EXECUTIVE SUMMARY

This section represents the executive summary of the Water System Master Plan (plan) for Sacramento Suburban Water District (District).

Introduction

The District's mission is 'to deliver a high quality, reliable supply of water and superior customer service at a reasonable price." The District's objectives in support of this mission include managing the District's groundwater supply to ensure its quality and quantity and maximizing the use of existing system capacity to generate revenues to offset other system costs. The purpose of this plan is to provide guidance to meet these objectives.

Historically, the District has primarily used groundwater as its water supply source. The District started significantly supplementing its groundwater supply with surface water in 1998 to address the declining groundwater table using in-lieu recharge. The District has made significant investments to put surface water supply and conjunctive use facilities in place. Its existing infrastructure and regional water resources needs place the District in a key position to help support regional conjunctive use efforts as well as meeting its own needs.

Description of Existing Water System

The District serves a population of approximately 160,000 in Sacramento County. Within the District are four service areas: the North Service Area (NSA), the Arbors at Antelope, McClellan Business Park, and the South Service Area (SSA). The term NSA is also used to describe a larger area consisting of the Arbors at Antelope, McClellan Business Park, and the previously described NSA. Water supply for the District is currently derived from active groundwater wells and surface water from Placer County Water Agency (PCWA) and the City of Sacramento (City). Figure ES-1 depicts the District's key water system facilities and the service areas.

The District's groundwater supply infrastructure has a total groundwater pumping capacity of 98,390 gallons per minute (gpm) from 89 active wells. Wells throughout the District are generally between 200 and 1,300 feet deep and draw water primarily from the Mehrten formation. The older, shallower wells typically produce up to 1,000 gpm. Some of the newer wells produce over 2,500 gpm.

The PCWA surface water supply is delivered via Folsom Reservoir and San Juan Water District's (SJWD) Peterson Water Treatment Plant (WTP) and then by gravity flow through the San Juan Cooperative Transmission Pipeline (CTP) followed by the Antelope Conveyance Pipeline (ACP) (formerly referred to as the Northridge Conveyance Pipeline). The District owns the total pipeline capacity of 59.2 mgd in the 48-inch diameter, gravity flow ACP and that same quantity of flow in the larger capacity CTP.

The District has a surface water supply from the American River through a contract with the City dating to 1964. In 2006, the District began receiving surface water from the City. This water is treated at the City's Fairbairn WTP and delivered to the District via the City's Howe Avenue transmission main to an existing interconnection located near Enterprise Drive and Northrop Avenue in the SSA.

The distribution system has 682 miles of pipelines that range in size from 48-inch mains down to 4-inch laterals. Pipeline material consists predominantly of asbestos cement, poly vinyl chloride (PVC), ductile iron, mortar lined coated steel, and cast iron pipe. There are 45 emergency interties with neighboring agencies along the District boundary. The NSA has three pressure zones and the SSA has one pressure zone.

The NSA has four active storage tanks. A five million gallon (MG) storage tank and booster pumping station located at the Antelope reservoir site stores both groundwater from nearby wells and treated surface water from the Peterson WTP. Another five MG capacity groundwater storage reservoir and booster pump station is located in the North Highlands service area. There is a 150,000 gallon elevated storage tank located in the Arbors at Antelope area and a 125,000 gallon elevated storage tank located at the District's Walnut Corporation Yard. There are two active elevated storage tanks in the McClellan Business Park service area. The SSA has a five MG storage tank and booster pumping station located at Enterprise Drive and Northrop Avenue.

There are two booster pump stations that are designed to boost water from the District's NSA into the McClellan Business Park service area. Backflow prevention valves are located at both pump stations to prevent flow within the McClellan Business Park service area from re-entering the NSA. Because the pressure gradient for the McClellan Business Park service area does not differ significantly from the NSA, the booster pump stations rarely are required to operate because sufficient flow is usually delivered by gravity.

The water system is monitored and operated automatically using a Wonderware/Tesco Controls supervisory control and data acquisition (SCADA) system. Almost two-thirds of active wells are connected to the SCADA system, as well as most of the reservoirs and booster pump stations. The District's SCADA system consists of three major components: remote site controls, radio communications, and the SCADA master station.

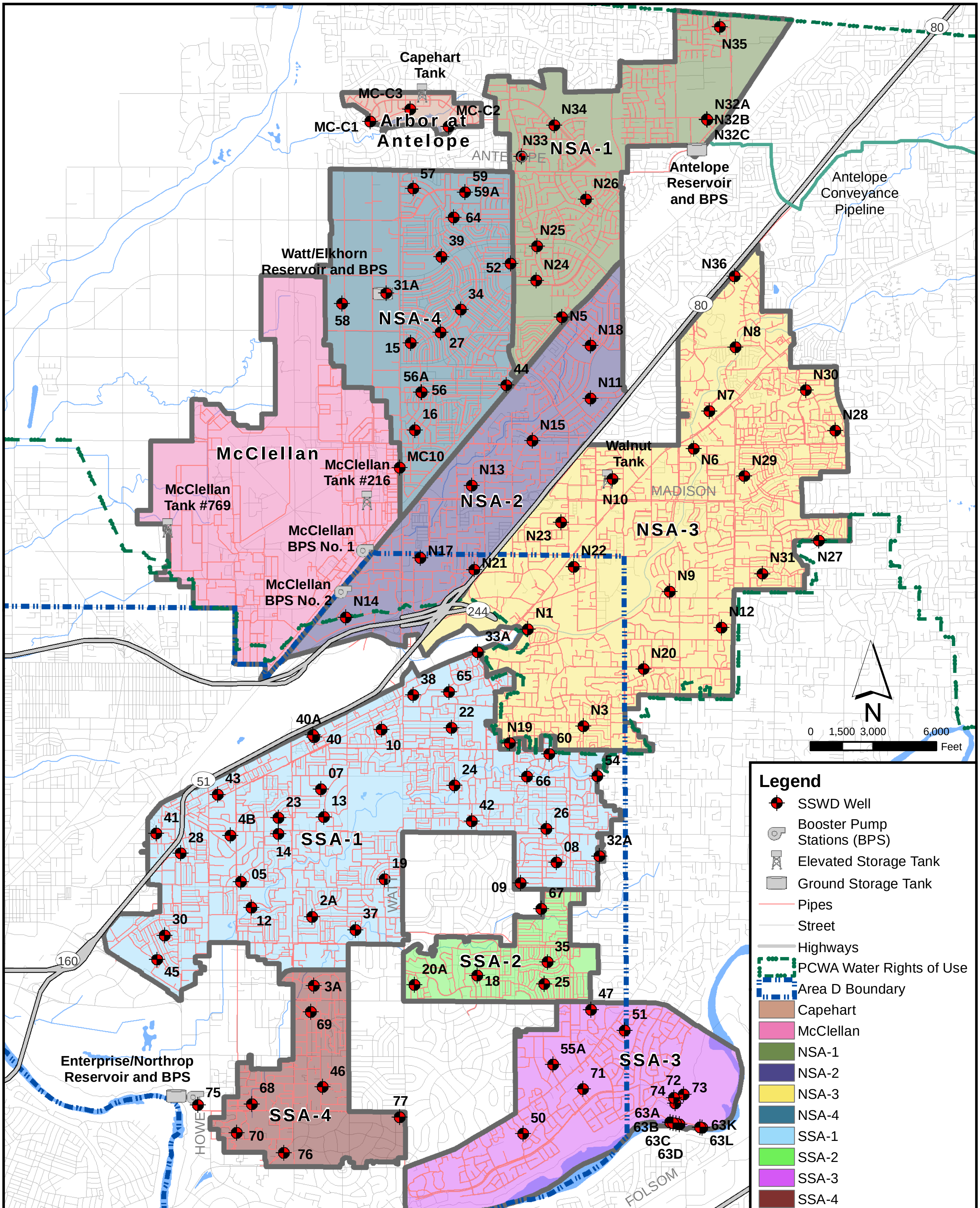
Water Requirements

Projected population, employment, and housing for the District's service area are based on estimates from the Sacramento Area Council of Governments (SACOG). SACOG estimates extend to the year 2035. For planning purposes, this study assumes that the District will be built-out by year 2035. The District's 2005 population was 156,627 and is expected to reach approximately 190,000 in 2035. The historical and projected population, housing, and employment for the District are illustrated on Figure ES-2.

The District has a mixture of land uses within its service area that is predominately single family residential with some attached residential and industrial (McClellan Business Park). There are several redevelopment and new growth areas located within the District, with the main ones being McClellan Business Park and the Fair Oaks Boulevard and North Watt Avenue corridors.

Total water production in 2008 was 38,498 acre-feet (ac-ft), which consisted of 23,516 (61 percent) ac-ft of groundwater and 14,982 ac-ft (39 percent) of surface water. The District had 43,998 customer connections in 2007, with 37,276 being single-family connections. Half of the District's customers are not currently metered. The District's metering schedule is based on being completely metered by the California state mandated year 2025 deadline.

Unaccounted-for water (UAW) use is unmetered water use such as for fire protection and training, system and street flushing, sewer cleaning, construction, system leaks, meter inaccuracies, and unauthorized connections. Since the District is not completely metered, data are unavailable for determining the percent of UAW. Current UAW is assumed for this study to be approximately 10 percent of total water production, decreasing by buildout to 8 percent.



BROWN AND CALDWELL

PROJECT	SITE	
135849	Water System Master Plan Sacramento Suburban Water District	Figure
DATE	TITLE	ES-1
6-11-09	Water System Facilities	

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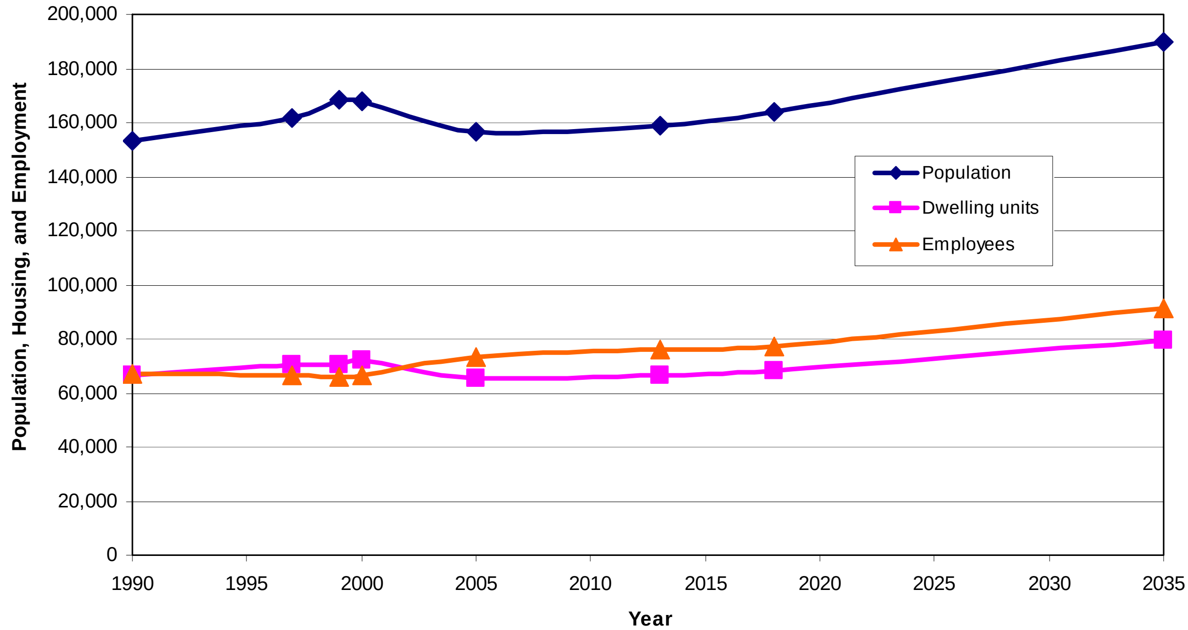


Figure ES-2. Sacramento Suburban Water District Historical and Projected Population, Housing, and Employment

Projected unit water use factors are based on 2005 unit water use with a reduction applied in unit water use due to metering, natural replacement of water-using fixtures, and continued California Urban Water Conservation Council (CUWCC) Best Management Practice (BMP) implementation. The unit water use factors are presented in Table ES-1. These unit water use factors do not include UAW.

Table ES-1. Unit water Use

		Year 2005	Year 2035
Single family (gpd/DU)	Metered	512	469
	Unmetered	563	--
Multi-family (gpd/DU)		210	184
Non-residential (gpd/employee)		104	99

Note: Does not include UAW.
gpd/DU = gallons per day/dwelling units

Buildout water demands in the District are based on SACOG year 2035 demographic projections and projected year 2035 unit water use and UAW factors. The historical and projected water use is presented oin Figure ES-3. The historical breakdown of surface water and groundwater use is also presented.

Three water demand projections were developed for McClellan Business Park. The high demand projection is the Environmental Impact Report's (EIR) buildout water estimate. The middle demand estimate is based on typical unit water use factors applied to the EIR's projected land use designations. The low demand estimate is based on applying unit water use factors to the SACOG defined land use. The middle demand estimate of 4,183 ac-ft/yr is used for this plan.

On February 28, 2008, California Governor Schwarzenegger introduced a seven-part comprehensive plan for improving the Sacramento-San Joaquin Delta. As part of the plan, the Governor directed state agencies to prepare and implement a program to achieve a 20 percent reduction in statewide average per capita water use by year 2020 (20x2020 Program). This program is not currently mandated by law. The 20x2020 Program has developed a draft year 2020 target of 175 gallons per capita per day (gpcd) for the Sacramento hydrologic region. The District's current use is 235 gpcd (2005 demand (36.8 mgd) divided by 2005 population (157,000 people)). To meet the 20x2020 Program target, the District would have to reduce per capita demands by approximately 22 percent in 2035 from the projected 2035 demand. This would result in a buildout demand of 37,300 ac-ft/yr, as shown on Figure ES-3. The projected demand of 48,000 acre-feet for 2035 is used in this plan.

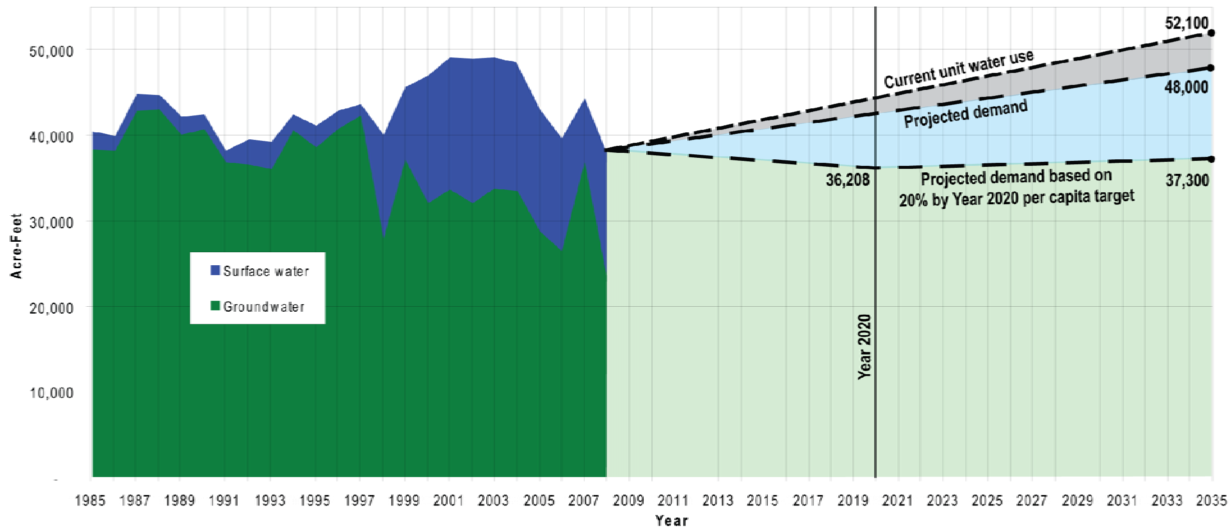


Figure ES-3. Historical Surface and Groundwater Production and Projected Demand

Water use varies continuously throughout a given day, as well as seasonally. The maximum day peaking factor (maximum day to average day demand) for the District is 2.0. The District's peak hour factor (peak hour to maximum day rate) is 1.7 based on SCADA data collected for the District production sources during July 2008. Table ES-2 presents the District's projected annual, maximum day, and peak hour demands at buildout.

Table ES-2. 2035 Maximum Day and Peak Hour Demands

Service area	Average annual demand		Maximum day demand		Peak hour demand
	acre-feet	mgd	mgd	gpm	gpm
NSA[a]	31,428	28.1	56.1	38,971	66,250
SSA	16,593	14.8	29.6	20,575	30,863
Total	48,021	42.9	85.7	59,546	97,113

[a] NSA demands includes Arbors at Antelope service area and McClellan Business Park service area (high McClellan Business Park demand) demands.

Climate change is projected to likely result in a 1 degree to 2 degree centigrade warming in average annual temperature by 2035. Climate change impacts to the District's water demands are uncertain. It is possible that the District's annual water demands would increase slightly by 2035 as a result of increased temperatures.

Water Supply

The District utilizes both groundwater and surface water as its water supply sources.

Groundwater

Historically, groundwater has been the primary source of water for both the NSA and SSA. The groundwater basin underlying the District is located in a portion of the North American subbasin which is part of the larger Sacramento Valley Groundwater Basin. According to California's Groundwater Resources Bulletin 118 (Department of Water Resources [DWR], 2004), the North American subbasin number is 5-21.64.

The water-bearing deposits underlying the District include the Miocene/Pliocene volcanic Mehrten Formation. The Mehrten Formation is the most productive fresh water-bearing unit in the eastern Sacramento Valley, though some of the permeable layers of the overlying older alluvium produce moderate amounts of water. Groundwater is generally recharged along the east side of the subbasin and through the younger alluvium of streams and rivers, and flows west/southwest through the subbasin.

Groundwater levels were generally declining in the District's portion of Sacramento County through 1998 and the previous 40 years, with many areas declining at a rate of 1.5 to 2.0 feet per year. A groundwater depression that was evident in 1968 significantly expanded and deepened by 1996. Groundwater levels under the NSA dropped approximately 40 feet from 1968 to 1996.

Since the 1960's, the District has had an in-lieu groundwater recharge program in place. This program involves the importation of surface water to partially offset groundwater usage, which has resulted in the local recovery of groundwater levels in the NSA. According to a November 2005 report prepared by Luhdorff and Scalmanini, the District has observed an increase in groundwater elevations of up to 20 feet in the NSA as a result of its importation of treated surface water. Since 1998, the District has recorded with the State Water Resources Control Board the volume of water that has been banked via their in-lieu groundwater recharge. The District has banked a total of 133,302 ac-ft since 1998.

The "sustainable yield" of the portion of the North American groundwater subbasin within Sacramento County was defined as part of the Water Forum process and the formation of the Sacramento Groundwater Authority (SGA). The estimated "average annual sustainable yield" defined by the Water Forum is 131,000 ac-ft/yr and is approximately equal to the magnitude of regional groundwater pumping in the basin in 1990 (EDAW/SWRI, 1999). This "sustainable yield" is in the Water Forum Agreement (WFA) and is an approximate value based on quantitative assessments of the basin's groundwater resources using the Sacramento County Integrated Groundwater and Surface Water Model (IGSM), which allowed for additional groundwater drawdown to levels of as much as 100 feet below mean sea level (WFA Appendix E; Baseline Conditions for Groundwater Yield Analysis, Final Report, May, 1997).

The Groundwater Management Plan (GWMP) Basin Management Objectives prepared by SGA state that the basin will be operated for groundwater level stabilization with no further drawdown. Pumping at levels approaching the "sustainable yield" value of 131,000 acre-feet per year (ac-ft/yr) would be expected to produce groundwater declines, which would be inconsistent with the GWMP objective.

The groundwater pumping targets for the District are defined using several approaches that consist of disaggregating the SGA defined "sustainable yield" to identify the District's portion. These approaches consist of the SGA area percentage, historical baseline, and stabilized groundwater level approaches. The results of this analysis provides a range of 24,000 ac-ft/yr to 41,000 ac-ft/yr for a possible groundwater pumping target. A long-term groundwater pumping target of 35,000 ac-ft/yr is selected for this study.

There are known groundwater contamination plumes located in the groundwater basin. These are the McClellan Business Park, McDonnell Douglas IRCTS, Aerojet, Mather Field, and the Roseville Railyard plumes. There is also a recently identified contaminated plume (Kennedy Jenks, 2007) located within the Carmichael Water District, to the east of the District. The District has five wells that are closest to these plumes that could be impacted within a few years. Based on the level of threat and individual plume site conditions, mitigation measures that include tracking monitoring, promoting additional monitoring wells, conducting additional modeling and studies, abandoning or replacing wells, and modifying well pumping are recommended for the District to implement. Although some of these measures are not a District responsibility, they may be facilitated by the District in conjunction with State and Federal regulatory agencies, principal responsible parties, SGA, and/or other neighboring water agencies.

Surface Water

The District imports surface water from three supply sources. The District's current surface water agreements are with PCWA and the City. The District has occasionally received Section 215 Central Valley Project (CVP) water from the US Bureau of Reclamation (USBR).

One of the constraints impacting the District's surface water supplies is the District's WFA. The District is a stakeholder in the Water Forum, a Sacramento regional water management initiative. The WFA was designed to achieve the two coequal objectives of providing a reliable and safe water supply for the region's economic health and planned development to the year 2030, and preserving the fishery, wildlife, recreational, and aesthetic values of the lower American River. The WFA identifies four water supply conditions based on the March to November unimpaired inflow into Folsom Reservoir (UIFR).

Placer County Water Agency Supply. In 1999, the former Northridge Water District and PCWA entered into a take or pay agreement for delivery of up to 12,000 to 29,000 ac-ft per year from PCWA's Middle Fork Project supply through the twenty-fifth year of the agreement. PCWA can take back the water at anytime for their needs. According to the agreement, the PCWA supply is currently available only during Water Forum average and wet years. After the first 10 years (starting in 2010), the supply becomes available only during Water Forum wet years. PCWA has projected that this supply would be reduced to 12,000 ac-ft/yr at buildout of PCWA's service area, which is anticipated to occur after 2024 (Brown and Caldwell, 2006). The PCWA surface water has place of use (POU) restrictions, therefore the District must use this water in the NSA only. The PCWA supply costs $107/ac-ft for 12,000 ac-ft/yr, which consists of fixed, treatment, and wheeling costs.

The infrastructure that delivers the PCWA water to the District has limited capacity in the summer. The spare infrastructure capacity equates to approximately 50,000 ac-ft/yr. The NSA buildout demand is approximately 34,000 ac-ft/yr. Because of seasonal demand variations, the NSA can only use 22,000 ac-ft/yr of the PCWA supply. Water supply in excess of 22,000 ac-ft/yr deliverable through the spare capacity in the San Juan Water District system could be used for groundwater recharge.

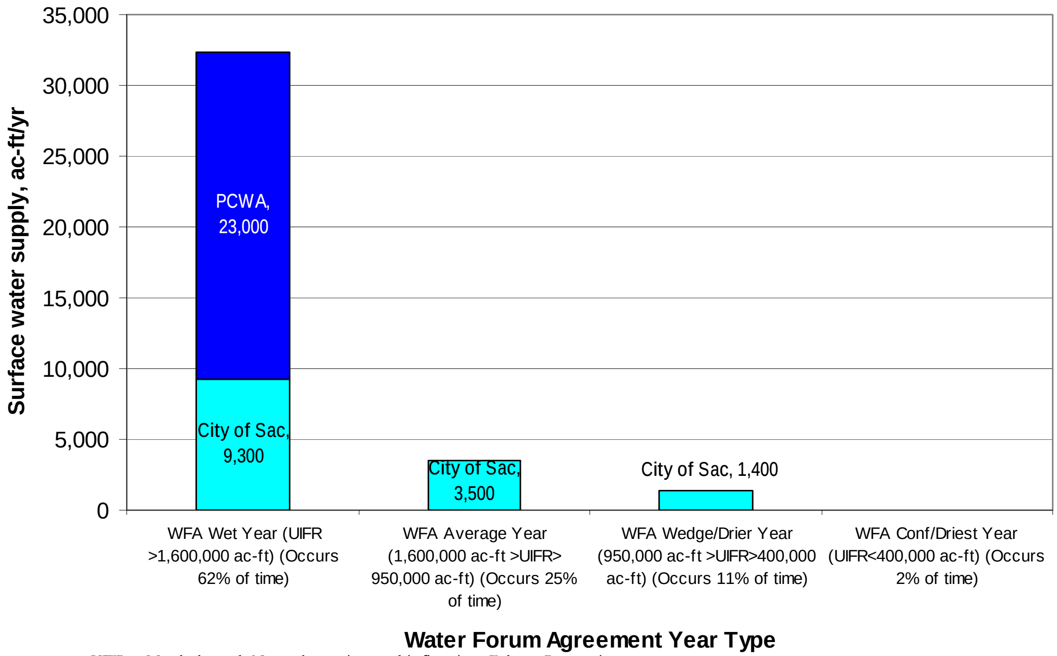
City of Sacramento Supply. In January 2004, the District entered into an agreement with the City for up to 20 mgd of surface water supply plus up to 10 mgd of additional water. A continuous supply of 20 mgd is equivalent to 22,404 ac-ft/yr. The City supply costs approximately $190/ac-ft.

The City's American River supply is for use within the portion of the service area of the District that is within the portion of the authorized POU for the City's American River water rights permits, referred to as "Area D". Most of the SSA and a portion of the NSA are within Area D.

This City supply to the District is subject to the WFA diversion restrictions as well as the Hodge flow criteria. Because of the Hodge Criteria, the available City supply in a WFA wet year is estimated to be on average 13,000 ac-ft/yr, but can vary significantly. Because of demand limitations, the SSA can only use approximately 9,000 ac-ft/yr of the City supply in WFA wet years. Lesser amounts of City water are available during WFA average and drier year types. The SSA buildout demand is 16,600 ac-ft/yr. The remaining deliverable City supply could be used for groundwater recharge.

Section 215 USBR Supply. Since 1991, the NSA has occasionally received a nominal amount of Section 215 USBR CVP water. Section 215 water is surplus or "spillway" water available typically in winter and spring in wet years. This water is treated at the Peterson WTP and delivered for use within the NSA.

The availability of the District's wholesale surface water supply sources considering contract, infrastructure, and demand limitations under the various Water Forum flow conditions are summarized on Figure ES-4. There is spare capacity in the SJWD system to deliver additional water to the NSA, such as Section 215 water. The potential impacts of climate change could change these estimates of water supply availability and their seasonal availability.



UIFR = March through November unimpared inflow into Folsom Reservoir.

Figure ES-4. Surface Water Supply - with Demand Limitations

Excess Capacity Evaluation

An analysis was performed to identify and quantify the District's excess groundwater supply based on well pumping capacity at buildout. The District's reliable well capacity is assumed to be 90 percent of the capacity from active wells for each service area. It is also assumed that the District's reliable well capacity is reduced in winter months (October through March) by an additional 10 percent to account for wells that are taken offline for maintenance during that period. The NSA has a July excess capacity of 1,000 gpm, and the SSA has a July excess capacity of 18,000 gpm. There is more excess capacity available in the non-summer months.

Buildout Water Supply Alternatives –Meet District Needs

The development of a conjunctive use strategy consists of integrating the buildout water needs, groundwater pumping target, available surface water supplies, groundwater supply capacity, and frequency of occurrence of WFA climate year types to arrive at the optimum mix of water supplies. An objective of the conjunctive use strategy is to have the District not exceed the groundwater pumping target and utilizing surface water as part of the supply in wet years when supplies are plentiful and less costly.

Figure ES-5 shows the groundwater and surface water use for each of the WFA year types for the overall District based on meeting the long-term groundwater pumping target of 35,000 ac-ft/yr.

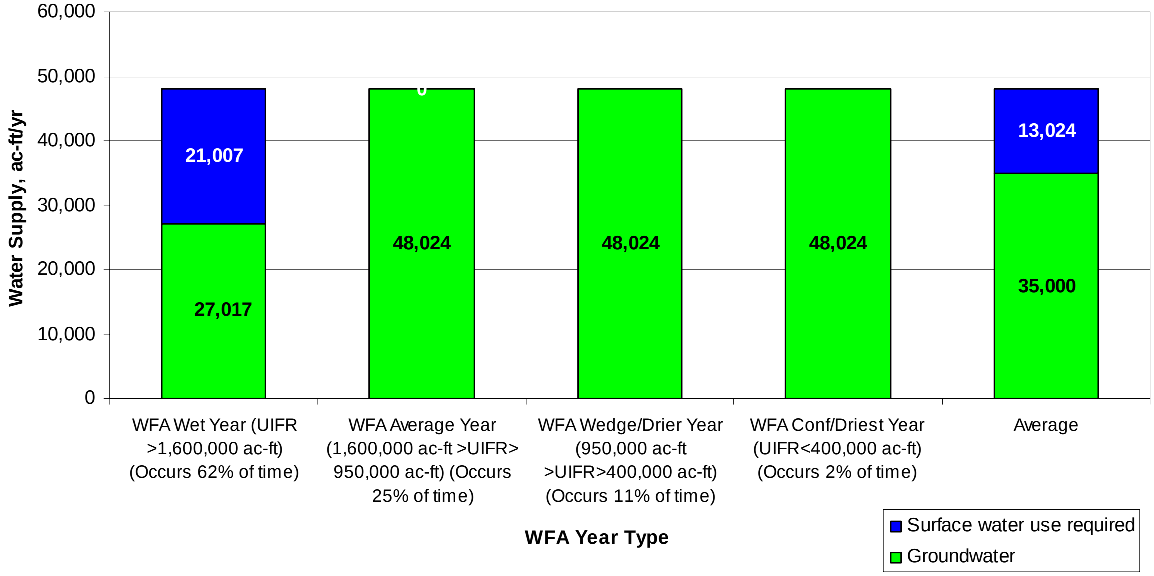


Figure ES-5. Conjunctive Use Strategy to Meet the District Needs

The PCWA water supply source may be reduced in future years to meet PCWA's own needs. This would result in a total wet year surface water supply for the District of 21,300 ac-ft/yr, a deficit of 3,700 ac-ft/yr, which meets 21,007 compared to the 25,000 ac-ft/yr need. If the PCWA supply became totally eliminated, the deficit would be 126,000 ac-ft/yr.

With a reduced PCWA supply, the District would have to supply surface water to the NSA from another source to be able to meet the groundwater target. This surface water could be supplied by USBR Section 215 water directly to the NSA or providing water to the NSA from the Sacramento River Water Reliability Study source. The ability to provide City water to the NSA is very limited because of demand limitations in the non-summer months when more of the City supply is available.

A key decision for the District is whether to continue participation in the Sacramento River Water Reliability Study. This project is proposing to construct a water treatment plant on the Sacramento River near the Sacramento International Airport and a transmission pipeline that would deliver treated surface water to areas within western Placer County and northern Sacramento County. The current project participants are the City, the City of Roseville, PCWA, and the District.

The District's need for surface water is primarily in wet and average climate years, particularly to replace a reduced or eliminated PCWA surface water supply. If the cost of the water supply from the Sacramento River Water Reliability Study is equal or lower than other wet year water supply sources, it would make sense to consider it. However, the cost of this alternative is likely higher than other supply sources given that considerable facilities and infrastructure would have to be constructed. A combination of increasing the use of the City and USBR 215 supply in wet years along with more aggressive water conservation might achieve the same purpose at lower cost. It is recommended that the District work with other project participants to define the cost of participation and use this cost information to make a project participation decision.

Water Supply Alternatives-Export from District

The District has enough surface and groundwater supplies to meet its own needs and still have capacity to supply water to others. The District has invested in constructing groundwater and surface water supply infrastructure that has the capacity to provide a regional water supply benefit.

There are two basic types of regional water projects in terms of water delivery, a conjunctive use strategy that would export a dry year supply and a continuous export supply through all types of climate years. A dry year supply only project would consist of delivering water to others that had a water need solely during dry years. The District would have to increase its use of surface water in wet years to allow it to pump additional groundwater in dry years to allow export to others and still meet the long-term groundwater target.

Figure ES-6 presents an in-lieu recharge scenario with the ability to export approximately 20,000 ac-ft/yr during drier and driest years, while still keeping the overall long-term groundwater pumping below the 35,000 ac-ft/yr target. The District would have to import up to 32,000 ac-ft/yr of surface water during wet years compared to the 2521,000 ac-ft/yr to just meet the District's needs. As described earlier, the deliverable surface water from PCWA and the City totals 32,000 ac-ft/yr while meeting contract, treatment, infrastructure, and demand limitations. The export quantities could be greater by conducting active aquifer storage and recovery (ASR).

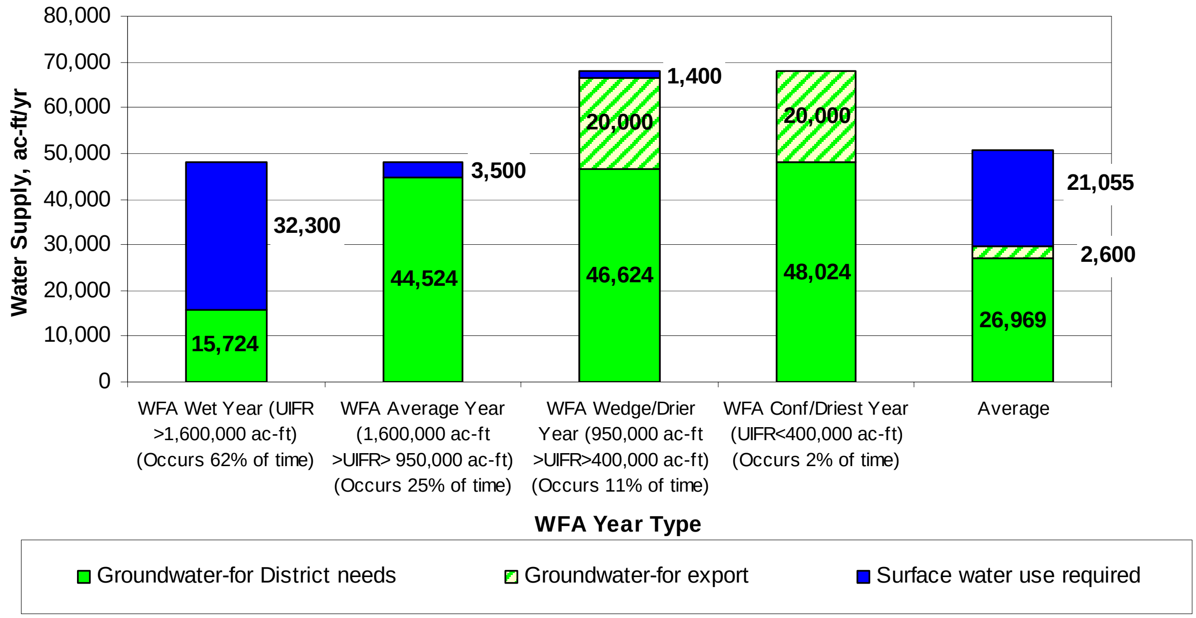


Figure ES-6. Conjunctive Use Strategy for Export from District

Possible regional water supply needs that could be addressed by exporting water from the District include:

1. Provide dry year supply using the Cooperative Transmission Pipeline. The water purveyors that depend on Folsom Lake have dry year water supply needs. The Cooperative Transmission Pipeline provides the infrastructure to deliver water to those agencies.
2. Provide groundwater contamination plume replacement water.
3. Wheel water for others. Utilize excess capacity in District pipelines to wheel water for other water agencies, such as in southwestern Placer County.
4. Provide surface water to others. Utilize surface water supplies to sell to local agencies to help them implement conjunctive use.
5. Provide to drought water bank. The District can provide water to downstream users by letting its surface water flow down the American River and pumping groundwater within the District instead, or by pumping banked water to the river.

Drinking Water Quality

Regulations governing drinking water quality that the District must comply with are established at the federal and state levels, with each setting Maximum Contaminant Levels (MCLs) that must not be exceeded. Regulations at the federal level are promulgated by the United States Environmental Protection Agency (USEPA) which is responsible for setting standards and assuring compliance. Regulations at the state level are maintained by the California Department of Public Health (CDPH) which carries out similar responsibilities.

The American River is an excellent quality source of drinking water. Peaks in turbidity levels, number of microorganisms, and organic carbon concentrations occur during wet weather and storm events. Watershed runoff and discharges contribute to these wet weather peaks. Aerojet groundwater remediation discharges to the American River are regulated under an NPDES permit. These discharges have occasionally violated the permit conditions. The American River raw water can be treated to meet all drinking water standards using conventional and direct filtration processes, as well as membranes.

Historically, the water quality of the District's groundwater and surface water supplies has been generally excellent, although there are some issues of potential concern. These issues are:

- Iron and Manganese – Two wells currently have wellhead treatment facilities in place for removal of iron and manganese. Iron and manganese are present in the groundwater aquifer in scattered and isolated areas.
- Methane – The District has taken steps to mitigate the presence of methane found in some of the deeper system wells (>800 ft) (and some wells shallower than 800 ft as well) through methods such as air strippers or by capping off the lower production zones.
- Radon – Though there is no current MCL for Radon, groundwater well samples from both the NSA and SSA exceeded the proposed MCL. Current discussions with the CDPH Indoor Radon Program indicate that a decision on the implementation/adoption of this rule has been postponed indefinitely.
- Groundwater Contamination Plumes – As discussed earlier, there are several groundwater contamination plumes within and close to the District's service area. These plumes contain perchlorate, N-Nitrosodimethylamine (NDMA), and various organic compounds.
- Disinfection Byproducts (DBPs) – While DBPs in the imported surface water meets the drinking water standards, the District should continue to monitor its surface water supplies for this constituent given the

potential older age of the water during lower demand periods and the need to balance having adequate chlorine residual and low DBPs.

Distribution System Evaluation

The District's hydraulic model was updated from a static model to an extended period model. Approximately 60,000 feet of distribution mains that the District has installed since 2006 were added in the model. A diurnal time pattern was established to simulate system demands over a 24-hour period. A peak hour factor (peak hour rate to maximum day rate) of 1.7 for the NSA and 1.5 for the SSA is used for estimating future peak hour demands. The extended period simulation model was operationally calibrated based on the July 6, 2008 through July 12, 2008 maximum day event.

The District maintains minimum service pressures of 35 pounds per square inch (psi) for maximum day and peak hour demand conditions with allowable minimum pressures down to 20 psi during maximum day plus fire flow demand conditions. Fire flow requirements vary from 1,500 gpm to 4,000 gpm depending on use and type of structure. Maximum allowable pipeline velocity is 5 feet per second (fps). Maximum allowable pipeline headloss varies from 5 to 10 feet per 1,000 feet of pipe.

The system was analyzed using the model for projected 2035 maximum day and peak hour demand conditions using groundwater as the only supply. Service pressures remained above 35 psi in all areas under maximum day demand conditions and dropped down below 35 psi along the east side of the NSA during peak hour demand conditions. Few pipelines exceeded the pipeline velocity and headloss criteria.

The NSA was evaluated for average day demands using the PCWA supply, since that supply would be minimally available in the summer months.

The SSA was evaluated under maximum day demands using the City supply at 20 mgd. The SSA was able to hydraulically utilize all of the City supply while still maintaining adequate system pressures.

The fire flow capacity while maintaining a residual pressure of 20 psi was analyzed using the hydraulic model. The model results indicate that the District has adequate fire flow capacity except for the Fair Oaks Boulevard Corridor the eastern portion of McClellan Business Park, Island area, and the western portion of SSA 2. These areas have inadequate fire flow due to the smaller pipe sizes. The District's maximum fire flow pipeline velocity criteria of 5 fps is not met in portions of the District's service area due to the use of smaller pipelines, even though these areas have an adequate fire flow supply flow rate.

The District's water system is characterized by ten distinct subareas or clusters of customers that are interconnected to neighboring subareas by several pipelines. Overall, both the NSA and SSA areas have ample supply capacity to meet buildout demands. Some of the subareas have surplus supply capacity that is used to help supply other subareas through adequate numbers of interconnecting pipleines. The McClellan Business Park subarea has only two interconnections. It is recommended that a third interconnection be added for improved reliability.

The areas of high and low pressure within the District were examined to determine the logical boundaries for new pressure zones. A pressure zone is typically designed to keep water pressure within a range of 40 to 80 psi during average demand periods. The ground elevations in the NSA vary by 116 feet, which is a 50 psi static pressure range. As a result of this range, the District provides pressures as low as 20 psi in the higher elevated areas of the NSA and pressures as high as 80 psi at the lower elevation areas based on modeling results for buildout demand. The SSA has ground elevations that vary by 72 feet, which is small enough such that a new pressure zone in the SSA is not warranted.

An option to address low pressures occurring in the northern and eastern areas of the NSA is to create two new pressure zones in these areas. Pressure reducing sustaining valves would be required to develop these two new pressure zones. A benefit of providing these additional pressure zones is that the District could realize energy cost savings of approximately $100,000 per year by reducing the HGL for a portion of the NSA.

An analysis of the Island Area distribution system was conducted by West Yost and Associates.

There are two corridor planning areas in the NSA that will be redeveloped in the future that were examined to determine the need for any infrastructure upgrades as a result of future development. The North Watt Avenue Corridor is located along northern Watt Avenue in NSA 4. The Fair Oaks Blvd Corridor is located in NSA 3 along Manzanita Avenue. The McClellan Business Park in the NSA is also in the process of being redeveloped. All of these areas have portions of limited fire flow capacity because of the smaller existing pipeline sizes and the District's fire flow pipe velocity criteria. In order to provide adequate fire flow supply and meet the maximum 5 fps velocity under fire flow conditions, select pipelines should be replaced with larger pipelines or parallel pipelines should be added as redevelopment occurs.

Storage Capacity Evaluation

The District uses water supplied from both storage and wells to help meet peak demands. The District uses groundwater pumped to the system by groundwater wells to provide a portion of the peak demands. Storage facilities consist of operational storage to supply peak hour demands, fire storage to meet fire flow requirements, and emergency storage to meet demands during emergency periods. An evaluation of the District's storage capacity needs was conducted for buildout demand conditions. The analysis shows that the District has adequate storage volume capacity and storage pumping capacity when combined with available groundwater well pumping capacity to meet peak demand conditions. The one exception is that a 2 to 3 MG groundlevel storage reservoir with pump station will be required for the meet the future demands of the McClellan Business Park.

Infrastructure Reliability Plan

An evaluation of the risk and consequence of failure of the District's key facilities was conducted. Key wells, all storage and booster pump stations, and key water supply transmission pipelines were evaluated.

Twenty six key wells were identified based on those wells that are either high producing or have a backup power generator. The risk of failure was assessed based on the results of the District's Well Facility Asset Management Plan and proximity to a known groundwater contamination plume. The consequence of well failure was based on the importance of a well in terms of supplying a subarea, provision of backup power, and those wells that are high producers. The combination of failure risk and consequence identified nine wells to focus regular well rehabilitation and well pump refurbishment efforts.

The risk of failure of storage and booster pump station facilities was based on age and reported significant maintenance issues. The consequence of failure was based on importance of the facility to meet demands. The failure risk and consequence for these facilities is relatively low.

Nineteen key pipeline segments were identified as those that have larger size, carry larger flows, carry supply from a key well, connect subareas, and deliver surface water. The risk of failure was assessed based on pipeline age and history of problems. The consequence of failure was based on the significance of the pipeline. The combination of failure risk and consequence concluded that the pipeline system is relatively secure.

Based on this risk-cost analysis, it is recommended that the District focus its efforts to regularly rehabilitate key wells, maintain storage and pumping facilities, and monitor the higher risk pipelines.

Standby Power Capability

The standby power capability at well sites and other water supply facilities were evaluated to ensure that the water system can supply average day and fire demands during a power failure. The District currently has standby power capability on 11 wells and all of the reservoir booster pump stations. Recent changes in air emission regulations have impacted the ability of the District to operate nine of its diesel powered generators.

District should provide additional backup power supply in the NSA to meet buildout demands. It is recommended that this backup power supply be placed on eight wells. The SSA is projected to have a backup power supply surplus at buildout.

Surge Analysis

Pressure surges typically develop during pump startup and shutdown and under accident conditions such as loss of power to the pumps or inadvertent valve closure. Cavitation or excessive pressure surging can lead to pipeline or component failure. A quantitative assessment of the District's existing distribution system was conducted to identify potential surge issues using the InfoSurge modeling software.

The surge analysis identified high and low transient pressures of up to 140 psi and as low as -14 psi that could occur during an emergency pump shutdown. The most extreme pressure range was found to occur immediately downstream of the pump and at the end of dead-end pipes near the pump, with the worst case occurring in the dead-end pipes. Pressure surge at pump startup also did not cause the extreme pressures that occurred during pump shutdown.

Because this analysis identified dead-end pipes as being vulnerable to negative pressures during abrupt pump shutdown, it is recommended that a more detailed surge analysis be done beginning at the well sites that do not currently have surge protection. Areas that have a lack of hydropnuematic tanks are the northern portion of NSA 1 and the northern portion of NSA 3. Preventative measures could be identified such as looping the piping, two-way surge valve anticipators at the pump, or hydropneumatic tanks.

McClellan Business Park Infrastructure Needs Technical Memorandum

The purpose of this technical memorandum is to evaluate the water system facilities needed to supply the McClellan Business Park at buildout. A McClellan Business Park buildout demand estimate 4,183 ac-ft is used for buildout infrastructure sizing.

Below is a summary of the key McClellan Business Park service area buildout infrastructure requirements as identified in this analysis.

1. Additional supply of two or three new groundwater wells located in the District's NSA outside of the McClellan regional contamination plume 2,000 ft buffer zone to meet projected demands at buildout.
2. The volume of additional storage facilities required at buldout is approximately 2 MG with the use of the existing elevated tanks or 3 MG without utilizing the existing elevated tanks.
3. To increase supply reliability into the McClellan Business Park service area, it is recommended that the District install a third intertie at the north end of the service area near 34th street.
4. Install PRVs at the BPS 1 and 2 intertie locations as well as at any added intertie location to enable the existing elevated storage tanks to function in the system during normal operations.

5. Pipeline improvements due to high velocities are predominantly required on the south east side of the McClellan Business Park service area, with most improvements being located close to the BPS 1 and BPS 2.

6. Pipeline improvements due to fire flow needs are potentially required in the office land use area in the northern area of the East McClellan District where existing pipelines are only 6-in diameter and cannot meet the 3,000 gpm fire flow requirement or District minimum velocity criteria.

SCADA Analysis Technical Memorandum

The purpose of this technical memorandum is to discuss the extent of the current Supervisory Control and Data Acquisition (SCADA) system and visualize potential other SCADA needs and uses in the District. This desktop review of the District's SCADA system shows a solid system in place and in progress. A significant number of active facilities are not currently connected to the SCADA system and standard products and services to complete the SCADA system are not well documented. Master station functions can be substantially improved by consistent application of SCADA standards, and this will prepare the District for more advanced SCADA applications.

Recommendations

An outcome of this planning analysis is recommendations regarding future planning, monitoring, operational, and infrastructure action items, as presented below:

1. Water Requirements
   a. Continue to implement water conservation best management practices.
   b. Track state demand reduction legislation (i.e. 20 percent by 2020 goal).
   c. Revise demand projections once the impact of metering, demand legislation, and climate change is better known, and to reflect changes in demographic and land use projections, including McClellan Business Park development progress.
   d. Conduct a system wide water audit to better quantify water system losses once the District is more metered.
2. Groundwater
   a. Improve groundwater pumping target estimate through certain hydrogeologic evaluations.
   b. Encourage the re-evaluation of the defined groundwater "sustainable yield" and the development of a regional groundwater accounting framework.
   c. Encourage other water purveyors to reduce their groundwater use by maximizing conjunctive use.
   d. Implement efforts to reduce the chance of reducing groundwater supply by continuing to track groundwater known contamination plumes and coordinating with stakeholders.
   e. Mitigate groundwater contamination of major plumes through potential mitigation measures including adding monitoring wells, modeling, and modified pumping scenarios.

f. Consider possible contaminating activities when siting new wells.

3. Water Supply Alternatives/Meet District Needs

   a. Monitor American River surface water supply to provide early drought warning and for climate change impacts such as changes to the frequency of Water Forum climate year types.

   b. Encourage the verification that the Water Forum approach of using the March to November inflow to Folsom Reservoir to define water year type provides the best benchmark.

   c. Monitor the future extent and frequency of surface water supplies from PCWA, the City, and USBR.

   d. Continue to implement a conjunctive use strategy to meet District needs by importing up to 21,000 ac-ft/yr of surface water in wet and average years from available supplies.

   e. Regularly monitor the amount of water banked or stored in the aquifer by the District.

   f. Evaluate participation with the Sacramento River Water Reliability Study with a water need of 10,000 ac-ft/yr in wet and average years and no need in dry years.

   g. Consider more aggressive water conservation as a component of the conjunctive use strategy.

   h. Investigate surface water supply options to eventually supplement or replace the PCWA supply.

4. Water Supply Alternatives-Export from District

   a. Encourage efforts to improve the local regulatory environment to allow aquifer storage and recovery.

   b. Proceed with the alternatives to supply dry year water by continuing discussions with the San Juan family, City of Folsom, and others. Determine needed improvements.

   c. Explore exporting water to the drought water bank and downstream diverters by meeting with interested parties to define requirements.

5. Drinking Water Quality

   a. Track the possible development of a new Radon drinking water standard and define the cost of compliance using radon treatment.

6. Distribution System Evaluation, SCADA, Infrastructure Reliability, Standby Power Capability, and Surge Analysis

   a. Add a third interconnection to McClellan Business Park to improve reliability.

   b. Conduct a preliminary design to add 2 to 3 MG of ground level storage with pump station to McClellan Business Park that considers reducing the area's pressure to fully utilize the existing elevated storage versus abandoning the elevated storage.

c. Upgrade pipelines in the eastern area of McClellan Business Park that do not provide adequate fire flow. Upgrade pipelines that provide adequate fire flow but exceed velocity criteria as part of the main replacement program.

d. Provide two to three new groundwater wells located in the NSA to meet future demands.

e. Evaluate creating new pressure zones in the NSA by developing a presdesign that quantifies costs and benefits and investigates other alternatives to address the low water pressures.

f. Replace existing smaller distribution system pipelines that do not meet the fire flow velocity standard with larger pipelines that as part of the overall main replacement program.

g. Upsize the Island Area distribution system to meet fire flow requirements.

h. Upsize transmission mains along North Watt Avenue and Fair Oaks Boulevard planning corridors to meet fire flow requirements.

i. Develop a SCADA system completion plan and guidelines that includes consideration of advanced SCADA functions such as energy management.

j. Expand SCADA system to include appropriate unmonitored sites.

k. Rehabilitate key wells on 7 year cycles.

l. Continue the two year maintenance program of the storage and booster facilities.

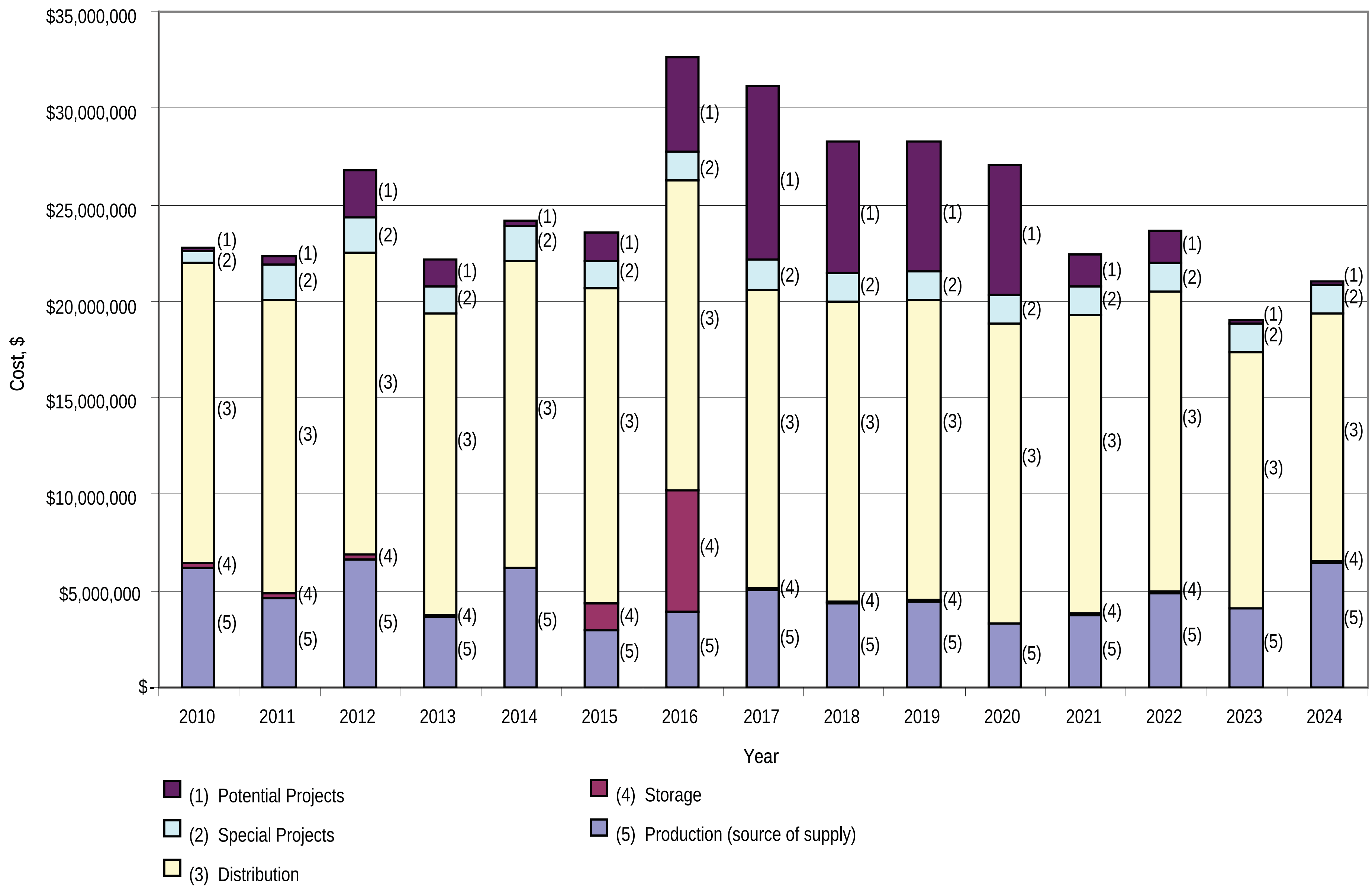
m. Monitor critical water supply transmission pipelines for leakage or operational signs of failure.

n. Provide additional backup power supply in the NSA to meet current and 2035 demands.

o. Conduct a more detailed surge analysis in areas identified as being potentially vulnerable to surge protection to identify possible remedies.

Capital Needs Analysis

A capital needs analysis for a 15-year period from 2010 through 2024 is intended to be used as a planning tool for the development of the District's capital improvement program. The District's capital needs are divided into five project categories: production (source of supply), storage, distribution, special, and potential. The annual costs for all projects by each of the five categories are shown on Figure ES-7. Distribution main replacements are a large portion of the costs within the distribution projects categories. Most of the potential projects are funded by others.



BROWN AND CALDWELL	PROJECT 135849-100	SITE Water System Master Plan, Sacramento Suburban Water District	Figure
	DATE 7-30-09	TITLE Capital Needs Analysis Total Annual Cost	ES-7