and

has developed an interim solution to meet the high demands within the Sierra Pressure Zone, which is to use the Roseville emergency intertie (Chapter 4). For budgetary purposes, we will assume full replacement of existing pumps with four larger pumps and an upgrade to the electrical system.

Water Distribution System

Peak Hour

As illustrated on Figure 7-7, the existing system in the Sierra Pressure Zone is able to meet the minimum pressure criterion during peak hour demand. System pressures range from 42 to 87 psi. These system pressures reflect the condition when all four pumps at the Sierra Pump Station are operating to meet peak hour demand. Based on previous analysis, this will only be possible if the District replaces the four existing pumps with four larger capacity pumps, and continues to move forward with their discussions with the Sacramento Municipal Utility District with installation of a new 750 kVA transformer for the Sierra and ARC-North Pump Stations. Results indicate that the head losses in the distribution pipelines are less than the maximum criterion of 10 ft/kft, except for a 2-inch pipeline along Eureka Road, which could not meet the criteria (head loss was 17 ft/kft). There is no velocity deficiency in the Sierra Pressure Zone; all velocities were less than 7 fps.

Maximum Day Plus Fire Flow

Available fire flow at a residual pressure of 20 psi was simulated in the Sierra system. Results indicate that the Sierra system is adequate to maintain a minimum residential fire flow requirement of 1,000 gpm at a single hydrant or a total of 1,000 gpm fire flow demand at two hydrants (500 gpm at each hydrant). Results also indicate that the Sierra system can meet the existing fire flow requirement for schools of 3,000 gpm throughout the pressure zone. It should be noted that there are areas for which the 2001 CFC would require a higher fire flow, however, only new development in this area will be held to the 2001 CFC fire flow requirements.

KOKILA RESERVOIR

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 7-7

San Juan Water District
Retail Water Master Plan
EXISTING 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 7-13 presents a summary of the operational, fire flow and emergency storage requirements for the American River Canyon North Pressure Zone.

There is not a dedicated storage tank supplying the ARC-North Pressure Zone. In addition, there are no plans to build a dedicated tank or site identified for a future tank. It is our recommendation that the District maintain the ARC-North storage requirements in the District's retail portion (11.42 MG) of the Hinkle Reservoir. As shown in Table 7-13, the total storage requirement is 1.81 MG in the ARC-North Pressure Zone.

Table 7-13. American River Canyon North Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	0.44
Fire Flow[(a)]	1,500 gpm for 2 hours	0.18
Emergency	average day demand	1.18
	Total Storage Requirement	1.81
Existing Storage Available		0.00
	Current Storage Surplus (Deficiency)	(1.81)
Emergency Supply Available	Hinkle Reservoir[(b)]	11.42
	Projected Storage Surplus (Deficiency)	9.61

(a) Because ARC-North has more recent development, the 2001 CFC was used for the fire flow requirements.

(b) Operational, emergency and fire flow storage volumes will be provided by Hinkle Reservoir.

The emergency intertie with the City of Folsom is also capable of providing a portion of the emergency storage requirement in the American River Canyon North Pressure Zone.

Pumping Capacity

Table 7-14 provides a summary of the evaluation of the pump station serving the ARC-North Pressure Zone.

As shown in Table 7-14, the ARC-North Pump Station is adequate to meet both the existing maximum day demand plus fire flow and peak hour demand pumping requirements within the ARC-North Pressure Zone.

Table 7-14. Summary of ARC-North Pressure Zone Pumping Capacity

Pump Station Serving Pressure Zone	ARC-North Pump Station
Firm pumping capacity	3,600 gpm
Average day demand in pressure zone	823 gpm
Maximum day demand in pressure zone[(a)]	1,234 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	2,734 gpm
Peak hour demand pumping requirement in pressure zone[(c)]	2,550 gpm
Reliability: At least two pumps (1 duty pump and 1 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)?	Maximum day demand plus fire flow
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.

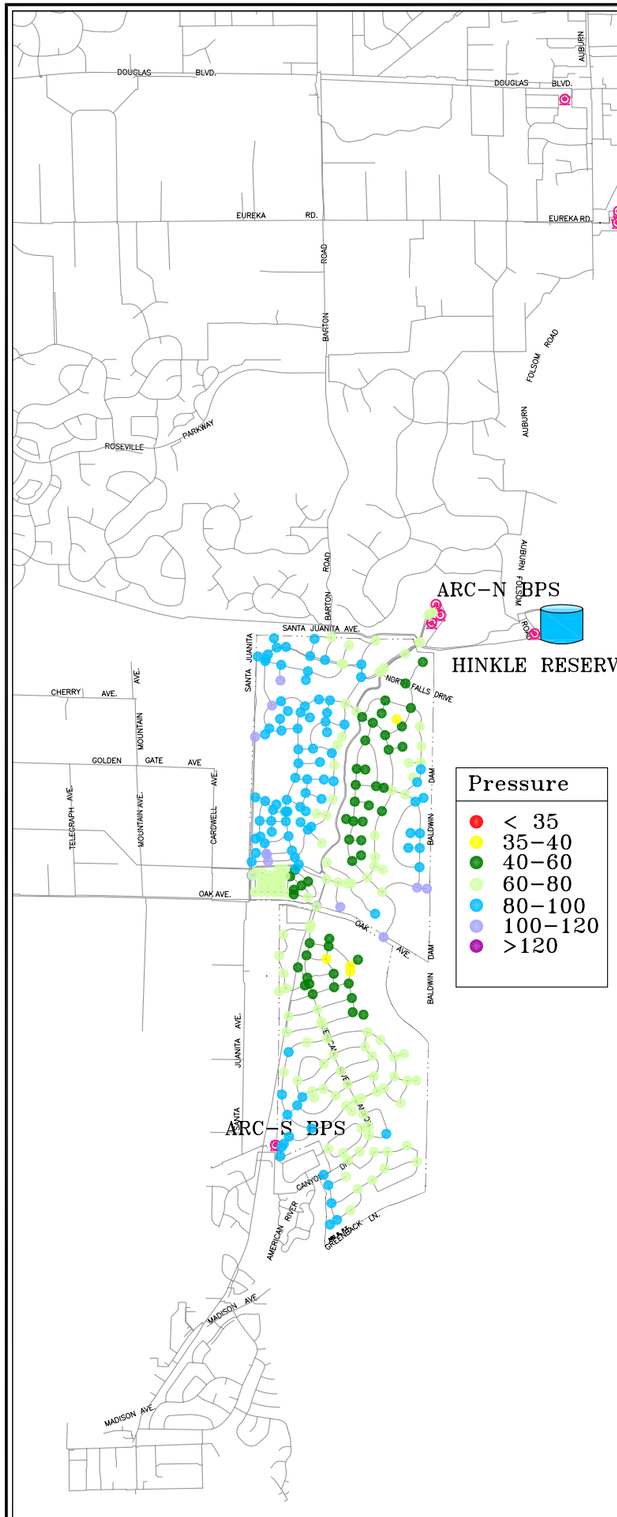
Water Distribution System

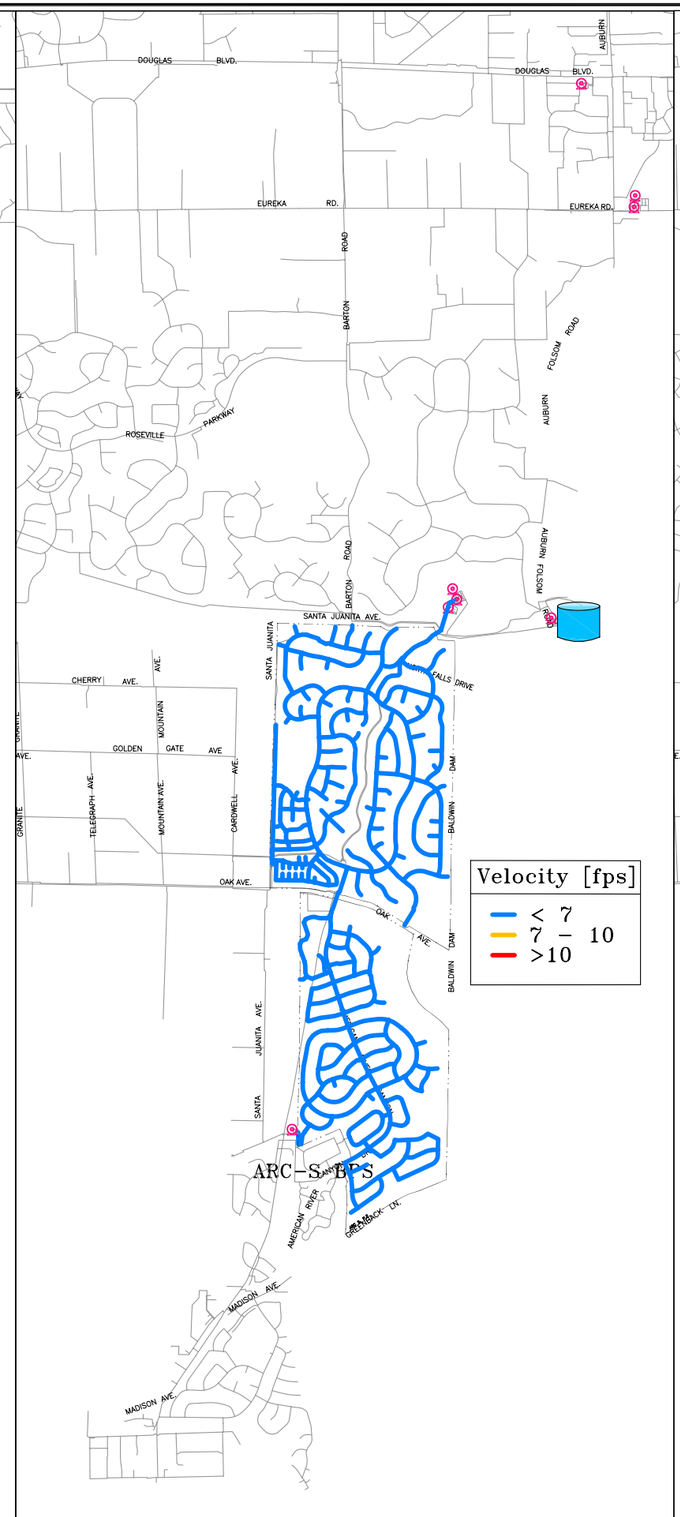
Peak Hour

During peak hour demand condition, there is no pressure or head loss deficiency in the ARC-North Pressure Zone. System pressures in this pressure zone range from 40 to 114 psi as shown in Figure 7-8. The head loss and velocity in the pipeline are also able to meet the recommended performance criterion.

Maximum Day Plus Fire Flow

Because ARC-North has more recent development, the 2001 CFC was used to develop fire flow requirements. Fire flows of 1,500 gpm were simulated in the ARC-North Pressure Zone. Simulation results indicate that the existing system of the ARC-North Pressure Zone is adequate to meet the minimum required residual pressure of 20 psi.





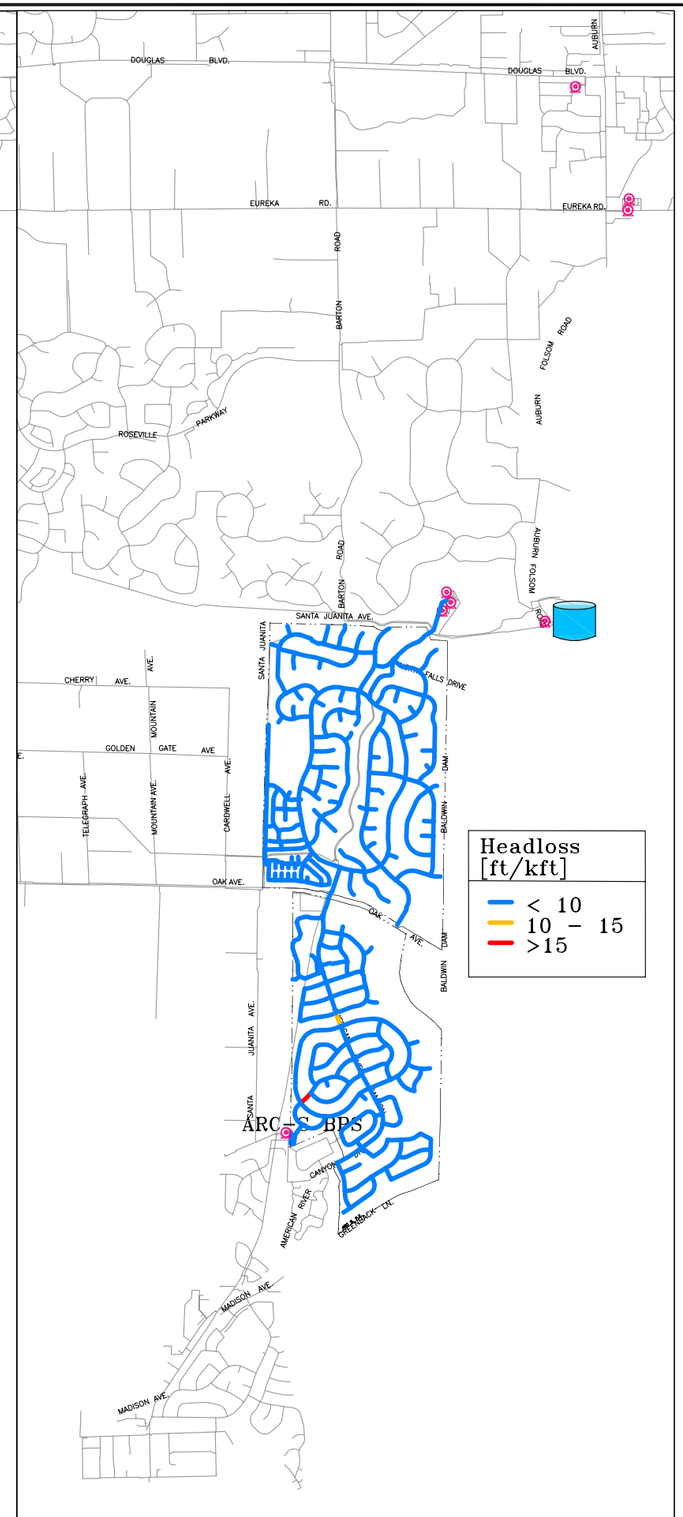


Figure 7-8

San Juan Water District
Retail Water Master Plan
EXISTING 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

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American River Canyon South Pressure Zone

Water Storage Capacity

Table 7-15 presents a summary of the operational, fire flow and emergency storage requirements for the ARC-South Pressure Zone.

There is not a dedicated storage tank supplying the ARC-South Pressure Zone. In addition, there are no plans to construct a dedicated tank or site identified for a future tank. It is recommended that the District maintain the ARC-South storage requirements in the District's retail portion (11.42 MG) of the Hinkle Reservoir. As shown in Table 7-15, the total storage requirement is 1.96 MG in the ARC-South Pressure Zone.

Table 7-15. American River Canyon South Pressure Zone Storage Requirements

Storage Component	Criteria	Storage Required, MG
Operational	25% of max day demand	0.38
Fire Flow[(a)]	2,500 gpm for 2 hours	0.30
Emergency	average day demand	1.28
	Total Storage Requirement	1.96
Existing Storage Available		0.00
	Current Storage Surplus (Deficiency)	(1.96)
Emergency Supply Available	Hinkle Reservoir[(b)]	11.42
	Projected Storage Surplus (Deficiency)	9.46

(a) Because ARC-South has more recent developed, the 2001 CFC was used to develop the fire flow requirements.

(b) Operational emergency and fire flow storage volumes will be provided by Hinkle Reservoir.

Since there are no feasible locations for storage in the pressure zone, it is recommended that this storage requirement be provided by Hinkle Reservoir and provided to the ARC-South Pressure Zone through both the ARC-South and ARC-North Pump Stations.

Pumping Capacity

Table 7-16 provides a summary of the evaluation of the pump station serving the ARC-South Pressure Zone.

As shown in Table 7-16, an additional 567 gpm (0.82 mgd) of pumping capacity is required at the ARC-South Pump Station to meet the existing maximum day plus fire flow demand in the ARC-South Pressure Zone. However, the District does have an existing connection to the ARC-North Pressure Zone on Oak Avenue. The ARC-North Pump Station has more than adequate capacity (see Table 7-14) to provide the additional 567 gpm to the ARC-South Pump Station during a maximum day demand condition.

To provide this water from the ARC-North Pump Station to the District's customers in the ARC-South Pressure Zone, two options are available:

- Option 1: Construct a new pump station at the northern part of ARC-South. This option would provide a reliable system to the District's customers in this pressure zone.
- Option 2: Replace the existing isolation valve located on Oak Avenue with a pressure reducing valve set at 71 psi. Currently, this isolation valve is manually operated, and is used to supply water from ARC-North to ARC-South during low demand conditions (see Figure 7-9).

It is recommended that the improvements described in Option 2 for the ARC-South Pressure Zone to provide the required flow during a maximum day plus fire flow. Based on recent discussions with the District, Option 2 was selected as the recommended alternative.

Table 7-16. Summary of ARC-South Pressure Zone Pumping Capacity

Pump Station Serving Pressure Zone	ARC-South Pump Station
Firm pumping capacity	3,000 gpm
Average day demand in pressure zone	889 gpm
Maximum day demand in pressure zone[(a)]	1,067 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	3,567 gpm
Peak hour demand pumping requirement in pressure zone[(c)]	2,045 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 567 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)	567 gpm (0.82 mgd)

(a) Maximum day demand equals 1.2 times average day demand.
(b) Fire flow which cannot be met from storage via gravity.
(c) Peak hour demand equals 2.3 times average day demand.

Water Distribution System

Peak Hour

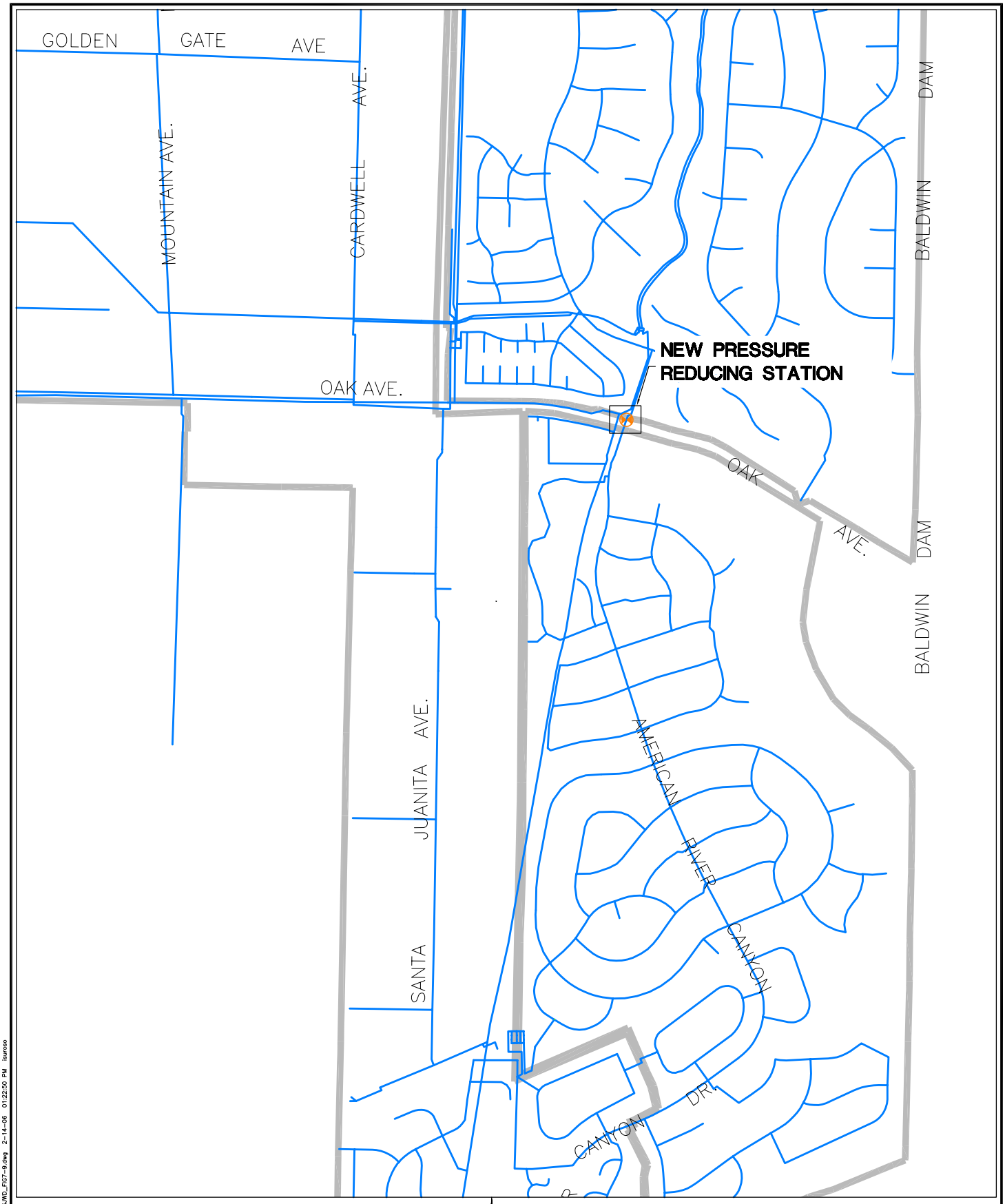
Figure 7-8 presents the pressures in the ARC-South Pressure Zone during a peak hour demand condition, and it shows that the existing system can meet the minimum pressure criterion of 35 psi. Pressures range from 37 to 91 psi. Head losses of 15 to 16 ft/kft were observed in pipes along Spring Water Way between Crow Canyon Drive and South Fork Way, and American River Canyon Drive. These undersized pipelines are existing 8-inch and 10-inch diameter pipelines. Because the system pressures in the ARC-South Pressure Zone are above the required minimum pressure during peak hour demand condition, no pipeline improvements are recommended.

Peak hour demand in the northern part of the ARC-South Pressure Zone is supplied solely from the ARC-South Pump Station. Demands in the northern part of ARC-South are met by conveying supply through a pipeline along American Canyon Drive, between Oak Canyon Way and Crow Canyon Drive. If this pipeline is taken out of service/maintenance, the northern part of the ARC-South pressure zone shall be served through a manually operated connection. This connection is currently used only during low demand conditions when the ARC-South Pump Station is not operating (winter time), and the ARC-South demand is supplied from the ARC-North Pump Station.

It is recommended that the improvements as described previously in Option 2 for the ARC-South Pressure Zone be constructed to improve system reliability.

Maximum Day Plus Fire Flow

Because ARC-South has newer development, the 2001 CFC was used to develop the fire flow requirements. Fire flows of 1,500 and 2,500 gpm were simulated in the ARC-South Pressure Zone. Simulation results indicate the existing system of the ARC-South Pressure Zone is adequate to meet the minimum required residual pressure of 20 psi.



LEGEND

EXISTING PIPELINE

PROPOSED PRESSURE REDUCING STATION

N

0 500 1000

SCALE IN FEET

Figure 7-9

San Juan Water District

Retail Water Master Plan

PEAK HOUR DEMAND

RECOMMENDED IMPROVEMENTS IN ARC-SOUTH PRESSURE ZONE

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Crown Point Pressure Zone

Water Storage Capacity

Table 7-17 presents a summary of the operational, fire flow and emergency storage requirements for the Crown Point Pressure Zone.

There is not a dedicated storage tank that supplies the Crown Point Pressure Zone. Because of the small size of this zone and its proximity to the Hinkle Reservoir, it is recommended that the District use its retail portion (11.42 MG) of the Hinkle Reservoir to supply all of the required storage for this pressure zone. As shown in Table 7-17, the total storage requirement is 1.76 MG in the Crown Point Pressure Zone.

Table 7-17. 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	1.13
	Total Storage Requirement	1.76
Existing Storage Available		0.00
	Current Storage Surplus (Deficiency)	(1.76)
Emergency Supply Available	Hinkle Reservoir[(a)]	11.42
	Projected Storage Surplus (Deficiency)	9.66

(a) Operational emergency and fire flow storage volumes will be provided by Hinkle Reservoir.

Pumping Capacity

Table 7-18 provides a summary of the evaluation of the pump station serving the Crown Point Pressure Zone.

As shown in Table 7-18, the recently constructed Hinkle-Crown Point Pump Station is adequate to meet the existing maximum day plus fire flow or peak hour demand pumping requirements.

Table 7-18. Summary of Crown Point Pressure Zone Pumping Capacity

Pump Station Serving Pressure Zone	Hinkle-Crown Point Pump Station
Firm pumping capacity	2,880 gpm[(a)]
Average day demand in pressure zone[(b)]	781 gpm
Maximum day demand in pressure zone	1,257 gpm
Fire flow demand to be met by pumping in pressure zone[(c)]	1,000 gpm
Total maximum day plus fire flow pumping requirement in pressure zone	2,257 gpm
Peak hour demand pumping requirement in pressure zone	1,861 gpm
Reliability: At least two pumps (1 lead pump and 1 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 plus fire flow
Additional capacity required (gpm)	No

(a) Based on new design pump capacity of the recently constructed Hinkle-Crown Point Pump Station received from the District on March 3, 2005

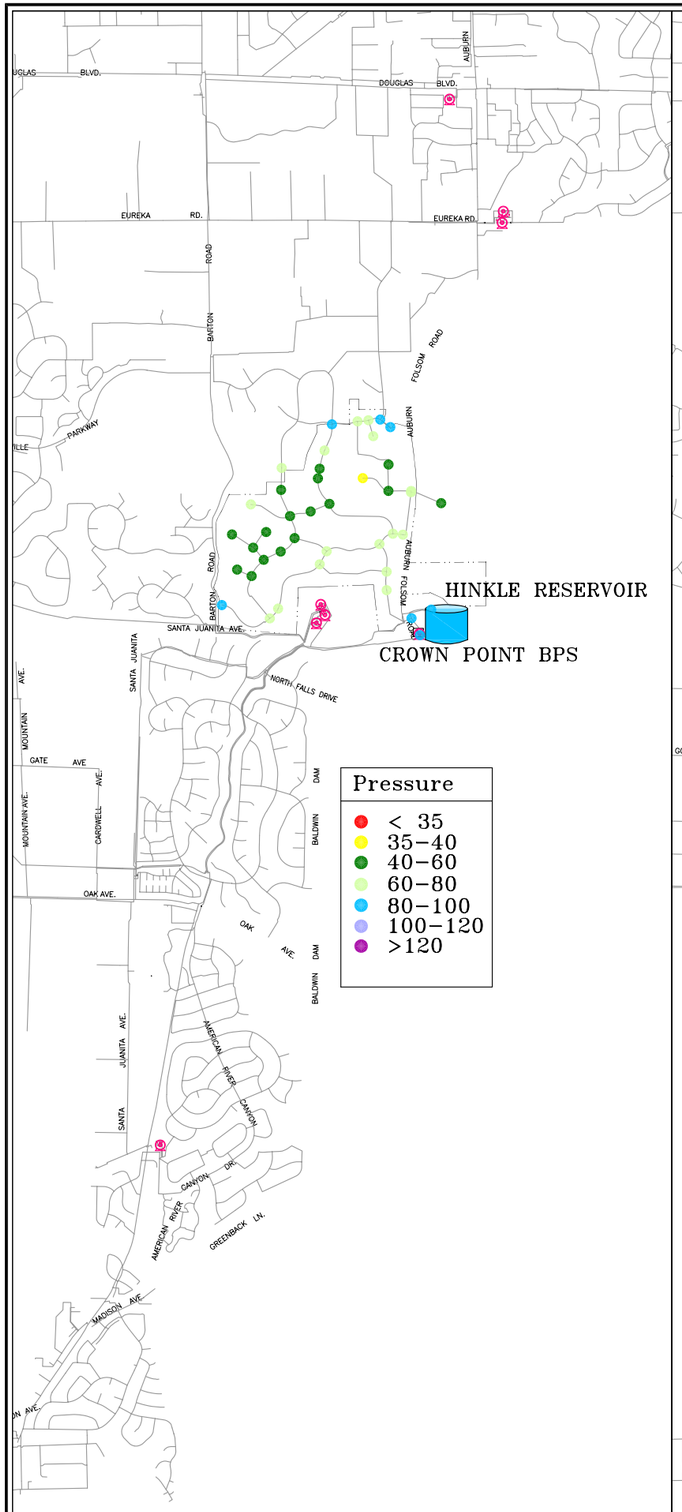
(b) Includes demands for Beals Point and the Sidney N. Peterson Water Treatment Plant, therefore, maximum day and peak hour peaking factors do not apply.

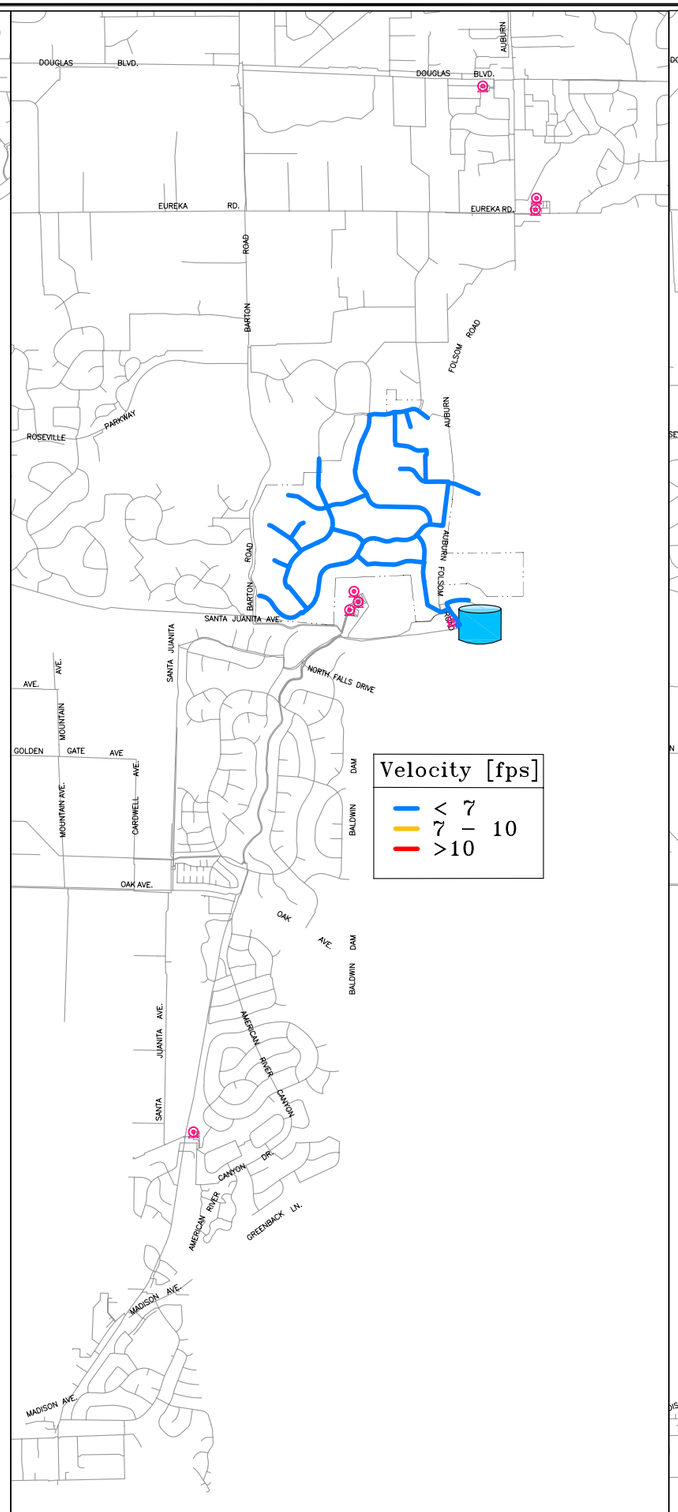
(c) Fire flow which cannot be met from storage via gravity.

Water Distribution System

Peak Hour

Under a peak hour demand condition, the existing system with planned improvements to the Crown Point Pump Station is able to meet the minimum pressure of 35 psi. System pressures during peak hour range from 38 to 89 psi. There are no head loss or velocity deficiencies in this pressure zone (See Figure 7-10).





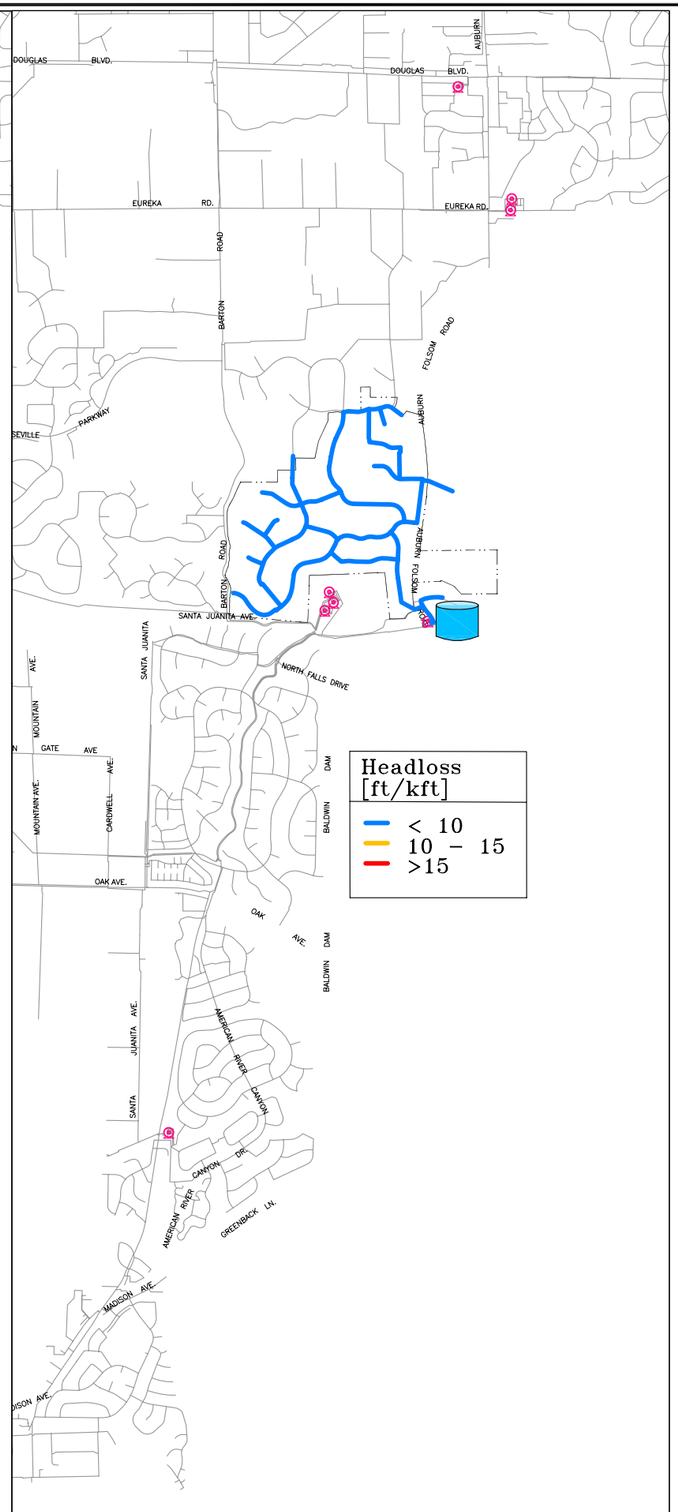


Figure 7-10

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

LEGEND:

- RESERVOIR OR TANK
- BOOSTER PUMP STATION
- PRESSURE ZONE

NOTES:

N

0 1500 3000
SCALE IN FEET

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Maximum Day Plus Fire Flow

Available fire flow at a residual pressure of 20 psi was simulated in the Crown Point system. Figure 7-11 presents those areas where the available fire flow is below the minimum residential fire flow requirement of 1,000 gpm at a single hydrant or a total of 1,000 gpm at two hydrants. It should be noted that there are areas for which the 2001 CFC would require a higher fire flow, however, only new development in this area will be held to the 2001 CFC fire flow requirements.

The recommended improvements are shown on Figure 7-11, and include:

- Upsize approximately 330 feet of existing 6-inch diameter pipeline along Edward Court to an 8-inch diameter pipeline.

- Upsize approximately 460 feet of existing 6-inch diameter pipeline along Lou Place from Crown Point Vista and Troy Way to 8-inch diameter.

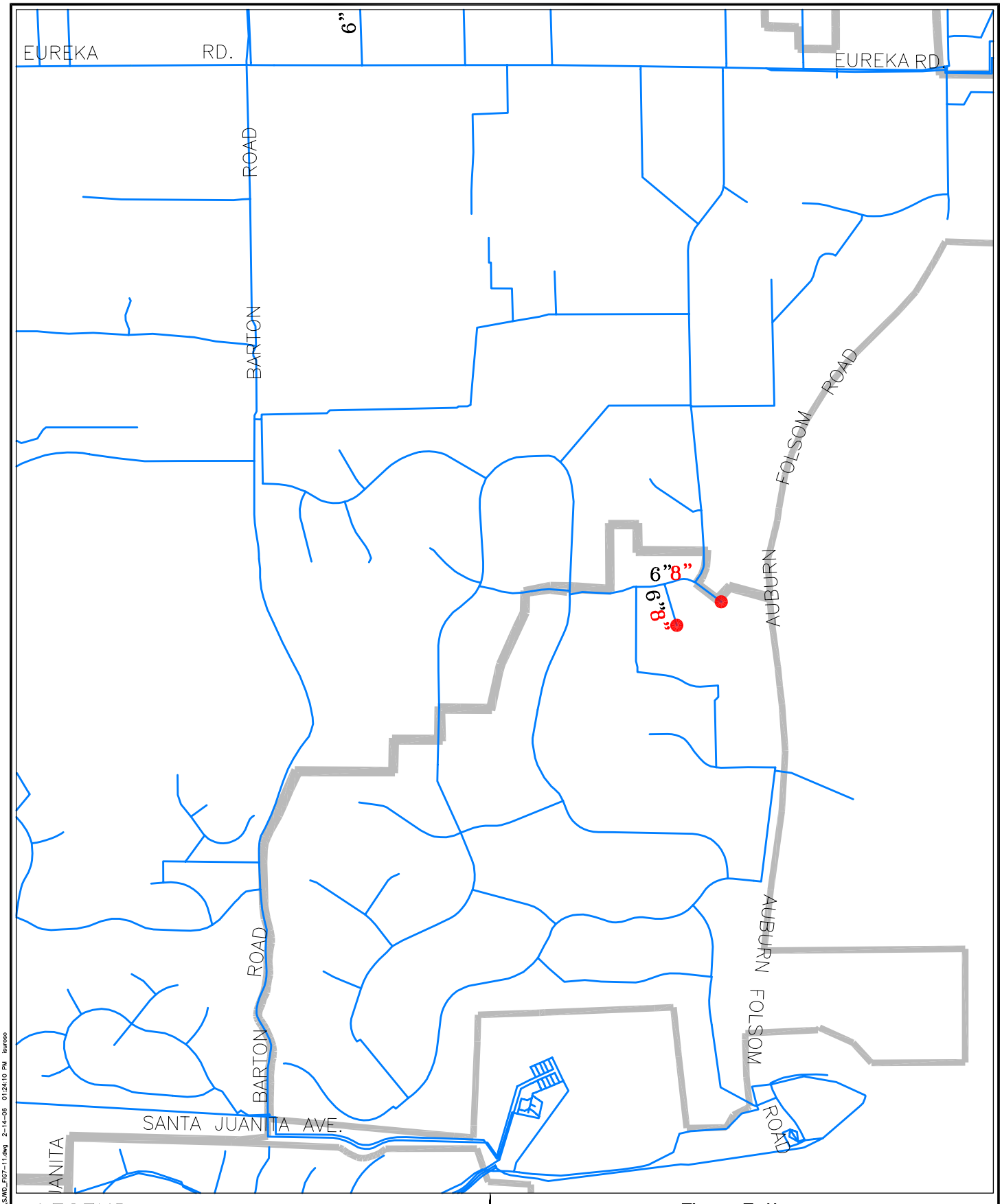

Figure 7-11
San Juan Water District
Retail Water Master Plan
MAX DAY PLUS FIRE FLOW DEMAND
RECOMMENDED IMPROVEMENTS IN
CROWN POINT PRESSURE ZONE

WEST YOST ASSOCIATES
Consulting Engineers

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SUMMARY OF RECOMMENDED IMPROVEMENTS FOR EXISTING WATER SYSTEM

The recommended improvements needed to eliminate deficiencies identified in the analysis of the existing retail distribution system 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 7-19). Table 7-19 also designates the type of capital improvement it is. The CIP ID refers to whether the improvement was generated by fire flow (FF) requirements or peak hour (PH) requirements.
- Approximately 5,275 lf of new, 18-inch diameter pipeline along Eureka Road from Barton Road to Auburn-Folsom Road
- Approximately 8,400 lf of new, 24-inch diameter pipeline from the proposed Joint Water Storage Facility (JWSF) along Sierra College Boulevard into the District's Sierra Pressure Zone.
- To improve system reliability/redundancy throughout the District's Lower Granite Bay Pressure Zone and to be able to use the total 1.65 MG storage capacity of the Los Lagos Tank, it is recommended that a 16-inch diameter pipeline along Twins Rock Road from Vogel Valley to Sierra Ponds Lane (approximately 6,600 lf) and a 12-inch diameter pipeline along Cavitt-Stallman Road, from Sierra Ponds Lane to Oak Pine Lane (approximately 2,500 lf) be constructed.

Pump Stations

- New Upper Granite Bay Pump Station: 1,892 gpm (2.72 mgd) capacity
- New standby generator:
  - Bacon Pump Station
  - Sierra and ARC-North Pump Station (separate from Bacon)

Storage

- New 2.6 MG Joint Water Storage Facility.

Miscellaneous

- Electrical improvements (Bacon Pump Station)
- New pressure reducing station between the ARC-North and ARC-South Pressure Zones.
- Construction of an emergency intertie from PCWA into the Kokila Reservoir. This project includes a pressure sustaining station and a new, 12-inch diameter pipeline (approximately 1,500 lf) from Sierra College Boulevard to the Kokila Reservoir site.

- Replacement of existing pumps (4), upgrades to electrical system at the Sierra Pump Station.
- New meter station on gravity line leaving Hinkle Reservoir. This meter would provide a method for measuring the supply provided to the Gravity system.

Table 7-19. Summary of Recommended Pipeline Improvements[a]

CIP ID[b]	Pressure Zone	Description	Diameter, inches	
			Existing	Recommended
FF01	Upper Granite Bay	Along Skyway Lane from 8032 Skyway Lane to Mooney Ridge Tank Site	6	8
FF02	Crown Point	Along Lou Place between Crown Point Vista and Troy Way, and along Edward Court south of Lou Place	6	8
PH02	Sierra	From JWSF along Sierra College Boulevard into Sierra Pressure Zone	NA	24
PH03	Bacon	Along Eureka Road, from Barton road to Auburn Folsom Road[d]	16	18
PH05	Lower Granite Bay	Along Cavitt-Stallman Road between Oak Pine Lane and Sierra Ponds Lane	NA	12
PH06	Lower Granite Bay	Along Twin Rocks Road between Vogel Valley Road and Sierra Ponds Lane (with one connection at Turner Drive)	NA	16
EI02[c]	Bacon	From Sierra College Boulevard to Kokila Reservoir	NA	12

(a) See Figure 9-1 for location.

(b) FF – Required to meet minimum existing fire flow criteria
PH – Required to meet minimum existing peak hour criteria.

(c) CIP is required for emergency intertie connection from PCWA to the District.

(d) CIP also includes replacement of the parallel 12-inch and 14-inch diameter pipelines along Eureka from Providence Lane to Auburn Folsom Road.