Final 2010 Urban Water Management Plan

Adopted : June 7, 2011

Prepared for:

Lake Arrowhead Community Services District

Prepared by:

Kennedy/Jenks Consultants

June 2011

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Lake Arrowhead Community Services District
P.O. Box 700
Lake Arrowhead, CA 92352

K/J Project No. 1089016*00

RESOLUTION 2011-07

RESOLUTION OF THE GOVERNING BOARD OF LAKE ARROWHEAD COMMUNITY SERVICES DISTRICT, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA ADOPTING THE 2010 URBAN WATER MANAGEMENT PLAN

WHEREAS, the California Urban Water Management Planning Act, Water Code section 10610 et seq. (the Act) mandates that every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre feet of water annually, prepare and adopt an updated Urban Water Management Plan (UWMP) at least once every five years on or before December 31, in years ending five and zero; and

WHEREAS, the Lake Arrowhead Community Services District (District) is an urban water supplier for purposes of the Act, and approved and adopted its most recent UWMP and submitted its 2005 UWMP to the California Department of Water Resources (DWR); and

WHEREAS, the Water Conservation Act of 2009, Water Code section 10608 et seq. (SBX7-7), extended the time by which urban retail water suppliers must adopt their 2010 UWMPs to July 1, 2011 and, among other things, established requirements for urban retail water suppliers to prepare urban water use targets in accordance with the goals of SBX7-7 to reduce statewide daily per capita water use by 15 percent by the year 2015 and 20 percent by the year 2020; and

WHEREAS, the District is an "urban retail water supplier" for purposes of SBX7-7 because it directly provides potable municipal water to more than 3,000 end users; and

WHEREAS, in accordance with applicable law, including the requirements of the Act and SBX7-7, the District has prepared its 2010 UWMP and has undertaken certain agency coordination, public notice, public involvement and outreach, public comment, and other procedures in relation to its 2010 UWMP; and

WHEREAS, as authorized by Section 10620(e) of the Act, the District has prepared its 2010 UWMP with its own staff, with the assistance of consulting professionals, and in cooperation with other governmental agencies, and has utilized and relied upon industry standards and the expertise of industry professionals in preparing its UWMP, and has also in part utilized and relied upon the DWR Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan (March 2011) and the DWR Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use (For the Consistent Implementation of the Water Conservation Act of 2009) (February 2011) in preparing its 2010 UWMP; and

WHEREAS, in accordance with applicable law, including Water Code sections 10608.26 and 10642, and Government Code section 6066, the District made its Draft 2010 UWMP available for public inspection, and caused to be published within the jurisdiction of the District at least two notices of public hearing regarding the District's 2010 UWMP, two of which publication dates were May 23, 2011 and May 30, 2011; and

WHEREAS, in accordance with applicable law, a public hearing was held on June 7, 2011 at 6:30 p.m., or soon thereafter, in the Board Room of the District, located at 840 Willow Creek Road, Lake Arrowhead, California 92352 to, among other things, provide members of the public and other interested entities with the opportunity to be heard in connection with the District's 2010 UWMP and the proposed adoption thereof; and

WHEREAS, pursuant to said June 7, 2011 public hearing on the 2010 UWMP, the District encouraged the active involvement of diverse social, cultural, and economic elements of the population within the District's service area with regard to the preparation of the UWMP, allowed input by member of the public and any other interested party regarding all aspects of the 2010 UWMP, allowed community input regarding the District's implementation plan for complying with SBX7-7, considered the economic impacts of the District's implementation plan for complying with SBX7-7, and adopted Method 3 under Water Code section 10608.20(b) for determining its urban water use targets; and

WHEREAS, the Board of Directors of the District has reviewed and considered the purposes and requirements and of the Urban Water Management Planning Act and SBX7-7, the contents of the 2010 UWMP, the documentation contained in the administrative record in support of the 2010 UWMP, and all public and agency input received with regard to the 2010 UWMP, and has determined that the factual analyses and conclusions set forth in the 2010 UWMP are supported by substantial evidence.

NOW THEREFORE, BE IT RESOLVED, DETERMINED AND ORDERED BY THE BOARD OF DIRECTORS OF THE LAKE ARROWHEAD COMMUNITY SERVICES DISTRICT AS FOLLOWS:

1. The District hereby adopts Method 3 under Water Code section 10608.20(b) for determining its urban water use targets, and the 2010 Urban Water Management Plan is hereby approved and adopted and ordered filed with the Secretary of the Board.

2. The General Manager of the District is hereby authorized and directed to include a copy of this Resolution in the District's 2010 Urban Water Management Plan and, in accordance with Water Code section 10644(a), to file the 2010 Urban Water Management Plan with the California Department of Water Resources, the California State Library, and any city or county within which the District provides water supplies within thirty (30) days of this adoption date.

3. The General Manager is hereby authorized and directed, in accordance with Water Code section 10645, to make the 2010 Urban Water Management Plan available for public review during normal business hours not later than thirty (30) days after filing a copy thereof with the California Department of Water Resources.

4. The General Manager is hereby authorized and directed, in accordance with Water Code section 10635(b), to provide that portion of the 2010 Urban Water Management Plan prepared pursuant to Water Code section 10635(a) to any city or county within which the District provides water supplies not later than sixty (60) days after filing a copy thereof with the California Department of Water Resources.

5. The General Manager is hereby authorized and directed to implement the components of the 2010 Urban Water Management Plan in accordance with the Urban Water Management Planning Act and SBX7-7, including, but not limited to, the District's Water Conservation Programs and its Water Shortage Contingency Plan.

6. The General Manager is hereby authorized and directed to recommend to the Board of Directors additional steps necessary or appropriate to effectively carry out the implementation of the 2010 Urban Water Management Plan, the Urban Water Management Planning Act and SBX7-7.

PASSED AND ADOPTED at a special meeting of the Governing Board of the District held on the 7th of June, 2011 by the following vote to wit:

AYES: Durand, Goodwin, Goss, Wagner, and Williamson
NOES: None
ABSTAIN: None
ABSENT: None

Geoffrey K. Goss, President of the
Board of Directors of the Lake
Arrowhead Community Services District

ATTEST:

Kathleen Field

(SEAL)

Kathleen Field, Secretary of the
Lake Arrowhead Community Services District
and to the Board of Directors

CERTIFICATION

I, Kathleen Field, Board Secretary to the Lake Arrowhead Community Services District, hereby certify that the foregoing is a full, true and correct copy of Resolution No. 2011-07 was adopted by the Board of Directors of said Agency at the special meeting of said Board held on the 7th day of June, 2011 by the following vote:

AYES: Durand, Goodwin, Goss, Wagner, and Williamson
NOES: None
ABSTAIN: None
ABSENT: None

Kathleen Field

Kathleen Field, Secretary of the Lake Arrowhead Community Services District and to the Board of Directors

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Section 1: Introduction

1.1 Overview

This volume presents the Urban Water Management Plan 2010 (Plan) for the Lake Arrowhead Community Services District (LACSD, District) certificated water service area. This chapter describes the general purpose of the Plan, discusses Plan implementation, and provides general information about LACSD and service area characteristics. A list of acronyms and abbreviations is also provided.

1.2 Purpose

An Urban Water Management Plan (UWMP) is a planning tool that generally guides the actions of water management agencies. It provides managers and the public with a broad perspective on a number of water supply issues. It is not a substitute for project-specific planning documents, nor was it intended to be when mandated by the State Legislature. For example, the Legislature mandated that a plan include a section which "describes the opportunities for exchanges or water transfers on a short-term or long-term basis." (California Urban Water Management Planning Act, Article 2, Section 10630(d).) The identification of such opportunities, and the inclusion of those opportunities in a general water service reliability analysis, neither commits a water management agency to pursue a particular water exchange/transfer opportunity, nor precludes a water management agency from exploring exchange/transfer opportunities not identified in the plan. When specific projects are chosen to be implemented, detailed project plans are developed, environmental analysis, if required, is prepared, and financial and operational plans are detailed.

In short, this Plan is a management tool, providing a framework for action, but not functioning as a detailed project development or action. It is important that this Plan be viewed as a long-term, general planning document, rather than as an exact blueprint for supply and demand management. Water management in California is not a matter of certainty, and planning projections may change in response to a number of factors. From this perspective, it is appropriate to look at the Plan as a general planning framework, not a specific action plan. It is an effort to generally answer a series of planning questions including:

- What are the potential sources of supply and what is the reasonable probable yield from them?
- What is the probable demand, given a reasonable set of assumptions about growth and implementation of good water management practices?
- How well do supply and demand figures match up, assuming that the various probable supplies will be pursued by the implementing agency?

Using these "framework" questions and resulting answers, the implementing agency will pursue feasible and cost-effective options and opportunities to meet demands. LACSD will explore enhancing basic supplies from traditional sources such as the imported State Water Project (SWP) as well as other options. These include groundwater extraction, water exchanges, recycling, indirect potable reuse, desalination, and water banking/conjunctive use. Specific

planning efforts will be undertaken in regard to each option, involving detailed evaluations of how each option would fit into the overall supply/demand framework, how each option would impact the environment, and how each option would affect customers. The objective of these more detailed evaluations would be to find the optimum mix of conservation and supply programs that ensure that the needs of the customers are met.

The California Urban Water Management Planning Act (Act) requires preparation of a plan that:

- Accomplishes water supply planning over a 20-year period in five year increments. (LACSD is going beyond the requirements of the Act by developing a plan which spans 25 years.)
- Identifies and quantifies adequate water supplies, including recycled water, for existing and future demands, in normal, single-dry, and multiple-dry years.
- Implements conservation and efficient use of urban water supplies.

In short, the Plan answers the question: *Will there be enough water for the Lake Arrowhead community in future years, and what mix of programs should be explored for making this water available?*

1.3 UWMP Regulatory Updates

In November 2009, newly passed State legislation, SBX7-7 (Steinberg), Chapter No. 4, was signed into law. That legislation calls for progress towards a 20 percent reduction in statewide urban per capita water use by 2020. The legislation mandates that each urban retail water supplier develop and report a water use target and report that number in the retailer's 2010 UWMP. It further requires that retailers report a 2015 water use interim target baseline daily per capita use, compliance daily per capita use and the methodology for determining those estimates.

The statute provides three possible methods for an urban retail water supplier to calculate their water use target and requires California Department of Water Resources (DWR) to develop a fourth method, which it is currently undertaking. DWR has also developed methodologies for calculating:

- base daily per capita water use,
- baseline commercial, industrial and institutional water use,
- compliance daily per capita water use,
- gross water use
- service area population,
- indoor residential water use and
- landscape area water use.

AB 1420, passed in 2007 and in effect as of January 2009, changes the funding eligibility requirements of Section 10631 of the Water Code (Urban Water Management Planning Act). For any urban water supplier to be eligible for grant or loan funding administered by DWR, the

State Water Resources Control Board (SWRCB), or the Bay-Delta Authority (such as Propositions 50 and 84), the supplier must show implementation levels of the 14 water use efficiency Demand Management Measures/Best Management Practices (DMMS/BMPs) listed and described in the UWMP Act and the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding Regarding Urban Water Conservation in California, or show the schedule by which the supplier will begin implementing the DMMs/BMPs. Any supplier not implementing the measures based on cost-effectiveness must submit proof showing why the measures are not cost-effective.

A checklist to ensure compliance of this UWMP with the Act requirements is provided in Appendix A.

1.4 Implementation of the Plan

Water Code Section 10617 defines an urban water supplier as any supplier that provides water to more than 3,000 service connections or supplies more than 3,000 acre-feet (af) of water annually. Currently, LACSD has approximately 7,800 water connections, therefore requiring the District to prepare and adopt an UWMP. This Plan has been prepared for the LACSD.

1.4.1 Joint Preparation of the Plan

LACSD cooperates with the Crestline Lake Arrowhead Water Agency and the San Bernardino Valley Municipal Water District in managing the region's water resources. LACSD coordinated the preparation of the Plan with the local community. The Lake Arrowhead Chamber of Commerce and the County of San Bernardino were notified of the opportunity to provide input regarding the Plan. Water resource specialists with expertise in water resource management were retained to assist the District in preparing the details of the Plan. Agency coordination for this Plan is summarized in Table 1-1.

TABLE 1-1
AGENCY COORDINATION SUMMARY

	Participated in UWMP Develop-ment	Received Copy of Draft	Comment on Draft	Attended Public Meetings	Contacted for Assist-ance	Sent Notice of Intent to Adopt	Not Involved
Crestline Lake Arrowhead Water Agency		✓				✓	
San Bernardino Valley Municipal Water District		✓				✓	
Lake Arrowhead Chamber of Commerce		✓				✓	
San Bernardino County Planning Department		✓				✓	

1.4.2 Plan Adoption

LACSD began preparation of this Plan for the LACSD service area in January 2010. The final draft of the Plan was adopted by the Agency Board in June 2011 and submitted to DWR within 30 days of Board approval. This Plan includes all information necessary to meet the requirements of Water Conservation Act of 2009 (Wat. Code, §§ 10608.12-10608.64) and the Urban Water Management Planning Act (Wat. Code, §§ 10610-10656).

1.4.3 Public Outreach

LACSD has encouraged community participation in water planning. For the current Plan, a public session was held for review and to solicit input on the Draft Plan before its adoption. Interested groups were informed about the development of the Plan along with the schedule of public activities. Notices of public meetings were published in the local press. Copies of the Draft Plan were made available on the District's website, at the local public library and sent to the County of San Bernardino, as well as interested parties.

LACSD has and continues to actively encourage community participation in its on-going water management activities and specific water related projects. The District's public participation programs include mailings, public meetings, and web-based communication. The District's water conservation program involves a variety of public awareness programs. The District has regularly scheduled Board of Director's meetings that include public comment on water issues.

Table 1-2 presents a timeline for public participation during the development of the UWMP. A copy of the public outreach materials, including paid advertisements, newsletter covers, website postings, and invitation letters are attached in Appendix B.

The District has fostered and maintains professional working relationships with community organizations such as the Arrowhead Lake Association (ALA), the Arrowhead Woods Architectural Committee (AWAC) and others.

TABLE 1-2
PUBLIC PARTICIPATION TIMELINE

Date	Event	Description
March 1, 2011	Preliminary Draft UWMP	Preliminary Draft released to solicit input
June 7, 2011	Public Hearing	Review contents of Draft UWMP and take comments. UWMP considered for approval and adoption by the LACSD Board
July 2011	Plan Submittal	File Final UWMP with DWR within 30 days of adoption

The components of public participation include:

Local Media

- Paid advertisements in local newspapers

Community-based Outreach

- Association Building Contractors (ABC)

- Arrowhead Lake Association (ALA)
- Arrowhead Woods Architectural Committee (AWAC)
- Chamber of Commerce
- Lake Arrowhead Board of Realtors
- Lake Arrowhead Country Club (LACC)

City/County Outreach

- Municipal Advisory Committee (MAC)
- County of San Bernardino
- Local Agency Formation Commission

Public Availability of Documents

- Lake Arrowhead CSD website
- LACSD offices
- Local library

1.4.4 Resources Maximization

Several documents were developed to enable LACSD to maximize the use of available resources and minimize use of Lake Arrowhead for a water supply, including LACSD Ordinances 65 and 69, the "Crestline Lake Arrowhead Water Agency (CLAWA) Overlap Area Agreement", and the LACSD Resolution 2005-04 SWP Transfer Agreement, which is a 10-15 year agreement between the District and CLAWA to take delivery of 7,600 AF of SWP water through San Bernardino Valley Municipal Water District (VALLEY DISTRICT), in annual increments. Chapter 3 of this Plan describes in detail the water resources available to LACSD for the 25-year period covered by the Plan. Additional discussion regarding documents developed to maximize resources is included in Section 3.4 and Chapter 6.

1.5 Background

The District is located approximately 90 miles east of Los Angeles on the North Slope of the San Bernardino Mountains in southern California. The general location of LACSD is shown on Figure 1-1.

In 1891, the area known today as Lake Arrowhead was acquired for construction of a reservoir to supply irrigation water to the San Bernardino Valley. The Arrowhead Reservoir Company was formed in 1891. In 1891 the company commenced construction of a dam at the east end of Little Bear Valley.

In 1905, the property was transferred to the Arrowhead Reservoir and Power Company (ARPC), for the purpose of also using the water for power generation. ARPC constructed a 185' semi-hydraulic earth filled dam between 1895 and 1915. The dam was completed in 1921, forming the basin that is present day Lake Arrowhead. As a result of a court decision which prevented delivery of the stored water to customers outside the natural watershed area for irrigation purposes, the ARPC ceased its operations in 1921.

In 1921, the Arrowhead Lake Company, a corporation formed by a group of Los Angeles businessmen, bought Little Bear Lake and the surrounding properties, changing the name to Lake Arrowhead and Arrowhead Woods respectively. The Arrowhead Utility Company (AUC) was formed in 1923 by the Arrowhead Lake Company. During its first year of operation, the AUC served 103 domestic water customers.

In 1971, the California Department of Water Resources, Division of Safety of Dams, ordered that all hydraulic-fill dams in the State of California be tested and evaluated for seismic stability. After an evaluation was done of the existing dam, it was determined that a second dam would be constructed to ensure safety.

The Lake Arrowhead Community Services District was formed March 16, 1978 under the Community Services District Law for the purpose of purchasing a privately owned water system serving properties in the community of Arrowhead Woods, which surrounds Lake Arrowhead. The District is a self governed Special District responsible for supplying water to customers within its certificated water service area, also known as the Arrowhead Woods. On June 7, 1983, voters approved the annexation of the Lake Arrowhead Sanitation District, governed by the Board of Supervisors of San Bernardino County (County) and operated under the County's Special Districts Department, to provide wastewater services. On July 1, 1983, the LACSD assumed control and operation of the Lake Arrowhead Sanitation District. This resulted in the expansion of the District to its current boundaries. LACSD currently provides wastewater services within the District’s sanitation boundary which includes the communities of Lake Arrowhead, Cedar Glen, Blue Jay, Twin Peaks, Deer Lodge Park, Rim Forest, Crest Park and Sky Forest.

On April 1, 1995, LACSD assumed ownership and control of the Deer Lake Water Corporation, which provides water to the residents of the area known as Deer Lodge Park (DLP). DLP is outside of the LACSD certificated water service area and is supplied with water from wells within DLP and water purchased from CLAWA. There is no physical connection between the LACSD water distribution system inside of its certificated water service area and the DLP water distribution system.

Prior to 2003, LACSD relied on Lake Arrowhead as the sole source of water supply for the Arrowhead Woods community. Other LACSD service areas utilize groundwater or imported water purchased from the CLAWA. In response to multi-year drought conditions and declining lake levels, LACSD initiated water management activities in 2002 to reduce water demands and explore alternative water supplies. Although these initiatives resulted in significant water demand reductions, LACSD entered into a voluntary agreement with the Arrowhead Lake Association in 2005 to limit lake withdrawals. In early 2006, the SWRCB issued an Order (Order WR 2006-0001) to limit lake withdrawals to 1,566 acre-feet per year (AFY) beginning in 2008.

FIGURE 1-1
LASCD VICINITY MAP

1.5.1 LACSD's Water Rights

In 2003, a complaint against LACSD's use of Lake Arrowhead as a water supply source was filed with the State Water Resources Control Board (SWRCB). As a result, the SWRCB required LACSD to develop a water resources compliance plan that would allow LACSD to meet its demands while maintaining lake levels. A Water Resources Plan was adopted by the LACSD Board in late 2005, and the SWRCB incorporated it as part of its Order WR 2006-0001. Under the Order, beginning in 2008 LACSD has been limited to withdrawals from Lake Arrowhead of 1,566 AF annually. This limitation necessitated the implementation of water conservation measures, a recycled water program, an annual limitation on new service connections and procurement of additional water supplies imported from outside the District, as well as other operations and reporting requirements.

The main elements of the Water Resources Plan are based on an agreement between the ALA and LACSD. Both entities recognized the importance of Lake Arrowhead to the community, both as a recreational amenity and as the most desirable source of domestic water for residential uses. ALA and LACSD entered into a legally binding settlement agreement that defines the manner in which Lake Arrowhead may be used as a domestic water supply without causing harm to the recreational and environmental values of the Lake. The Agreement was approved by the LACSD Board on November 4, 2005 and approved by the ALA Board on November 5, 2005. The terms of the agreement are as follows:

1. ALA recognizes that LACSD is the owner of a valid pre-1914 right to divert water from Lake Arrowhead for consumptive purposes, and LACSD recognizes that ALA is the owner of a valid pre-1914 right to divert water to create Lake Arrowhead for recreational purposes.

2. Without quantifying or otherwise limiting LACSD's pre-1914 right, and notwithstanding any right that may be acknowledged by the SWRCB, LACSD agrees that beginning in January 2007, LACSD will limit its diversions from the Lake to 1,555 AF on a long-term average basis. This amount will be inclusive of all withdrawals from the Lake, whether for domestic or irrigation purposes. For purposes of this Memorandum of Understanding (MOU), "long-term average" means a rolling average over a period of the previous ten (10) years. The amount of the "long-term average" may be adjusted upward or downward by mutual agreement of LACSD and ALA based on information that is collected and analyzed. LACSD agrees that if the level of the Lake reaches 5,103 feet, LACSD's withdrawals shall be limited according to a mutually agreeable schedule that will take in to account the month of the year and whose goal will be to ensure that withdrawals for that year are limited to no more than 1,555 AF.

3. ALA and LACSD agree that their mutual goal is to maintain the level of the Lake at or above 5,100 feet (ALA datum).

4. LACSD currently has in place a medium-term solution designed to accomplish the parties' mutual goal of maintaining the level of the Lake at or above 5,100 feet. In order to accomplish this goal on a long-term basis, the parties will work together to formulate and implement a physical solution that creates a permanent and reliable source of supplemental water. In order to obtain a permanent and reliable source of supplemental water, LACSD will use best efforts to obtain an entitlement of water from State Water

Project Contractors. LACSD will further use best efforts to formulate and implement measures to achieve the goal of maintaining the level of the Lake at or above 5,100 feet.

5. ALA agrees to withdraw its Notice of Intent to Appear, all written testimony, all exhibits, and any other evidence or policy statements from the State Board Enforcement hearing on Cease and Desist Order 262.31-18 and Administrative Civil Liability Complaint No. 262.5-40. ALA further agrees to support LACSD's position in the hearing.

6. ALA agrees that if the Lake is operated and managed in the manner expressed herein, ALA will not allege injury to downstream users or environmental interests.

7. This Agreement shall be specifically enforceable in Superior Court for the County of Riverside. Specifically, the parties shall consent and submit to the jurisdiction of the Court maintaining continuing jurisdiction over the case City of Barstow, et al. vs. City of Adelanto, et al., Case No. 208568 for the purpose of administration and enforcement of this Agreement. Such submission shall be solely for the purpose of enforcement and administration of this Agreement. LACSD acknowledges that it is already subject to the jurisdiction of the Court in that case.

1.6 Climate

Lake Arrowhead has four distinct seasons, which is a unique climate for southern California. Summers in the Lake Arrowhead area are generally in the 80s. Winter temperatures range from below freezing to an average winter high in the 50s. Average annual precipitation during the period 1941 through 2009 was approximately 40 inches.

Average evapotranspiration (ETo), precipitation and temperature for the Lake Arrowhead area are listed in Table 1-3.

TABLE 1-3
CLIMATE DATA FOR LACSD

	Jan	Feb	Mar	Apr	May	Jun
Standard Monthly Average ETo (inches)[a]	1.8	2.6	4.6	6.0	7.0	7.6
Average Rainfall (inches)[b]	8.6	8.0	6.5	2.9	1.1	0.2
Average High Temperature (ºF)[b]	45.7	48.8	53.1	60.1	67.3	75.9
Average Low Temperature (ºF)[b]	28.9	29.8	31.4	35.3	41.3	48.4

	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Standard Monthly Average ETo (inches)[a]	8.1	7.4	5.4	4.1	2.4	1.8	58.8
Average Rainfall (inches)[b]	0.1	0.4	0.8	1.6	4.2	5.7	40.1
Average High Temperature (ºF)[b]	81.9	81.2	76.8	65.8	53.8	46.7	63.1
Average Low Temperature (ºF)[b]	56.5	56.0	50.8	42.1	34.3	29.7	40.4

Notes:
(a) 2004-2009 data from Lake Arrowhead CIMIS Station #192
(b) 1941-2009 data from Western Regional Climate Center Lake Arrowhead Station (044671) - http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca4671

1.7 Potential Effects of Global Warming

A topic of growing concern for water planners and managers is global warming and the potential impacts it could have on California's future water supplies. DWR's California Water Plan Update 2009 considers how climate change may affect water availability, water use, water quality, and the ecosystem.[1]

Volume 1, Chapter 5 of the California Water Plan, "Managing an Uncertain Future," evaluated three different scenarios of future water demand based on alternative but plausible assumptions on population growth, land use changes, water conservation and also future climate change might have on future water demands. Future updates will test different response packages, or combinations of resource management strategies, for each future scenario. These response packages help decision-makers, water managers, and planners develop integrated water management plans that provide for resources sustainability and investments in actions with more sustainable outcomes. Further detailed guidance is currently being developed by the State of California and the U.S. Environmental Protection Agency for use in integrated regional water management planning.

1.8 Other Demographic Factors

Water service is provided to residential, commercial, institutional, and recreational customers and for environmental and other uses, such as fire protection and pipeline cleaning.

Over the past decade while most of California experienced significant increases in residential construction, Lake Arrowhead actually experienced a decline in the local population along with a decrease in the demand for water. This decrease is in part due to the Order WR 2006-0001 issued by SWRCB, discussed previously, which required LACSD beginning in 2008 to address their lack of available water with "permanent water use restrictions applicable to all customers" as discussed in Ordinance 69.

Lake Arrowhead includes commercial areas oriented to tourists and seasonal residents as well as year-round residents. Lake Arrowhead is a summer mountain resort area with the lake being the focal point, providing recreational opportunities in the form of boating, fishing and swimming. The land use is primarily made up of full-time and part-time residences, with the majority of residences being part-time vacation homes used only on weekends or in the summer.

The District's 2005 UWMP attempted to quantify or summarize the seasonal or part-time residences using census data. The District's water service area lies within what the U.S. Census Bureau refers to as the Lake Arrowhead Census Designated Place (CDP), which is discussed further in Chapter 2. There was an average annual increase of 4.4% in full-time residents for the Lake Arrowhead CDP from 1990 to 2000. Also, in 1990, the ratio of full-time to part-time was 30.6% (2,981/9,759) and in 2000, the same ratio was 39.1% (4,292/10,983). Therefore, approximately only every 1 in 4 people in Lake Arrowhead are full-time residents with the remainder being part-time.

[1] Final California Water Plan Update 2009 Integrated Water Management: Bulletin 160.

1.9 List of Abbreviations and Acronyms

The following abbreviations and acronyms are used in this report.

AB	Assembly Bill
ABC	Association Building Contractors
ACOE	U.S. Army Corps of Engineers
Act	California Urban Water Management Planning Act
AF	acre-feet
AFY	acre-feet per year
ALA	Arrowhead Lake Association
AMR	Automatic Meter Reading
ARPC	Arrowhead Reservoir and Power Company
AUC	Arrowhead Utility Company
AWAC	Arrowhead Woods Architectural Committee
AWWA	American Water Works Association
AWWARF	American Water Works Association Research Foundation
BMPs	Best Management Practices
CCF	One Hundred Cubic Feet
CDPH	California Department of Public Health
CCR	Consumer Confidence Report
CDP	Census Designated Place
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLAWA	Crestline Lake Arrowhead Water Agency
County	San Bernardino County
CSD	Community Services District
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
DBP	Disinfection by-products
Delta	Sacramento-San Joaquin Delta
DLP	Deer Lodge Park
DMM	Demand Management Measures
DOF	California Department of Finance
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources
DWSAP	Drinking Water Source Assessment and Protection
EC	Electrical conductivity
Edison	Southern California Edison

EIR	Environmental Impact Report
EPA	Environmental Protection Agency
ETo	Evapotranspiration
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GWMP	Groundwater Management Plan
HET	High Efficiency Toilet
HEW	High Efficiency Washer
IPR	Indirect Potable Reuse
IWRP	Integrated Water Resources Program
IAW	International Water Association
LACC	Lake Arrowhead Country Club
LACSD, District	Lake Arrowhead Community Services District
M&I	Municipal and Industrial
MAC	Municipal Advisory Committee
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
MOU	Memorandum of Understanding
MPH	Mary P. Henck
MWA	Mojave Water Agency
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
PCAs	Possible Contaminating Activities
PHG	Public Health Goal
PUC	California Public Utilities Commission
PWSS	Public Water System Statistics
RAP	Remedial Action Plan
RO	Reverse Osmosis
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SBX7-7	Senate Bill 7 of Special Extended Session 7
SCAG	Southern California Association of Governments
SWP	State Water Project

SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
μg/L	micrograms per liter
umhos/cm	micromhos per centimeter
UCLA	University of California, Los Angeles
ULFT	Ultra Low-flush Toilet
UV	Ultraviolet
UWMP, Plan	Urban Water Management Plan
VALLEY DISTRICT	San Bernardino Valley Municipal Water District
WUE	Water use efficiency
WRP	Wastewater Reclamation Plant
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Section 2: Water Use

2.1 Overview

This chapter describes current and historic water usage and the methodology used to project future demands within Lake Arrowhead Community Services District's (LACSD's, District's) service area. Water usage has been divided into sectors of residential, commercial, institutional, irrigation, and system losses.

Several factors can affect demand projections, including:

- Land use revisions
- New regulations
- Consumer choice
- Economic conditions
- Environmental factors
- Conservation programs
- Plumbing codes

The District is unique for the following reasons and the standard California Department of Water Resources (DWR) methods for projecting population do not accurately reflect its situation:

(1) As discussed in Chapter 1, in early 2006, the State Water Resources Control Board (SWRCB) issued an Order (WR 2006-0001) to LACSD to limit lake withdrawals to 1,566 acre-feet per year (AFY). This Order took effect on LACSD's water supply in January 2008. (Refer to Appendix C for a copy of the SWRCB Order WR 2006-0001.)

(2) A high ratio of seasonal residents in the area vs. permanent residents due to the resort/vacation type of environment.

(3) A downward trend in water use since 2004 and other local data patterns since 2000.

For these reasons the District feels that the published DWR methodologies for projecting population (from Southern California Association of Government (SCAG), U.S. Census, number of water connections, or the California Department of Finance (DOF) data sources) do not accurately portray its service area. All of these sources project an increase of at least 1% annual growth in population from 2000 and into the future. It is unlikely that the District will experience such growth.

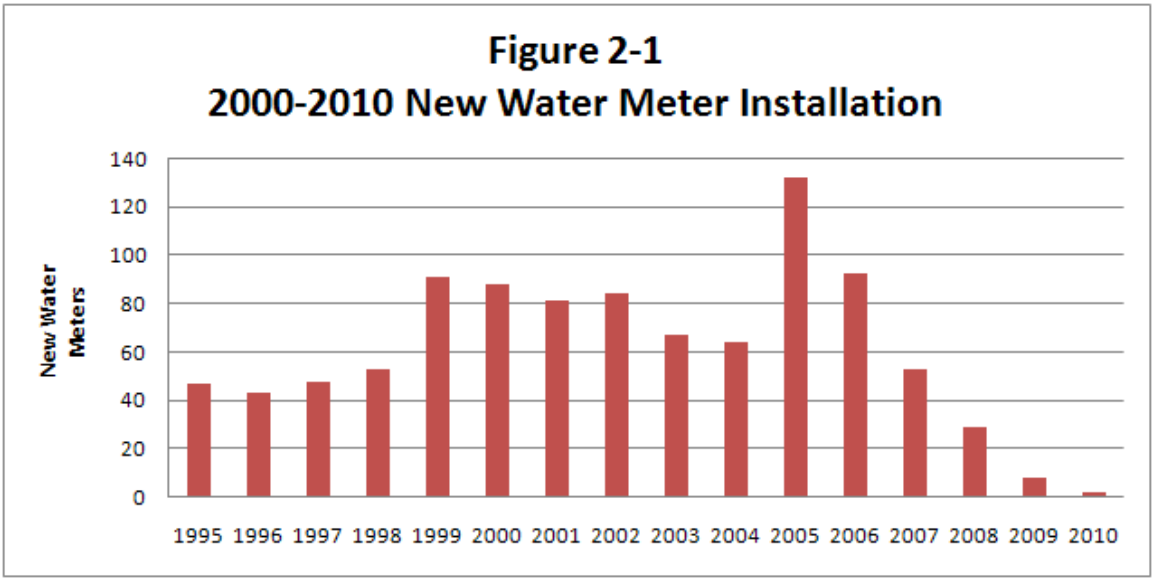
In this 2010 UWMP the District utilizes local data sources to project its population growth, which display a negative trend from about 2000 and into the future. The local data sources District staff believes most accurately depict the population trend are:

(1) Weekday wastewater flows from 2001-2010 (from LACSD Grass Valley Wastewater Treatment Plant (WWTP)), which show a decline in the volume of wastewater flows. The District is assuming these lower wastewater flows represent the decline in the District's population of water users living in Lake Arrowhead full-time over the past decade.

(2) Rim of the World Unified School District enrollment data from 1998-2010 show a decline in the percentage of students enrolled. The District is assuming the declining student population represents the decline in the District's population of water users living in Lake Arrowhead full-time over the past decade.

(3) Annual water sent to the distribution system data for the District (reported to DWR via Public Water System Statistics), which show District usage of water trends downward from 2001-2005 and then again from 2007-2010.

As can be seen from Figure 2-1, except for 2005-2006, when a moratorium on LACSD meter installation was expected to occur and property owners installed meters while they were still available, rather than based on actual need, the number of new meters installed by LACSD has generally declined for the last decade. In all of 2010, only two (2) new meters were installed.



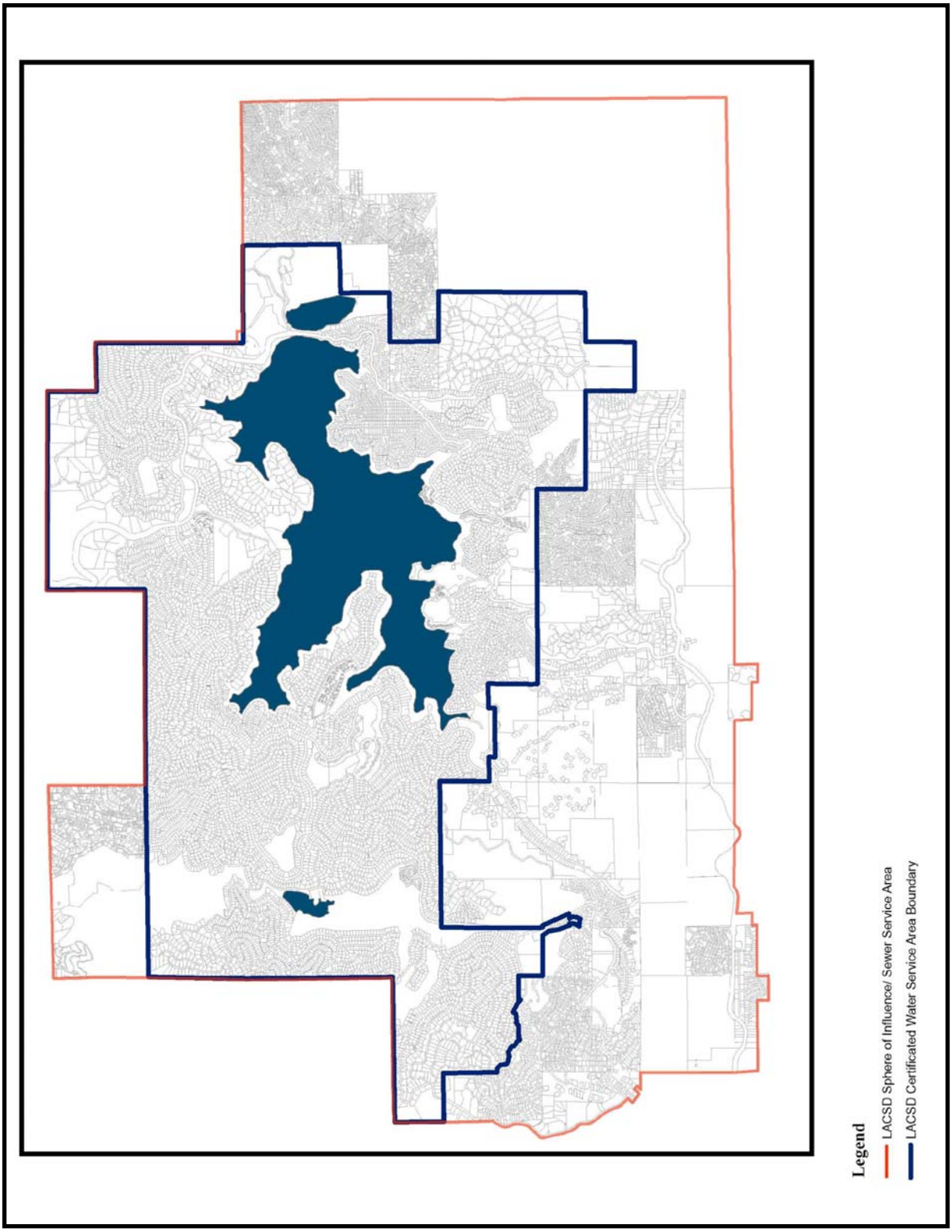
2.2 Population

The LACSD currently has approximately 7,800 water meters installed and 11,000 wastewater connections over an area encompassing approximately 15 square miles.

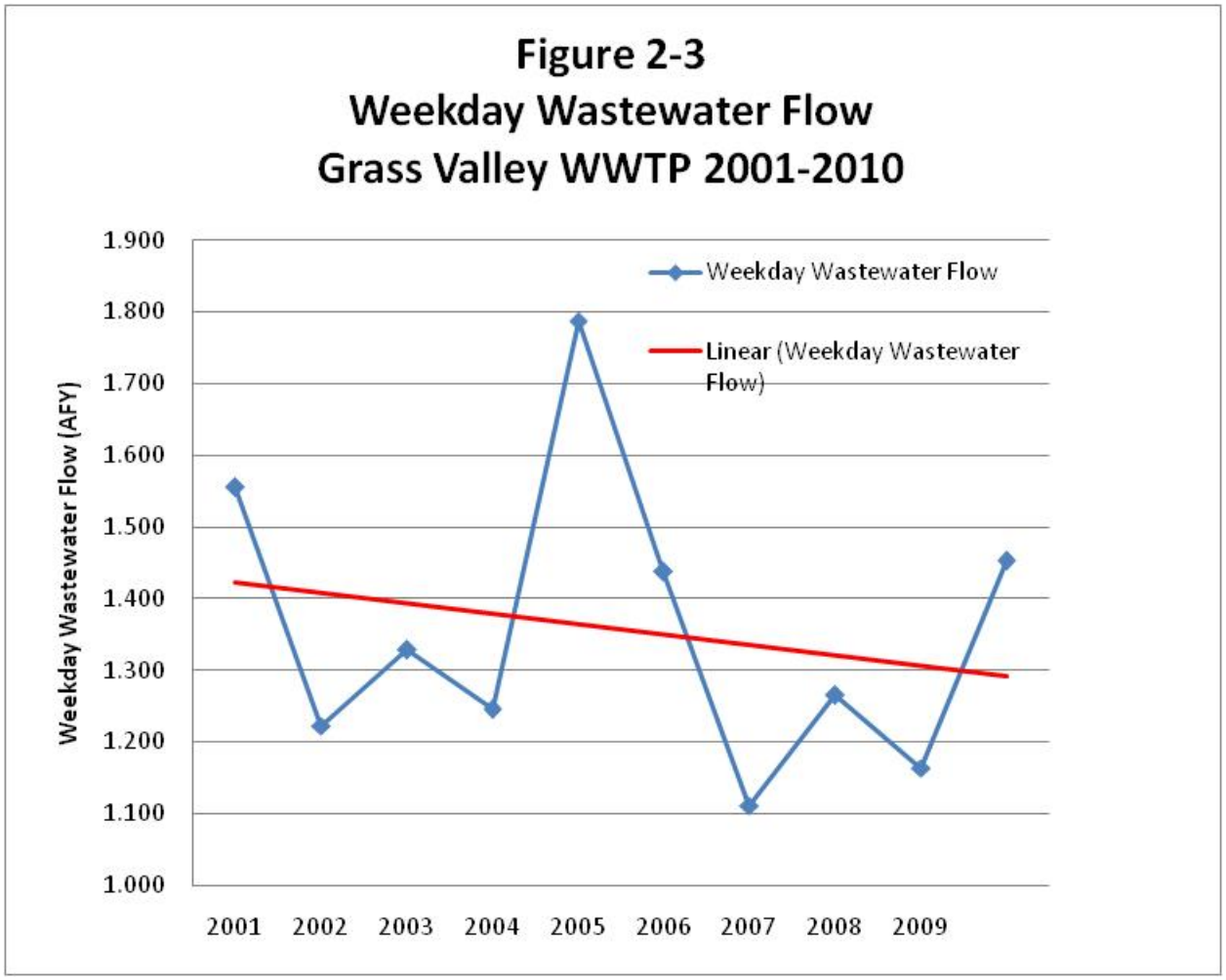
2.2.1 Service Area

The LACSD is a Special District responsible for providing water services to its certificated water service area known as Arrowhead Woods and wastewater services within all of LACSD's service area including the communities of Lake Arrowhead, Cedar Glen, Blue Jay, Twin Peaks, Deer Lodge Park, Rim Forest, Crest Park and Sky Forest. The boundaries for the wastewater service area are larger than the boundaries for the water service area; therefore there are customers to whom the LACSD provides wastewater service but not water service. The water system boundary includes approximately 4,900 acres and is essentially the same boundary as that of the community known as the Arrowhead Woods (Figure 2-2).

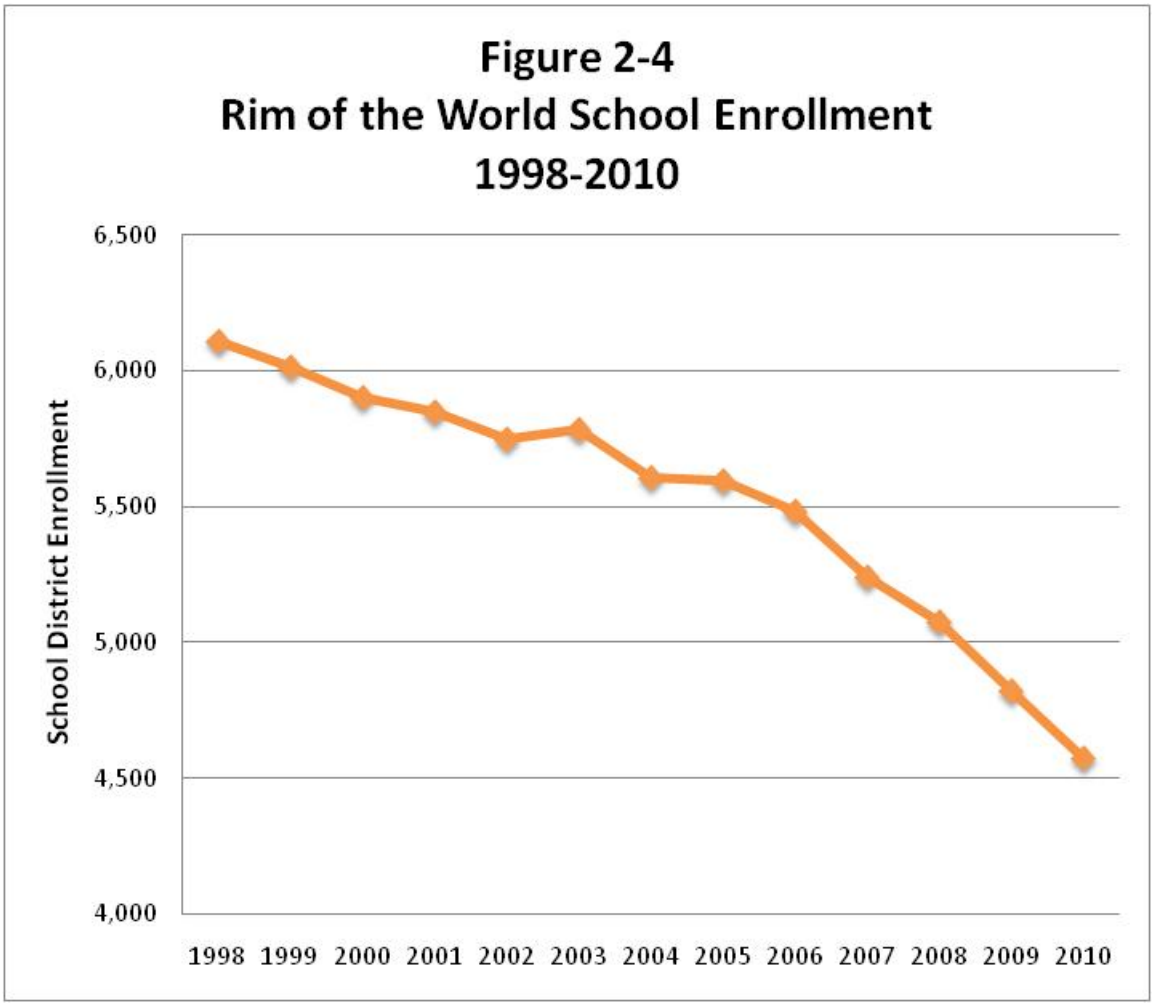
FIGURE 2-2
LASCD SERVICE AREA MAP



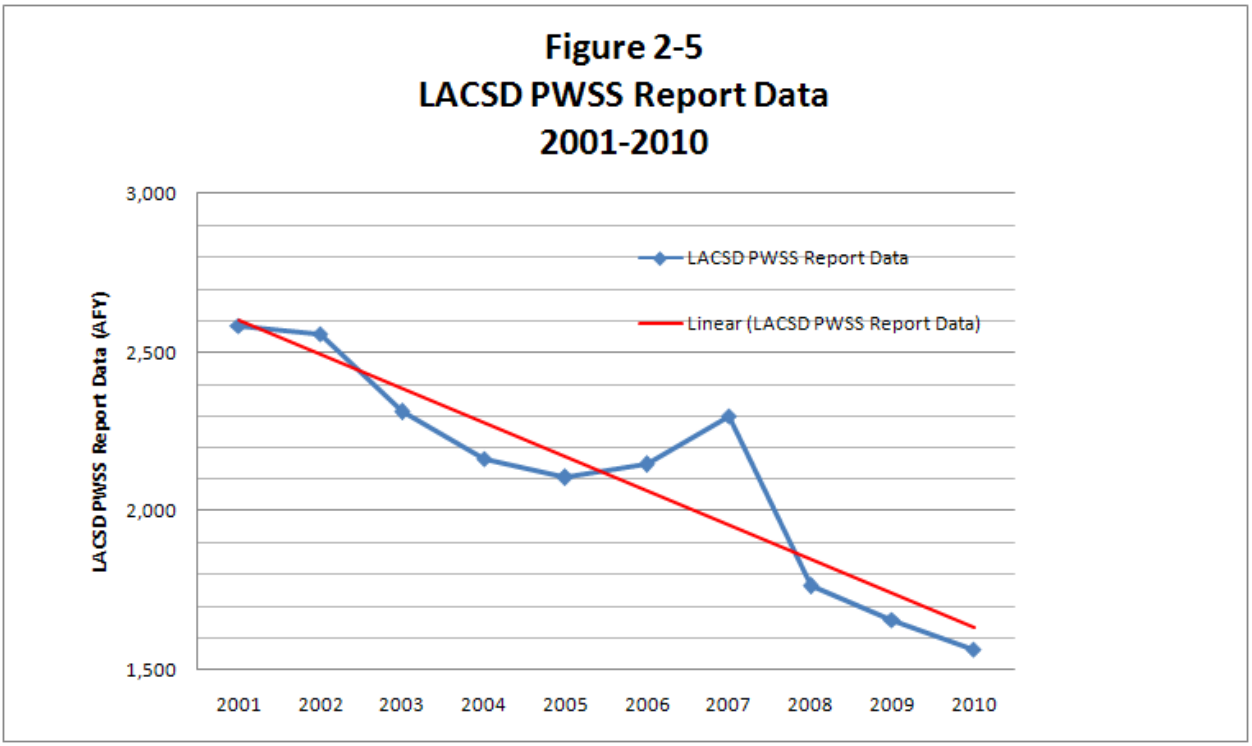
The local data sources District staff believes most accurately depict the population trend are discussed below. The first source is the weekday wastewater flows from 2001-2010 from the LACSD's Grass Valley WWTP that shows a 1.0% decline on an annual basis in the wastewater flow. This decline can be seen on Figure 2-3, using data from 2001 through 2010. The District is assuming these wastewater flows represent the decline in the District's population of full-time water users over the past decade. In 2005 there was a period of heavy rain (in early January and early February, for a total of approximately 29 inches more than average for those two months) that greatly influenced the wastewater flow for that year.



The next set of local data is the Rim of the World Unified School District enrollment data from 1998-2010, which shows a steady decline (at a rate of 2.1% on an annual basis) in the number of students enrolled (Figure 2-4). The District is assuming the declining student population represents the decline in the District's population of water users living in Lake Arrowhead on a full-time basis over the past decade.



The annual water that was sent to the distribution system for the District (reported to DWR via Public Water System Statistics reports) shows a downward trend of water usage from 2001 through 2009. It should be noted that the summer of 2007 was unusually hot, with the average monthly temperatures varying between 2-5 degrees higher than average from March through August. As can be seen on Figure 2-5, from 2001 through 2010, there was a 4.4% decline on an annual basis in LACSD's water that was sent to the distribution system.



In conclusion, because of the above local data, it is recommended that LACSD be conservative in projecting population for its service area. For the period 2000 through 2010, using the above local data, it is recommended to use the most conservative downward trend, which is 2% downward as shown on Figure 2-4 (Rim of the World School Enrollment, rounded from 2.1%) for the population projection. The initial population from 2000 is from the US Census for the Lake Arrowhead Census Designated Place (CDP). For the years 2010-2020, the District is projecting no net increase, i.e. no growth, in the population until 2020. After 2020, LACSD staff is projecting that while being conservative and assuming some stabilization of the growth in the area, the following 15 years will have a 0.5% annual increase in the population. Therefore, Table 2-1 shows an overall population decrease from 2005 to 2035 of 0.15% for the District.

TABLE 2-1
CURRENT AND PROJECTED POPULATION ESTIMATES
LAKE ARROWHEAD CENSUS DATA PLACE*

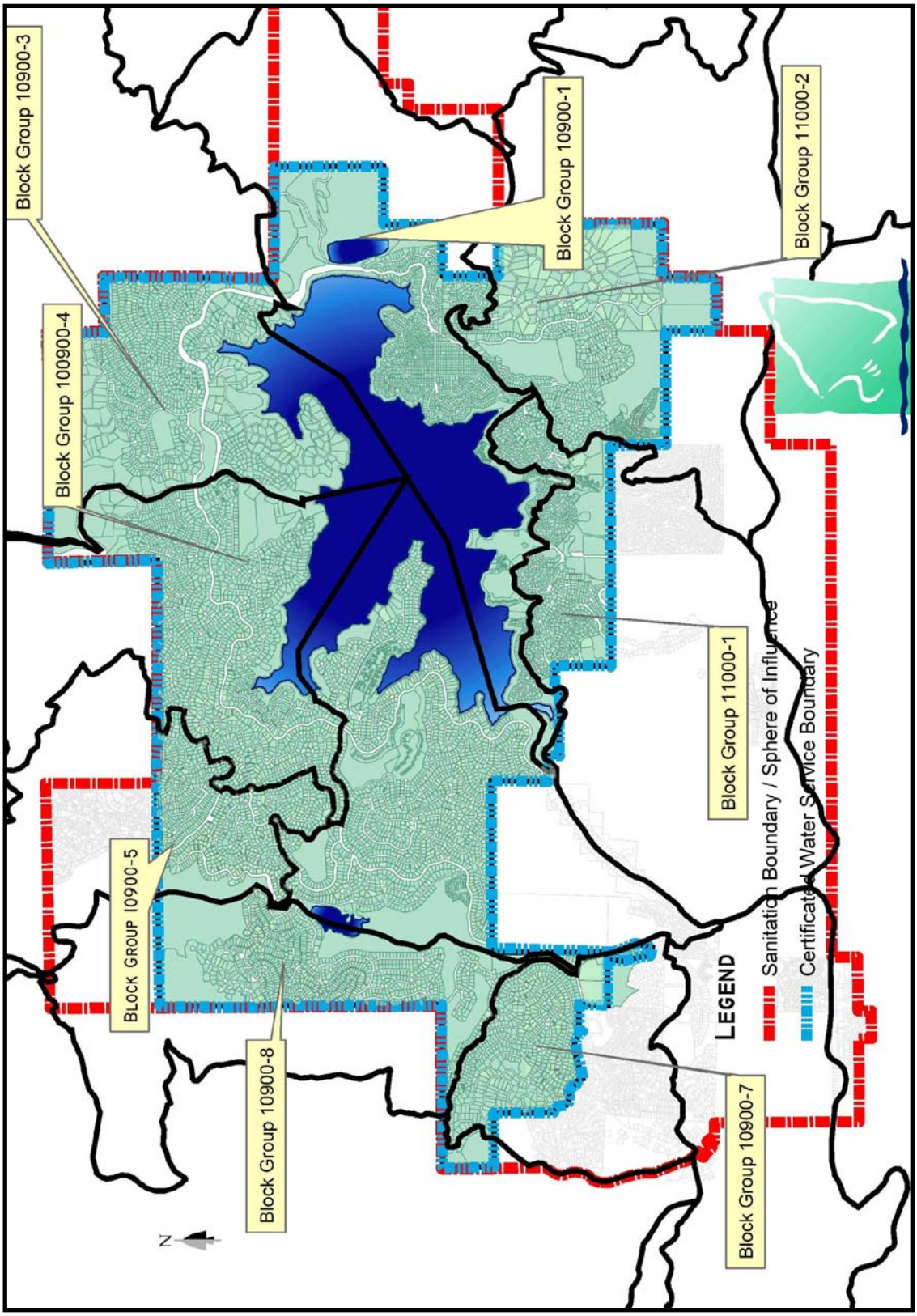
	2000[a]	2005	2010	2015	2020	2025	2030	2035	Annual % Change 2005-2035
Lake Arrowhead CDP[b]	8,934	8,041	7,147	7,147	7,147	7,326	7,505	7,683	-0.15%
Grass Valley Block Totals[b]	3,010	2,709	2,408	2,408	2,408	2,468	2,528	2,589	-0.15%
Total Lake Arrowhead CDP and Grass Valley Blocks[b]	**11,944**	**10,750**	**9,555**	**9,555**	**9,555**	**9,794**	**10,033**	**10,272**	**-0.15%**

*Notes: Census Block Group Boundaries do not match the LACSD Certificated Water Service Boundary (Refer to Figure 2.6).

(a) Taken from 2000 US Census Data for Lake Arrowhead CDP.

(b) Projected using -2% population decrease from 2000-2010. Then 0% population increase (no growth) from 2010-2020. Finally from 2020-2035, a population increase of 0.5% is projected, based on LACSD staff experience, while being conservative and assuming some stabilization of growth.

FIGURE 2-6
LACSD CENSUS BLOCKS AND WATER SERVICE BOUNDARIES



2.3 Existing and Targeted Per Capita Water Use in LACSD Service area

2.3.1 Base Daily per Capita Water Use for SBX7-7 Reduction

As described in Senate Bill 7 of Special Extended Session 7 (SBX7-7), it is the intent of the California legislature to increase water use efficiency and the legislature has set a goal of a 20 percent per capita reduction in urban water use statewide by 2020. The requirements of SBX7-7 apply to retail water suppliers. Consistent with SBX7-7, the 2010 UWMPs must provide an estimate of Base Daily Per Capita Water Use. This estimate utilizes information on population as well as base gross water use. For the purposes of this UWMP, population was estimated as described in the previous section. Base gross water use is defined as the total volume of water, treated or untreated, entering the distribution system of LACSD, excluding: recycled water; net volume of water placed into long-term storage; and water conveyed to another urban water supplier. This calculation of Base Daily Per Capita Water Use is limited to LACSD's retail water service area (as described in Chapter 1).

The UWMP Act allows urban water retailers to evaluate their base daily per capita water use using a 10 or 15-year period. A 15-year base period within the range January 1, 1990 to December 31, 2010 is allowed if recycled water made up 10 percent or more of the 2008 retail water delivery. If recycled water did not make up 10 percent or more of the 2008 retail water delivery, then a retailer must use a 10-year base period within the range January 1, 1995 to December 31, 2010. Recycled water did not make up 10 percent of the 2008 delivery to the LACSD retail area and for this reason Base Daily Per Capita Water Use has been based on a 10-year period. In addition, urban retailers must report daily per capita water use for a five year period within the range January 1, 2003 to December 31, 2010. This 5-year base period is compared to the Target Based Daily Per Capita Water Use to determine the minimum water use reduction requirement (this is described in more detail in the following sections). Table 2-2 reports the data used to calculate the Base Daily Per Capita Water Use in gallons per capita per day (gpcd), and the 10-year and 5-year base periods.

TABLE 2-2
BASE DAILY PER CAPITA WATER USE

Base Period Year						
Sequence Year	Calendar Year	Distribution System Population	Annual System Gross Water Use (AFY)	Annual Daily Per Capita Water Use (gpcd)	10-Year Average (gpcd)	5-Year Average (gpcd)
1	1995	10,268	2,570	223		
2	1996	10,604	2,720	229		
3	1997	10,940	2,650	216		
4	1998	11,276	2,422	192		
5	1999	11,612	2,510	193		
6	2000	11,944	2,370	177		
7	2001	11,705	2,583	197		
8	2002	11,466	2,559	199		
9	2003	11,227	2,312	184		
10	2004	10,988	2,164	176	**198.63**	
11	2005	10,750	2,105	175	193.78	
12	2006	10,511	2,145	182	189.10	
13	2007	10,272	2,297	200	187.44	**183.26**
14	2008	10,033	1,763	157	183.95	177.87
15	2009	9,794	1,659	151	179.77	172.94
				Period Selected		**183**

Note: Shaded cells show calendar years used in selected 5-year average.

2.3.2 Urban Water Use Targets for SBX7-7 Reduction

In addition to calculating base gross water use, SBX7-7 requires that LACSD identify their demand reduction targets for year 2015 and 2020 by utilizing one of four options:

- Option 1. 80% of baseline gpcd water use (i.e., a 20% reduction).
- Option 2. The sum of the following performance standards: indoor residential use (provisional standard set at 55 gpcd); plus landscape use, including dedicated and residential meters or connections equivalent to the State Model Landscape Ordinance (80% ETo existing landscapes, 70% of ETo for future landscapes); plus 10% reduction in baseline commercial, industrial institutional use by 2020.
- Option 3. 95% of the applicable state hydrologic region target as set in the DWR "20x2020 Water Conservation Plan" (February, 2010) (20x2020 Plan).
- Option 4. Not applicable.

LACSD's service area is within the South Lahontan Hydrologic Region (#9) as defined by DWR and this hydrologic region has been assigned a 2020 water use target of 170 gpcd per the DWR 20x2020 Plan. LACSD's base daily per capita water use of 183 gpcd for the 5-year base period is close to 95% of the 170 gpcd target (i.e., 162 gpcd). Therefore, to comply with SBX7-7, the District selects Option 3 to reduce its Base Daily Per Capita Water Use by 5% below target. This results in the 2020 gpcd target for LACSD to be 162 gpcd, as shown in Table 2-3.

TABLE 2-3
COMPONENTS OF TARGET DAILY PER CAPITA WATER USE

Period	Value		Unit	
10-year period selected for baseline gpcd	*First Year*	1995	*Last Year*	2004
5-year period selected for maximum allowable gpcd	*First Year*	2003	*Last Year*	2007
Highest 10-year Average	199		gpcd	
Highest 5-year Average	**183**		gpcd	
Compliance Water Use Target (20% Reduction on 10yr)	159		gpcd	
Maximum Allowable Water Use Target (5% Reduction 5yr)	162		gpcd	
2020 Target	**162**		gpcd	
2015 Interim Target	**172**		gpcd	
Methodology Used	Option #3			

LACSD plans to meet the proposed 20x2020 water use target using the existing methods of conservation that have been working to date for the District and other methods discussed in Section 2.6.2, Chapter 4 Recycled Water, and Chapter 7 Demand Management Measures.

2.4 Projected Water Use

2.4.1 Demand Forecast Methodology

Historical and current water use data were collected and broken out by water use sector to allow for detailed analysis and for making different assumptions about each type of water use for future years. In addition to water use data, the number of residential service connections was collected to estimate service area population and per capita water use.

For historical projection records, DWR annual Public Water System Statistics (PWSS) data were used because the records break out metered water deliveries by customer class and number of connections by customer class. For the purposes of this Plan, projected water demand estimates are based on the following:

- Population (Refer to Section 2.2)
- Demand Management Measures (Refer to Section 7.0)
- Recycled Water Use (Refer to Section 4.0)
- Number of Water Service Connections

With respect to the number of new water service connections from 1995 to 2009, refer to Figure 2-1, which indicates that the number of new meters installed by LACSD has generally declined for the last decade with only two (2) new meters being installed in 2010.

Based on the above factors the District estimates that water demand will increase at the same rate projected for the District's population from 2010 through 2035, as described in Table 2-1. The production projection assumes a 0% increase (i.e., no growth) from 2010-2020. From 2020-2035, a production increase of 0.5% is projected.

Table 2-4 summarizes LACSD's projected water demands through 2035, with and without conservation using the SBX7-7 requirements discussed previously in Section 2.3. Please note that LACSD's demand projections are the same with and without conservation.

TABLE 2-4
PROJECTED WATER DEMANDS

	2005	2010	2015	2020	2025	2030	2035
Water Demands[(a)] (AF)	2,105	1,565	1,565	1,565	1,604	1,644	1,685
GPCD[(b)] (No Conservation)	175	146	146	146	146	146	146
SBX7-7 Req'd GPCD[(c)]	N/A	183	172	162	162	162	162
SBX7-7 Savings[(d)] (AF)	N/A	0	0	0	0	0	0
Water Demands w/ Conservation[(e)]	N/A	1,565	1,565	1,565	1,604	1,644	1,685

Data Source: Demands are assumed to grow at the same rate as the population rate from 2010-2035, as presented in Table 2-1.

Notes:
(a) LACSD's demand projections without conservation.
(b) Calculated using the estimated population from Table 2-1.
(c) See Table 2-3.
(d) Calculated as the difference between the projected GPCD without conservation and the SBX7-7 Required GPCD times the population.
(e) LACSD's demand projections with conservation using the SBX7-7 requirements. The demands are the same with and without conservation.

The District customers are primarily single family residential, with a small number of institutional, commercial, and irrigation accounts. Past, present and future metered water use by customer type is presented in Table 2-5. Please note that in Table 2-5, only the water use sectors used in LACSD are listed. The typical sectors that are not listed on the table including multi-family residential or industrial are not used in the District.

TABLE 2-5
CURRENT AND PROJECTED WATER DELIVERIES (BY CUSTOMER TYPE) (AFY)

Water Use Sector[a]	2005[b]	2010[b]	2015	2020	2025	2030	2035
Metered Single Family Residential	1,508	1,054	1,054	1,054	1,079	1,106	1,133
Commercial/ Institutional	177	157	157	157	160	164	168
Metered Landscape Irrigation	109	31	31	31	32	33	34
Metered Other	66[c]	0	0	0	0	0	0
Non-Revenue Water[d]	312	323	323	323	332	341	351
Total	**2,105**	**1,565**	**1,565**	**1,565**	**1,604**	**1,644**	**1,685**

Data Source: Deliveries are assumed to increase at the same rate as the population rate from 2010-2035, as presented in Table 2-1.

Notes:
(a) LACSD's water demand projections are the same with and without conservation.
(b) Actual data from LACSD records.
(c) From raw Lake Arrowhead Country Club (LACC) wells.
(d) Non-revenue water is unaccounted for water from system losses.

2.4.2 Low Income Projected Water Demands

Senate Bill 1087 requires that water use projections of a UWMP include the projected water use for single-family and multi-family residential housing for lower income households as identified in the housing element of any city, county, or city and county in the service area of the supplier. The County of San Bernardino's (County) 2007 General Plan last updated its housing element in April 12, 2007. Also, the Draft Lake Arrowhead Community Plan updated in February 2007 was reviewed. The County's housing element identifies the number (up to the year 2008) and specifies general locations of low income households in the County/Community of Lake Arrowhead. However, the housing element does not project the number or location of low-income households in the future. For this reason, it is not possible to project water use for lower income households separate from overall residential demand. However, the County will not deny or condition approval of water services, or reduce the amount of services applied for by a proposed development that includes housing units affordable to lower income households unless one of the following occurs:

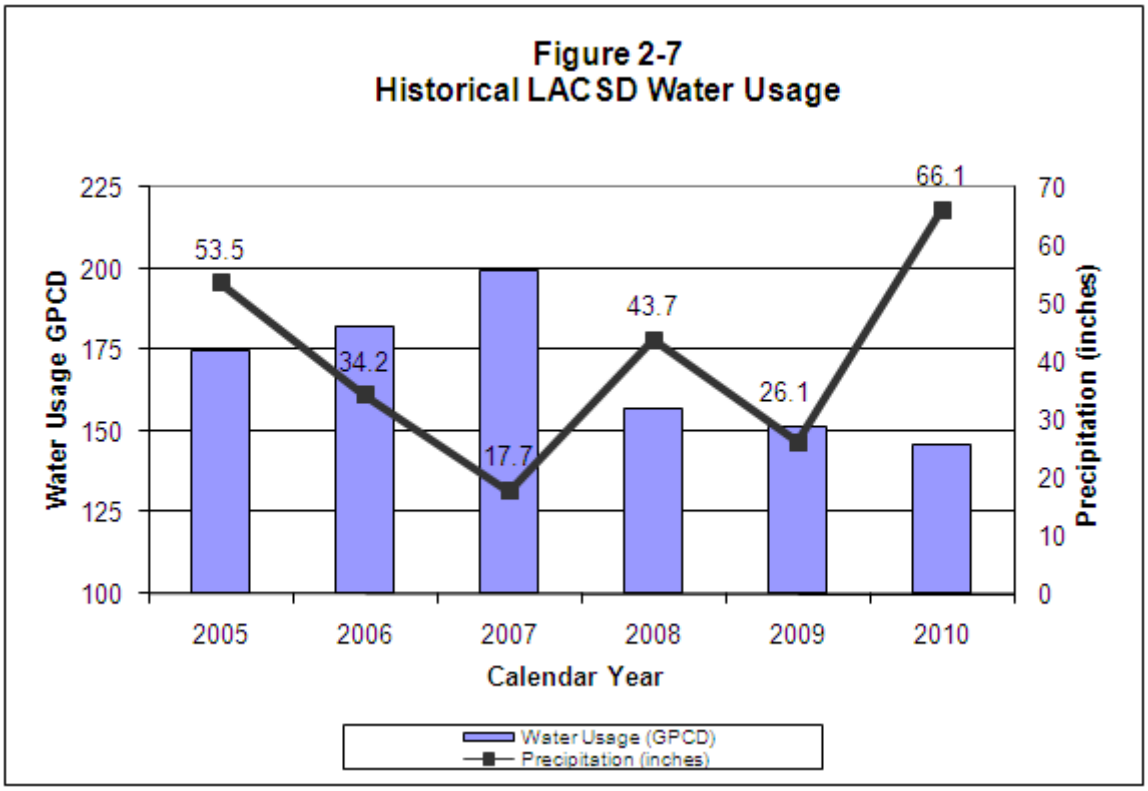
- the County specifically finds that it does not have sufficient water supply,
- the County is subject to a compliance order issued by the State Department of Public Health that prohibits new water connections, or
- the applicant has failed to agree to reasonable terms and conditions relating to the provision of services.

2.5 Weather Effects on Water Usage

California faces the prospect of significant water management challenges due to a variety of issues including population growth, regulatory restrictions and climate change. Climate change has special concern because of the range of possibilities and their potential impacts on essential operations, particularly operations of the State Water Project. The most likely scenarios involve accelerated sea level rise and increased temperatures, which will reduce the Sierra Nevada snowpack and shift more runoff to winter months. These changes could create challenges for the maintenance of the present water export system through the fragile levee system of the Sacramento-San Joaquin Delta.

The other much-discussed climate scenario or impact is an increase in precipitation variability, with more extreme drought and flood events posing additional challenges to water managers.[2] These precipitation pattern alterations would impact LACSD's water supply by changing how much and when water is available, how it is stored and changes in use priorities. Expected impacts to the imported SWP water supply include reduce availability of surface to regions south of the Delta and greater stress on local groundwater to augment reductions.

Since 2005, LACSD's water usage has fluctuated from 146 to 200 gallons per capita per day (gpcd), as shown on Figure 2-7. The non-relation between water usage and total precipitation can be attributed to many factors such as the unusual economic events of recent years, the effects of conservation and the effects of the 2006 SWRCB Order WR 2006-0001.



[2] Final California Water Plan Update 2009 Integrate Water Management: Bulletin 160.

2.6 Conservation Effects on Water Usage

Since the 2005 UWMP there have been a number of regulatory changes related to conservation including new standards for plumbing fixtures, a new state model landscape ordinance, a state retrofit on resale ordinance, new Green Building standards, and target demand reduction goals.

Prior to 2003, LACSD relied on Lake Arrowhead as the sole source of water supply for the Arrowhead Woods community. Since then, the LACSD service area utilizes groundwater and imported water purchased from the Crestline-Lake Arrowhead Water Agency (CLAWA). In response to multi-year drought conditions and declining lake levels, LACSD initiated water management activities in 2002 to reduce water demands and explore alternative water supplies. Although these initiatives resulted in significant water demand reductions, LACSD entered into an agreement regarding protection of the beneficial uses of Lake Arrowhead with the Arrowhead Lake Association (ALA) in 2007 with the goal to maintain lake level above 5,100 feet (ALA Datum). In early 2006, the SWRCB issued Order WR 2006-0001, which limited lake withdrawals to 1,566 AFY beginning in 2008.

Because of the Order WR 2006-0001, LACSD issued the following two Ordinances to regulate water policy and usage. Ordinance 65 explains the water connection policy required to accommodate the SWRCB's Order and Ordinance 69 explains the required conservation policies imposed on LACSD users. See Appendix D for copies of both Ordinances.

2.6.1 Ordinance No. 65

On May 9, 2006, the District determined and declared a water shortage emergency and adopted Ordinance No. 65 establishing a Water Connection Policy of the District. Ordinance No. 65 established a yearly maximum limit of sixty (60) new permits for service within the Arrowhead Woods Certified Water Service Area.

2.6.2 Ordinance No. 69

Because of the SWRCB Order, until the District secures a predictable and reliable source or sources of water, there is an immediate water shortage, necessitating conservation efforts and restrictions on unnecessary or non-essential uses of water to ensure that the District has sufficient water supplies for human consumption, sanitation and fire protection.

Ordinance No. 69 states a "Permanent Water Use Efficiency Policy" for the LACSD that requires the following restrictions on District water use based on the declaration that water use in contravention of these practices constitutes a waste of District water and use of District water that is unnecessary and/or nonessential.

- **Outdoor Cleaning Practices:**
    1. There shall be no hose washing of any hard or paved surfaces including, but not limited to sidewalks, walkways, driveways, parking areas, patios, porches, decks, and verandas, except that, flammable or other dangerous substances may be, if otherwise permitted by law, disposed of by direct hose flushing for the benefit of public health and safety. Sweeping is encouraged for routine maintenance. Washing patios, porches, decks and verandas shall be by bucket and mop or high-pressure washer only.

2. No water shall be used to clean, fill or maintain levels in decorative fountains, ponds, lakes or similar structures used for aesthetic purposes unless such water is part of a recirculation system.
3. Vehicles may be hand washed using a bucket while parked on residential properties. Rinsing may be done by using a leak free hose equipped with a positive shut off nozzle, but not in a manner that causes or allows excess water to flow or runoff onto an adjoining sidewalk, street, gutter or ditch.

- **Hospitality Industry Standards:** No restaurant, hotel, cafe, cafeteria or other public place where food is sold, served or offered for sale, shall serve drinking water to any person unless expressly requested.

- **Leak-Free Maintenance Standards:** No Customer of the District shall permit water to leak from any facility on the Customer's premises. A person may not:
  1. Fail to repair a controllable leak, including a broken sprinkler head, a leaking valve, leaking or broken pipes, or a leaking faucet;
  2. Operate a permanently installed irrigation system with
     a. A broken head resulting in any leakage;
     b. A head that is out of adjustment and the arc of water from the spray head is over a street or parking lot; or
     c. A head that is misting because of high water pressure when the system is not in operation.

Chapter 7 of this 2010 UWMP provides further discussion of both Ordinances.

Section 3: Water Resources

3.1 Overview

This section describes the water resources available to the Lake Arrowhead Community Services District (LACSD, District) and the purveyors for the 25-year period covered by the Plan. These are summarized in Table 3-1 and discussed in more detail below. Both currently available and planned supplies are discussed.

TABLE 3-1
SUMMARY OF CURRENT AND PLANNED WATER SUPPLIES (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies						
Wholesale (Imported)						
CLAWA Overlap[(a)]	62	62	62	62	62	62
CLAWA II[(b)]	150	150	150	0	0	0
Local Supplies						
Lake Arrowhead Surface Water[(c)]	1,566	1,566	1,566	1,566	1,566	1,566
Groundwater Basin[(d)]	192	225	225	225	225	225
Recycled Water Supply[(e)]	127[(e)]	200[(e)]	200[(e)]	200[(e)]	200[(e)]	200[(e)]
Total Existing Supplies	**1,970**	**2,003**	**2,003**	**1,853**	**1,853**	**1,853**
Planned Supplies						
New Projects[(f)]						

Notes:
(a) Crestline Lake Arrowhead Water Agency (CLAWA) Overlap agreement – See Section 3.2 for details.
(b) See Section 3.2 for details. Assumes CLAWA II agreement is NOT extended to 2035. The 150 AFY is only an estimate; agreement is NOT limited to 150 AFY.
(c) See Section 3.3. Per SWRCB Order WR 2006-0001.
(d) See Section 3.4. Provided per LACSD Engineering Staff.
(e) Recycled Water Phase I delivery to Lake Arrowhead Country Club (LACC) came on-line in the summer 2010. This supply is already accounted for by LACC in agreement dated November 27, 2007; therefore, this number is NOT included in the Total Supply. See Chapter 4 Recycled Water, Table 4-8 of this Plan for details.
(f) To be determined.

The term "dry" is used throughout this chapter and in subsequent chapters concerning water resources and reliability as a measure of supply availability. As used in this Plan, dry years are those years when supplies are the lowest, which occurs primarily when precipitation is lower than the long-term average precipitation. The impact of low precipitation in a given year on a particular supply may differ based on how low the precipitation is, or whether the year follows a high-precipitation year or another low-precipitation year. For the State Water Project (SWP), a low-precipitation year may or may not affect supplies, depending on how much water is in SWP storage at the beginning of the year. Also, dry conditions can differ geographically. For example, a dry year can be local to the LACSD service area (thereby affecting local groundwater replenishment and production), local to northern California (thereby affecting SWP water deliveries), or statewide (thereby affecting both local groundwater and the SWP). When the term "dry" is used in this Plan, statewide drought conditions are assumed, affecting both local groundwater and SWP supplies at the same time.

The LACSD has three sources of water for potable use; (1) SWP water purchased from Crestline Lake Arrowhead Water Agency (CLAWA) and San Bernardino Valley Municipal Water District (VALLEY DISTRICT) and delivered ("wheeled") by CLAWA through its system, (2) surface water from Lake Arrowhead, and (3) groundwater from five wells in the Grass Valley groundwater basin.

3.2 Wholesale (Imported) Water Supplies

3.2.1 Imported Water Supplies

VALLEY DISTRICT and CLAWA are State Water Project contractors. VALLEY DISTRICT's contractual "Table A amount" is up to 102,600 acre-feet per year (AFY) and CLAWA's is up to 5,800 AFY of water from the SWP. VALLEY DISTRICT's and CLAWA's local source of supply is surface water from Silverwood Lake, which is part of the East Branch of the SWP. CLAWA's pipelines, as originally sized and constructed, can deliver the ultimate design capacity of 5,800 AFY across CLAWA's service area. However, CLAWA's treatment plant, pump stations and storage tanks will need modifications.

SWP water is currently being supplied to small portions of the Arrowhead Woods community through the CLAWA Overlap Agreement, also known as CLAWA I, which was brought on-line in 2003. A second source of SWP water, known as CLAWA II, is the CLAWA and VALLEY DISTRICT agreement, which was approved by the three agencies (LACSD, CLAWA and VALLEY DISTRICT), and came on-line in 2007.

The CLAWA I turnout connection is located in the northwestern portion of the LACSD near the intersection of Brentwood Drive and Oakmont Drive. This connection currently provides approximately 62 AFY of imported water (based on historic metered sales), and serves the small portion of the service area known as the Overlap Area. The second intertie, which provides imported water under CLAWA II, is located on Rim of the World Drive near Burnt Mill Road. The LACSD has an agreement with CLAWA to take 7,600 acre-feet (AF) of water over a 10 to 15 year period. There is an additional CLAWA connection that serves exclusively the Deer Lodge Park (DLP) water system, which is not part of the LACSD's certificated water service area.

These agreements are included in Appendix E.

The source, location, and capacity of LACSD's imported water connections are summarized in Table 3-2 taken from LACSD's "Water Facilities Master Plan", completed March 2008 (2008 WMP).

TABLE 3-2
ACTIVE IMPORTED WATER CONNECTIONS

Connection	Source	Location	Available Capacity at Connection[(a)] (gpm)	Entitled Capacity at Connection
CLAWA I Turnout	CLAWA	Brentwood Drive and Oakmont	100 - 500	100 AFY
CLAWA II Turnout	CLAWA	Rim of the World Drive	1,500	7,600 AF over 10-15 years

Source: LACSD 2008 WMP
Note:
(a) Available capacity is the amount of flow the connection can physically provide with the existing pipe/valve sizing.

3.2.2 CLAWA I Agreement

In 2003 the LACSD and CLAWA identified 436 parcels that include 298 residences which are located within the boundaries of the Arrowhead Woods certificated water service area and the CLAWA water service area commonly referred to as the Overlap Area. Based upon historical consumption records, these residences historically consumed 62 AFY of potable water.

In July 2003, the LACSD and CLAWA entered into an agreement regarding a SWP water supply for the Overlap Area. Under this agreement, the LACSD pays regular rates and charges to CLAWA for delivery of overlap water, an amount equal to the average annual use of the homes in the Overlap Area. The agreement also addresses delivery of water to satisfy previous use within the Overlap Area as well as advance deliveries for future use in the Overlap Area. The agreement states:

> "Nothing herein shall prevent the Agency (CLAWA) from delivering such water to the LACSD to satisfy previous use within the Overlap Area, or from providing advance deliveries to the LACSD for future use within the Overlap Area, if approved by the Agency."

CLAWA at its sole discretion shall determine if, when and under what circumstances that the LACSD may take delivery of such water to satisfy previous use within the Overlap Area, or from providing advance deliveries to the LACSD for future use within the Overlap Area. The LACSD estimates that there is approximately 1,800 AF to satisfy previous historical use in the Overlap Area, which is above and beyond the 62 AFY.

3.2.3 CLAWA II Agreement (as amended)

In 2005, the LACSD, CLAWA and the VALLEY DISTRICT entered into Agreements to deliver SWP water to the LACSD. The project encompasses a one-time purchase of 8,000 AF of SWP water by CLAWA (on behalf of the LACSD) from VALLEY DISTRICT, and a 10-15 year agreement between the LACSD and CLAWA to take delivery of 7,600 AF of SWP water, in annual increments. The purchased water will be extracted from Lake Silverwood, treated, and wheeled by CLAWA through its conveyance system to the LACSD. In turn, the LACSD delivers the purchased SWP water to its Arrowhead Woods customers. The Agreement also includes certain capital improvements to deliver and manage the delivery of the water. The Agreement was amended in 2009 to reflect the lower annual demand being experienced by the LACSD.

The Agreement (Amended CLAWA II) includes the following:

1) After the initial three years of fixed minimum purchase amounts, the LACSD will pay CLAWA back, with interest and a defined rate per year, for the water advanced purchased for the LACSD by CLAWA.

2) After year three, the LACSD will compensate CLAWA for treatment and transportation costs only on water actually delivered to the LACSD.

3) CLAWA has first call in any year to use the SWP water to satisfy consumptive needs within its own service area.

The agreement provides for the LACSD to receive all the water it purchases. The LACSD does not anticipate it will utilize 100% of the purchased water during the 10-15 year term of the agreement. If water is not delivered during the 10-15 year term the agreement may be extended subject to requirements of California Environmental Quality Act (CEQA).

The CLAWA II turnout and the Burnt Mill pipeline were completed in 2006, and LACSD began taking deliveries in May 2007. LACSD also completed construction of a one (1) million gallon (mg) storage reservoir in October 2007 located between Burnt Mill Road and Cottage Grove Road to facilitate the management of water delivered from the CLAWA II turnout and to enhance operational storage in the LACSD's Zone 1.

Table 3-3 lists the amounts of imported water from 2005-2010 purchased by LACSD. CLAWA I averaged 94 AFY between the years of 2005 through 2010. Total deliveries through the CLAWA II agreement are 1,299 AFY through December 31, 2010, leaving a total of 6,301 AF that the LACSD can purchase over the next five years or more if the agreement is extended.

TABLE 3-3
HISTORICAL IMPORTED WATER SUPPLY DELIVERIES (AFY)

	2005	2006	2007	2008	2009	2010
CLAWA I	71.8	67.1	257.0	94.1	54.7	21.0
CLAWA II	N/A	N/A	715.0	409.5	148.3	26.0
Total	**71.8**	**67.1**	**971.0**	**503.6**	**203.0**	**47.0**

Source: LACSD Water Operations Monthly Reports.

3.2.4 Imported Water Supply Reliability

As stated previously, VALLEY DISTRICT and CLAWA can import up to their contractual amounts of water from the SWP "Table A" water. SWP water is subject to various reliability constraints In an effort to assess the impacts of these varying conditions on SWP supply reliability, the California Department of Water Resources (DWR) issues a biannual "State Water Project Delivery Reliability Report;" the most recent update (2009 SWP Report) was released in August 2010. The Report assists SWP contractors in assessing the reliability of the SWP component of their overall supplies.

The updated analyses in the 2009 SWP Report indicate that the SWP, using existing facilities operated under current regulatory and operational constraints and future anticipated conditions, and with all contractors requesting delivery of their full Table A amounts in most years, could deliver 60 percent of Table A amounts on a long-term average basis.

The DWR analyses also project that SWP deliveries during multiple-dry year periods could average about 34 to 35 percent of Table A amounts and could drop as low as 7 to 11 percent during a critically dry single year.

Through the CLAWA I and II agreements, LACSD is able to request specified amounts of SWP water on an annual basis; however, the availability and total amount of water may be subject to the annual SWP allocation available to VALLEY DISTRICT and CLAWA in any given year type. As VALLEY DISTRICT serves as the source of the SWP supply for the CLAWA agreements, and is able to regulate its annual Table A amount allocations through its local groundwater basins, these reliability concerns are ameliorated.

3.3 Lake Arrowhead Surface Water

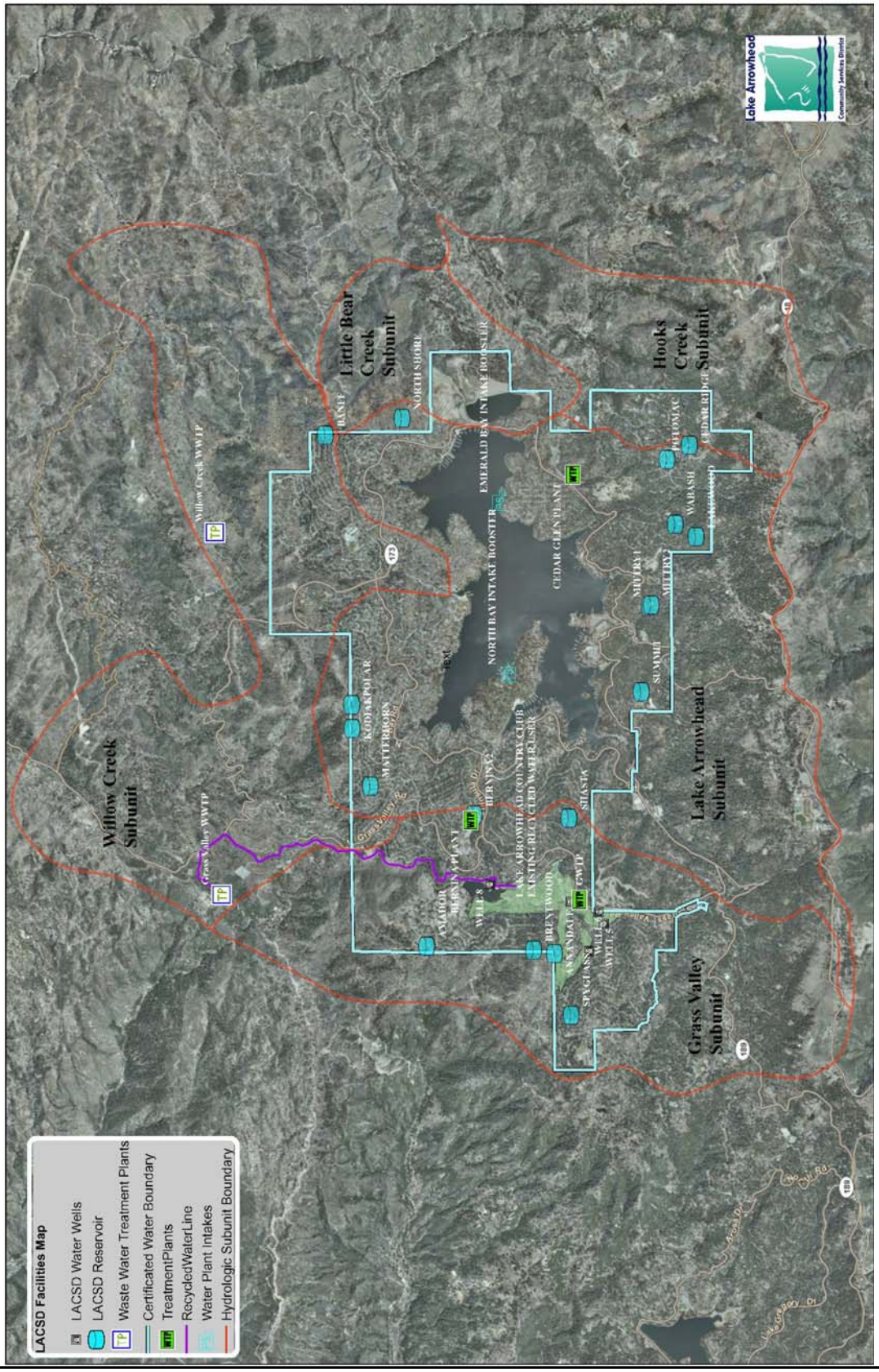
From its inception, the area commonly known as the Arrowhead Woods has relied entirely on withdrawals from Lake Arrowhead to meet demands for water supply. Lake Arrowhead was created by the construction of an earth fill dam on the Little Bear drainage completed in 1915. When full, the reservoir has a capacity of approximately 47,000 AF. Lake Arrowhead is filled from precipitation and surface runoff via Orchard Creek, Cumberland Creek, Fleming Creek, Burnt Mill Creek and Little Bear Creek as well as subsurface springs. The LACSD has two raw water intakes that convey water to the LACSD's water treatment plants (WTPs). These raw water intakes are the Emerald Bay intake, which is located at Palisades Drive and feeds the Cedar Glen WTP, and the North Bay intake, which is located at Hamiltair Drive and feeds the Bernina Water Treatment Plant.

Since the 2008 SWRCB Order WR 2006-0001 limiting the LACSD's withdrawal to 1,566 AFY, the LACSD has been forced to evaluate alternative sources of water supply. The water supplied from Lake Arrowhead has always been the community's least cost, best quality and most reliable source of water supply.

3.3.1 Water Treatment Plants

The LACSD operates two WTPs: Bernina and Cedar Glen. The Bernina WTP, located at Bernina Drive and Rhine Road, has a permitted capacity of 5.0 mgd. The Cedar Glen WTP, located on Cumberland Drive, has a permitted capacity of 2.0 mgd. The locations of these WTPs are shown on Figure 3-1.

FIGURE 3-1
LASCD FACILITIES MAP



3.3.2 Lake Arrowhead Surface Water Supply Reliability

Historically, surface water from Lake Arrowhead has been a reliable source of water for the LACSD. The level of Lake Arrowhead varies depending on rainfall amounts that are extremely variable and tend to be cyclic, with wet and dry periods about every five to eight years. The climate supports abundant forest and ground cover vegetation. However, because of SWRCB Order WR 2006-0001, the annual quantity of surface water from Lake Arrowhead available to the LACSD has been reduced to a maximum of 1,566 AFY. In most year types, lake water is available to the LACSD. The LACSD is currently evaluating alternatives regarding a permanent additional supplemental water supply.

3.4 Groundwater

DWR has not identified the Lake Arrowhead or Grass Valley groundwater basins in its Bulletin No. 118. These groundwater basins are not adjudicated and the basins currently do not have a groundwater management plan associated with them. As part of the package of water-related legislation adopted in late 2009, a groundwater bill, SBX7-6, was enacted. This bill requires monitoring of groundwater levels by local entities and reporting of levels to DWR on an annual basis. Because the two local groundwater areas are not identified in Bulletin No. 118, the LACSD will not be obligated to the provisions of SBX7-6.

The Lake Arrowhead area is located in the San Bernardino Mountains. The Lake Arrowhead area has been subdivided into multiple hydrologic subunits (Refer to Figure 3-1). The subunits are named according to the major surface water drainage feature in the subunit. The boundaries of the subunits represent surface water drainage areas.

The Lake Arrowhead basin is generally defined as the watershed around Lake Arrowhead. The Grass Valley Basin is located to the West of Lake Arrowhead. The Grass Valley Basin is a hydrologic subunit of the Lake Arrowhead watershed separated from the other subunits by surface water drainage divides (GeoScience 2005). The drainage area for the Grass Valley Basin is approximately 2.6 square miles (Tetra Tech 2003).

Groundwater resources are limited in the Lake Arrowhead area. The geology in the Lake Arrowhead area is primarily made up of fractured granite. Groundwater in granitic mountain areas occurs where there are open fractures in the rock and it is difficult to estimate the true production of water from this type of geology.

Groundwater recharge into the fractured granitic rock and alluvium in the Lake Arrowhead area occurs through infiltration and percolation of precipitation and surface runoff in stream channels that flow from local mountains and hills. A minor amount of recharge could occur through underflow from adjacent groundwater basins and bedrock, but this has not been verified with ground water level data from wells. Groundwater recharge rates are generally highest during spring runoff when soils are saturated, temperatures are low, and evapotranspiration is low.

The primary sources of groundwater discharge out of the Lake Arrowhead area are groundwater production from wells and underflow outflow. Other sources of discharge include evapotranspiration and surface water discharge out of the area. (IWRP, 2007)

The LACSD currently owns and operates five active groundwater wells. The wells pump groundwater from the Grass Valley Basin into the distribution system after being treated. The location of each well is shown on Figure 3-1. Relevant hydraulic data for these wells are shown in Table 3-4. Combined production from the District's wells is approximately 225 AFY.

TABLE 3-4
LACSD WELL CAPACITY SUMMARY

Well Number	Location	Nominal Capacity (gpm)
1	Grass Valley Basin	60
2	Grass Valley Basin	60
5	Grass Valley Basin	120
6	Grass Valley Basin	70
8	Grass Valley Basin	60
Maximum Instantaneous Capacity		**370**

Source is Water Operations Staff.

3.4.1 Available Groundwater Supplies

Recent historical and projected groundwater pumping for the LACSD area is summarized in Tables 3-5 and 3-6.

TABLE 3-5
HISTORICAL GROUNDWATER PRODUCTION FOR POTABLE USE (AFY)

	2005	2006	2007	2008	2009	2010
Grass Valley Basin	39.77	109.52	61.52	100.24	144.62	191.54

Source: LACSD Water Operations Monthly Reports.

TABLE 3-6
PROJECTED GROUNDWATER PRODUCTION (AFY)

	2010	2015	2020	2025	2030	2035
Grass Valley Basin	191.54	225	225	225	225	225

Note:
Projections based on hydraulic improvements to be completed in 2011 per LACSD staff. Please note that 2010 is actual and not projected.

Table 3-7 summarizes the net average annual groundwater supply estimate for the Grass Valley groundwater basin within the LACSD service area. The net average groundwater yield of the entire LACSD service area is estimated to be 225 AFY.

Based on the fractured bedrock geology of the area, it is difficult to site and predict the yield of groundwater wells especially in dry years. The District staff is assuming that the groundwater supply in a single-dry water year will be 100 percent of the average year supply and the available supply will be 80 percent for multiple-dry water years. The multiple-dry year percentage was derived assuming 100% supply until the third year, when approximately 90% of the average supply is assumed available and finally by the fourth year, only 80% availability is achieved. The reliability of dry water year production capacity will be refined as the District groundwater monitoring program is implemented and additional data is collected.

The Average Year, Single-Dry Water Year and Multiple-Dry Water Year Supply Reliability in the LACSD groundwater basin is shown in Table 3-7. For a single-dry water year, the supply is estimated at 225 AFY and for a multiple-dry water year, the supply is estimated at 180 AFY.

TABLE 3-7
LACSD GROUNDWATER BASIN
SUPPLY RELIABILITY

Anticipated Supply	Average Year (AFY)	Single-Dry Water Year (AFY)	Multiple-Dry Water Year (AFY)
Grass Valley Basin[a]	225	225	180

Note:
(a) Assume a single-dry water year is 100% of average year supply and multiple-dry water year is 80% of average supply.

3.4.1.1 Adequacy of Supply

At this time, the long term reliability of the groundwater wells is not known. Based on other wells in the region, the production may vary depending on the long-term weather patterns. If a sustained drought is experienced, well production may decline or be stopped. To a lesser extent, it is possible that the water production may be impacted by seasonal weather patterns.

3.4.1.2 Sustainability

The California DWR has not identified the Lake Arrowhead or Grass Valley groundwater basins in its Bulletin No. 118. These groundwater basins are not adjudicated.

3.4.2 Potential Supply Inconsistency

Because the District's historically reliable source of supply, surface water from Lake Arrowhead, has been limited by the SWRCB Order WR 2006-0001, additional supplemental sources of water are needed. In addition, the District's groundwater supply reliability is unknown at this time, further increasing the importance of additional supplemental water supplies. While the District currently has sources such as imported water supplies from the SWP through the CLAWA Agreements, these too could have annual variability. LACSD is assessing the need for a sufficiently large additional imported water supply to meet local water demands during dry periods.

3.5 Transfers, Exchanges, and Groundwater Banking Programs

In addition to SWP water supplies and groundwater, LACSD is currently exploring opportunities to purchase water supplies from other water agencies and sources. Transfers, exchanges, and groundwater banking programs, such as those described below, are important elements to enhancing the long-term reliability of the total mix of supplies currently available to meet the needs of the District.

3.5.1 Transfers and Exchanges

An opportunity available to LACSD to increase water supplies is to participate in voluntary water transfer programs. Since the drought of 1987-1992, the concept of water transfer has evolved into a viable supplemental source to improve supply reliability. The initial concept for water transfers was codified into law in 1986 when the California Legislature adopted the "Katz" Law (California Water Code, Sections 1810-1814) and the Costa-Isenberg Water Transfer Law of 1986 (California Water Code, Sections 470, 475, 480-483). These laws help define parameters for water transfers and set up a variety of approaches through which water or water rights can be transferred among individuals or agencies.

According to the California Water Plan Update 2009, up to 27 million AFY of water are delivered for agricultural use every year. Over half of this water use is in the Central Valley, and much of it is delivered by, or adjacent to, SWP and Central Valley Project (CVP) conveyance facilities. This proximity to existing water conveyance facilities could allow for the voluntary transfer of water to areas such as LACSD, via VALLEY DISTRICT and/or CLAWA. Such water transfers can involve water sales, conjunctive use groundwater substitution and water sharing and usually occur as a form of spot, option, or core transfers agreements. The costs of a water transfer would vary depending on the type, term, and location of the transfer. The most likely voluntary water transfer programs would probably involve the Sacramento or southern San Joaquin Valley areas, although other sources may become available through time.

3.5.2 Opportunities for Short and Long-Term Transfers and Exchanges

To meet its approximate current water demand of 1,600 AFY, as well as its projected future demand, LACSD is evaluating additional demand management measures, development of additional local water supplies, and transfers of imported water supplies. LACSD is working to identify potential water transfer opportunities and a viable delivery option. Because it is likely that potential water transfers will originate distant from LACSD, existing facilities owned and operated by other water agencies, as well as the construction of new delivery facilities, may be necessary to deliver the transferred water to LACSD's service area. Furthermore, because LACSD currently receives SWP supplies purchased from VALLEY DISTRICT through CLAWA II, it is likely that the SWP California Aqueduct will be utilized to convey transferred water to adjacent SWP contractors. Potential SWP contractors from which LACSD could receive transferred water include CLAWA (LACSD's current SWP delivery mechanism), Mojave Water Agency (MWA), and VALLEY DISTRICT. LACSD is preparing a comprehensive evaluation of its water supply delivery options. The resultant report will specifically address the physical and institutional means by which additional water supplies could be delivered to the LACSD service area and is anticipated to be finalized in 2011. The LACSD Board of Directors will decide whether to follow any of the recommendations presented in the report.

3.5.3 Groundwater Banking Programs

With recent developments in conjunctive use and groundwater banking, significant opportunities exist to improve water supply reliability for LACSD. Conjunctive use is the coordinated operation of multiple water supplies to achieve improved supply reliability. Most conjunctive use concepts are based on storing groundwater supplies in times of surplus for use during dry periods and drought when surface water supplies would likely be reduced.

Groundwater banking programs involve storing available SWP or other surface water supplies during wet years in groundwater basins in, for example, the San Joaquin Valley. Water would be stored either directly by surface spreading or injection, or indirectly by supplying surface water to farmers for their use in lieu of their intended groundwater pumping. During water shortages, the stored water could be pumped out and conveyed through the California Aqueduct to CLAWA on behalf of LACSD as the banking partner, or used by the farmers in exchange for their surface water allocations, which would be delivered to CLAWA on behalf of LACSD through the California Aqueduct. Several conjunctive use and groundwater banking opportunities are available to LACSD.

3.6 Planned Water Supply Projects and Programs

The District is currently evaluating potential supplemental water supply options. This section identifies the potential alternatives for additional water supplies. As discussed in Section 3.5.2, agencies that could deliver water to LACSD are CLAWA, MWA or VALLEY DISTRICT. All of these agencies are SWP contractors, which potentially may allow LACSD to obtain supplemental water supplies and utilize their access to SWP conveyance capacity. Water would have to be delivered through new piping from MWA or VALLEY DISTRICT. Delivery from CLAWA also requires new infrastructure upgrades. For LACSD and these agencies to be able to evaluate the benefits and limitations of providing water delivery services, it is necessary to conduct a comprehensive evaluation of the delivery options.

The District has secured $1,000,000 in the Federal Fiscal Year (FFY) 2010 U.S. Department of Interior Bureau of Reclamation (Bureau) portion of the House Energy and Water Appropriations Bill for continued development of the District's Integrated Water Resources Program (IWRP). The District and the Bureau worked together to complete the IWRP Final Report in 2007 under Federal Cooperative Agreement #06-FC-35-0188 and in 2008 and 2009 began development of a hydrodynamic model of Lake Arrowhead and installed stream and precipitation gaging stations under MOA #08-MU-35-0009. The next steps are to continue with the following tasks:

- Appraisal Study of Imported Water Pipeline and Renewable Energy Project
- Continued Operation And Maintenance Of Existing Stream And Precipitation Gages
- Finalize Development Of Hydrodynamic Model Of Lake Arrowhead – Element Necessary for Indirect Potable Reuse (IPR)

This is currently being completed and anticipated to be finalized in 2011. The alternatives will be assessed based on economic factors including capital cost and operation and maintenance cost, non-economic factors such as permitting, physical constraints, and existing facilities, and existing institutional arrangements between the water agencies and districts.

3.7 Development of Desalination

The California UWMP Act requires a discussion of potential opportunities for use of desalinated water (Water Code Section 10631[i]). LACSD has evaluated opportunities for using desalinated water in future supply options. However, at this time, none of the opportunities are practical or economically feasible for LACSD, and LACSD has no current plans to pursue them. Therefore, desalinated supplies are not included in the supply summaries in this Plan. However, should a future opportunity emerge for LACSD to consider development of desalination, these potential

future supply opportunities are described in the following sections, including opportunities for desalination of brackish water, groundwater, recycled, and seawater.

3.7.1 Opportunities for Brackish Water and/or Groundwater Desalination

As discussed in Chapter 5, the groundwater supplies in the LACSD service area are not considered brackish in nature, and desalination is not required. However, LACSD and CLAWA (a SWP contractor) could team with other SWP contractors and provide financial assistance in construction of other regional groundwater desalination facilities in exchange for SWP supplies. The desalinated water would be supplied to users in communities near the desalination plant, and a similar amount of SWP supplies would be exchanged and allocated to LACSD/CLAWA from the SWP contractor. A list summarizing the groundwater desalination plans of other SWP contractors is not available; however, LACSD would begin this planning effort should the need arise.

In addition, should an opportunity emerge with a local agency other than an SWP contractor, an exchange of SWP deliveries would most likely involve a third party, such as CLAWA. Most local groundwater desalination facilities would be projects implemented by other retailers of SWP contractors and, if an exchange program was implemented, would involve coordination and wheeling of water through the CLAWA contractor's facilities to LACSD.

3.7.2 Opportunities for Seawater Desalination

Because the LACSD service area is not in a coastal area, it is neither practical nor economically feasible for LACSD to implement a seawater desalination program. However, similar to the brackish water and groundwater desalination opportunities described above, LACSD could provide financial assistance to other retailers and/or team with a SWP contractor to provide financial assistance in the construction of other purveyor's seawater desalination facilities in exchange for SWP supplies.

3.7.3 Opportunities for Indirect Potable Reuse

As evaluated in LACSD's IWRP, this option uses advanced treatment (beyond tertiary treatment) of recycled water for indirect potable reuse via augmentation of Lake Arrowhead.

The project concept is to provide advanced treatment at the Grass Valley WWTP for up to 1.5 mgd. The process will produce approximately 1.1 mgd (approximately 1,200 AFY) of product water. The advanced treated recycled water will be conveyed to the Grass Valley area for use at LACC and further conveyed to another recycled use site. When Lake Arrowhead is not already full, all remaining recycled water will be conveyed to the Grass Valley Lake tunnel for conveyance to Lake Arrowhead. The product water will enter Lake Arrowhead's western edge for mixing with surface water. The water will remain in the upper half of the lake until lake turnover occurs during the winter and when the entire lake volume mixes. Lake water will eventually be extracted by the District's water intakes for treatment at their water treatment plants.

A caveat for this Project is that approval by the State Health Department to use Lake Arrowhead is still speculative. Also, while this Project is technically viable and has been accepted by regulators in other areas, public (locally and statewide) perception of IPR projects has historically been the major impediment to implementation. Please refer to the LACSD's 2007 IWRP for further details.

Section 4: Recycled Water

4.1 Overview

This section of the Plan describes the existing and future recycled water opportunities available to the Lake Arrowhead Community Services District (LACSD, District) service area. The description includes estimates of potential supply and demand for 2010 to 2035 in five year increments.

4.2 Recycled Water Plan

In the summer of 2010, the Recycled Water Phase I Project to the Lake Arrowhead Country Club (LACC) came on-line and delivered approximately 127 acre-feet (AF) of recycled water to the LACC for use on their golf course (see Figure 3-1). This was the first recycled water use in the District's service area. Between 2005 and 2010, the District treated an average annual wastewater flow of 1.39 million gallons per day (mgd) or 1,553 AFY. The District currently produces between 1,500 and 2,000 AFY of treated wastewater that is conveyed through an outfall pipeline to the District's disposal facility in the City of Hesperia. This disposal site consists of groundwater recharge percolation into the Mojave River Basin.

In the past, Federal and state laws, implemented and administered by the State Water Resources Control Board, Lahontan Region (Regional Board) prohibited the use of recycled water in the District service area because their rules governing the discharge of waters of a waste origin did not permit use in locations above 3,200 feet in elevation.

In January 2003, the District made a request for a Basin Plan amendment that would allow the discharge of waters that are of waste origin above 3,200-foot elevation. In early September 2003, the Regional Board recommended approval of the Basin Plan Amendment. The amendment was reviewed and approved by the State Water Resources Control Board and the US Environmental Protection Agency in 2004. These changes have allowed the District to proceed with the implementation and completion of the Phase I Recycled Water Project. The Project can supply up to one million gallons per day of recycled water for irrigation. Currently the only permitted customer is the Lake Arrowhead Country Club.

The District provides both water and wastewater service to the Lake Arrowhead area. The water service area consists of approximately 4,900 acres (7,800 water meters) which are the same boundaries as those of the Arrowhead Woods community. The District collects, treats and disposes of domestic wastewater generated in the general Lake Arrowhead area, including Rim Forest, Twin Peaks, Blue Jay, Aqua Fria, Cedar Glen, and the Villas, which have a combined estimated 10,700 wastewater connections. These "wastewater only" service areas are supplied by other water providers.

The Lahontan Regional Water Quality Control Board (RWQCB) adopted Order R6V-2007-0022 Master Water Recycling Requirements at its June 13-14, 2007 meeting, allowing the District to supply up to 1.0 mgd of disinfected, tertiary recycled water to the LACC golf course and potentially other unidentified users in the Lake Arrowhead area. The first phase of the Recycled Water Project will deliver approximately 200 AFY for irrigation of the LACC golf course. The

project was completed in mid-2010 and has since delivered 127 AF of recycled water to the LACC golf course during the first summer season. The recycled water agreement between LACSD and LACC is included in Appendix E.

Currently, LACSD has documented their recycled water strategies in the following documents that serve to identify the recycled water plans for its service area that are discussed in the following sections:

- *LACSD Water Demand and Supply Final Report* (2003 Water Supply Report) (Tetra Tech 2003)
- LACSD *Phase 2 Recycled Water System Study of the Expanded Use of Recycled Water for Outdoor Irrigation* (2006 Phase 2 RW Study) (Tetra Tech 2006)
- *LACSD Phase 2 Recycled Water System Feasibility Study Report* (2009 Phase 2 RW Feasibility Study) (IEC 2009)

4.3 Potential Sources of Recycled Wastewater

Order R6V-2007-0022 authorizes the use of recycled water at sites located within the District's sanitation boundary, which coincides with the Lake Arrowhead watershed boundary (Permit Area). The Permit Area includes the communities of Lake Arrowhead, Cedar Glen, Blue Jay, Twin Peaks, Deer Lodge Park, Rim Forest, Crest Park, and Sky Forest. The Order also authorizes recycled water use for construction dust control and soil compaction, and for landscape irrigation at parks, golf courses, schools, cemeteries, and greenbelts.

4.3.1 Existing Wastewater Treatment Facilities

The District operates two wastewater facilities (WWTPs), Grass Valley and Willow Creek that treat sewage generated by the Lake Arrowhead community and immediately surrounding areas. These two WWTPs currently discharge de-nitrified secondary effluent to a pipeline which transports it to a percolation disposal site, adjacent to the Mojave River, located in the City of Hesperia. An annual average of approximately 2 mgd of municipal sewage is treated at the plants. The quantity of effluent percolated to the Mojave Groundwater Basin depends on the amount of effluent that is being recycled for irrigation use but averages just over 1 mgd.

The Grass Valley WWTP serves as the principal wastewater treatment facility for the District. It receives raw wastewater directly from the Grass Valley drainage area and through an inter-tie pipeline that originates at the Willow Creek WWTP receives partially primary treated wastewater and sludge from the Lake Arrowhead drainage area. The Willow Creek WWTP functions as a flow equalization and partial primary treatment facility. Full primary, secondary and nitrogen removal treatment are provided at the Grass Valley WWTP. The Recycled Water Phase I Upgrade project, consisting of a new membrane filtration/ultraviolet (UV) disinfection facility, with a capacity of 1 mgd, has been completed at the Grass Valley WWTP to provide tertiary water suitable for irrigation usage.

The Grass Valley WWTP is currently rated and permitted for 3.75 mgd. The District’s upgrade of the Grass Valley WWTP to produce one (1) mgd peak capacity of tertiary treatment facilities (membrane filtration, ultraviolet light disinfection) was to receive wastewater that has undergone advanced secondary treatment (primary, secondary, and denitrification). The resulting recycled

water is distributed to recycled water users (currently one golf course irrigation user). Advanced secondary treated wastewater flows in excess of recycled water demand are transported via a 9.4-mile outfall pipeline system to the Hesperia Disposal Site where the District is authorized to use effluent for crop irrigation and also to infiltrate effluent through percolation ponds.

Per the District's Ordinance 69, "Permanent Water Use Efficiency Policy", between October 16th and April 30th, no outdoor irrigation is allowed, thus creating an on-season (May-October) and an off-season (October through April) for recycled water use. As stated in the District's 2006 Phase 2 RW Study, the amount of recycled water available for the summer irrigation season was decided by the District to be 1,479 AFY (1.32 mgd), the average on-season (irrigation) flow rate. From Table 4-1, it can be seen that this on-season flow rate is just below the average wastewater flow for the years 2005-2010.

TABLE 4-1
AVERAGE WASTEWATER FLOWS (AFY)

Agency	2005	2006	2007	2008	2009	2010	Average Flow (AFY)
Lake Arrowhead CSD	2,033	1,645	1,159	1,461	1,350	1,669	1,553

Source: LACSD Engineering Staff.

4.3.2 Recycled Water Phase I Facilities

As stated previously, in mid-2010 the District brought on-line the Recycled Water Phase I project which included improvements producing up to 1.0 mgd of effluent meeting Title 22 recycled water standards for outdoor irrigation within the District's service area. Due to the limited outdoor irrigation season in the District, the Recycled Water Phase I will contribute 200 AFY to the water supply annually.

The Recycled Water Phase I project was made up of three distinct capital improvement projects:

1) **Grass Valley WWTP Improvements** - was an upgrade of the plant from advanced secondary treatment to tertiary treatment (approximately 1 mgd) and expansion of capacity to 3.75 mgd (dry weather, maximum average 72- hour flow) for the plant's total wastewater treatment capacity. The upgrade is complete; the expansion is still in construction with an expected completion date of mid-2011.

2) **Recycled Water Storage and Delivery** - consisted of one, one million gallon storage pond, 14,000 lineal feet of 14-inch pipe (to accommodate up to 2,500 gallons per minute (gpm)) and a pump station to convey recycled water from the Grass Valley WWTP to the LACC golf course.

3) **Lake Arrowhead Country Club (LACC) Golf Course On-site Retrofits** - consisted of modifications to the existing, golf course irrigation system which included the backflow protection, separation of potable and recycled water systems, tagging and signage, setbacks and perimeter protection improvements.

These improvements were necessary to comply with regulatory requirements during extreme wet weather events when emergency discharges are made to Grass Valley Creek. In addition to complying with a current cease and desist order, Title 22 recycled water is available for use during the irrigation season within the District's service area.

4.3.3 Planned Improvements and Expansions

The District has evaluated plans for Phase II of its recycled water plan in the future, which could expand the supply of recycled water for the Lake Arrowhead area beyond the Phase I capacity of 1.0 mgd. The Lahontan RWQCB Master Permit is only for Phase I of the LACSD recycled water plan, so the Phase II would require a new permit.

On October 24, 2003 the District Board of Directors accepted as complete the 2003 Water Supply Report. On January 11, 2005, the Board of Directors authorized preparation of an addendum to that report. The addendum evaluated the expanded use of recycled water for outdoor irrigation.

The addendum, the 2006 Phase 2 RW Study, considered the District's potential recycled water availability, an analysis of potential recycled water customers, a preliminary design of the infrastructure needed to serve them and off-season recycled water storage evaluation.

The study of potential recycled water customers was performed and a list of high demand areas identified, which had a high concentration of irrigation demand. A limited geographical service area system to these high demand users was proposed. Also, the storage options for expanded use of recycled water for irrigation were studied. A District-wide system with 100 million gallons of off-season storage was proposed. Five of the tank sites and associated pipelines are located in Federal Forest Service lands.

The District completed the 2009 Phase 2 RW Feasibility Study that evaluated various combinations of pipeline, reservoir, and pump station improvements contemplated for the Phase 2 expansion of the recycled water system. The objective of the Phase 2 improvements was to convey recycled water from the Phase 1 system to the Phase 2 demand areas (see Figure 4-1) currently identified as the University of California, Los Angeles (UCLA) Conference Center and the Shelter Cove Homeowners Association within the North Shore high demand area. Note that the Mary P. Henck (MPH) Middle School high demand area is situated in close proximity to the alignment corridors studied; however, the District is considering the installation of artificial turf at the school in lieu of supplying recycled water for irrigation of the existing grounds. Furthermore, the Phase 2 improvements studied are sized with regard to future transmission capacity requirements for the ultimate system as estimated in the 2006 Tetra Tech Report.

FIGURE 4-1
LASCD PHASE 2 RECYCLED WATER IMPROVEMENTS MAP

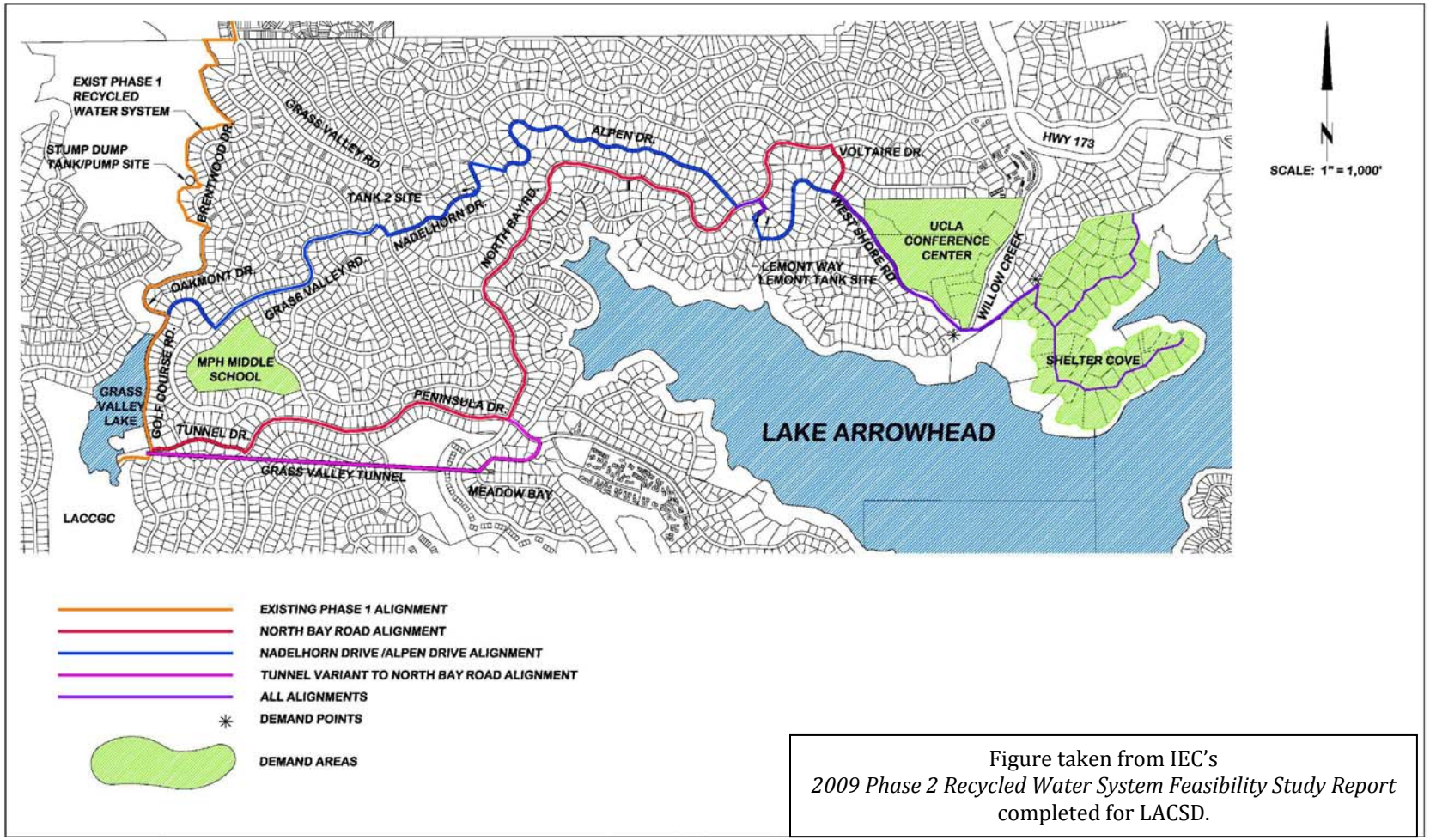


Figure taken from IEC's
2009 Phase 2 Recycled Water System Feasibility Study Report
completed for LACSD.

Capital recovery cost for recycled water production, storage and delivery for the UCLA Conference Center high demand area, for Phase 2 capital expenditures, is estimated at approximately $10,600 per acre-foot (AF).

The wastewater flow projections for 100 percent build-out of the District during the on-season (May through October) and off-season (October through April) irrigation periods are presented in Table 4-2. The projections in the table are for the weekday flows and include 0.20 mgd for the combined backwash water from the Bernina and Cedar Glen Water Treatment Plants. It is anticipated that weekend/holiday rates will continue to be 25% higher than the weekday flows.

TABLE 4-2
PROJECTED LACSD WASTEWATER FLOW RATES

Year	Total Connections	On-Season (Irrigation)	Off-Season (Non-Irrigation)
2010	11,199	1.81	1.56
2011	11,308	1.85	1.60
2012	11,417	1.89	1.64
2013	11,526	1.93	1.68
2014	11,635	1.97	1.72
2015	11,744	2.01	1.76
2016	11,853	2.05	1.81
2017	11,962	2.09	1.85
2018	12,071	2.13	1.89
2019	12,180	2.18	1.94
2020	12,289	2.22	1.98
2021	12,398	2.27	2.03
2022	12,507	2.31	2.08
2023	12,616	2.35	2.12
2024	12,725	2.40	2.17
2025	12,834	2.45	2.22
2026	12,943	2.49	2.27
2027[(a)]	12,983	2.54	2.30
2028	12,983	2.54	2.30
2029	12,983	2.54	2.30
2030	12,983	2.54	2.30
2031	12,983	2.54	2.30
2032	12,983	2.54	2.30
2033	12,983	2.54	2.30
2034	12,983	2.54	2.30
2035	12,983	2.54	2.30

Source: LACSD Phase 2 Recycled Water System Study of the Expanded Use of Recycled Water for Outdoor Irrigation, April 2006.

Note: (a) From 2027-2035, build-out is assumed to have occurred and therefore there is no further increase in wastewater flows.

Table 4-3 presents a summary of the flow rates and related information that is recommended in the 2006 Tetra Tech Report to be used for planning purposes.

TABLE 4-3
LACSD PLANNING RECYCLED FLOW PROJECTIONS

Item	Flow Rate (mgd)
Projected at Build-out	
- On-Season	2.54
- Off-Season	2.30
- Maximum Daily Flow	5.32
Average Available Recycled Water	
- 2004	1.32
Minimum Available Recycled Water	
- 2004	1.21
- At Build-out	1.50

Source: *Phase 2 Recycled Water System Study of the Expanded Use of Recycled Water for Outdoor Irrigation*, April 2006.

Table 4-4 provides the projected wastewater treatment capacity for the LACSD service area.

TABLE 4-4
PROJECTED WASTEWATER COLLECTION AND CAPACITY

	Capacity (mgd)					
Facility	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Grass Valley WWTP[(a)]	2.5	3.75[(c)]	3.75	3.75	3.75	3.75
Willow Creek WWTP[(b)]	1.7	0	0	0	0	0
Total	**4.2**	**3.75**	**3.75**	**3.75**	**3.75**	**3.75**

Source is Lahontan's RWQCB Master Permit for Recycled Water Use.
Notes:
(a) Capacity is dry weather, maximum average 72-hour, with 1 mgd capacity for Title 22-quality, disinfected, tertiary recycled water.
(b) Capacity is dry weather, maximum average 24-hour flow.
(c) Phase I Recycled Water Project Expansion estimated to be completed in mid-2011.

4.3.4 Summary of Available Source Water Flows

As discussed previously, the wastewater flow from the LACSD WWTPs is the only potential source of water for the non-potable water system. The flows projected to be available are shown in Table 4-5.

TABLE 4-5
SUMMARY OF AVAILABLE SOURCE WATER FLOWS

Source	Current Flow[(a)] (mgd)	Projected Flow[(a)] (mgd)	Projected to be Available for Non-Potable Use (AFY)	Date for Flow Projection
LACSD wastewater	1.8	2.5	2,800	2027

Note: (a) Taken from Table 4-2.

4.4 Recycled Water Demand

In this section, current recycled water use is discussed, and potential recycled water users within LACSD's service area are identified. For each potential user, estimates are provided for

annual demand. A plan for encouraging and optimizing the use of recycled water is also discussed.

4.4.1 Current Use

Currently, recycled water is served to landscape irrigation customers, including the LACC Golf Course. Table 4-6 provides a summary of existing recycled water use.

TABLE 4-6
ACTUAL RECYCLED WATER USES

Type of Use	Treatment Level	Actual 2010 Use (AF)
Landscape – Golf course	Disinfected tertiary	127[(a)]

Note: (a) The Recycled Water Phase I project was completed in mid-2010 and has since delivered 127 AF of recycled water to the LACC golf course.

4.4.2 Potential Users

Potential recycled water users were identified through a number of sources including:

- Water consumption records for LACSD
- Land use maps
- Tetra Tech 2006 Report

The District compiled a list of major residential and large individual irrigation users, and layout of a cost effective phased distribution system to serve these potential recycled water customers. A summary of the Phase II Recycled Water System listing the high demand areas, and the estimated costs for a distribution system and cumulative demands for each area is provided in Table 4-7. The assumption for the projected recycled wastewater is all of the additional flows are recycled and that the possible users are identified.

TABLE 4-7
LACSD POTENTIAL RECYCLED WATER USERS

High Demand Areas	Distribution System Construction Costs[(1)]	Storage Construction Costs	Initial Yearly O&M Costs	Cumulative Peak Demand (mgd)	Cumulative Average Demand (mgd)
LACC Golf Course and Grass Valley (GV) Park	N/A	N/A	N/A	1.008	0.403
MPH Middle School & Hamiltair Area	$5,600,000	$42,200,000	$138,000	1.162	0.465
UCLA Conference Center	$1,700,000	$21,200,000	$12,000	1.222	0.489
North Shore	$6,500,000	$24,900,000	$125,000	1.309	0.524
North End Area	$3,700,000	$12,100,000	$65,000	1.350	0.540
Cedar Ridge	$5,600,000	$22,800,000	$119,000	1.386	0.554
Arrowhead Village	$3,800,000	$21,900,000	$53,000	1.408	0.563
Training and Reporting Costs			**$23,000**		
Total	**$26.9M**	**$145.1M**	**$535K**		

Source: Tetra Tech 2006 Report.
Note: (a) Assuming all of the additional flows are recycled and that the possible users are identified. Report recommended limiting geographical service area to certain high demand users that totaled $13.6M of construction costs.

There are additional costs to expand the Grass Valley WWTP tertiary treatment facilities beyond 1.0 mgd. This has not been evaluated and is not included in the opinion of estimated costs. However, this additional cost should be analyzed and considered prior to proceeding with the Phase II Recycled Water System.

4.4.3 Projected Recycled Water Demand

At the April 14, 2009 LACSD Board of Directors meeting, the Board by consensus directed District staff to discontinue the pursuit of additional recycled water for customers until the economics of adding those customers become practical. Board members emphasized that this item be shelved for only a few years due to the probable cost increase of purchasing supplemental water. As described in the 2009 Phase 2 RW Feasibility Study, under the most optimistic pipeline proposal recycled water is simply uneconomical to provide for discretionary uses such as landscape irrigation.

As described in the report, several pipeline routes were evaluated along with various locations for storage and pumping facilities. Under the lowest cost alternative the recycled water would be $10,600/AF. The District's water conservation emphasis is for less landscaping, native low water use landscaping or leaving areas in their natural condition. To facilitate the Phase 2 Project would require the identified users to be very aggressive in their use of recycle water leading to landscaping conditions directly contradicting the message the District is sending to its other customers. The District believes that on top of the stifling economics, there would not be an effective communication strategy to satisfy the concerns of the community about the apparent inequities of the Phase 2 Recycled Water project.

Based on the April 14, 2009 LACSD Board decision on recycled water, the total potential annual recycled water demand that is cost effective to serve is approximately 200 AFY, which is the

capacity of the newly constructed Phase I Recycled Water project. Table 4-8 summarizes the projected future use by user type.

TABLE 4-8
RECYCLED WATER PROJECTIONS

	Flows (AFY)					
	2010	**2015**	**2020**	**2025**	**2030**	**2035**
LACSD[(a)]	200	200	200	200	200	200

Note: (a) Phase I Recycled Water project capacity. Since this supply is already accounted for by LACC in an agreement dated November 27, 2007, this recycled water is not included as part of the "Total Existing Supply" in Table 3-1, discussed previously.

4.4.4 Recycled Water Comparison

As shown in Table 4-9, LACSD's 2005 UWMP projected a total recycled water usage for landscape irrigation of 200 AF by the year 2010. Approximately 127 AF was served in 2010 to the LACC golf course for landscape irrigation. The difference was due to the Recycled Water Phase I starting in mid-2010 instead of at the beginning of 2010 as originally planned. In 2011, it is planned that approximately 200 AF of recycled water will be used for irrigation at the LACC golf course.

TABLE 4-9
RECYCLED WATER USES - 2005 PROJECTION COMPARED WITH 2010 ACTUAL

User Type	2005 Projection for 2010 (AF)	2010 Actual Use (AF)
Landscape	200	127
Groundwater Recharge	0	0
Total	**200**	**127**

4.5 Methods to Encourage Recycled Water Use

If and when the District decides that implementing more recycled water phases is cost effective, then they would consider incentives to encourage recycled water use. The incentives method would be developed as implementation of the District's recycled water program progresses. LACSD may consider providing financial assistance to water users to offset the costs of (1) on-site retrofits for recycled water use, (2) monitoring, enforcement and training for recycled water use, and (3) delivery of recycled water at a reduced rate or a rate less than that of potable water.

Section 5: Water Quality

5.1 Overview

The quality of any natural water is dynamic in nature. This is true for the State Water Project (SWP) water brought into the Lake Arrowhead Community Services District's (LACSD's, District's) service area. During periods of intense rainfall or snowmelt, routes of surface water movement are changed; new constituents are mobilized and enter the water while other constituents are diluted or eliminated. The quality of water changes over the course of a year. These same basic principles apply to groundwater and Lake Arrowhead's surface water. Depending on water depth, groundwater will pass through different layers of rock and sediment and leach different materials from those strata. Water quality is not a static feature of water, and these dynamic variables must be recognized.

Water quality regulations also change. This is the result of the discovery of new contaminants, changing understanding of the health effects of previously known as well as new contaminants, development of new analytical technology, and the introduction of new treatment technology. All water purveyors are subject to drinking water standards set by the Federal Environmental Protection Agency (EPA) and the California Department of Public Health (CDPH). An annual Consumer Confidence Report (CCR) is provided to all residents who receive water from the District. That report includes detailed information about the results of quality testing of the water supplied during the preceding year (CCR, 2009).

Several state, regional and county agencies have jurisdiction and responsibility for monitoring water quality and contaminant sites. Programs administered by these agencies include basin management, waste regulation, contaminant cleanup, public outreach, and emergency spill response.

This section provides a general description of the water quality of imported water, surface water from Lake Arrowhead, and groundwater supplies. A discussion of potential water quality impacts on the reliability of these supplies is also provided.

5.2 Imported Water Quality

The primary source of drinking water supplied to District customers in Arrowhead Woods is from Lake Arrowhead. It is supplemented by water from groundwater wells and purchased water from San Bernardino Valley Municipal Water District (VALLEY DISTRICT) through the Crestline-Lake Arrowhead Water Agency (CLAWA). CLAWA treats the imported SWP water and, except for the four summer months, delivers it into the District's distribution system, where it is blended with water treated by the District.

CLAWA and VALLEY DISTRICT provide imported SWP water to LACSD's service area. The source of SWP water is rain and snow from the Sierra Nevada, Cascade, and Coastal mountain ranges. This water travels to the Delta through a series of rivers and various SWP delivery structures. There it is pumped into a series of canals and reservoirs, which provides water to urban and agricultural users throughout the San Francisco Bay Area and central and southern California. Both CLAWA and VALLEY DISTRICT receive SWP water from Lake Silverwood.

Perhaps the most important difference in quality between surface water and groundwater is the presence of microbes in surface water. Surface water is exposed to a variety of microbial contaminants while groundwater in general is not. As a result, there are considerably more water quality regulations for surface water providers. CLAWA pumps surface water from Silverwood Lake, treats and disinfects the water at a "multi-barrier" treatment plant located near the south shore of the Silverwood Lake, then pumps the treated water uphill to CLAWA's storage and pipeline distribution system which extends from Job's Peak, near Cedarpines Park, eastward to Green Valley Lake.

An important property of SWP water is the chemical make-up caused by its passage through the Delta. The Delta is basically a very large marsh (or estuary) with large masses of plants and peat soils. These contribute organic materials or Total Organic Carbon (TOC) to the water. Salt water can also move into the Delta from San Francisco Bay and the Pacific Ocean. This brings in salts, notably bromide and chloride. None of these chemicals are harmful in and of themselves; however, when bromide and TOC react with disinfectants such as ozone, chlorine, or chloramines, a reaction occurs forming substances known as disinfection by-products (DBPs). A variety of health-based concerns are associated with DBPs (Calfed 2007).

Another important property of SWP water is the mineral content. SWP water is generally low in dissolved minerals, such as calcium, magnesium, sodium, potassium, iron, manganese, nitrate, and sulfate. Most of these minerals do not have health based concerns. Nitrate is the main exception, as it has significant health effects for infants; however, the nitrate content of SWP water is very low. Also of significance is the chloride content. Although not a human health risk, chloride can have a negative impact on agricultural activities and regulatory compliance for local sanitation agencies. The chloride content of SWP water varies widely from well over 100 milligrams per liter (mg/L) to below 40 mg/L, depending on Delta conditions.

All surface waters can have taste and odor problems caused by the growth of algae in reservoirs, such as Silverwood Lake. Under certain conditions, algae can grow in large mats, which then die, releasing foul smelling chemicals. Although harmless, the taste and odor causing chemicals can generally be very unpleasant for consumers.

SWP water meets or exceeds applicable standards. However, there is concern with some constituents that are approaching SWP acceptance criteria, particularly arsenic. As of January 2006, the Federal arsenic MCL was revised to 10 micrograms per liter (µg/L) (down from 50 µg/L), which will have significant impacts on water utilities in California that will need to install or modify treatment to remove arsenic. Additionally, this lowering of the standard likely will affect what the California Department of Water Resources (DWR) will establish as the appropriate criteria for arsenic in water added to the SWP system, which is currently set at 4 µg/L.

5.3 Lake Arrowhead Surface Water Quality

The quality of water from Lake Arrowhead is in compliance with all regulations, and it is anticipated that there will be not be significant changes in quality owing to the water management practices of the District. Influent turbidities rarely exceed 1.0 nephelometric turbidity units (NTU) and final water turbidities normally range from 0.02 to 1.0 NTUs. Except for two constituents, turbidity and bacteria, the untreated lake water meets or exceeds the State's primary and secondary regulations for finished water (LACSD, Watershed Sanitary Survey,

2001).). Due to the nature of the small watershed tributary to Lake Arrowhead, the lake water quality is very good, with total mineral content less than 100 mg/l.

A watershed sanitary survey was originally completed in 1995 to determine the vulnerability of the lake to contaminants. That survey was updated in 2001 and again most recently in 2009; it concluded that the lake is at low risk for contamination, with the greatest potential being the proximity to the lake of the wastewater pump stations and the wastewater collection system. The District filed its Vulnerability Assessment with State and Federal agencies in 2006.

5.4 Groundwater Quality

The District obtains its groundwater from five wells in the Grass Valley groundwater basin, located to the west of Lake Arrowhead. LACSD's treated groundwater currently meets all the regulatory requirements.

During the past years, the District has taken hundreds of water samples in order to determine the presence of any radioactive, biological, inorganic, volatile organic, or synthetic organic contaminants. The state allows the District to monitor for certain substances less than once per year because the concentrations of these substances do not change frequently.

The District's efforts to increase its water supply have meant that customers receive both imported water and groundwater now, instead of water derived only from Lake Arrowhead. The result is that customers have noticed a difference in how this water tastes. LACSD's groundwater has a four times higher calcium carbonate content than water from Lake Arrowhead. Water high in calcium carbonate is often called "hard." The imported water from CLAWA, while not as hard as groundwater, also has higher calcium carbonate content than water from Lake Arrowhead. To improve the taste of hard water, the District has decided to blend groundwater and overlap water with lake water at the Bernina water treatment plant (WTP).

5.5 Groundwater Protection

The general goal of groundwater protection activities is to maintain the groundwater and the aquifer to ensure a reliable high quality supply. Activities to meet this goal include continued and increased monitoring, data sharing, education and coordination with other agencies that have local or regional authority or programs. LACSD currently has five (5) groundwater production wells that it operates. To increase its groundwater protection activities, LACSD has been taking the following actions as presented below.

5.5.1 Water Quality Monitoring

Since 1990, community water systems in California have been providing an Annual Water Quality Report to customers under regulations adopted in 1989 by the CDPH. However, the 1996 amendments to the Federal Safe Drinking Water Act and recently adopted federal regulations now require a "Consumer Confidence Report". In addition, California law now requires a similar report to consumers.

This report must contain information on the quality of water delivered by the system and characterize any risks from exposure to contaminants detected in the drinking water.

Contaminant levels have previously had a Maximum Contaminant Level (MCL). The Federal Government has now established a Maximum Contaminant Level Goal (MCLG) for each constituent that has an MCL. The State of California is currently establishing their own Public Health Goal (PHG) for each of the same contaminants. Where the State has not yet set a PHG, the requirement levels noted in the tables on the following pages refer to the federal MCLG.

5.5.2 Wellhead Protection

Since California has not developed a wellhead protection program, the groundwater portion of the Drinking Water Source Assessment and Protection (DWSAP) Program serves as the wellhead protection program for the State since 1999. The Program consists of drinking water source assessment and source water protection elements. For example, activities such as inventory of possible contaminating activities (PCAs) and vulnerability analysis are part of a complete DWSAP that target protecting the water resources.

5.5.3 Identification and Destruction of Abandoned Wells

The presence of abandoned groundwater wells represents a potential hazard to the quality of the groundwater basin. Abandoned and improperly destroyed wells can act as conduits for contaminants to reach drinking water supplies. It is vital for the long-term protection of the basin that abandoned wells be located and destroyed.

While it is the landowner's responsibility to destroy an abandoned well, local water agencies should be proactive about making sure that abandoned wells are in fact destroyed. The destruction of abandoned groundwater wells should be performed in accordance with state standards. California Water Code Section 13750.5 requires that those responsible for the destruction of water wells possess a C-57 Water Well Contractor's License. Whenever a water well is destroyed, a report of completion must be filed with the California DWR within 60 days of the completion of the work. The San Bernardino County (County) Department of Public Health, Division of Environmental Health Services is responsible for permitting and inspecting construction and destruction of wells.

LACSD policy is for all functional and abandoned wells, a "well site control zone," the area immediately surrounding the well alternatively referred to as the "wellhead," needs to be established. The purpose of this zone is to provide protection from vandalism, tampering, or other threats at the well site. The size of this zone can be determined by using a simple radius, or an equivalent area. The well site control zone should be managed to reduce the possibility of surface flows reaching the wellhead and traveling down the unprotected casing. CDPH recommends a minimum radius of 50 feet for well site control zones for all public water systems in the state. The Program applies to the abandoned wells as well as functional activities that could potentially lead to "source water contamination" according to EPA regulations. (IWRP, 2007).

5.5.4 Hazardous Materials Response

Currently, local and county hazardous materials teams handle responses to hazardous materials incidents. Increased coordination between LACSD and hazardous materials teams will allow for assessment of the potential for chemical spills to impact groundwater sites. LACSD has established protocols for staff in their "District Disaster Preparedness Plan."

5.6 Water Quality Impacts on Reliability

5.6.1 Groundwater

The quality of water dictates numerous management strategies a water purveyor will implement, including, but not limited to, the selection of raw water sources, treatment alternatives, blending options, and modifications to existing treatment facilities. Maintaining and utilizing high quality sources of water simplifies management strategies by increasing water supply alternatives, water supply reliability, and decreasing the cost of treatment. The source water supplies are of good quality for LACSD. Maintaining high quality source water allows for efficient management of water resources by minimizing costs.

Maintaining the quality of water supplies increases the reliability of each source by ensuring that deliveries are not interrupted due to water quality concerns. A direct result from the degradation of a water supply source is increased treatment cost before consumption. The poorer the quality of the source water, the greater the treatment cost. Groundwater may degrade in quality to the point that is not economically feasible for treatment. In this scenario the degraded source water is taken off-line. This in turn can decrease water supply reliability by potentially decreasing the total supply and increasing demands on alternative water supplies.

Currently, water quality does not affect water supply reliability in the LACSD service area. Maintaining the current level of quality is vital to maintaining a reliable water supply.

A goal of the LACSD's monitoring program is to detect long-term changes in groundwater quality. This includes detection of poor quality water. By identifying the occurrence of reduced quality groundwater, mitigation actions can be taken to mitigate the elements creating the poorer quality water which will help maintain long-term water supply reliability.

Section 6: Reliability Planning

6.1 Overview

The Act requires urban water suppliers to assess water supply reliability that compares total projected water use with the expected water supply over the next twenty years in five year increments. The Act also requires an assessment for a single-dry year and multiple-dry years. This chapter presents the reliability assessment for Lake Arrowhead Community Service District's (LACSD's) service area.

LACSD revised its mission statement in 2006 to include "…*protect our water resources and preserve our environment.*" This Plan helps LACSD to achieve this goal even during dry periods based on a conservative water supply and demand assumptions over the next 25 years, as discussed in the following sections.

6.2 Reliability of Water Supplies

Each water supply source has its own reliability characteristics. In any given year, the variability in weather patterns around the state may affect the availability of supplies to the LACSD's service area differently. For example, from 2000 through 2002, southern California experienced dry conditions in all three years. During the same period, northern California experienced one dry year and two average years. LACSD's service area is typical in terms of water management in southern California; local water supplies are used to a greater extent when imported supplies are less available due to dry conditions in the north, and larger amounts of imported water supplies are used during periods when northern California has wetter conditions. State Water Project (SWP) supplies first came to the LACSD's service area in 2003 via an agreement with the Crestline Lake Arrowhead Water Agency (CLAWA). Additional supplies have been available since 2005 through a second agreement with CLAWA and the San Bernardino Valley Municipal Water District (VALLEY DISTRICT). SWP supplies have supplemented the overall supply of the LACSD service area, which previously depended primarily on the Lake Arrowhead surface water.

As discussed in Section 3.2 of Chapter 3, each SWP contractor's Water Supply Contract contains a Table A amount that identifies the maximum amount of water that a contractor may request. However, the amount of SWP water actually allocated to contractors each year is dependent on a number of factors than can vary significantly from year to year. The primary factors affecting SWP supply availability include hydrologic conditions in northern California, the amount of water in SWP storage reservoirs at the beginning of the year, regulatory and operational constraints, and the total amount of water requested by the contractors. The availability of SWP supplies to the CLAWA and VALLEY DISTRICT and the other SWP contractors is generally less than their full Table A amounts in many years and can be significantly less in very dry years.

DWR's "State Water Project Delivery Reliability Report 2009" (2009 SWP Report), issued in August 2010, assists SWP contractors in assessing the reliability of the SWP component of their overall supplies. The Report updates DWR's estimate of the current (2009) and future (2029) water delivery reliability of the SWP. The updated analysis shows that the primary component of

the annual SWP deliveries (referred to as Table A deliveries) will be less under current and future conditions, when compared to the preceding report (SWP Delivery Reliability Report 2007).

Through the CLAWA I and II agreements, LACSD is able to request specified amounts of SWP water on an annual basis; however, the availability and total amount of water may be subject to the annual SWP allocation available to VALLEY DISTRICT and CLAWA in any given year type. As VALLEY DISTRICT serves as the source of the SWP supply for the CLAWA agreements, and is able to regulate its annual Table A amount allocations through its local groundwater basins, these reliability concerns are ameliorated.

6.3 Average, Single-Dry, and Multiple-Dry Year Planning

The LACSD has three sources of water for potable use; (1) SWP water purchased from CLAWA and VALLEY DISTRICT and delivered ("wheeled") by CLAWA through its system, (2) surface water from Lake Arrowhead, and (3) groundwater from five wells in the Grass Valley groundwater basin. Also, there is recycled water available.

These supplies are available to meet demands during average, single-dry, and multiple-dry years. The following sections elaborate on the different supplies available to LACSD during each of the various dry year conditions. Each subsection explains the criteria for estimating the single-dry and multiple-dry year supplies that are then used in the comparison tables in Section 6.4.

6.3.1 State Water Project Table A Supply

Through the CLAWA I and II agreements, LACSD is able to request specified amounts of SWP water; however, the availability and total amount of water may be subject to the annual SWP allocation in any given year type. As VALLEY DISTRICT serves as the source of the SWP supply for the CLAWA agreements, and is able to regulate its annual Table A amount allocations through its local groundwater basins, these reliability concerns are ameliorated. Therefore for this Plan, the availability of SWP supplies to VALLEY DISTRICT and CLAWA for LACSD is assumed to not be impacted by single-dry and multiple-dry year weather changes.

6.3.2 Lake Arrowhead Surface Water

Surface water supplies from Lake Arrowhead are limited by the State Water Resources Control Board (SWRCB) Order WR2006-0001 to 1,566 acre-feet per year (AFY) for use by the District beginning in 2008. In most year types, lake water is available to the District, subject to this upper limit. The District is currently evaluating alternatives for a supplemental water supply.

6.3.3 Groundwater

Supplies from the Grass Valley Groundwater Basin are projected to be 225 AFY in average years as shown previously in Table 3-7. Also shown in the table is that for a single-dry year, the supply is 225 AFY and for a multiple-dry year, the supply is estimated at 180 AFY.

6.3.4 Recycled Water

Since recycled water is produced from wastewater, this source has the advantage of consistently being available during any type of average, single-dry, or multiple-dry year. The recycled water facilities for LACSD as discussed in Chapter 4 of this Plan. As discussed previously, since this supply is already accounted for by LACC in an agreement dated November 27, 2007, this recycled water is not included as part of the Total Water Supply in the following tables of this chapter.

6.4 Supply and Demand Comparisons

The available supplies and water demands for LACSD's service area were analyzed to assess the region's ability to satisfy demands during three scenarios: an average water year, single-dry year, and multiple-dry years. The tables in this section present the supplies and demands for the various drought scenarios for the projected planning period of 2010-2035 in five year increments. Table 6-1 presents the base years for the development of water year data. Tables 6-2, 6-3, and 6-4 at the end of this section summarize, respectively, Average Water Year, Single-Dry Water Year, and Multiple-Dry Year supplies.

TABLE 6-1
BASIS OF WATER YEAR DATA

Water Year Type	Base Years[(a)]	Historical Sequence
Average Water Year	Average	1922-2003
Single-Dry Water Year	1977	--
Multiple-Dry Water Years	1931-1934	--

(a) Taken from "2009 State Water Project Delivery Reliability Report."

6.4.1 Average Water Year

Table 6-2 summarizes LACSD's water supplies available to meet demands over the 20-year planning period during an average/normal year. As presented in the table, LACSD's water supply is broken down into existing and planned water supply sources, including wholesale (imported) water and local supplies. Demands are shown with and without the effects of an assumed urban demand reduction (conservation) resulting from SBX7-7 imposed reductions.

6.4.2 Single-Dry Year

The water supplies and demands for LACSD's service area over the 20-year planning period were analyzed in the event that a single-dry year occurs, similar to the drought that occurred in California in 1977. Table 6-3 summarizes the existing and planned supplies available to meet demands during a single-dry year. Demand during dry years was assumed to increase by 10 percent.

6.4.3 Multiple-Dry Year

The water supplies and demands for LACSD's service area over the 20-year planning period were analyzed in the event that a four-year multiple-dry year event occurs, similar to the drought that occurred during the years 1931 to 1934. Table 6-4 summarizes the existing and planned

supplies available to meet demands during multiple-dry years. Demand during dry years was assumed to increase by 10 percent.

6.4.4 Summary of Comparisons

As shown in the analyses above, LACSD has adequate supplies to meet demands during average, single-dry, and multiple-dry years throughout the 20-year planning period, with the possible exception of a multiple-dry year in 2035. Therefore, the District will need to secure the additional water supply discussed in Chapter 3 before that date.

TABLE 6-2
PROJECTED AVERAGE/NORMAL YEAR SUPPLIES AND DEMAND (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies						
Wholesale (Imported)[a]						
CLAWA Overlap	62	62	62	62	62	62
CLAWA II	150	150	150	0	0	0
Local Supplies[a]						
Lake Arrowhead Surface Water	1,566	1,566	1,566	1,566	1,566	1,566
Groundwater Basin	192	225	225	225	225	225
Total Existing Supplies	**1,970**	**2,003**	**2,003**	**1,853**	**1,853**	**1,853**
Total Estimated Demands[b] (w/out Conservation)	1,565	1,565	1,565	1,604	1,644	1,685
Total Adjusted Demand[b]	**1,565**	**1,565**	**1,565**	**1,604**	**1,644**	**1,685**

Notes:
(a) Taken from Chapter 3 Water Resources, Table 3-1.
(b) Conservation is assumed in demands using SBX7-7. See Chapter 2 Water Use, Table 2-4. The demands are the same with and without conservation.

TABLE 6-3
PROJECTED SINGLE-DRY YEAR SUPPLIES AND DEMAND (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies						
Wholesale (Imported)[a]						
CLAWA Overlap	62	62	62	62	62	62
CLAWA II	150	150	150	0	0	0
Local Supplies[b,c]						
Lake Arrowhead Surface Water	1,566	1,566	1,566	1,566	1,566	1,566
Groundwater Basin	192	225	225	225	225	225
Total Existing Supplies	**1,970**	**2,003**	**2,003**	**1,853**	**1,853**	**1,853**
Total Estimated Demands[d] (w/out Conservation)	1,722	1,722	1,722	1,764	1,808	1,854
Total Adjusted Demand[e]	**1,722**	**1,722**	**1,722**	**1,764**	**1,808**	**1,854**

Notes:
(a) SWP supplies are assumed to not be impacted by single-dry year weather changes. Refer to Section 6.3.
(b) Taken from Chapter 3 Water Resources, Table 3-1.
(c) Assumed 100% available during single-dry year. Refer to Section 6.3.
(d) Assumed increase in total demand of 10 percent during dry years.
(e) Conservation is assumed in demands using SBX7-7. See Chapter 2 Water Use, Table 2-4. The demands are the same with and without conservation.

TABLE 6-4
PROJECTED MULTIPLE-DRY YEAR SUPPLIES AND DEMAND (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035
Existing Supplies[a]						
Wholesale (Imported)[b]						
CLAWA Overlap	62	62	62	62	62	62
CLAWA II	150	150	150	0	0	0
Local Supplies[c]						
Lake Arrowhead Surface Water[d]	1,566	1,566	1,566	1,566	1,566	1,566
Groundwater Basin[e]	180	180	180	180	180	180
Total Existing Supplies	**1,958**	**1,958**	**1,958**	**1,808**	**1,808**	**1,808**
Total Estimated Demands[f] (w/out Conservation)	1,722	1,722	1,722	1,764	1,808	1,854
Total Adjusted Demand[g]	**1,722**	**1,722**	**1,722**	**1,764**	**1,808**	**1,854**

Notes:
(a) Supplies shown are annual averages over four consecutive dry years (unless otherwise noted).
(b) SWP supplies are assumed to not be impacted by multiple-dry year weather changes. Refer to Section 6.3.
(c) Taken from Chapter 3 Water Resources, Table 3-1.
(d) Assumed 100% available during multiple-dry year. Refer to Section 6.3.
(e) Assumed 80% available during multiple-dry year. After third dry year, 90% of supply would be available and after fourth year, 80% of supply is available.
(f) Assumes increase in total demand of 10 percent during dry years.
(g) Conservation is assumed in demands using SBX7-7. See Chapter 2 Water Use, Table 2-4. The demands are the same with and without conservation.

Section 7: Water Demand Management Measures

7.1 Overview

This section describes the water Demand Management Measures (DMMs) implemented by the District.

In December 2000, the District became a signatory to the Memorandum of Understanding Regarding Water Conservation in California (MOU) of the California Urban Water Conservation Council (CUWCC), establishing a firm commitment to the implementation of the Best Management Practices (BMPs) or Demand Management Measures (DMMs). The CUWCC is a consensus-based partnership of agencies and organizations concerned with water supply and conservation of natural resources in California. By becoming a signatory, the District committed to implement a specific set of locally cost-effective conservation practices in its service area. Since becoming a signatory, the District has reduced per capita use by about 15 percent.

The District is unique in that it is made up almost exclusively by residential accounts, 70 percent of which are seasonal second homes. The conservation programs implemented are tailored to address the characteristics of this community and have largely focused on public information, water losses (both system and customer losses) as well as residential rebates. The District is implementing most of the Foundational BMPs as defined in the revised MOU and UWMP Act. The Programmatic BMPs are being implemented through a gallons per capita per day (GPCD) approach.

7.1.1 Implementation Levels of BMPs

The MOU and BMPs were revised by the CUWCC in 2008. The revised BMPs now contain a category of “Foundational BMPs” that signatories are expected to implement as a matter of their regular course of business. These include Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs, and water waste ordinances) and Public Education (public outreach and school education programs). These revisions are reflected in the reporting database starting with reporting year 2009. The new category of foundational BMPs is a significant shift in the revised MOU.

Signatories to the urban MOU are allowed by Water Code Section 10631(j) to include their biennial CUWCC BMP reports in an UWMP to meet the requirements of the DMMs sections of the UWMP Act. The BMP reports for 2009-2010 are attached as Appendix F.

The following sections detail the District’s conservation programs and compliance with the BMPs.

7.2 Utility Operations

7.2.1 Operations Practices

a. Conservation Coordinator: The District has had a full time Conservation Coordinator since 2003. Customer services and meter shop personnel also support conservation program activities.

b. Water Waste Prevention: In June 2008, the Board of Directors of the Lake Arrowhead Community Services District adopted Ordinance No. 69 to restrict the use of District water for non-essential purposes.

The three purposes of this Ordinance No. 69 are to conserve the District's water supply for the greatest public benefit; to adopt provisions that will change the water-use habits of customers; and to consolidate all of the water conservation policies and regulatory measures of the District in one ordinance.

The Ordinance addresses the following uses: outdoor cleaning practices, hospitality industry standards, leak free maintenance standards, irrigation practices, landscape standards and water use efficiency audits.

During the irrigation season (May 1 through October 15), the following policies are enforced:

- Irrigation is only allowed on Monday, Wednesday and Friday.
- Irrigation is only allowed from 12:01 A.M. to 8 A.M. and from 6 P.M. to midnight on approved days.
- Water run-off onto other properties or the street is not allowed.
- Irrigation is not allowed outside the boundaries of the property owner's parcel (Exceptions to this are being considered for adoption).
- Irrigation should only provide sufficient water to maintain minimal landscaping needs.
- Leaks or out of adjustment sprinkler heads must be repaired immediately.

Year round water use efficiency policies are enforced as follows:

- Leaks in plumbing or your water distribution system must be repaired immediately.
- No wash down of sidewalks, driveways, parking lots, etc. Use a broom.
- Cars must be washed with a bucket and only rinsed with a hose that has a shutoff nozzle.
- Restaurants may not serve water to customers unless requested.
- No new lawn/turf grass is permitted, with possible exception for public sports fields.

7.2.2 Water Loss Control

The District has implemented the American Water Works Association (AWWA) water audit methodology and full component analysis. In 2009 the District participated in the Southern

California Edison "Water Leak / Leak Detection and Water System Loss Control Study". The pilot project was designed to the AWWA water audit methodology and recommended leakage intervention options. The District initiated the analysis in order to improve understanding of its resource balance, ensure accountability and efficient operation, and examine the potential for water savings.

The Water Audit utilized the new International Water Association (IWA)/AWWA standardized Water Balance methodology to disaggregate and validate components of system input volume, consumption volume, apparent loss volume and real loss volume with a goal of identifying potential for reduction of water loss volumes.

The study had multiple phases: a detailed top down water audit and economic level of leakage analysis, and leakage field measurements and proactive leakage intervention through leak detection, repair and pressure management. Table 7-1 provides results for the operational performance Indicators.

TABLE 7-1
AWWA WATER BALANCE: PERFORMANCE INDICATORS

Parameter	Value
Non-Revenue Water (% of System Input Volume or Unaccounted for System Losses)[a]	24%
Apparent Losses	2 gal/connection/day
Real Losses	56 gal/connection/day
Infrastructure Leakage Index (ILI)[b]	2.7

(a) Non-revenue water is the same as listed in Table 2-5.
(b) The Infrastructure Leakage Index is calculated by comparing the annual volume of Real Losses for the system against an internationally derived standard that relates to the best that can be technically achieved for that system. The available water resources in LACSD are limited and costly to purchase, therefore, it is prudent that LACSD operations practice water conservation as well as the end-user conservation.

The results of the audit indicate that the system input meters appear to be operating well and that the District is very effective and quick in responding to reported leaks, which are repaired on average in less than a day, a performance that is among the best in North America. The ILI is within the AWWA's category of acceptable performance.

The system-wide volume of real losses was 40 million gallons (MG) for the 3-month audit period, about 16 MG of which are hidden losses or leaks waiting to be detected and repaired. The rest of the real losses were from leaks that have been repaired by the District during the audit period and background leakage (leaks too small to be detected). The relatively high percentage of non-revenue water is a factor of the following three system characteristics:

a. A long distribution system is required to serve the rural region
b. Disproportionately low delivery volumes because of the transient population; losses therefore account for a higher percentage when use is lower
c. Higher pressures because of the elevation changes

The final recommendations from the report include that the District enhance meter evaluation and testing, continue with current reactive leak repair policy, improve tracking of leak and repair

time, and consider reducing system pressure. The District is currently evaluating these recommendations.

7.2.3 Metering With Commodity Rates For All New Connections And Retrofit Of Existing Connections

All of the District's customers are metered and billed volumetrically. In 2008 the District replaced all of its meters with Automatic Meter Reading (AMR) technology. In January 2009, billing was switched from a bi-monthly to a monthly cycle.

7.2.4 Retail Conservation Pricing (formerly BMP 11)

All of the District's customers are metered and billed monthly with an increasing block rate structure (Table 7-2) and a highly punitive fourth tier.

TABLE 7-2
CONSUMPTION CHARGES

Volume of water used In hundred cubic feet (CCF)	Charges
Tier 1: 0-7	$0.68
Tier 2: 8-13	$1.74
(If monthly use is over 7, 1-13 CCF's charged at $1.74)	
Tier 3: 14-40	$6.21
Tier 4: 41+	$12.93

The volumetric portion of revenues currently do not meet the 70 percent threshold. The District's current rate structure was developed in the early 2000s and designed for water sales of about 3,000 acre-feet per year (AFY). Since that time sales have dropped by about 60 percent and, as a result, the fixed costs are an increasingly larger portion of revenues.

A combination of factors has had significant impacts on the District's sales and operations (Section 2.2). School enrollment has declined 2.1 percent per year since 1998, water production has dropped by about 4.5 percent per year since 2001 and the service area has suffered from the general economic decline of the Inland Empire over the past three years (unemployment rate over 14 percent). Between 2007 and 2009, the impacts have been dramatic, resulting in volumetric revenue dropping by 13 percent.

In addition to the demographic and economic shifts, fixed rates occupy a unique importance for the District which has to maintain service year round even though 70 to 75 percent of the residences are only occupied a fraction of that time. For example, on an annual basis over 80 percent of the monthly bills mailed to customers are for zero consumption (i.e., less than 750 gallons used). To try and generate 70 percent of its revenue from volumetric rates would result in a fiscal collapse of the water enterprise. The District Board of Directors is currently considering adjustments to the rates applied to the first and second tiers, which were originally developed to reward water conserving households, as well as the breadth of the tiers.

For more information on the District's rate structure planning process go to the 2008 Comprehensive Financial Master Plan Final Report (Appendix Section 2) at: http://www.lakearrowheadcsd.com/Index.aspx?page=141 (or refer to Appendix G of this Plan).

7.3 Education

7.3.1 Public Information Programs

Public Information is a primary focus of the District's conservation program. The District's annual Public Information Plan establishes key communication messages and focuses on three key strategy areas:

1. Public Information Efforts: information materials and multimedia presentations
2. Community Relations: customer participation programs and special events
3. Media Relations: advertising, press releases and local media contacts

The District communicates with its customers in a variety of ways including advertising, bill inserts and newsletters, special events and speaker's bureau events (Table 7-3). The Public Information Plan defines an aggressive Water Conservation Awareness campaign that includes:

- Bi-annual News Letters
- Intermittent Billing Inserts
- Regular display ads and advertorials in the weekly newspaper
- Regular media press releases
- Regular presentations to community groups, service clubs and home owners associations
- Water Conservation Information Booth at community events
- Information sharing via Multi Water District Meetings
- Electronic distribution of press release, water conservation events and publications (brochures, programs and newsletters)
- Community signs, table tents
- Education (K-12 Water conservation calendar contest)
- Informative Website that provides a tips, rebate information, educational resources and more (http://www.lakearrowheadcsd.com/).

TABLE 7-3
LACSD PUBLIC INFORMATION ACTIVITIES

	2006	2007	2008	2009	2010
Paid advertising	52	52	52	52	52
Bill Inserts / Newsletters / Brochures	5	12	12	12	6
Bill showing water usage in comparison to previous year's usage	✓	✓	✓	✓	✓
Special Events, Media Events	3	2	2	2	2
Speaker's Bureau		4	4	4	
Program to coordinate with other government agencies, industry and public interest groups and media	✓	✓	✓	✓	✓
Expenditures - $	$40,500	$60,970	$67,425	$68,175	$72,000

7.3.2 School Education Programs

The District has been implementing an Education program since 2007 (Table 7-4). The highlight of the program is the Water Conservation Calendar Contest. Flyers on water conservation are distributed to about 2,400 students in the District and teachers are encouraged to incorporate the contest into a classroom activity and incorporate the topic into their lesson plans. Entries on the theme of "Use Less Water" are received and fourteen winners are chosen to have their artwork and ideas on Water Use Efficiency published in the Calendar. Five thousand copies of the calendar were distributed in 2008; 2,250 to students and the rest were made available at school offices, at the library, local coffee shops, the Chamber of Commerce and local Real Estate offices.

The District also provides school tours of the water treatment plant, during which the students receive a presentation on Water Conservation. In 2008, 146 students in grades 4 through 6 were given a tour of the plant, provided conservation materials, the Mountain Landscape Guide with water use efficient and fire safe landscaping planning information, as well as literature about residential rebate programs. Students are toured in small groups, each group is given a water conservation presentation and encouraged to ask questions and share ideas.

Additionally, in 2008 efforts were made to coordinate with the Rim of the World Unified School District to provide instructional assistance, educational materials and classroom presentations that meet the state education framework requirements. The Snowflake "A Water Cycle Story" was purchased for all 1st through 3rd grade classrooms and libraries in the District and distributed in January of 2009.

TABLE 7-4
LACSD SCHOOL EDUCATION PROGRAMS

	Number of Students Reached				
	2006	2007	2008	2009	2010[(a)]
Grades K-3rd	0	760	760	621	577
Grades 4th-6th	0	570	570	675	297
Grades 7th-8th	0	850	850	683	897
Expenditures - $	$0	$15,000	$15,000	$15,000	$14,000

Note: (a) Sixth graders now are in the same school with the 7th and 8th graders.

7.4 Programmatic BMPs

The following sections describe the District's programmatic BMP activities. The District is choosing the GPCD approach towards compliance.

7.4.1 Residential

The District has reduced its per capita use significantly over the past decade through a combination of public information, incentive, loss reduction and audit programs. The largest customer class in the District service area is residential, accounting for over 95 percent of customers and about 85 percent of total use. The District, therefore, has focused the majority of its conservation efforts on residential uses and users.

7.4.2 Residential Assistance Program (formerly DMMs 1 and 2)

Mitigating water losses has been a high priority for the District, as discussed in Section 7.1.2 which describes the system-wide water loss analysis undertaken by the District.

In 2008 the District undertook another major water loss reduction program by replacing all of its meter with an AMR system. The primary goal of the program was to manage customer leaks; the secondary goal was to obtain better information about District customers and their water use patterns.

The District uses the AMR information proactively. Every day it runs an Exception Report which identifies those homes showing a constant water use in the preceding 24 hour period. These reports are prioritized by volume and staff is immediately dispatched to the property. If homeowners are present, they are provided an audit, dye tablets and other information to help them locate and fix the leak. If the homeowners are not present and the leak is significant, the District will shut off the water. In 2009, District staff went to 2,200 leak events (Table 7-5).

TABLE 7-5
WATER SURVEY DATA

	2006	2007	2008	2009[(a)]	2010[(a)]
Number of Surveys Offered	7,437	7,649	7,692	2,210	1,603
Number of Surveys Completed	53	38	17	2,210	1,603

Note: (a) 2009 the program changed to a proactive leak/survey program, which is why the number of surveys "offered" is the number completed.

The AMR data is also used to ensure compliance with local ordinances, particularly the landscape watering restrictions. If customers are watering on non-irrigation days or during non-irrigation hours, this will show up on the Exception Report and staff may visit the homes. The penalties range from a warning on the first incident, penalties up to 100 percent of the consumption charge for repeat violations, up to finally putting a restrictor on the meter for recalcitrant customers.

Customers who want to track their use are provided with the information from Customer Service staff. The District is currently working on providing a web based platform so that customers can check their use at any time.

The District's previous audit program, which began in 2003 and ran through the middle of 2008, was advertised in newspapers and bill inserts. This program has been replaced by the AMR leak program. Due to the District's low permanent occupancy rate, this program is expected to be more effective at reducing water losses and demand than the traditional audit route. It allows the District to respond immediately to customer leaks, among other benefits. However, if customers call and request an audit, one is still provided to them free of charge.

7.4.3 Landscape Water Survey (formerly DMM 1)

The Residential Assistance and Landscape Water Survey programs have always been implemented together. The audit program that superseded the AMR program included both - indoor and landscape elements.

The current program based on AMR data is described in Section 7.4.2. This program is also used to ensure compliance with local ordinances, particularly the landscape watering restrictions. If customers are watering on non-irrigation days or during non-irrigation hours, this will show up on the Exception Report and staff may visit the homes. The penalties range from a warning on the first incident, penalties up to 100 percent of the consumption charge for repeat violations, up to finally putting a restrictor on the meter for recalcitrant customers.

Due to the District's low permanent occupancy rate, this program is expected to be more effective at reducing water losses and demand than the traditional audit route. It allows the District to respond immediately to customer leaks and monitor compliance with landscape ordinances. If customers call and request an audit, one is still provided for them free of charge.

7.4.4 High Efficiency Clothes Washers (former DMM 6) and Water Sense Specification Toilets (former DMM 14)

The District has been providing rebates to its customers since 2006 (Table 7-6) and is currently participating in the CUWCC's One Stop Rebate program to provide rebates for High Efficiency Toilets and Washers (HETs and HEW). The program is funded in part through state grant monies which ran into some challenges in 2007 and 2008 when state funding was stalled. Since the state reallocated the funding, the number of rebates have started to increase; over 60 rebates were issued in the last quarter of 2010 compared with 40 rebates in all of 2009. The District has started once again to advertise the program through bill inserts and other mechanisms. Since the program started in March 2007, rebates have been provided for 260 ultra low-flow toilets (ULFTs), 79 high efficiency toilets (HETs) and 155 high efficiency washers (HEWs).

TABLE 7-6
REBATES PROVIDED BY LACSD

Device	2006	2007	2008	2009	2010
High Efficiency Washing Machines	0	42	64	18	27
High Efficiency Toilets / Ultra Low Flow Toilets	0	13	85	41	36

7.5 Commercial, Industrial, and Institutional (CII) Conservation Programs (formerly DMM 9)

CII use does not account for a large portion of consumption in the District's service area. LACSD has about 130 commercial and institutional meters which use about 14 percent of total use. The District has no industrial accounts.

The District has identified and ranked all of its CII customers. Free water audits are available to District customers upon request however none have been completed to date (Table 7-7). The District is addressing CII water use through its AMR leak program (see Section 7.4.2 for more information).

TABLE 7-7
COMMERCIAL, INDUSTRIAL, AND INSTITUTIONAL (CII) SURVEYS

Account Type	Number of Surveys	2006	2007	2008	2009	2010
Commercial	Offered	104	104	104	10	10
	Completed	0	0	0	10	10
Institutional	Offered	30	30	30	2	2
	Completed	0	0	0	2	2

7.6 Landscape (formerly DMM 5)

In 2003, the District developed a marketing and targeting strategy for landscape surveys. The survey included irrigation system checks, a review and development of irrigation schedules, and provides the customer with the report and other information. The surveys offered and completed were tracked each year (Table 7-8). The agency provided follow-up surveys, an evaluation of the surveyed sites, and a follow up for those sites that do not show reasonable water use reduction.

In 2004 the District received a grant from the Bureau of Reclamation to pilot a Smart Controller program. The District installed 76 Evapotranspiration (ETo) Controllers for the pilot and targeted top users, both residential and CII. The District also purchased two weather stations for collecting real-time ETo data became part of the California Irrigation Management Information System (CIMIS) Weather Station Network. The District recorded significant savings, although the pilot coincided with a year of record rainfall. While the program showed some potential the resources required to monitor the controllers, make sure the savings were achieved and maintained proved to be significantly more than expected. The District decided not to continue with the program due to the consistent monitoring it required, and instead to pursue other opportunities for water savings.

Since 2008, the District has focused on developing and implementing a regulatory framework for water savings with Ordinance 69 and its strict implementation. In developing Ordinance 69, the District worked with local landscapers to develop the restrictions. The District utilizes its AMR system to identify customers that are not complying with the restrictions and contact the customer and impose penalties as appropriate. The District is currently monitoring the savings from this program. Audits are still available upon request.

TABLE 7-8
LANDSCAPE SURVEYS

	2006	2007	2008	2009	2010
Number of Dedicated Irrigation Meters	80	77	77	87	73
Number of Surveys Offered	80	77	77	8	7
Number of Surveys Completed	5	2	0	8	7

7.7 LACSD BMP and SBX7-7 Compliance

The SBX7-7 calculations are described in Chapter 2. The AB 1420 target was calculated using the GPCD compliance method. The Baseline GPCD was calculated using the average annual potable water GPCD for the years 1997 through 2006. Table 7-9 presents the data used for the GPCD determination.

TABLE 7-9
DATA FOR AB 1420 CALCULATION

Year	Population	Production (AFY)	Production (GPY)	GPCD
1996	10,604	2,720	886,202,539	229
1997	10,940	2,650	863,511,706	216
1998	11,276	2,422	789,088,973	192
1999	11,612	2,510	817,910,032	193
2000	11,944	2,370	772,308,357	177
2001	11,705	2,583	841,670,904	197
2002	11,466	2,559	833,760,614	199
2003	11,227	2,312	753,273,015	184
2004	10,988	2,164	705,151,340	176
2005	10,750	2,105	685,961,974	175
2006	10,511	2,145	699,067,701	182
2007	10,272	2,297	748,479,747	200

The GPCD target for the MOU compliance and the SBX7-7 targets have already been met by the District (Table 7-10), at its current use of about 151 gpcd. The District, however, recognizes the need to maintain and build on existing programs and plans to continue all existing activities, continue to expand the use of its AMR system and increase the number of rebates offered.

TABLE 7-10
LACSD COMPLIANCE TARGETS (GPCD)

		Target		
Compliance	**Baseline**	**2015**	**2018**	**2020**
MOU/AB 1420	189		156	
SBX7-7	183	172		162
Current Use	151			

7.7.1 Evaluating Effectiveness of the DMMs

LACSD will continue to track all program activities including outreach activities, rebate distribution, audits and leak interventions. Program effectiveness and per capita use will be monitored through the billing and consumption system. For example, the District will measure

impacts of the new leak program by tracking leak events, duration and losses as the program progresses. The District will continue to develop its AMR system as a tool to measure effectiveness and to communicate that information to its customers.

7.7.2 Impacts of Conservation

It is not expected that, at this time, the conservation programs currently being implemented or scheduled for implementation will have any significant negative effect on water use within LACSD's service area or affect the District's ability to further reduce demand.

Section 8: Water Shortage Contingency Planning

8.1 Overview

Water supplies may be interrupted or reduced significantly in a number of ways, such as a drought which limits supplies, an earthquake which damages water delivery or storage facilities, a regional power outage, or a toxic spill that affects water quality. This chapter of the Plan describes how Lake Arrowhead Community Services District (LACSD, District) plans to respond to such emergencies so that emergency needs are met promptly and equitably.

During previous drought periods, water users within LACSD relied on surface water supplies from Lake Arrowhead to meet their potable water supply needs without imposing restrictions on water use. After the State Water Resources Control Board (SWRCB) issued Order (WR 2006-0001) in 2006 to LACSD to limit lake withdrawals to 1,566 acre-feet per year (AFY) permanent water use restrictions were necessary in addition to finding other sources of supply. Lake Arrowhead still serves as the best quality lowest cost fresh water source for the District. Actions of the LACSD to address water shortages are summarized below.

8.2 Coordinated Planning

The District took the following steps due to the SWRCB Order:

- On May 9, 2006, the District determined and declared a water shortage emergency and adopted Ordinance No. 65 (Appendix D) establishing a Water Connection Policy of the District. Ordinance No. 65 established a yearly maximum limit of sixty (60) new permits for water service within the LACSD certificated water service area.

- On June 27, 2006, the District adopted Resolution 2006-07 again declaring a water shortage emergency condition pursuant to Water Code Section 350 et seq.; and concurrently with the declaration of water shortage emergency, the District adopted Resolution 2006-08 that implemented certain landscape restrictions.

- On June 10, 2008, the District adopted Ordinance No. 69 (Appendix D), which establishes a “Permanent Water Use Efficiency Policy” for the LACSD that requires restrictions on District water use based upon the declaration that water use in contravention of these practices constitutes a waste of District water and use of District water that is unnecessary and/or nonessential. The three purposes of Ordinance No. 69, which was adopted pursuant to Water Code Section 375, et seq., were:

  (1) to conserve the District's water supply for the greatest public benefit by providing for water conservation under the declaration of a water shortage emergency condition in order to minimize the effect of a shortage of water to the Customers of the District

  (2) to adopt provisions that will change the water-use habits of Customers to significantly reduce the consumption of water for the long term human consumption, sanitation and fire protection of the Customers

(3) to consolidate all of the water conservation policies and regulatory measures of the District in one ordinance.

8.3 Minimum Water Supply Available During Next Three Years

The minimum water supply available during the next three years would occur during a three-year multiple-dry year event between the years 2011 and 2013. As shown in Table 8-1, the total supplies are approximately 2,000 AFY during the next three years. When comparing these supplies to the demand projections provided in Chapters 2 and 6 of this Plan, LACSD has adequate supplies available to meet projected demands should a multiple-dry year period occur during the next three years.

TABLE 8-1
ESTIMATE OF MINIMUM SUPPLY FOR THE NEXT THREE YEARS

	Supply (AFY)		
Source	**2011**	**2012**	**2013**
Existing Supplies			
Wholesale (Imported)[a]			
CLAWA Overlap	62	62	62
CLAWA II	150	150	150
Local Supply[b]			
Lake Arrowhead Surface Water	1,566	1,566	1,566
Groundwater Basin	225	225	225
Total Existing Supplies	**2,003**	**2,003**	**2,003**
Planned Supplies			
New Projects[b]	0	0	0
Total Supplies	***2,003***	***2,003***	***2,003***
Total Estimated Demands[c]	**1,565**	**1,565**	**1,565**

Notes:
(a) SWP supplies from Crestline Lake Arrowhead Water Agency (CLAWA) and San Bernardino Valley Municipal Water District (VALLEY DISTRICT) are assumed to not be impacted by multiple-dry year weather changes. See Table 6-4.
(b) Taken from Chapter 3 Water Resources, Table 3-1. Local supplies are assumed to be 100% available, with the exception of recycled water which is already accounted for by agreement to LACC and is not included as a supply in this table.
(c) See Chapter 2 Water Use, Table 2-4. Demands are the same with and without conservation.

8.4 Actions to Prepare for Catastrophic Interruption

8.4.1 General

The District addresses three categories of catastrophic events: 1) Regional Power Outages, 2) Wildfires and, 3) Earthquakes. The primary effect on the District during any of these events is a loss of power to the water treatment plants, water pumping stations and the wastewater collection and treatment systems. At this time approximately 85% of the District's water systems are equipped with emergency power generation that will supply power during a catastrophic event. The remaining facilities are equipped to be supported by portable power generation and

in the event of a catastrophic event the District would acquire and connect these portable units to supply power to keep the water supply system in operation.

The District's "Disaster Preparedness Plan" and "Wild Land Fire Policy" identify the specific actions which will take place in the event of a catastrophic emergency. The District also has an "Emergency Operations Plan" that provides a detailed plan for the evaluation and mitigation of the water distribution system in the case of a major earthquake. The "Emergency Operations Plan" outlines the specific sequence of events in order to bring back on-line facilities as resources allow and detailed instructions for emergency operations of each facility.

The LACSD service area is bounded on the west by a major portion of the San Andreas Fault. A major earthquake along the southern portion of the San Andreas Fault would affect the LACSD service area. The California Division of Mines and Geology has stated two of the aqueduct systems that import water to southern California (including the California Aqueduct) could be ruptured by displacement on the San Andreas Fault, and supply may not be restored for a three to six-week period. The situation would be further complicated by physical damage to pumping equipment and local loss of electrical power.

DWR has a contingency aqueduct outage plan for restoring the California Aqueduct to service should a major break occur, which it estimates would take approximately four months to repair.

Experts agree it may be at least three days after the earthquake before outside help could get to the area. Extended supply shortages of both groundwater and imported water, due to power outages and/or equipment damage, would be severe until the water supply could be restored.

Combined water storage of the LACSD totals approximately 9.4 million gallons of water in storage tanks, which can be gravity fed to residences, even if there is a power outage. The public would be asked to reduce consumption to minimum health and safety levels, extending the supply to seven days. This would provide sufficient time to restore use of the Lake Arrowhead's surface water via pumping and a significant amount of groundwater production. After the local water supply is restored, the pumping capacity of the LACSD could meet the reduced demand until such time that the imported water supplies were reestablished. In an emergency, LACSD could exceed its allocation in using the surface water from Lake Arrowhead, if necessary. Updates on the water situation would be made as often as necessary.

The area's water sources are generally of good quality, and no insurmountable problems resulting from industrial or agricultural contamination are foreseen. If contamination did result from a toxic spill or similar accident, the contamination would be isolated and should not significantly impact the total water supply. In addition, such an event would be covered by the LACSD's "Disaster Preparedness Plan."

8.4.2 SWP Emergency Outage

In addition to earthquakes, the SWP could experience other emergency outage scenarios. Past examples include slippage of aqueduct side panels into the California Aqueduct near Patterson in the mid-1990s, the Arroyo Pasajero flood event in 1995 (which also destroyed part of Interstate 5 near Los Banos), and various subsidence repairs needed along the East Branch of the Aqueduct since the 1980s. All these outages were short-term in nature (on the order of weeks), and DWR's Operations and Maintenance Division worked diligently to devise methods

to keep the Aqueduct in operation while repairs were made. Thus, the SWP contractors experienced no interruption in deliveries.

One of the SWP's important design engineering features is the ability to isolate parts of the system. The Aqueduct is divided into "pools." Thus, if one reservoir or portion of the California Aqueduct is damaged in some way, other portions of the system can still remain in operation. The primary SWP facilities are shown on Figure 8-1.

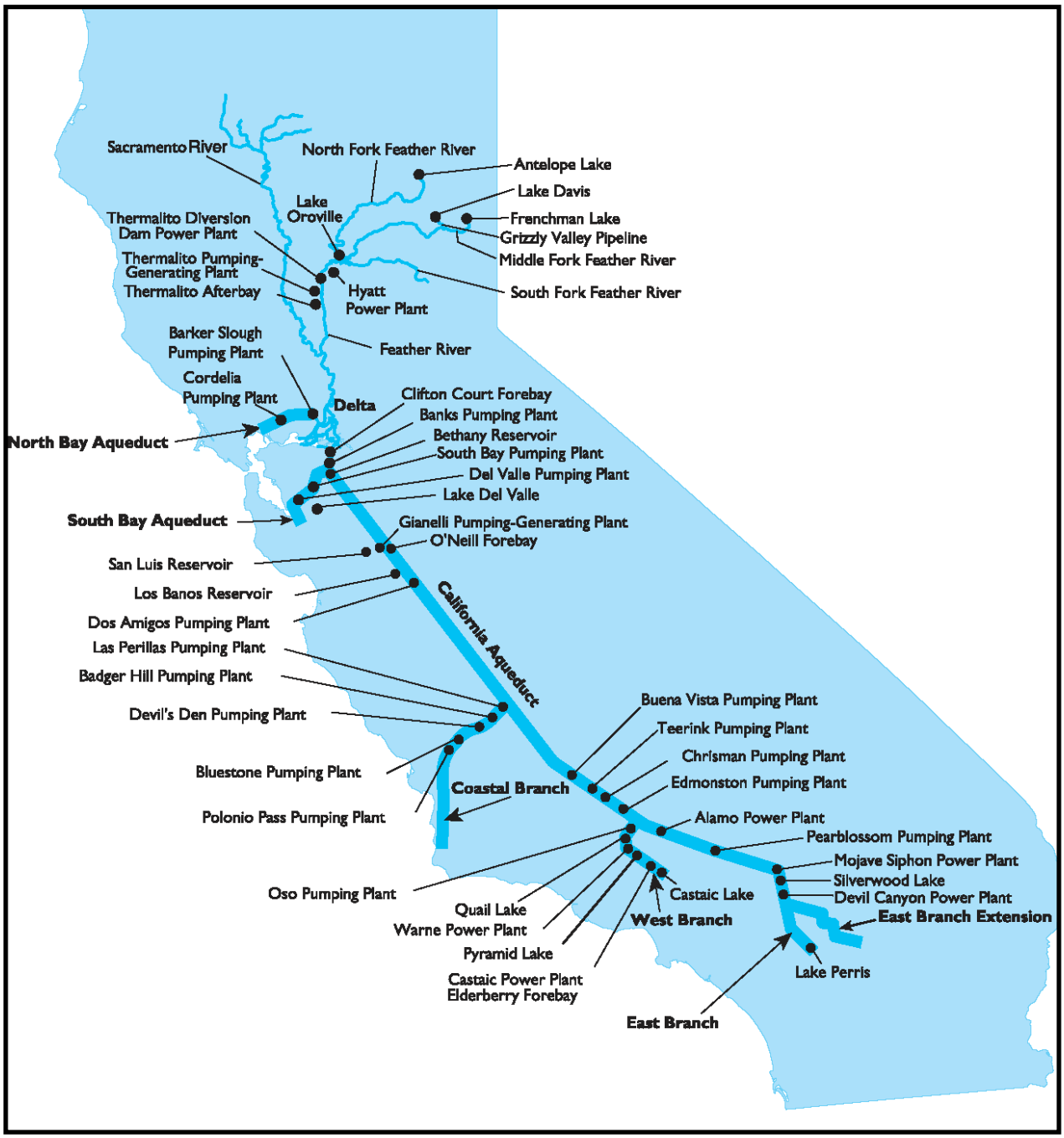
8.4.2.1 Complete Disruption of the East Branch of the California Aqueduct

The East Branch of the California Aqueduct begins at a bifurcation of the Aqueduct south of Edmonston Pumping Plant, which pumps SWP water through and across the Tehachapi Mountains. From the point of bifurcation, the East Branch is an open canal. Water is conveyed through the canal to the Mojave Siphon and Power Plant, which pumps water into Silverwood Lake where the turnout to the CLAWA and VALLEY DISTRICT service areas is located.

If a major earthquake (an event similar to or greater than the 1994 Northridge earthquake) were to damage a portion of the East Branch, deliveries could be interrupted. The exact location of such damage along the East Branch would be key to determining emergency operations by DWR and the East Branch SWP contractors. For this scenario, it was assumed that the East Branch would suffer a single-location break and deliveries of SWP water from north of the Tehachapi Mountains or of contractor water stored in groundwater banking programs in the San Joaquin Valley would not be available. It was also assumed that Silverwood dam would not be damaged by the event and that water in Silverwood Lake would be available to CLAWA and VALLEY DISTRICT.

An outage on the East Branch presents a worst-case scenario for CLAWA or VALLEY DISTRICT. In this scenario, CLAWA and VALLEY DISTRICT would rely solely on local supplies. An assessment of the supplies available to meet demands in LACSD's service area during a six-month East Branch outage and the additional levels of conservation projected to be needed are presented in Table 8-2 for 2010 through 2035.

FIGURE 8-1
PRIMARY SWP FACILITIES



During an outage, the local supplies available would consist of water from Lake Arrowhead and groundwater, and potentially local groundwater regulated by VALLEY DISTRICT through the CLAWA delivery system. To be conservative, local groundwater production is assumed to be one-half of normal and imported water from CLAWA I and II agreements in Table 3-1 is assumed to be one-half of the annual contract amount.

Table 8-2 shows that, for a six-month emergency outage, LACSD is in a fair position to handle the emergency outage due to the fact that the demands have decreased by approximately 40% since the SWRCB's 2006 Order was enacted and its SWP agreements with CLAWA and VALLEY DISTRICT can be backed up during an SWP outage by using VALLEY DISTRICT's groundwater supplies. In an emergency such as a SWP outage, additional conservation would likely be achieved through voluntary conservation, but mandatory measures would be enacted by LACSD if needed.

TABLE 8-2
PROJECTED SUPPLIES AND DEMANDS DURING
SIX-MONTH DISRUPTION OF IMPORTED SUPPLY SYSTEM

Water Supply Source	2010	2015	2020	2025	2030	2035
Wholesale Supplies[a]						
CLAWA/VALLEY DISTRICT Supply[b]	106	106	106	31[c]	31	31
Local Supplies						
Existing Supplies[d]						
Lake Arrowhead Surface Water	783	783	783	783	783	783
Groundwater Basin	113	113	113	113	113	113
Total Existing and Planned Supplies	**1002**	**1002**	**1002**	**896**	**927**	**927**
Demands						
Total Estimated Demands[e] (w/out Conservation)	861	861	861	882	904	927
Total Demand w/ Conservation[e]	**861**	**861**	**861**	**882**	**904**	**927**
Additional Conservation Required[f]	N/A	N/A	N/A	N/A	N/A	N/A

Notes:
(a) Assumes complete disruption in SWP supplies and in deliveries through the California Aqueduct for six months.
(b) Assumes CLAWA I and II contract amounts are supplied through VALLEY DISTRICT's groundwater basin supplies to represent 6 months supply of contract amount shown in Table 3-1.
(c) Assumes CLAWA II agreement ends in 2020.
(d) See Table 3-1. Annual supplies from Table 3-1 have been divided by 2 to represent 6 months of supply, with the exception of recycled water which is already accounted for by agreement to LACC and is not included as a supply in this table.
(e) Demands are assumed to be one-half of average/normal year demands (see Table 2-4). The demands are the same with and without conservation.
(f) No additional conservation is required.

8.4.3 Regional Power Outage Scenarios

For a major emergency such as an earthquake, Southern California Edison (Edison) has declared that in the event of an outage, power would be restored within a 24 hour period. For

example, following the 1994 Northridge earthquake, Edison was able to restore power within 19 hours. Edison experienced extensive damage to several key power stations, yet was still able to recover within a 24 hour timeframe.

LACSD

At this time approximately 85% of the District's water systems are equipped with permanent emergency power generation that will supply power during a catastrophic event. The remaining facilities are equipped to be supported by portable power generation and in the event of a catastrophic event the District would acquire and connect these portable units to supply power to keep the water supply system in operation.

8.5 Mandatory Prohibitions During Shortages

As discussed in Section 8.2, because of the Order WR 2006-0001, LACSD issued two ordinances to regulate water policy and usage. Ordinance No. 65 explains the water connection policy required to accommodate the SWRCB's Order and Ordinance No. 69 explains the required conservation policies imposed on LACSD users.

8.6 Consumptive Reduction Methods During Restrictions

8.6.1 Supply Shortage Triggering Levels

Water Code Section 350 provides that the District may declare a water shortage emergency to prevail within the area it serves when it finds that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply.

Also, due to the limitation imposed upon the District by the Order WR 2006-0001, the present nonpermanent and non-reliable availability of other sources for water and the current demands on the District for water, in a dry year or single-dry year period, the available supply of water may be less than necessary to satisfy all needs of the District's present and/or future Customers for all current water usages. Consequently, until the District secures a predictable and reliable source or sources of water, there is an immediate water shortage, necessitating conservation efforts and restrictions on unnecessary or non-essential uses of water to ensure that the District has sufficient water supplies for human consumption, sanitation and fire protection.

Table 8-3 presents the District's consumption reduction methods which reduce water use that are included in the District's Ordinance No. 69. The third stage of reductions in conjunction with other supplemental programs such as implementing the recycled water program was intended to produce more than a 50% reduction in water demand. Since the beginning of 2000, the District has seen almost a 40% reduction in water production.

TABLE 8-3
CONSUMPTION REDUCTION METHODS

Consumption Reduction Methods	Stage When Method Takes Effect	Estimated Reduction (%)
Mandatory Conservation[(a)]	Stage One	10%
Mandatory Conservation[(a)]	Stage Two	15%
Mandatory Conservation[(a)]	Stage Three	>40-50%

Note: (a) Refer to District Ordinance No. 69 for details. Currently, the District is experiencing almost a 40% reduction in usage due to mandatory conservation practices and supplemental supply programs.

8.6.2 Consumption Limits

Residential customers whose annual water use is greater than 200 Billing Units (equals 0.46 ac/ft or 149,600 gallons) on any District account in two of the preceding three years are required to complete a water use efficiency audit performed by an independent water use efficiency professional approved by the District.

The following restrictions and policies are now in effect and apply to the use of District water:

(1) Water Use Efficiency:

- Irrigation is only permitted on Monday, Wednesday and Friday.
- Leaks must be fixed immediately upon detection.
- Run-off is not permitted.

(2) Irrigation:

- Irrigation must be shut-off from October 16th through April 30th.
- Irrigation is only permitted between 6 pm and 8 am.
- Irrigation is only permitted on Monday, Wednesday and Friday.
- Irrigation is not permitted outside the boundary of the customer's parcel.
- Broken or out of adjustment sprinkler components must be shut off until repairs are completed.
- Landscaping may not be watered beyond what is needed for natural growth and to sustain life.

8.6.3 New Demand

On May 9, 2006, the District determined and declared a water shortage emergency and adopted Ordinance No. 65 establishing a Water Connection Policy of the District. Ordinance No. 65 established a yearly maximum limit of sixty (60) new permits for service within the LACSD.

8.7 Penalties for Excessive Use

The following section provides a summary of the penalties, if any, that are implemented for excessive water use for LACSD's service area, as outlined in Ordinance No. 69.

8.7.1 Penalties for Violation of Permanent Water Use Restrictions

The penalties and regulatory fees to be imposed for violations of any of the provisions of LACSD's Ordinance No. 69 are as follows:

1. For the first violation by any Customer of any of the provisions of this Ordinance, the District shall issue a written notice of the fact of such violation to the Customer.

2. For a second violation by any Customer of any of the provisions of this Ordinance within a calendar year, the District shall issue a written notice of the fact of such violation to the Customer and impose a penalty in the amount of 25% of the Customer's water consumption charges for the parcel of property where the violation occurred for the billing period in which the violation occurred.

3. For a third violation by any Customer of any of the provisions of this Ordinance within a calendar year, the District shall issue a written notice of the fact of such violation to the Customer and impose a penalty in the amount of 50% of the water consumption charges for the parcel of property where the violation occurred for the billing period in which the violation occurred.

4. For a fourth violation by any Customer of any of the provisions of this Ordinance within a calendar year, the District shall issue a written notice of the fact of such violation to the Customer and impose a penalty in the amount of 100% of the water consumption charges for the parcel of property where the violation occurred for the billing period in which the violation occurred.

5. After a fourth violation of any of the provisions of this Ordinance, the District shall issue a written notice of the fact of such violation to the Customer and may install a water flow restricting device of one gallon per minute (1 GPM) for service lines up to one and one-half inches (1-1/2") size and comparatively-sized restrictors for larger services or terminate a Customer's service, in addition to the regulatory fees and penalties provided for herein, upon a prior determination that the Customer has repeatedly violated this Ordinance or District rules and regulations regarding the conservation of water and that such action is reasonably necessary. A regulatory fee as established by the District's Rules and Regulations will be imposed on the Customer's account for any installation and removal of the flow restrictor or termination of District water service.

The water restrictor may be removed or water service restored after the Customer demonstrates that the cause of the violation has been corrected and that all fines, penalties and regulatory fees have been paid. The above penalties and regulatory fees shall be cumulative and applied in addition to the current charges of the District for Customer water consumption, including tiered rates applying to higher levels of water consumption.

Table 8-4 summarizes the penalties and charges for excessive use along with the stage when they take effect. Penalties for failure to comply with the Permanent Water Conservation Policies or the Mandatory Water Conservation Phases are further defined in District Ordinance No. 69.

TABLE 8-4
PENALTIES AND CHARGES

Penalties or Charges	Stage When Penalty Takes Effect
Surcharge 25% of affected month's water bill	Second offense
Surcharge 50% of affected month's water bill	Third offense
Surcharge 100% of affected month's water bill	Fourth offense
Installations of a flow restriction device	Fifth offense

Refer to District Ordinance No. 69 for details.

8.7.2 Penalties for Violation of Landscaping Standards

If District water is used in violation of the landscaping standards set forth in Section Five, Paragraph E of the Ordinance No. 69, the following penalties and regulatory fees will be imposed:

a) The first violation will result in a written notification sent to the Customer specifying the violation. The Customer must immediately cease using District water for any prohibited purpose or be subject to additional penalties and regulatory fees.

b) After 10 days of the date of initial written notification of violation, the continued prohibited use of District water will result in written notice of intent to install a flow restrictor. If all prohibited use of District water has not ceased within 72 hours of written notice of intent to install a flow restrictor, installation will result, and, consistent with District Rules and Regulations, the cost of installation of the flow restrictor will be assessed to the Customer's account.

c) After 10 days of the date of installation of a flow restrictor, the continued prohibited use of District water will result in written notice of intent to shut off the affected water meter. If all prohibited use of District water has not ceased within 72 hours of written notice of intent to shut off the affected water meter, the meter will be turned off, and, consistent with District Rules and Regulations, a fee will be assessed to the Customer's account. The meter will not be reinstated until the violation has been corrected and all fines, penalties and regulatory fees have been paid.

The above penalties and regulatory fees shall be applied in addition to the current District charges for water consumption, including fixed charges and tiered rates that may apply to water consumption. The water restrictor will be removed or water service restored after the Customer demonstrates that the cause of the violation has been corrected and that all fines, penalties and regulatory fees and penalties have been paid.

The District will not be responsible for any damages incurred by or resulting to the landscaping, irrigation system, or property caused by the restrictions established herein or by the water meter being shut off.

8.8 Financial Impacts of Actions During Shortages

The following section addresses the financial impacts of actions during water shortages for LACSD. Table 8-5 lists the current Water Conservation pricing in effect at the time this Plan was prepared.

TABLE 8-5
WATER CONSERVATION PRICING

Tier	LACSD Customers (Pricing Per 100 Cubic Feet)
1 (0 to 700 cubic feet)	$0.68
2 (800 to 1,300 cubic feet)	$1.74
(If monthly use is over 7, 1-13 CCF's charged at $1.74)	
3 (1,400 to 40,000 cubic feet)	$6.21
4 (41,000 cubic feet and above)	$12.93

The District's current fees and charges are collected through customers' monthly bills. In 2004, the amount of fees and charges collected on the monthly bill were not sufficient to fund the cost of the necessary water purchases and District facilities and a supplemental water fee was added to each customer's water bill. The objective of the fee was to diversify the District's water supply to fulfill its goal to eliminate reliance on the lake as the community's sole source of water supply. The supplemental fee will remain in effect through fiscal year 2018-2019.

The District carries reserves in the water system accounts, including a Rate Stabilization Fund. The balance of reserves the District has is maintained primarily for facility repair and replacement. Flexibility would exist to draw upon these reserves under a shortage crisis to handle extreme fluctuations in revenue and expenses.

8.9 Water Shortage Contingency Resolution

The District's Water Connection Policy is included as Ordinance No. 65. This Ordinance also authorizes the District Board of Directors to declare a water shortage emergency and adopt regulations and restrictions on the delivery and consumption of water.

Ordinance No. 69 states a "Permanent Water Use Efficiency Policy" for the LACSD that requires restrictions on District water use based on the declaration that water use in contravention of these practices constitutes a waste of District water and use of District water that is unnecessary and/or nonessential.

8.10 Mechanism to Determine Reductions In Water Use

In 2008 the District replaced all of its meters with an Automated Meter Reading (AMR) system. The primary goal of the program was to manage customer leaks; the secondary goal was to obtain better information about District customers and their water use patterns. All of the District's accounts are using the AMR system. The system can identify those homes showing a constant water use in the preceding 24 hour period, which most likely indicates a water leak. These reports are prioritized by volume and staff is immediately dispatched to the property. The AMR data are also used to ensure compliance with local ordinances, particularly the landscape watering restrictions. If customers are watering on non-irrigation days or during non-irrigation hours, this will show up on the Exception Report. Table 8-6 lists the District's water use monitoring mechanisms.

TABLE 8-6
WATER USE MONITORING MECHANISMS

Mechanisms For Determining Actual Reductions	Type And Quality Of Data Expected
Daily Monitoring of Water Production	Production in mgd
AMR	Individual consumption in CCF

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