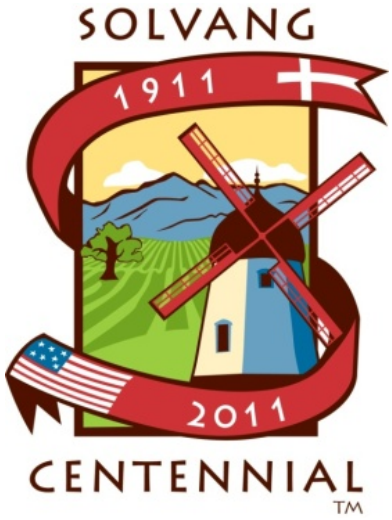

CITY OF SOLVANG

WATER SYSTEM MASTER PLAN UPDATE

FINAL DRAFT

April 2011

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1.0 INTRODUCTION

1.1 Purpose of Plan Update

The primary purpose of the Water System Master Plan Update is to perform the following: 1) evaluate present and future water supply and demand conditions; 2) analyze and identify water system supply and distribution deficiencies; and 3) develop recommendations and a capital improvement program to address deficiencies.

1.2 Water System Master Planning History

In 2002, the City of Solvang contracted with Provost & Pritchard Engineering Group (P&P) to prepare an update of the City of Solvang 1996 Water System Master Plan prepared by Boyle Engineering. The scope of the work performed by P&P at that time included:

- Review previous master planning studies of the City water system.
- Analyze those studies in light of current information; confirm or revise previous assumptions in the planning studies.
- Prepare a summary of current recommendations for capital improvements to the system, and present a rationale for those recommendations.
- Prepare a summary of the project recommendations for environmental analysis concerning extension of the City's Permit No. 15878 to divert underflow from the Santa Ynez River.

The P&P Master Plan Update was completed in October 2002. In August 2009, City staff performed a minor update of the 2002 Master Plan Update. This 2011 Master Plan Update (the "2011 Update") is City Staff's further minor update of the Provost & Pritchard 2002 Master Plan Update.

Prior to implementing the recommendations of the Master Plan Update, the City is required to complete a CEQA environmental review process. A Notice of Preparation was issued December 4, 2002 for a thirty day public review period. URS Corporation was hired to complete the Environmental Impact Report. Due to a series of delays related to the Cachuma Project EIR and negotiation of mitigation measures the internal administrative draft was issued in November of 2004 with a second draft put on hold in October of 2006.

In January 2011 URS prepared an updated Initial Study/Environmental Checklist. A Notice of Preparation was sent out to the Office of Planning and Research and interested parties dated January 6, 2011. A Scoping Hearing was held on January 19, 2011 in Solvang with about 25 people in attendance. The public comment period ended on February 6, 2011. The City received twenty comment letters addressing issues to be covered in the Final EIR.

1.3 Additional Background

Several important events have occurred since the completion of the 1996 Water System Master Plan prepared by Boyle Engineering and the Update prepared by P&P in 2002.

a. The State Water Project (SWP) connection to the Solvang system was completed and placed in service in August 2002.

b. New sections of water main were installed to connect the SWP source to Reservoir No. 1, generally in conformance with the recommendations of the 1996 Master Plan.

c. A new 1,000 gpm booster pumping station was installed to transfer water from the lower pressure zone (Zone 1) to the upper pressure zone (Zone 2). This station is located at the site of Reservoir No. 1.

d. A few years ago the United States Bureau of Reclamation (USBR) began preparation of an EIR reviewing the operation of their Cachuma Reservoir project. The Cachuma EIR involves several complex environmental issues, is still in progress, and is not expected to be completed for several months, possibly not until 2013. In addition to other regional issues, the Cachuma EIR will evaluate adequacy of flows in the Santa Ynez River to support coldwater fisheries. That investigation and the Cachuma EIR process may result in modifications of river flows.

e. The City's existing permit No. 15878 to appropriate water from the Santa Ynez River provides for diversion of up to 5 cubic feet per second (cfs) and up to 3,600 acre feet per year (AFY) from the underflow of the River. Increasing withdrawals pursuant to the permit now requires environmental review because additional facilities must be constructed to increase pumping capacity. Solvang has petitioned the State Water Resources Control Board seeking an extension of time to construct facilities and prove up the diversion capability and the beneficial use of the full amount Solvang plans to divert from the river at Buildout. The SWRCB also requires environmental review as a condition of processing the request for the extension of time.

f. Solvang is preparing an environmental document based in part on the United States Fish & Wildlife Service Biological Opinion for the Cachuma Project and the Santa Ynez River watershed to analyze the potential environmental impacts of the additional diversions sought by Solvang including installation of the new wells, pipelines, and treatment (filtration) plant that will be required to accomplish those diversions.

g. An additional purpose of this 2011 Update is to establish the timing (by month, maximum instantaneous diversion rate, and total annual amount of diversion) that Solvang needs to pump from the River to fill its water needs. The EIR will analyze how those diversions can be managed to accommodate fisheries and minimize impacts on other diverters from the River.

The combined effect of the above changes in conditions justifies the need to update the Master Plan and confirm (or revise) the previous recommendations.

1.4 Reference Materials

The following reference materials and documents were reviewed in the process of preparing this 2011 Master Plan Update:

- 1996 Boyle Water System Master Plan
- 2002 Provost & Pritchard Water System Master Plan Update
- 2009 City Staff Water System Master Plan Update
- City water production/ consumption records from 1986 through 2010
- City of Solvang General Plan Land Use and Housing Elements (adopted July 27, 2009)
- Skytt Mesa Subdivision, EIR Summary
- State Water Resources Control Board (SWRCB) Permit 15878

1.5 Summary of Master Plan Update

In general, the following conclusions and recommendations from the P&P 2002 Master Plan remain consistent with current (2011) conditions:

- Distribution system model and pipe sizing recommendations.
- Need for additional wells along the Santa Ynez River.
- Need for water treatment (filtering and disinfecting) of river well water.
- Reliance on the State Water Project for a portion of the City's annual supply as a relatively reliable and good quality supplemental water source.
- Need to provide a single chemical for disinfection throughout the entire distribution system (since the State Water Project uses chloramines, this type of disinfectant is recommended).

Based on our current review, the following elements of the P&P 2002 Master Plan have been updated:

- Water consumption projections are modified based on changes in usage, and are lower than previous projections.

- Preferred priority for water sources has been revised. It is recommended that the City use the Santa Ynez River Wells as the primary source of water, and the State Water Project as a second source. Continued access to both water sources is recommended to provide redundancy of supplies during extended drought periods. Further discussion of this topic is contained later in this 2011 Update.

- Use of on-site generation facilities to manufacture sodium hypochlorite solution (disinfectant liquid) is not recommended. Current practice within the industry is trending away from the use of this equipment, due to high maintenance requirements, and toward the bulk purchase of liquid sodium hypochlorite.

2.0 CURRENT CONDITIONS

2.1 Customer Base and Water Demand Summary

The City of Solvang has a current population of 5,487 (based on California Department of Finance Table E-4 population estimates for January 1, 2010). The service population increases during the summer months when the tourist population swells. A review of annual deliveries indicates that summer month deliveries during July, August, and September are about 35% of the total annual deliveries.

Based on Supply Summary Water Statistics reports submitted by the City of Solvang to the Department of Water Resources, Table 2.1 presents Historic Water Use by Source in acre-feet for the past 25 years (1986 through 2010):

Table 2.1
Historic Water Use by Source (AF)

Year	Upland Wells	River Wells	SYRWCD ID No. 1	State Water	Total
1986	111	1,340	577	NA	2,028
1987	103	1,287	609	"	1,999
1988	33	1,366	754	"	2,153
1989	22	1,283	775	"	2,080
1990	16	1,356	591	"	1,963
1991	150	1,135	567	"	1,852
1992	125	1,182	561	"	1,868
1993	466	368	1,055	"	1,889
1994	353	564	888	"	1,805
1995	486	515	604	"	1,605
1996	311	1,016	314	"	1,641
1997	482	1,040	136	"	1,658
1998	501	879	46	"	1,426
1999	480	915	172	"	1,567
2000	555	674	327	"	1,556
2001	739	292	464	NA	1,495
2002	373	288	378	459	1,498
2003	201	190	10	1,103	1,504
2004	179	313	43	1,042	1,577
2005	143	50	36	1,225	1,454
2006	99	102	32	1,256	1,489
2007	143	200	31	1,303	1,677
2008	191	183	31	1,168	1,573
2009	162	207	66	1,092	1,527
2010	136	174	79	1,006	1,395
Average					**1,691**

It is interesting to note from Table 2.1 that water deliveries in the City are declining. The total volume of water delivered to customers historically has shown a decline. This is somewhat of a surprise because the number of customers is increasing. Staff believes the reasons for the decline are a combination of the following factors:

a. Due to water conservation public information campaigns by the City, customers have shown good stewardship, and have actually reduced their water use through conservation, plumbing retrofits, and similar actions. This is most probable with large users.

b. Customers are using less water for landscaping; this could be attributed to weather patterns, user costs, environmental awareness, or any combination.

c. Taken in combination, it appears that the residents of Solvang are paying relatively high monthly charges for water. As a consequence, users are more cautious with water usage.

Historic Water Sales in acre-feet for the past 10 years are shown in Table 2.2:

Table 2.2
Historic Water Sales

Year	Population (1)	Water Delivered (AF) (2)	Water Use (gal/cap/day)
2001	5,388	1,560	258
2002	5,442	1,519	249
2003	5,443	1,382	227
2004	5,441	1,464	240
2005	5,408	1,363	225
2006	5,351	1,321	220
2007	5,340	1,512	253
2008	5,397	1,483	245
2009	5,434	1,396	229
2010	5,487	1,306	212
Average			**236**

Notes:
(1) Taken from California Department of Finance Table E-4 Population Estimates made January 1 of each year.
(2) Data was compiled from the metered deliveries table on DWR Public Water System Statistics Reports.

As can be seen from Table 2.2, the overall average water delivery rate for the last 10 years (2001-2010) is approximately 236 gallons per capita per day. This general figure incorporates an allowance for both residential and commercial uses; although it may be possible to separately project the demands for each class of user, it is likely that no improvement in accuracy could be obtained by doing so. Use of this typical demand for planning for future needs is recommended.

2.2 Current Supply

The City of Solvang currently has multiple sources of water supply including City wells (both upland wells and river wells), interconnects with ID-1, and a connection with the State Water Project. These sources of supply are described in more detail below.

River Wells 3 & 7A. The City of Solvang currently has two active river wells that supply domestic water to its customers. Wells 3 and 7A are located on the banks of the Santa Ynez River.These wells are both at risk of being under the influence of the Santa Ynez River because the surface water migrates across the channel. If surface water is within 150 feet of a well, the water from that well must be treated. The level of treatment increases to full surface water requirements if the surface water is within 100 feet of the well. At present Solvang does not have the ability to provide that level of treatment so a well must be shut down when the river flows close to it.

Well 3 is located just west of Alisal Road. It produces approximately 340 gpm. Water from this well is treated on-site with chloramines and discharged into 200 feet of 36 inch pipe. The large pipe serves as a chlorine contact chamber, to achieve the required contact time before water is discharged to the distribution system.

Well 7A is located approximately 500 feet east of Well 3. Well 7A produces approximately 110 gpm. Chlorine contact time for this well is achieved in a 16-in diameter pipe before it is discharged into the distribution system.

The City's existing Permit No. 15878 to appropriate water from the Santa Ynez River allows Solvang to divert up to 5 cubic feet per second and up to 3,600 acre feet per year from the underflow of the River. A permit is essentially a supervised opportunity to establish a water right. Solvang's permit now requires environmental review because Solvang was not able to prove-up its full requested usage prior to the date specified in the Permit. Solvang has petitioned the State Water Resources Control Board (SWRCB) seeking an extension of time to construct facilities and prove-up the diversion capability and demonstrate beneficial use of the full amount Solvang plans to divert from the river at Buildout.

The City has lost a number of wells in or near the River as a result of floods. Those wells must be replaced and water pumped from the River underflow into the City's water system to prove that the City can and has put the requested amount of river water to beneficial use. The City needs to establish how much time will be needed to prove-up the intended use of river water. Once the use is established, the City can obtain a license to annually divert the proven amount. A license to divert is essentially an appropriative water right granted by the State Water Resources Control Board., however, even a license is subject to conditions and to restrictions on pumping due to hydrologic conditions and to address public trust and environmental issues.

Solvang Central Well 4. Well 4 is located downtown near the Solvang City Hall. Well 4 is capable of producing 320 gpm, and the well water is disinfected with chloramines. Very little detention time is available for disinfectant contact prior to delivery to

customers. However, because this well is not directly influenced by the River, the lack of detention time is currently acceptable to the Department of Public Health (DPH).

Solvang Upland Wells 21 & 22 (Inactive). Well 21 is located outside the City of Solvang limits atop a hill just east of Chalk Hill Road, on the site of Reservoir 2. This well had a capacity of 115 gpm when last used. It is inactive at this time due to its historic low production and high levels of iron (Fe), manganese (Mn) and hydrogen sulfide (H_2S).

Well 22 is located in the Creekside subdivision on the east side of town and was never used as a producing well due to very high levels of H_2S experienced during well development. Wellhead treatment for Wells 21 and 22 is considered cost prohibitive at this time.

SYRWCD - Improvement District No. 1 Interconnects. This local improvement district sells water to the City of Solvang upon demand. Water from ID-1 is delivered into the City distribution system at two metered interconnect locations. Interconnect #2 is located in Zone 2 at the City limit boundary and Alamo Pintado Road. Interconnect #1 is located in Zone 1 on Old Mill Road. Each of these interconnects has a maximum delivery capacity of approximately 1,200 gpm. Water supplied to the City of Solvang from this source is purchased from ID-1 at a standard residential (retail) rate. Although the water is essentially the same as water Solvang pumps from Wells 3 and 7A, the cost of this water is much greater and as such is only used as a backup source of water.

The City of Solvang has become less dependent on water from ID-1 during years that State Water is available. In recent years Solvang has only purchased ID-1 water during the annual two week maintenance shutdown of the State Water Project (SWP).

State Water Project Turnout. The City of Solvang has the ability to purchase a maximum annual allotment of 1,500 AFY from the State Water Project. This maximum annual water supply is equal to an average flow rate of 927 gpm. This water source depends on the snow pack of the northern Sierras and its delivery is subject to environmental restrictions in the Sacramento to San Joaquin River Delta. Based on the California Department of Water Resources SWP delivery reliability Report 2009 the amount of water available to the City for domestic use could be reduced to approximately 90 AFY (6%) or perhaps even less in a given year, depending on the availability of runoff to the SWP and environmentally related pumping restrictions in the Delta. In spite of the current record wet winter, as of March 31, 2011, the State Water Project allocation was only 70%. Although the official estimate is that the SWP will average 61% reliability by 2029, the City is conservatively planning on the availability of this source of water to be no more than about 40% on average. Despite low reliability, SWP water is significantly less expensive than water from ID-1.

When new River Wells are in place and local rainfall is above average within the Santa Ynez River watershed, the City may not need its entire SWP allocation. The City of Solvang may want to consider selling available SWP water to other agencies in years that the City has a surplus.

Table 2.3 presents a summary of current supply and anticipated long-term average supply for the City of Solvang:

Table 2.3
Current and Anticipated Future Supply by Source

Supply Source	2010 Annual Production (AF)	Anticipated Long-term Average Production (AFY)
Local Sources		
Santa Ynez River Wells	174	1,200
Central Well 4	136	100
Upland Wells	- 0 -	Unknown
Local Subtotal	**310**	**1,300**
External Sources:		
Improvement District No. 1 (2)	79	80
State Water Project Allocation	1,006	600
Total All Supply Sources	**1,395**	**1,980**

Notes:

(2) Higher amounts could be obtained from this source. However, use of this source is minimized at this time due to the high cost of this source.

The anticipated long-term average production (supply) is based on the assumption that droughts and other factors will periodically reduce deliveries below the actual demand exisiting in the City of Solvang. In 2001 the SWRCB staff verified 1,053 acre-feet of diversion from the City's River Wells in operation at that time. If State Water were not available, as much as 1,800 AFY would be required from the River Wells in combination with Well No. 4 and the ID-1 connections to meet demand for Buildout. Well No. 4 historically provided a peak annual production of 380 acre-feet but production has declined over time. It's possible that rehabilitation could improve capacity. However, the anticipated long-term average production from Well No. 4 is approximately 100 AFY.

As previously mentioned, the amount of water available pursuant to Solvang's SWP allocation is annually adjusted based on the percentage of total contract supplies the SWP can deliver to the central coast. The official SWP reliability estimate is currently that deliveries will fluctuate between 6% and 95% of the contract allocation. Based on the 70% deliveries in this extremely wet year, however, for practical planning purposes Solvang is assuming that its deliveries from the SWP will average 40% of its 1,500 AF annual SWP allocation.

2.3 Water Conservation

For several years now the City of Solvang has actively promoted water conservation. Current water conservation Best Management Practices (BMPs) being implemented include: metering of all water deliveries, promotion of native and drought tolerant landscaping, an ongoing public information campaign through news paper adds, City vehicle advertisements and mailers to businesses and homeowners, and conservation pricing (high water rates). These measures have been very successful as can be seen by the fact that the average per capita water use has dropped from approximately 250

gpcd in 2002 to 236 gpcd in 2010. This is reduction of approximately a 6% over eight years.

Although not subject to the requirements of AB797 and SB7x7 (Urban Water Management Planning), the City of Solvang intends to continue to promote water conservation and make efforts to achieve an additional 20% conservation by year 2020. In addition to continuing current BMPs, the City of Solvang intends to promote and implement the following additional BMPs: school education, and enhanced conservation pricing (tiered rate structure).

2.4 Pressure Zones and Interconnects

The City of Solvang has four pressure zones and two interconnects:

- Zone 1 lies in the lowest and largest part of the City, and receives water from the Santa Ynez River Wells, Well 4, the State Water Project turnout and one connection to ID-1.

- Zone 2 lies in the higher parts of the City, generally north of Eucalyptus Avenue, and receives water from one connection to ID-1, and a pump station located at the Reservoir 1 site that pumps directly into Zone 2 with a capacity of up to 1,000 gpm.

- Zone 3 is the highest pressure zone and is a small zone located entirely within Zone 2. Water for Zone 3 is supplied by two 335-gpm booster pumps and a 5,000-gallon hydro-pneumatic tank located at the Reservoir 1 site.

- Zone 4 is a small zone which receives water from Zone 1 and is located on the Alisal Ranch. A small booster pump feeds two 20,000 gallon cisterns in this zone.

2.5 Storage and Booster Pumping

The City currently has a total of 1.24 million gallons of gross water storage. Table 2.4 summarizes the zone location and size of the City's reservoirs.

Table 2.4
Current Water Storage Facilities

Location	Gross Storage Volume, (gallons)
Reservoir 1, Zone 1	576,000
Reservoir 3, Zone 1	194,000
Reservoir 2, Zone 2	423,000
Hydro-pneumatic Tank, Zone 3	4,000
Riley Road Cisterns, Zone 4	40,000
Total Storage (gallons)	**1,237,000**

From Table 2.4 it can be seen that the total Zone 1 storage is 770,000 gallons, and total Zone 2 storage is 423,000 gallons.

It is important to consider the adequacy of existing storage within the system. Storage provides two essential benefits to the customers: 1) a way to equalize daily fluctuations in demand, and 2) a reservoir for emergency purposes such as fire protection and loss of supplies due to power outages or main breaks. Storage is not a mandatory part of a water system. Given enough reliable well supply, for example, a system could operate satisfactorily without storage. However, reservoir storage improves reliability. In addition, it is typically more economical to provide system storage to satisfy maximum day demands and fire protection, than to have no storage and satisfy maximum day demands by over-sizing supply facilities.

The calculated need for storage volume is often broken into three individual components: 1) operational storage, 2) fire protection storage, and 3) emergency storage. Each is discussed below for the entire system. No differentiation is made for the amount of storage need for an individual zone.

Operational Storage. This component of the reservoir storage is required to equalize (or balance) the difference between system supply and demand based on the maximum day demand. Operational storage is commonly calculated as the maximum day demand, in gallons per minute, over a 6 hour duration (or 25% of the maximum day demand, in gallons per day). Currently, the maximum day demand is approximately 2,700,000 gallons/day or 1,860 gpm. This equates to approximately 450,000 gallons of required operational storage.

Fire Protection Storage. Depending on local fire codes and interpretations, most cities maintain the ability to satisfy a sustained fire flow for several hours on the maximum usage day of the year. A common fire flow requirement used for commercial areas might include a sustained flow of 2,500 gallons per minute for a 4 hour duration. This equates to a stored volume of 600,000 gallons dedicated for fire protection exclusively. This is over and above the volume required for operational storage. The volume of water stored for fire protection must be available to all pressure zones. If storage is not provided in each zone, then piping, valves, and pumping are required to assure that the water can be moved from storage to a fire. The City also has two interconnects to the ID-1 distribution system, one in each primary zone. The ability to draw flows from either or both of these two connections provides additional fire flow capability. For this reason storage for fire protection is considered adequate.

Emergency Storage. The American Water Works Association (AWWA) recommends a target of 8 hours of water storage based on the maximum day demand. This assumption implies that all water sources are out of service for that interval. In Solvang, the availability of redundant water supplies reduces the risk to users of supply shortage caused by power outages. The existing emergency generators at Well 4 and at the State Water Project Pumping Station further reduce the risk. However, the projection that the future long term average SWP deliveries will be 40% of the allocation indicates that the City cannot afford the loss of any well in the system. Additional provision for standby power will be needed to assure the maximum-day supply, and more emergency

storage will also be required. Due to the fact that the City has redundant supply sources and emergency generators at some of its supply facilities, a target of 4 hours of emergency water storage based on the maximum day demand is the minimum recommended. With a maximum day demand of approximately 2,700,000 gallons, emergency storage of 450,000 gallons is recommended.

Table 2.5 summarizes the recommended storage components and overall reservoir storage volumes recommended for Solvang:

Table 2.5
Recommended Total Storage Volume

Storage Component	Recommended Volume (gallons)
Operational Storage	450,000
Fire Protection Storage (1)(2)	600,000
Emergency Storage	450,000
Total Recommended Volume	**1,500,000**

Notes:
(1) Fire protection is based on a 4-hr demand at 2,500 gpm.
(2) Fire protection storage for each pressure zone may also require pumps and valves to move water between zones.

The present storage volume in the Solvang water system of approximately 1.2 million gallons is inadequate by approximately 300,000 gallons. This is consistent with reports by the Water Division staff regarding current difficulties in meeting peak hour demands in the summer on peak tourist weekends. It is recommended that this storage deficiency be addressed prior to significant additional development within the City.

3.0 FUTURE CONDITIONS

3.1 Projected Water Demands

Future water demands have been projected based on current ongoing development and potential future development within the City as described below.

Current Development. The Solvang (Skytt) Mesa Residential Subdivision has been approved for development of open land bordered on the east by Hans Christian Andersen Park, on the south by Highway 246, and on the north by Chalk Hill Road. This development will contain169 residential homes with lot sizes ranging from 0.25 to 1.25 acres. In the Solvang Mesa Residential Subdivision Project EIR, an estimated water demand factor of 0.84 AFY/unit was used to determine the cumulative demand for this development and is used for the purposes of this report. Based on the estimated water demand factor mentioned above, the Solvang Mesa Development will demand approximately 142 AFY. The Solvang Mesa is located within Zone 1. Construction began in 2005 and is anticipated to be built in four phases over 15 years. Construction of Phase 1 has been completed and nearly all of the 38 lots in this phase are occupied.

Potential Development (Growth) within the City. The City General Plan (adopted July 27, 2009) shows that there will be very little developable space remaining in the City after development of the Solvang Mesa Residential Subdivision. The General Plan Housing Element shows a net increase of housing units of approximately 497 units at Buildout. Of that total, 169 are within the Solvang Mesa Development, leaving a remainder of approximately 328 units. Locations of the growth will be primarily infill, that is, new housing units located throughout the City on present undeveloped or underdeveloped lots. The prospect of substantial redevelopment at higher densities is possible, but unlikely to occur within the next 20 or so years, and is therefore outside the planning horizon of this document. (It is not possible to determine how utilities, regulations, and housing priorities will change outside that time.) Although it is prudent to plan for future conditions, excessive conservatism in planning has the impact of imposing costs on present users for facilities that may never be fully used. As a consequence, it is important to evaluate the potential for future growth with full participation of stakeholders.

According to the Solvang General Plan, the number of existing dwelling units at the time of General Plan adoption was approximately 2,452 units. These existing dwelling units plus the approximately 497 additional units at Buildout total 2,949 units. The current number of existing dwelling units as of January 2011 is approximately 2,485 units. The difference between the Buildout total of 2,949 units and the current existing units of 2,485 is 464 future units. Per the California Department of Finance housing estimates for January 1, 2010 (Table E-5), the estimated persons per household (unit) is 2.353. Using these numbers for planning purposes, and an average water demand of approximated at 236 gallons per capita per day, an estimated additional 289 AFY will be required at Buildout. The historic long term average demand for Solvang is 1,691 AFY. Therefore, the projected future water demand at Buildout is 1,980 AFY. Table 3.1 below presents current and historic long-term average production (demand), as well as projected annual demand at Buildout.

Table 3.1
Current, Historic Long-Term Average, and Projected Annual Water Demands

Condition	Annual Water Demand (AFY)
Current 2010 Production (Demand)	1,395
Long-Term Average Production (Demand)	1,691
Additional Production Required at Buildout	289
Future Buildout Demand	**1,980**

Based on a comparison of Tables 2.3 and 3.1, it appears the City should have adequate water to supply Buildout needs using a diversity of water supply sources assuming Santa Ynez River Wells are further developed. A key remaining issue is to identify the best combination of sources and capacities to reliably and economically satisfy the future Buildout demand.

3.2 Future Water Supplies

As previously noted, several sources of water are available for use by the City, and there is a good amount of flexibility in selecting which water source to use. From a long term planning perspective, the selection of a preferred water source should consider several factors:

- Reliability, especially during prolonged droughts;
- Water quality; and
- Cost

The development and use of recycled water is cost prohibitive at this time and anticipated to continue to be so for many years to come. Therefore, the use of recycled water as a viable future water supply source is not considered in this Water System Master Plan Update. In addition, the sewage effluent is currently percolated into the underground so it remains in the Santa Ynez Valley water system. Therefore, the investment in additional treatment and infrastructure to utilize recycled water would not produce a net increase in local water supply. In reviewing the sources available to the City, the following priority of water sources is recommended, for the reasons noted:

3.2.1 Priority 1 - Santa Ynez River Wells. This water source appears to be more reliable during droughts than the State Water Project source. Reliance on this water source also commits the City to water treatment and the installation of a filtration plant. Water treatment is discussed further in Section 4.1.

In order to retain this source of water for any use in the future, the City must soon add new wells and demonstrate a continued reliance on this water source for beneficial use. Failure to do so will risk loss of the SWRCB permit for any such future use. The present permit allows the City to withdraw and use as much as 5 cfs (approximately 3.22 mgd). The City presently has capacity to withdraw only 450 gpm (340+110). This is equivalent to approximately 1.00 cfs or 0.65 mgd. Several additional wells must be installed to allow full beneficial use of this source. Installation and use of additional wells is necessary to avoid reduction or loss of the supply altogether.

The full 5 cfs capability of the River Wells might not be available every day due to hydrologic or environmental limitations that may constrain diversion from the Santa Ynez River under certain conditions. These potential reductions combined with potential reductions in the allocation of SWP could occasionally jeopardize the City's ability to satisfy the projected maximum day demand at Buildout. Therefore, it is recommended that the City proceed with efforts to assure a full 5 cfs (maximum-day) diversion capability from the river. Although that total diversion capability will only be needed on the high demand days each year. Table 3.2 presents an estimated summary of projected monthly Santa Ynez River underflow diversions for the Buildout condition.

Table 3.2
Projected Monthly River Underflow Diversions at Buildout

Month	% of Annual Demand (1)	Average Diversion Rate (cfs)	Average Diversion Volume (AF/month)
January	5.1	1.64	101
February	4.8	1.71	95
March	4.6	1.48	91
April	6.9	2.29	136
May	8.9	2.86	176
June	10.5	3.51	209
July	12.0	3.87	238
August	12.9	**4.15**	**255**
September	12.0	4.00	238
October	9.6	3.09	190
November	7.5	2.49	148
December	5.2	1.68	103
Total	**100**		**1,980**

Notes:
(1) Based on 2003-2008 average seasonal demands.

Table 3.2 shows the anticipated quantity of water that will be extracted from the Santa Ynez River underflow each month for a typical year if no other sources are available. Average-day water extraction from the underflow is approximately 2.73 cfs (1,225 gpm). However, 5.19 cfs will be needed to meet maximum-day demand based on a max-day peaking factor of 1.9 as estimated in the P&P 2002

Master Plan. The max-day peaking factor is the ratio of maximum day demand divided by the average day demand.

3.2.2 Priority 2 - State Water Project Supply. The City has committed to the capital costs of providing this water source to City customers. The necessary connections have been installed. The overall water quality of this source is good. Although drought reliability of this source is less than for the Santa Ynez River Wells, the predominance of urban users of this water throughout the State indicate a high political ability to maintain the supply at some reduced level even during sequential dry years. From the perspective of Solvang, it is important to note that the State Water Project source (Northern California) is distinctly separate from the watersheds supplying the Santa Ynez River. The ability to draw water from either source allows the City a more secure supply under drought conditions because droughts tend to affect the northern California water sheds and the Santa Ynez River watershed differently. This supply diversity is a substantial benefit to the City.

3.2.3 Priority 3 – Solvang Central and Upland Wells. The water produced from Well 4 is relatively high in dissolved minerals, but in compliance with California Department of Public Health (DPH) regulations. Although the well continues to produce reliably, it is relatively old. In 2008 the pump was rehabilitated. Water from Well 4 can be provided without further treatment, but is pumped from a greater depth than the Santa Ynez River Wells. Currently the delivery cost of this water is similar to the Santa Ynez River Wells. However, if treatment is implemented for the River Wells the delivery cost of water from the river wells will be significantly greater than Well 4 water costs.

Well 21 is fully equipped but inactive due to water quality problems. To provide water similar in quality of other sources, this well would need to be equipped with a wellhead treatment system for iron and manganese removal. When considering this added cost, the overall delivery cost of water from Well 21 would be quite high. This well should remain as an emergency backup supply only, and should be exercised periodically to ensure the equipment is serviceable when needed.

Well 22 has not been equipped and has never been utilized due to water quality problems. To provide water similar in quality of other sources, this well would need to be equipped with a wellhead treatment system for hydrogen sulfide removal. When considering this added cost, the overall delivery cost of water from Well 22 would be relatively high. This well should remain as an emergency backup supply at this time. As water supply costs increase in the future, treatment at this well may become economically feasible. Use of Well 22 would require the installation of a pump, motor, treatment system, and necessary piping to connect it to the distribution system.

3.2.4 Priority 4 - Improvement District No. 1 Interconnects. Due to the high cost of this supply source, the two ID-1 connections are now used as a last resort, when other supplies are inadequate to maintain the volume of supply needed. This philosophy should be continued unless a reduced wholesale water rate can

be negotiated with ID-1. The water available from this source is of similar quality and reliability as the City's own Santa Ynez River Wells Even with treatment, water from the City's wells will cost substantially less than the current ID#1 rates.

3.3 Overall Adequacy of Supply

Evaluation of the above supply and demand issues indicates that the City of Solvang has a dependable supply of water adequate for the Buildout condition. The City's primary sources of water supply include the River Wells and the State Water Project. The availability of alternate sources, such as the SYRWCD-ID No.1 connections and Well 4, provides assurance that the City will continue to serve its customers with safe and adequate water during highly unusual climate events such as prolonged drought. The added cost of maintaining these redundant water supply sources appears to be moderate and well advised.

4.0 CONSIDERATIONS

4.1 State Regulatory Restrictions.

The California Department of Public Health (DPH) requires that water pumped from a shallow aquifer near a surface water source, such as the Santa Ynez River Wells, is subject to the following requirements for treatment:

Table 4.1
DPH Treatment Requirements for River Wells

Distance from well to nearest surface water	Testing Requirements	Treatment Requirements
99 feet (or less)	Microbial testing monthly	Filtration; High level disinfection
100 feet to 149 feet	Microbial testing monthly	Filtration (when microbial test results indicate the need); High level disinfection
150 feet (or greater)	Testing similar to groundwater sources	Unfiltered supply is acceptable

Since any wells along the Santa Ynez River are likely to be within the 100-foot limit at some point during their service life due to meandering of the river, installation of a treatment facility for the water is necessary to ensure uninterrupted use of this supply source. The most cost effective method of treating the well water is to manifold (or combine) the discharge from several wells and pipe the combined flow to a single treatment facility capable of treating the combined flow. One possible treatment system is pressure filtration. Although the water system pressure drops by about 10 psi as the water passes through the filter, this type of treatment system allows the water to enter the water distribution system without the need for a second set of booster pumps. This method was described in the 1996 Master Plan, and the recommendation remains a feasible alternative. Other feasible treatment systems exist and should be investigated further before deciding on a final treatment approach.

Disinfection of the water is also required. The 1996 Master Plan recommendation that chlorine be applied and maintained to provide the needed disinfectant contact time, and ammonia be added subsequently to convert the chlorine to chloramines, compatible with the State Water Project Water, is still appropriate.

4.2 Operational Impacts of Chloramines

The State Water Project supply is disinfected with chloramines. It is recommended that all other water supply sources in the City be disinfected similarly with chloramine systems. In general, this requires addition of both chlorine and ammonia to the water.

Once the SWP Solvang turnout went into service in 2002, chloramine disinfection systems (chlorine and ammonia feed systems and dosage control equipment) were added and are now in service at the River Wells and Well 4.

With the introduction of chloramines came the need for increased system monitoring. Due to the location of the Solvang turnout in the overall State water system, the residual amount of chloramines is directly affected by the number of other water purveyors drawing water from the State water system and water temperature fluctuations based on time of year.

If the ID-1interconnects are used solely as a standby source in the future, chloramine systems may not be needed there. Prolonged use of this source without chloramine systems could cause taste and odor complaints.

4.3 Redundancy and Service Continuity

Modern utilities are expected to deliver water of adequate quality and pressure, continuously, without interruption. Customers expect the ability to provide water to be reliable during natural disasters, droughts, and similar events. In order to maintain this level of service, the City of Solvang must actively consider the issue of redundant facilities, and select a level of redundancy that is appropriate for the City. Facilities often considered to provide redundancy include the following:

- Alternate water sources and supplies.
- Extra (or standby) wells, pumps, and equipment
- Standby power systems for pumping and treatment equipment
- Water storage tanks

The City needs a redundant water supply system that it can use if a River Well is offline. Well 21 & 22 should be considered as potential redundant water supply sources at some time in the future, but would require installation of treatment systems. There are many combinations of the above elements that will allow the City to maintain a reliable supply.

4.4 System Reliability Improvements

Distribution system reliability can be enhanced with a combination of standby power and reservoir storage. Each community, based on history of power outage severity, must decide for itself an acceptable/desired level of service, and the corresponding level of standby power and reservoir storage. The following recommendations are intended to enhance supply reliability.

4.4.1 Standby Power.

An important part of the overall operating characteristic of the system is its ability to provide dependable water service during power outages. At present, the City uses two trailer-mounted diesel powered generator sets, designed to be towed to any desired site in the City and to power a well or pump for the duration of a power outage. These two generators appear to provide an acceptable level of service, although they are not sufficient for a

generalized electrical blackout. Therefore, it is recommended that the City install a permanent generator at the SWP Pumping Station.

4.4.2 Reservoir Storage. Provision of adequate water storage is also necessary. Section 2.5 summarized the need for added storage in the distributions system. The recommended storage volume is 1.5 million gallons. The present storage volume in the Solvang water system of approximately 1.2 million gallons is inadequate by approximately 300,000 gallons. It is recommended that this storage deficiency be addressed prior to significant additional development within the City.

4.5 Water Quality

Previous sections of this report have addressed the issue of mixing water disinfected by two different disinfection methods. Based on phone conversations between the City of Solvang and the City of Santa Maria, mixing of chloraminated and chlorinated water is not expected to present a problem for short durations less than two days. Extended use of the two different water types will have adverse affects on the distribution system. The blended water is unstable, and may cause undesirable chemical reactions within the distribution piping. The undesirable chemical reactions in the distribution system could lead to taste and odor problems.

Another water quality issues facing Solvang is the use of domestic water softeners used to reduce domestic water hardness. Softeners pass domestic water through a negatively charged plastic bead media covered with sodium (Na) ions. Positively charge ions such as, calcium (Ca) and magnesium (Mn), have a greater attractive force than sodium ions to the negatively charged media. The stronger attractive force of Ca and Mn ions displaces weakly attached sodium ions. Once the media cannot exchange Ca and Mn ions for Na ions, the media is rinsed with a brine solution. All the displaced Ca and Mn ions are then discharged to the City's sewer system and Wastewater Treatment Plant. This is one of the main reasons home water softeners create specific conductance (EC) compliance problems for wastewater treatment facilities.

The SWP water has an average EC value of one-third of the recorded EC values for the River Wells. The water is generally described as "softer" than the River Wells supply. This superior water quality can be of benefit to the City. Mixing SWP and River Well waters could help reduce the frequency of media regeneration for water softeners and thereby reduce the amount of salt sent the Wastewater Treatment Plant.

A public information campaign is ongoing by the City to encourage optimized use of home water softeners and recommending: 1) use of canister type water softeners that are regenerated off-site by private water softening service companies, or 2) use of demand style regenerating water softeners as opposed to clock style regenerating units. The demand style softeners produce less brine waste to the sewer system.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The following recommendations are intended to assist and guide the City of Solvang in continuing to provide reliable and reasonably priced water service to its present and future customers. The recommendations represent, in some cases, the need for significant capital improvements. The recommendations are summarized below and cost estimate information is provided in Section 6.0 - Capital Improvement Program.

5.2 Water Supply Improvements

It is recommended that the City's first priority be to develop and secure their water rights from the Santa Ynez River underflow. The State Water project and the Santa Ynez River Wells should be maintained as firm water supply sources. Since new River Wells will take one to two years to install, water from the State Water Project will be required to supplement demand until River Wells can handle the average day demand. The City should install as many new wells along the Santa Ynez River as is economically feasible while attempting to extract a peak flow of 5 cfs from the river underflow.

The number of wells required to withdraw 5 cfs from the River underflow is a function of well discharge capacity. It is estimated that six new wells each with a capacity of 300 gpm will be required in addition to the two existing wells to achieve a peak capacity of 5 cfs. If the new River Wells are capable of higher capacity, it may be possible to achieve 5 cfs with fewer wells. 10-year capital cost estimates are based on six new wells at this projected yield.

As previously discussed, River Wells will require treatment. A pressure filter plant (or other type of treatment plant) at a site near the River Wells is required to filter the combined output of the River Wells. The treatment plant should also include construction of a backwash system to contain filter backwash water and allow for recovery of most of the backwash water. The remaining backwash water must be discharged to the sewer system. That process will need to be investigated further during final design. Treated water from the treatment plant should be discharged in two locations to improve water distribution within the City's piping network.

5.3 Distribution System Improvements

It is recommended that the City implement an annual waterline, fire hydrant and valve replacement program to replace aging infrastructure and undersized waterlines. Although the asbestos cement and PVC portions of the City's distribution piping are not susceptible to corrosion, the cast iron and ductile iron portions are. Also, 2" diameter piping in a municipal water system is substandard. All sections of 2" diameter waterline should be replaced with 6" waterline. One section of 4" galvanized steel piping in First Street should be replaced or abandoned in place. In addition, the Water Distribution System Evaluation prepared by Stetson Engineering, dated February 22, 2008 identified one section of waterline that is significantly undersized based on current standards. The existing 8" waterline in Kronborg Drive from Elsinore Drive to the 12" Reservoir 2

inlet/outlet pipe should be replaced with a 12" waterline. Although this replacement is not urgent it is recommended that this line be replaced within the next 10 years or prior to any significant new development.

The typical life span of fire hydrants and valves is approximately 40 years. However, if properly maintained, fire hydrants and valves can function satisfactorily for many years beyond this. Therefore, it is recommended that fire hydrants and valves over 50 years old, or known to be malfunctioning, be inspected and scheduled for replacement as needed. Priority should be given to valves and fire hydrants within areas zoned institutional, commercial or industrial. It is also recommended that the City update it's Water System Atlas Maps which have not been updated for many years.

5.4 Reservoir Storage Improvements

It is recommended that the City construct additional storage of approximately 400,000 gallons in Zone 1 within the next 10 years or prior to any significant new development. A 400,000 gallon reservoir is recommended to ensure the City's total useable storage is approximately 1.5M gallons. It is further recommended that Zone 4 be reconfigured by doing the following: 1) replace the old cisterns (40,000 gallons capacity) with a new 400,000 gallon reservoir set to the Zone 1 hydraulic grade line, 2) relocate the Riley Road booster station (that serves Zone 4) up the hill next to the new reservoir, and 3) replace the 6" diameter waterline in Riley Road with a 10" waterline from the new reservoir to Rancho Alisal Road. In addition to providing the needed storage, the new reservoir will significantly improve fire protection to all customers south of the Santa Ynez River including the City's Wastewater Treatment Plant. Steps to procure this reservoir site should proceed in the next few years.

The roof at Reservoir 1 has been experiencing problems for the past few years and is becoming deteriorated. It is recommended that the roof for Reservoir 1 be replaced.

5.5 Standby Power

Installation of a permanent emergency generator at the SWP Pumping Station is recommended to improve water supply reliability by ensuring the City's ability to provide water service during power outages. To reduce costs, a single generator can be sized and used to provide emergency power both to the SWP Pumping Station and to the future River Wells treatment facility. (It is anticipated that the future River Wells treatment facility will be located near the existing SWP Pumping Station.)

5.6 Alternative Supply Sources

The City may want to consider upland sources outside the City Limits in areas of the groundwater basin where previously drilled wells have produced high yields and water of relatively good quality. The City may also want to consider negotiating a long term agreement with SYRWCD-ID1 for a reduced wholesale water rate in exchange for an agreed upon guaranteed annual purchase by Solvang of say a minimum of 400 AFY.

6.0 CAPITAL IMPROVEMENT PROGRAM

6.1 Capital Improvement Cost Estimates

Cost estimates provided are considered conceptual level estimates and include between 15% and 35% contingency depending upon the anticipated complexity of the project. The total estimated cost of Supply System Improvements based on the 10-Year Plan is $5,450,000, and based on the 15-Year Plan is $5,170,000. The total estimated cost of Distribution System Improvements based on the 10-Year Plan is $3,275,000, and based on the 15-Year Plan is $2,005,000. See Section 6.4 below for further discussion on the 10-Year and 15-Year Plans.

6.2 Supply System Improvements

In order to improve water supply reliability and bring the City's water supply system up to an adequate level of service, completion of several recommended capital improvement projects is necessary. The most urgent project for the City is the construction of River Wells and a treatment facility with sufficient capacity to develop and secure the City's water right of 5 cfs diversion from the Santa Ynez River underflow. The recommended supply system improvements are summarized below.

1. New River Wells, Piping, and Treatment Facility.
2. Emergency Generator at SWP Pumping Station.

6.3 Distribution System Improvements

In order to improve overall reliability of the water system and bring the City's water distribution facilities up to an adequate level of service, completion of several recommended capital improvement projects is necessary. The recommended distribution system improvements are summarized below.

1. Reservoir 1 Roof Replacement.
2. Update of Water System Atlas Maps.
3. Annual Waterline, Fire Hydrant and Valve Replacement Program.
4. New Reservoir 4, waterline, and booster station relocation.

6.4 Phased 10-Year and 15-Year Capital Improvement Programs

Tables 6.1 and 6.2 on the following pages present a 10-year and 15-year phasing, respectively, of the recommended capital improvement projects along with the engineer's estimate of probable cost for each project. The 15-year Program, presented in Table 6.2 is provided as an alternative to the 10-year Program and contains a scaled back version of the River Wells Project and reduced overall Capital Improvement Program (CIP). The 15-year Program is intended to lessen the financial impact and burden of the recommended CIP by reducing overall costs and spread the cost over five additional years. All costs are based on March 2011 costs.

Table 6.1

Phased 10-Year Capital Improvement Program

Project Name & Description	Total Project/Program Cost		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21
Drill Six River Wells in Santa Ynez River *Drill and equip wells with pumps, motors, piping, and electrical equipment.*	$ 1,300,000		$ 600,000	$ 700,000								
Water Treatment Facility *Construct water treatment and disinfection facility to meet State requirements and enhance water supply reliability.*	$ 4,000,000		$ 1,000,000	$ 2,500,000	$ 500,000							
Well Transmission Lines *Construct waterlines to transmit well water to treatment facility.*	$ 1,000,000		$ 1,000,000									
Well & Waterline Easements *Acquire easememnts for new river wells and transmision waterline.*	$ 50,000		$ 50,000									
Reservoir #1 Roof Replacement *Replace reservoir roof. Corrugated roof stoppers no longer work and roof is exhibiting signs of serious deterioration.*	$ 425,000					$ 225,000	$ 200,000					
Water Distribution System Study & Map *Inspect and inventory old, deteriorated, and deficient waterlines, fire hydrants, valves and appurtenances. Prioritize and develop a 20-yr water distribution system maintenance/replacement program. Atlas map updated.*	$ 50,000					$ 50,000						
Waterline, Fire Hydrant and Valve Replacement Program *Old, deteriorated and undersized waterlines will be replaced as identified and prioritized in the Water Distribution System Study.*	$ 850,000				$ 100,000	$ 100,000	$ 100,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000
Permanent Generator at SWP Pumping Station *Purchase and install a permanent generator at the City's SWP Pumping Station to ensure the ability to deliver water during power outages.*	$ 100,000										$ 50,000	$ 50,000
New Reservoir #4 to Replace Cisterns *Replace old and undersized cistrens with new 400,000 gallon reservoir to ensure capability to meet future summertime peak water demands. Replace waterline in Riley road and relocate booster pumping station.*	$ 950,000							$ 325,000	$ 325,000	$ 300,000		
Total:	**$ 8,725,000**		**$ 2,650,000**	**$ 3,200,000**	**$ 600,000**	**$ 375,000**	**$ 300,000**	**$ 435,000**	**$ 435,000**	**$ 410,000**	**$ 160,000**	**$ 160,000**

Table 6.2

Phased 15-Year Capital Improvement Program

Project Name & Description	Total Project/Program Cost		11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26
Drill River Wells in Santa Ynez River *Drill and equip wells with pumps, motors, piping, and electrical equipment.*	$ 900,000		$ 600,000	$ 300,000													
Water Treatment Facility *Construct water treatment and disinfection facility to meet State requirements and enhance water supply reliability.*	$ 3,500,000		$ 750,000	$ 2,250,000	$ 500,000												
Well Transmission Lines *Construct waterlines to transmit well water to treatment facility.*	$ 650,000		$ 650,000														
Well & Waterline Easements *Acquire easememnts for new river wells and transmision waterline.*	$ 20,000		$ 20,000														
Reservoir #1 Roof Replacement *Replace reservoir roof. Corrugated roof stoppers no longer work and roof is exhibiting signs of serious deterioration.*	$ 425,000					$ 225,000	$ 200,000										
Water Distribution System Study & Map *Inspect and inventory old, deteriorated, and deficient waterlines, fire hydrants, valves and appurtenances. Prioritize and develop a 20-yr water distribution system maintenance/replacement program. Atlas map updated.*	$ 25,000					$ 25,000											
Waterline, Fire Hydrant and Valve Replacement Program *Old, deteriorated and undersized waterlines will be replaced as identified and prioritized in the Water Distribution System Study.*	$ 520,000						$ 100,000			$ 110,000			$ 150,000			$ 160,000	
Permanent Generator at SWP Pumping Station *Purchase and install a permanent generator at the City's SWP Pumping Station to ensure the ability to deliver water during power outages.*	$ 100,000										$ 50,000	$ 50,000					
New Reservoir #4 to Replace Cisterns *Replace old and undersized cistrens with new 400,000 gallon reservoir to ensure capability to meet future summertime peak water demands. Replace waterline in Riley road and relocate booster pumping station.*	$ 950,000							$ 325,000	$ 325,000					$ 150,000	$ 150,000		
Vacuum-Valve Exercising Truck *Purchase truck with vacuum equipment for cleaning out valve cans and electically operated valve exercising euipment for valve maintenance.*	$ 85,000																$ 85,000
Total:	**$ 7,175,000**		**$ 2,020,000**	**$ 2,550,000**	**$ 500,000**	**$ 250,000**	**$ 300,000**	**$ 325,000**	**$ 325,000**	**$ 110,000**	**$ 50,000**	**$ 50,000**	**$ 150,000**	**$ 150,000**	**$ 150,000**	**$ 160,000**	**$ 85,000**

RESERVOIR 2
450,000 GAL

WELL 21
(INNACTIVE)

OVERDEL LN. S.S.

RESERVOIR 1
600,000 GAL,
ZONE 2 BOOSTER STATION
ZONE 3 BOOSTER STATION
& 4,000 GAL. HYDRO
PNEUMATIC TANK.

S.S. #3

ZONE 2
SYRWCD–ID1
INTERCONNECT

S.S. #4

WELL 22
(NO PUMP)

ZONE 3

ZONE 1

ZONE 4

CITY LIMITS

FREDENSBORG WAY
RINGSTED DR
RINGSTED PL.
AUGUSTENBORG PL.
VIBORG ROAD
SKAGEN DR
HORNBECK
NYSTED DRIVE
KOLDING AVE
CREEKSIDE DR
HOLLY LN
REBILD DR
REBILD
KRONBORG DR
KRONBORG CIR
AALBORG CT
AALBORG WAY
ELSINORE DR
FREDENSBORG CANYON RD
ALISAL RD
MESA DR.
CHALK HILL RD
ABELTOFT WAY
BAKKE WAY
NORDENTOFT WAY
VIGARD DR
ROSKILDE RD
HINDFELL WAY
LILLIBAKKE CT
ALAMO PINTADO RD
VILLAGE LANE
HONEY LOCUST
HWY 246
EUCALYPTUS DR
LAUREL AVE
MAPLE AVE
ELM AVE
FIR AVE
ATTERDAG RD
FOURTH PL
FIFTH ST
SECOND PL
FIRST PL
PINE ST
OLD MISSION DR
MISSION DRIVE
WINDMILL LN
OLD MILL RD
SKYTOP
MESA DR.
COAST OAK DR.
PETERSEN AVE
PARK VIEW TRAIL
MYRTLE CT
ASH LANE
AARHUS DR.
VESTER HOF
VESTER STED
MIDTENHOF
OSTER STED
NYKOBING
COPENHAGEN DR
OAK ST
SYCAMORE WAY
ELVERHOY WAY
ELVERHOY CT
BIRCH DR
THIRD ST
MOUNTAIN VIEW DR
WILLOW DR
ESROM DR
FREYA DR
ODIN WAY
VALHALLA DRIVE
JUNIPER DR
FIRST ST
FIRST CT
GLEN WAY
MANZANITA DR
FJORD DRIVE
PEPPERWOOD WAY
SANDALWOOD WAY
IRONWOOD WAY
HICKORY WAY
SANTA YNEZ RIVER
SOLVANG
WWTP
RANCHO ALISAL DR.

WELL 4 & CHLORINATION/
AMMONIA STATION

S.S. #2

SOLVANG SWP BOOSTER STATION
CONNECTED TO CCWA TURNOUT

WELL 3
CHLORINATION/AMMONIA
STATION & WELL 7A
AMMONIA STATION

WELL 7A CHLORINATION STA.

WELL 7A

WELL 3

ZONE 1 SYRWCD–ID1
INTERCONNECT

RILEY ROAD S.S.

RILEY ROAD
BOOSTER STATION

CISTERNS
2–20,000 GAL. EA.

S.S. #1

RESERVOIR 3
200,000 GAL

GRAPHIC SCALE
(feet)
0 500 1000 1500 2000

SOLVANG
WATER SYSTEM MASTER PLAN
APRIL 2011

SCALE 1:1200

LEGEND
- WATER FACILITY
- PRESSURE ZONE 1
- PRESSURE ZONE 2
- PRESSURE ZONE 3
- PRESSURE ZONE 4
- CITY LIMITS
- SAMPLE STATION – ROUTINE
- SAMPLE STATION – ALTERNATE
- ROADS (REFERENCE)