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WATER SYSTEM MASTER PLAN FOR LOS ANGELES COUNTY WATERWORKS DISTRICT NO. 40 (ANTELOPE VALLEY)

DRAFT
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EXECUTIVE SUMMARY

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I. INTRODUCTION

The purpose of the Los Angeles County Water Works District No. 40 (Antelope Valley) Master Plan is to serve as a guide to system improvements during the next 20 years. The Master Plan sets forth evaluations of existing water demands and supply sources, existing water system deficiencies, and future water demands and supply sources. The results of those evaluations serve as the basis for establishing recommended facilities required to meet current and future customer water demands within each of District 40's service areas. The Master Plan also addresses alternative sources for meeting future supply requirements and alternative financing mechanisms for constructing the recommended facilities.

II. BACKGROUND

The Los Angeles County Waterworks District No. 40 (LACWWD) is a special water district formed pursuant to Division 16 of the State Water Code to supply water for urban use throughout the Antelope Valley. District No. 40 is the largest domestic water purveyor in the Antelope Valley, currently providing service to approximately 123,000 people. It comprises eight regions serving customers in the communities of Lancaster and Palmdale (Region Nos. 4 and 34), Pearblossom (Region No. 24), Littlerock (Region No. 27), Sun Village (Region No. 33), North East Los Angeles County (Region No. 35), Lake Los Angeles (Region No. 38), and Rock Creek (Region No. 39). Of these regions, the water system for Region Nos. 4 and 34 are integrated and operated as one water system, and the water systems for Region Nos. 24, 27, and 33 are integrated and operated as one water system.

In order to evaluate the capabilities of the existing system, and to identify facilities needed to meet future demands, hydraulic network models were created for each of District No. 40's water systems. Existing demands were established and distributed based on District No. 40 billing records. Future demands were based on population projections by Los Angeles County Department of Regional Planning and distributed based on existing growth patterns and

local/regional planning documents. Each model was adjusted (calibrated) for the existing system so that actual field conditions/responses were reproduced in model simulations. Once calibrated, the models were used to identify not only existing system deficiencies and remedies but also recommended future system facilities.

The following criteria were used to identify facilities necessary to remedy existing system deficiencies and facilities necessary to serve anticipated future demands:

- Ground water wells and booster pumping plants shall be capable of supplying customer demands for the highest day demand of the year (maximum day demand).

- Gravity storage capacity shall be capable of meeting maximum day demand for a 24 hour period plus fire flow, with no wells or booster pumping plants in operation.

- Pipeline capacities shall be adequate to meet various demand scenarios while generally limiting velocities to five feet per second (5 fps).

III. WATER DEMANDS AND SUPPLY REQUIREMENTS

LACWWD has historically met (and will continue to meet) water demands with a combination of imported water and ground water. With significant historic and projected growth, optimizing management of both sources of supply is chief among LACWWD priorities.

A. Existing Water Demands and Supply

The current population in LACWWD No. 40 is about 123,000 persons, constituting 39,200 service connections. In 1997, total water demand was about 47,600 acre feet (AF), of which about 60% (28,100 AF) was supplied by imported State Water Project (SWP) water purchased by LACWWD from the Antelope Valley East-Kern Water Agency (AVEK); the remaining 40% (19,500 AF) was supplied by ground water wells operated by LACWWD.

California Department of Water Resources (CDWR) reports that existing SWP facilities have a 65% chance of making full deliveries for current demands and will have a 25% chance of making full deliveries for projected 2020 demands. Availability of SWP water varies from year to year, depending on a number of factors (precipitation, regulatory restrictions, legislative restrictions, and operational considerations), and is especially unreliable during dry years. Therefore, LACWWD ground water supplies must be adequate to ensure customer demands can be met.

In addition to SWP availability fluctuations, LACWWD's ability to use AVEK supplies is currently limited to certain portions of District No. 40 due to transmission facility restrictions. The maximum quantity of water that can currently be purchased from AVEK for direct delivery to LACWWD customers is about 60% of District No. 40's demand.

In order to minimize impacts from uncertain deliveries and limited transmission facilities, and to maximize the use of imported water, LACWWD is conducting a three-year feasibility study (scheduled for completion in December 1999) in cooperation with AVEK and the United States Geological Survey (USGS) to assess Aquifer Storage and Recovery (ASR) capabilities in the Valley. The study consists of injecting SWP water (treated to drinking water standards) into the Lancaster ground water subbasin for subsequent extraction. The study has shown that an ASR program with SWP water in the Lancaster subbasin is feasible. LACWWD intends to actively pursue implementation of a full-scale ASR program, which will increase supply reliability by banking SWP water during wet months (October to March) for extraction when needed.

The production, transmission, storage, and distribution facilities recommended in the Master Plan as necessary to remedy existing deficiencies will be funded by existing customers. Various financing mechanisms are described and rated within the Master Plan.

B. Future Water Demands and Supply

The population in LACWWD No. 40 is projected to increase to as many as 370,000 persons by 2010 and to about 460,000 by 2020; projected water demands will increase accordingly. In order to meet the anticipated demands and to improve reliability, LACWWD will have to pursue various strategies, including: improved utilization of available supplies, protection of ground water quality, reduction of long-term water demands through implementing Best Management Practices (BMPs) for water conservation, improvement of SWP water supply reliability, purchase of additional imported water supplies, and enhanced/expanded management of the ground water basin.

The production, transmission, storage, and distribution facilities recommended in the Master Plan as necessary to meet anticipated additional demands will be funded by new customers; developers of large scale land developments will likely construct new facilities (in accordance with LACWWD Standards) for subsequent transfer to LACWWD.

IV. FUTURE ACTION

Prior to formal adoption of the Master Plan, LACWWD will prepare all required environmental reviews as outlined by the California Environmental Quality Act (CEQA) for the Plan as a whole. Depending upon the findings of the Initial Study for Environmental Assessment of the Master Plan, LACWWD will determine whether an Environmental Impact Report or Negative Declaration (mitigated or other) must be prepared. If, during the CEQA process, LACWWD determines that certain limited facilities identified in the Plan (e.g. distribution pipelines) are required to continue to provide a safe and reliable supply to its customers, individual environmental documents will be prepared as needed.

REPORT SUMMARY

PWS-0204-0012

REPORT SUMMARY

The following represents a summary of the Water System Master Plan for Los Angeles County Waterworks District No. 40, Antelope Valley (LACWWD). The summary's format approximates that of the general text, and emphasizes the most important elements of each chapter of the Water System Master Plan.

I. INTRODUCTION

The purpose of the District No. 40 Water System Master Plan is to serve as a guide for system improvements during the next 20 years, or until a subsequent Master Plan revision is prepared. The Master Plan sets forth evaluations of existing water demands and supply sources, existing water system deficiencies, and future water demands and supply sources. The results of those evaluations serve as the basis for establishing recommended facilities required to meet current and future customer water demands within each of District 40's service areas. The Master Plan also addresses alternative sources for meeting future supply requirements and alternative financing mechanisms for constructing the recommended facilities.

Recommended system improvements are based on certain planning assumptions with regard to population growth and community development. If population growth and community development vary from the planning assumptions relied upon, LACWWD may have to advance the construction schedule in order to meet actual demands if they exceed projected demands. Conversely, it may be possible for LACWWD to defer construction of those same facilities if actual demands are less than projected demands.

LACWWD is the largest domestic water purveyor in the Antelope Valley. District No. 40 is a special water district formed pursuant to Division 16 of the State Water Code to supply water for urban use throughout the Antelope Valley. It comprises eight regions serving customers in the communities of Lancaster and Palmdale (Region Nos. 4 and 34), Pearblossom (Region No. 24), Littlerock (Region No. 27), Sun Village (Region No. 33), North East Los Angeles County (Region No. 35), Lake Los Angeles (Region No. 38), and Rock Creek (Region No. 39). District

No. 40 currently has an area of approximately 190 square miles within the boundaries of its eight regions, and an additional 364 square miles within the boundaries of the respective Spheres of Influence of the various regions. District No. 40's service area population is currently estimated to be approximately 123,000 people, with single family residential customers estimated to average 3.17 persons per water service connection.

The District No. 40 domestic water system consists of 42 wells (with a combined capacity of 38,500 gpm), 17 well site booster pumping plants, 13 interzone booster pumping plants, 51 water storage reservoirs (with a combined capacity of 59 MG), and over 800 miles of transmission and distribution pipelines, as well as 13 connections to imported water supplies provided by the Antelope Valley East-Kern Water Agency (AVEK).

II. WATER DEMANDS AND SUPPLY REQUIREMENTS

The population within District No. 40's service area is projected to increase from about 123,000 persons currently to as many as 373,000 persons by 2010 and to approximately 460,000 persons by 2020 (the 2010 and 2020 figures assume that all areas currently within the various Spheres of Influence will be annexed to existing regions). Correspondingly, the average number of service connections is expected to increase from about 39,200 currently to about 124,500 services by 2010 and to approximately 159,600 services by 2020.

Based on projected per-unit water demand, annual water supply requirements may increase from about 47,600 acre feet per year (AF/Yr) in 1997 to as much as 125,200 AF/Yr by 2010 and to 152,600 AF/Yr by 2020. Supply requirements fluctuate throughout the year, and are influenced primarily by seasonal temperatures. The necessary water supply, storage, and transmission capabilities of the water system with each of District No. 40's regions is dictated by various factors, including current and projected demands, fire flow requirements, equalization requirements, and emergency storage and conveyance requirements.

III. WATER SUPPLY

Historic water supply requirements within the Antelope Valley have varied considerably over time. Annual supply requirements peaked in the early 1950s at over 225,000 AF/Yr; most was produced from wells and was supplied to agricultural users. Agricultural uses within the Valley declined starting in the mid to late 1950s, leading to dramatic reductions in water demand; by 1990, supply requirements for all uses had declined to 128,000 AF, much of which (about 45%) was surface water supplied to the Valley through the State Water Project (SWP). Water supply requirements within the Valley began increasing again in the early 1990s in response to increased demands from the residential, commercial, and industrial sectors. LACWWD supply increased from approximately 19,400 AF in 1985 to 47,500 AF in 1997.

The Antelope Valley Ground Water Basin (hereafter Basin) is comprised of two primary aquifers (commonly referred to as the deep aquifer and the principal aquifer), and is divided into twelve subunits. Ground water levels within the Basin declined by as much as 200 feet between 1915 and 1988 in the Lancaster area, which lead to some subsidence (lowering of ground surface elevations) in certain areas. Ground water levels may have recovered somewhat in recent years due to reduced water production and increased use of imported water. According to the USGS, the safe yield of the Basin is estimated to be somewhere between 31,200 AF/Yr and 59,100 AF/Yr.

SWP deliveries to the Antelope Valley began in 1972 and are made by three SWP contractors: AVEK, Palmdale Water District (PWD), and Little Rock Creek Irrigation District (LCID). The three contractors have a combined entitlement of 158,000 AF/Yr, of which about 153,800 AF/Yr is thought to be available to Valley users. However, historic SWP deliveries have fluctuated and, based upon the fact that the SWP cannot supply 100% of state-wide entitlements, the actual amount available to the Valley is less. SWP deliveries within the Valley between 1983 and 1995 varied between 9% and 69% of total entitlements. Reclaimed water may eventually become available in sufficient quantities to augment SWP water as a source of supply for various purposes (e.g. irrigation, recharge) within the Valley as a whole and District No. 40 in particular.

Growth within the Valley is projected to be considerable over the course of the planning period, which will in turn result in increased water supply requirements. Various alternatives are available for supplying the required quantities; the recommended strategy includes improved utilization of available supplies, protection of ground water quality, reduction of long term water demands (on a per capita basis), improvement of SWP supply reliability, purchase of additional imported water supplies, and enhanced/expanded management of the Basin.

IV. EXISTING WATER SYSTEM FACILITIES

The existing water system within District No. 40 consists of 42 wells, 17 well site booster pumping plants, 13 interzone booster pumping plants, 51 water storage reservoirs, over 800 miles of transmission and distribution pipelines, and 13 connections to AVEK's imported water supply system. As of 1997, there were 39,200 active service connections within District No. 40, of which 25,000 (or 64%) were located within Region 4's Pressure Zone 2555, which is in turn located in the Lancaster area.

District No. 40's existing system consists of eight separate regions, Regions 4, 24, 27, 33, 34, 35, 38, and 39. Regions 4 and 34 are by far the largest, accounting for about 87% of total water demands. District No. 40's 42 wells have a combined production capacity of approximately 38,500 gpm. District No. 40's 30 booster pumping plants are used to pump water from well sites to storage reservoirs and from lower zones to higher zones. The 51 storage reservoirs currently in service have a combined storage capacity of 58 MG; however, only 47 MG of said total is available in the form of gravity service level storage (i.e. capable of providing service during pumping plant or power failures).

V. WATER SYSTEM MODELS

The water system within each of District No. 40's eight regions was replicated in a computer modeling program known as CYBERNET, an AutoCAD based hydraulic network analysis program. The models were then operated in a manner that simulated the operation of actual

facilities and the results used to evaluate each system's effectiveness, identify existing deficiencies, and assess the ability of proposed improvements to remedy the deficiencies.

The model of each system was based upon LACWWD distribution sheets and other record data, and included reservoirs, pipelines (with C-values assigned according to each pipe segment's material and age), and pumping units (with pump characteristics derived from SCE pump tests). Operational scenarios were created based upon system records and operational data, and daily demand fluctuations were established using the Los Angeles County Department of Public Works (LACDPW) Design Manual. Demands were distributed based upon LACWWD metered consumption records for each region for the years 1995, 1996, and 1997.

The models were calibrated before the analyses were conducted. Calibration consisted of using pressure recorders to measure pressure fluctuations at various points in each system under varying demands, and of measuring flow rates at various types of facilities (e.g. fire hydrants, booster pumping plants). The results of the calibration indicated that pressures anticipated by the model were generally within 10% of actual.

The results of the model run indicated a number of existing deficiencies within each region. Most deficiencies had to do with supply and storage shortfalls, rather than pipe sizes or materials. The deficiencies noted in the model runs were used to compile the list of existing system reinforcements described in the Recommended Improvements chapter (see below).

VI. RECOMMENDED WATER SYSTEM IMPROVEMENTS

In order to meet current water supply requirements in the affected regions, LACWWD will consider constructing 22 new wells in Regions 4 and 34; four new wells in Regions 24, 27, and 33; five new wells in Region 38; and one new well in Region 39.

In order to meet projected water supply requirements in the affected regions, LACWWD (and/or developers) will consider constructing 108 additional new wells in Regions 4 and 34; 9 additional new wells in Regions 24, 27, and 33; one new well in Region 35; 16 additional new wells in

Region 38; and two additional new wells in Region 39. Also, additional connections with AVEK's treated water supply system will be required to enable LACWWD to maximize its use of imported water in meeting annual water demands. In order to supply the District's projected demands, AVEK will have to expand its Quartz Hill Plant from 65 MGD to approximately 97 MGD and construct additional transmission facilities.

In order to meet current storage requirements in the affected regions, LACWWD will consider constructing new storage reservoirs with a combined capacity of approximately 54 MG immediately, including 47 MG for Regions 4 and 34; 2 MG for Regions 24, 27, and 33; 4 MG for Region 38; and 1 MG for Region 39.

In order to meet projected storage requirements in the affected regions, LACWWD (and/or developers) will consider constructing additional new storage reservoirs with a combined capacity of approximately 159 MG over the next twenty two years, including 141 MG for Regions 4 and 34; 7 MG for Regions 24, 27, and 33; 10 MG for Region 38; and 1 MG for Region 39. Additional storage may be constructed after 2020, depending upon the extent and distribution of future development.

In order to improve transmission capacity within and between the various pressure zones within District No. 40's eight regions, LACWWD will consider constructing several new segments of transmission pipeline in several portions of the District No. 40 service area. Transmission system improvements required immediately include 56,000± LF of 36" diameter pipeline, 18,800± LF of 30" diameter pipeline, 15,000± LF of 24" diameter pipeline, 23,000± LF of 16" diameter pipeline, and 18,000± LF of 12" diameter pipeline. Transmission system improvements required for projected development may consist of the construction of up to 12,000± LF of 48" diameter pipeline, 34,000± LF of 42" diameter pipeline, 80,000± LF of 36" diameter pipeline, 24,000± LF of 30" diameter pipeline, 80,000± LF of 24" diameter pipeline, 74,000± LF of 20" diameter pipeline, 93,000± LF of 16" diameter pipeline, and 410,000± LF of 12" diameter pipeline, along with required appurtenances.

If the District decides to fund the recommended improvements through direct financing, facility priorities must be established. Since District 40 is heavily dependent on AVEK deliveries, production facilities (i.e. wells) should be given highest priority in order to provide some redundancy should AVEK stop deliveries for an extended period of time. Once sufficient production facilities have been constructed, storage facilities should be given priority. This will provide short term emergency storage even if it is provided at reduced pressures.

VII. PROJECT FINANCING

There are a number of financing programs available to public agencies for funding various types of projects and programs, including potable water and reclaimed water facilities and source water quality protection. The programs typically offer low interest rates (sometimes as low as 0%), and some also offer grants for projects benefiting low income areas. Competition for the available funds is often fierce owing to the considerable cost savings that can be realized. Local agencies can also arrange their own funding through bond sales and the collection of various taxes, rates, fees, and charges.

New development is generally required to pay for the facilities necessary to serve it; funds are collected in the form of capital facility charges and distribution facility charges, and developers often construct their own on-site facilities. It is therefore not necessary for local agencies (such as LACWWD) to arrange financing for the construction of facilities for the benefit of new development; however, constructing facilities necessary to remedy deficiencies in existing facilities that serve existing customers does require financing, and should be done in a manner that reduces hardships for those customers.

Because the populations of the eight regions within District No. 40 vary widely, the recommended strategy for financing improvements necessary to eliminate existing deficiencies is organized into two elements, one pertaining to the three relatively populous regions (Regions 4, 34, and 38) and the other pertaining to the five less developed regions (Regions 24, 27, 33, 35, and 39). The reason for the separate strategies is based upon the nature of available funding

programs, the scope of necessary facilities, and the potential for realizing economies of scale within the three more populated regions.

The recommended strategy for the three larger regions consists of creating a list of urgently needed facilities and a list of facilities that can be deferred. The urgently needed facilities would be funded through a bond sale of sufficient size to realize reduced bond issuance expenses (in relative terms). The deferred facilities would be funded directly as LACWWD accumulates funds through rates and fees. Funds necessary to both repay the bonds and pay for directly funded facilities would be collected through a phased series of fee and/or rate increases.

The recommended strategy for the five smaller regions consists of assembling packages of projects within each region and submitting applications to the U.S. Department of Agriculture, Rural Development (USDA-RD) to fund as many improvements as possible through the low cost Water and Wastewater Loan/Grant Program. Additional facilities can be financed either directly or through bond issues; in the latter case, facilities should be packaged with facilities from the larger regions in order to minimize bond issuance expenses. Again, funds necessary to repay borrowed funds and pay for directly financed facilities would be collected through a phased series of rate and/or fee increases.

CHAPTER I

CHAPTER I
INTRODUCTION

The Los Angeles County Department of Public Works (hereafter LACDPW) is the largest retail water purveyor in the Antelope Valley, currently serving about 123,000 people through approximately 39,200 active service connections. LACDPW has designated the Antelope Valley for service by Los Angeles County Waterworks District No. 40 (hereafter LACWWD), which is a special water district formed pursuant to Division 16 of the State Water Code to supply water for urban use. It comprises eight regions serving customers in the communities of Lancaster and Palmdale (Region Nos. 4 and 34), Pearblossom (Region No. 24), Littlerock (Region No. 27), Sun Village (Region No. 33), North East Los Angeles County (Region No. 35), Lake Los Angeles (Region No. 38), and Rock Creek (Region No. 39). Regions 4 and 34 are adjacent to each other and are operated jointly by LACWWD; similarly, Regions 24, 27, and 33 are in close proximity to each other, and LACWWD operates their systems jointly.

The purpose of the District No. 40 Water System Master Plan is to serve as a guide for system reinforcements and improvements during the next 10 to 20 years. This Water System Master Plan reflects current and anticipated conditions within the District No. 40 service area, and presents projected water requirements and recommended system reinforcements and improvements based on said conditions. Proposed system improvements and related capital expenditures are limited to 2020 since estimates and projections beyond twenty years cannot be made with any degree of certainty. The system improvements recommended herein are considered to be reasonably accurate, particularly through 2010; however, the Water System Master Plan may have to be revised from time to time as conditions and trends change.

A. PROJECT PLANNING AREA

District No. 40 is situated in the Antelope Valley, which lies in the southwesterly portion of the Mojave Desert, southeasterly of the Tehachapi Mountains, and northeasterly of the San Gabriel Mountains; see Figure I-1, the Vicinity Map.

District No. 40 and its Sphere of Influence (SOI) encompasses about 554 square miles of the 2,400± square mile area of Valley floor and adjacent foothills of the Antelope Valley (190 square miles within District No. 40, 364 square miles within SOI); see Figure I-2, the District No. 40

Region Boundary Map. Of the 554 square miles, approximately 5 square miles are public lands (and therefore undevelopable) under the jurisdiction of the United States Bureau of Land Management (USBLM), so there are about 549 square miles of land within District No. 40 and its SOI that are available for development.

The Project Planning Area constitutes the portion of the Antelope Valley wherein LACWWD either already provides or is prepared to provide water service. Existing development primarily occupies Regions 4 and 34. It also occupies portions of the remaining regions, which are situated southerly, southeasterly, and easterly of Regions 4 and 34. Future development is expected to occur within Regions 4 and 34 primarily as infill and as new development westerly of the cities of Lancaster and Palmdale, and in undeveloped areas within the remaining regions.

1. Existing Environment

The Antelope Valley encompasses approximately 2,400 square miles in northern Los Angeles County, southern Kern County, and western San Bernardino County. The Valley is bordered on the southwest by the San Gabriel Mountains, on the northwest by the Techachapi Mountains, and on the east by a series of hills and buttes that generally follow the San Bernardino County line. The Los Angeles County portion of the Valley includes the major communities of Lancaster and Palmdale, and the smaller communities of Littlerock and Lake Los Angeles.

Ground surface elevations within the Antelope Valley range between 2,300 feet and 3,500 feet above sea level. Temperatures often exceed 100°F during summer months, with a mean temperature range between 63°F and 93°F. During winter months, the mean temperature ranges between 34°F and 57°F.

Average precipitation within the Antelope Valley watershed ranges between five and ten inches/year, from less than five inches/year along the northerly boundary of the Valley to about ten inches/year along the Valley's southerly boundary. Most precipitation occurs between October and March; however, short duration thundershowers do sometimes

occur during the summer months. Ground water replenishment is estimated in various studies to range between 31,200 and 59,100 AF/Yr. See Chapter III for a detailed description of the Valley's water resources.

2. History and Economy

Before the 1940s, human activity within the Antelope Valley was largely confined to Native Americans, miners, and pioneering agricultural families. Significant growth began with rapidly increasing military and agricultural activity during and immediately after World War II. The military presence resulted from the opening of Muroc Army Air Base, which was subsequently renamed Edwards Air Force Base (AFB) in memory of Captain Glen Edwards, who was killed while test flying an experimental bomber in 1948. By about 1953, agricultural uses occupied approximately 73,000 acres producing primarily feed crops such as alfalfa, barley, and wheat.

Land uses in the Valley have been transitioning from agricultural uses to residential and commercial uses for some time. By 1993, only about 12,800 acres remained in agricultural production. Some industrial growth has occurred, much of which is associated with the aerospace industry. The Valley is also mined for various minerals, including borate, aggregate, and salt. Nevertheless, employment within the Valley is limited, with a large percentage of the population commuting to jobs in the southerly portions of Los Angeles County.

B. WATER SYSTEM FACILITIES

The existing water system within District No. 40 consists of 42 wells, 17 well site booster pumping plants, 13 interzone booster pumping plants, 51 water storage reservoirs, and over 800 miles of transmission and distribution pipeline. In addition, there are 13 connections with an imported water supply system owned and operated by the Antelope Valley East-Kern Water Agency (AVEK), which supplies certain of District No. 40's regions with treated State Water Project (SWP) water transported to the Valley through portions of the California Aqueduct. As of

1997, there were approximately 39,200 active service connections within District No. 40, of which about 25,000 (or 64%) were located within Region 4's Pressure Zone 2555, which serves portions of the Lancaster area.

LACWWD operates, maintains, and improves the District No. 40 water system so that it is capable of meeting demands for existing and continuing land development, and corresponding increases in population. System improvements are constructed as needed to provide continued service to existing customers and to future customers. Facilities are designed and constructed to accommodate weather and terrain extremes, meet existing seismic requirements, and provide basic water service. The system improvements recommended herein are intended for development of those water supply facilities and water service facilities that are required to meet immediate as well as long range demands, all in accordance with current land use general plans and zoning maps.

C. PLAN PREPARATION

Preparation of the District No. 40 Water System Master Plan involved the following:

- Conferences with LACWWD and LACDPW Staff;
- Review of District No. 40 data and records;
- Inspection and evaluation of existing water system facilities;
- Review of available population data, including projections;
- Review of existing and proposed land use data;
- Determination and distribution of existing and future water requirements;
- Preparation of computer models and analysis of existing and proposed systems;
- Determination of required water system improvements;
- Establishment of improvement construction schedule and capital cost estimates;
- Development of estimated improvement capital costs;
- Summary of findings; and
- Workshops with the County Board of Supervisors and public attendees.

Water supply, water storage, and water delivery data developed and collected by LACWWD were essential in determining water supply and facility requirements. LACWWD collects supply and storage data with sufficient accuracy to permit determination of maximum month and average annual demands. Maximum day and peak hour demands were determined utilizing established peaking factors. In addition, water meter records are sufficient to define the geographic distribution of water demands within the service area with reasonable accuracy. In the future, better water supply, water storage, and water delivery data may become available; as better data becomes available, it should be compared with existing data to confirm estimated water demands and supply requirements.

D. FUTURE ACTION

Prior to formal adoption of the Master Plan, LACWWD will prepare all required environmental reviews as outlined by the California Environmental Quality Act (CEQA) for the Plan as a whole. Depending upon the findings of the Initial Study for Environmental Assessment of the Master Plan, LACWWD will determine whether an Environmental Impact Report or Negative Declaration (mitigated or other) must be prepared. If, prior to formal adoption of the Plan and during the CEQA process, LACWWD determines that certain limited facilities identified in the Plan (e.g. distribution pipelines) are required to continue to provide a safe and reliable supply to its customers, individual environmental documents will be prepared as needed.

E. ABBREVIATIONS AND DEFINITIONS

Since the District No. 40 Water System Master Plan incorporates a number of abbreviations and terms which may be unfamiliar, the following explanations are set forth for the reader's convenience.

1. Abbreviations

a.	AF	Acre Foot or Feet
b.	AFB	Air Force Base

c.	AF/Yr	Acre Foot or Feet per Year
d.	AICUZ	Air Installation Compatible Use Zone(s)
e.	ASR	Aquifer Storage and Recovery
f.	AVEK	Antelope Valley-East Kern Water Agency
g.	BMP	Best Management Practice(s)
h.	ccf	Hundred Cubic Feet
i.	CDHS	California Department of Health Services
j.	CDWR	California Department of Water Resources
k.	CEQA	California Environmental Quality Act
l.	CIWMB	California Integrated Waste Management Board
m.	CSDLAC	County Sanitation Districts of Los Angeles County
n.	DOA	Department of Airports (Los Angeles County)
o.	fps	Feet Per Second
p.	gpcd	Gallons per Capita per Day
q.	gpm	Gallons per Minute
r.	LF	Linear Feet
s.	LCID	Little Rock Creek Irrigation District
t.	LACDPW	Los Angeles County Department of Public Works
u.	LACWWD	Los Angeles County Water Works District No. 40
v.	MCL	Maximum Contaminant Level
w.	MG	Million Gallons
x.	MWD	Metropolitan Water District of Southern California
y.	NEPA	National Environmental Policy Act
z.	OPPR	Off-Peak Power Rates
aa.	PWD	Palmdale Water District
bb.	PBMP	Potential Best Management Practice(s)
cc.	psi	Pounds per Square Inch
dd.	RWQCB	Regional Water Quality Control Board(s) (California)
ee.	SCAG	Southern California Association of Governments
ff.	SOI	Sphere of Influence
gg.	SWRCB	State Water Resources Control Board (California)

hh.	SWTR	Surface Water Treatment Regulations
ii.	TDS	Total Dissolved Solids
jj.	THMs	Trihalomethanes
kk.	ULF	Ultra Low Flow
ll.	USBLM	United States Bureau of Land Management
mm.	USDA-RD	United States Department of Agriculture, Rural Development
nn.	USEPA	United States Environmental Protection Agency
oo.	USGS	United States Geological Survey
pp.	UWMP	Urban Water Management Plan
qq.	VOC	Volatile Organic Constituent
rr.	WRP	Water Reclamation Plant

2. Definitions

a. Acre Foot or Feet

When discussing water quantities, an acre foot is the quantity of water required to cover one acre (43,560 square feet) to a depth of one foot. An acre foot contains 43,560 cubic feet, or 325,850 gallons, of water.

b. Artificial Ground Water Recharge (also Artificial Recharge)

The intentional use of imported water or reclaimed water to recharge/replenish ground water supplies. Artificial ground water recharge is usually accomplished by the construction of either infiltration/percolation basins or injection wells; the former accomplish recharge by allowing water to infiltrate and percolate to ground water, while the latter directly inject water into the ground water body. Artificial recharge is depicted on Figure I-3.

c. Basin Safe Yield (also Safe Yield)

The quantity of ground water that can be extracted from an aquifer that does not exceed average net annual recharge and thus does not lead to depletion of ground water in storage. For example, if an aquifer's average net annual recharge is 2,000 AF/Yr, that aquifer's maximum safe yield is 2,000 AF/Yr. Exceeding safe yield over the long term leads to ground water overdraft.

d. Black Water

Any water that contains human, animal, or food wastes.

e. Conjunctive Water Use (also Conjunctive Use)

The use of two or more water sources in conjunction with each other. Generally, conjunctive use consists of the use of ground water supplies together with surface water supplies, the latter consisting of either local water (i.e. from streams or lakes), imported water, or reclaimed water. Conjunctive use can take many forms; for instance, ground water can be used for domestic supply at the same time that reclaimed water is used for irrigation purposes. The intent of conjunctive use is to ensure balanced use (thereby maintaining ground water levels) over the long term, with surface water supplies used during periods of increased precipitation, and ground water supplies used during periods of limited precipitation (e.g. critically dry or drought years).

f. Consumptive Water Use/Nonconsumptive Water Return (also Consumptive Use/Nonconsumptive Return)

Consumptive water use is that portion of each unit of water that is actually used by the consuming organism (e.g. animal or plant). The portion that is unused and is returned to the ground water body is referred to as nonconsumptive water

return. Both are usually expressed as a percentage, and represent an estimate only. Consumptive use is the water that is subsequently carried away (usually in the atmosphere) following mechanisms such as evapotranspiration and evaporation. For example, if 1,000 gallons of water were applied to turf in an area with 60% consumptive use and 40% nonconsumptive return, 600 gallons would be considered consumed and therefore unavailable for ground water recharge, while the remaining 400 gallons would be considered recharge to the ground water body.

g. Demand

Demand is the amount of water needed by all classifications of user (e.g. residential, industrial, commercial) over a specific period. Maximum month demand is the month during which water demands are at their highest, and typically occurs in July or August in the northern hemisphere. Maximum day demand (MDD) is the day during which water demands are at their highest, and also typically occurs in July or August. Peak hour maximum day demand (PHD) is the hour during which water demands peak, and typically occurs in the early afternoon of the maximum demand day. Minimum hour maximum day demand is the hour of the maximum demand day during which demands are at their daily minimum, and typically occurs in the early morning hours. Average demand is the average amount of water needed by all classifications of user, and can be expressed in terms of average annual, monthly, daily, or hourly use.

h. Forebay

A water storage facility (e.g. welded steel tank) that serves as the source of supply for a booster pumping plant, which pumps water from the forebay either into a distribution system (to maintain service level pressure) or to a higher pressure zone (for subsequent storage and distribution). Water stored in a

forebay is not considered available for emergency purposes, as it is dependent upon pumping facilities (rather than gravity) to provide service level pressure.

i. Gray Water

Non-toilet household wastewater, such as wash water from kitchen sinks, bathroom sinks and tubs, and laundry tubs.

j. Ground Water Basin (also Basin)

An underground water body that is confined by various types of impermeable geologic structures, such as significant upthrusts of subterranean bedrock (known as barriers) or mountain ranges. District No. 40's boundaries overlie the Antelope Valley Ground Water Basin.

k. Ground Water Overdraft (also Overdraft)

A phenomenon that results from producing more water from a ground water basin/subbasin than is recharged (in net terms) over the long term. For example, producing 2,500 AF/Yr from a basin that is only recharged with 1,500 AF/Yr results in ground water overdraft (hereafter referred to as overdraft) of 1,000 AF/Yr. Ground water overdraft is also considered to be ground water mining.

l. Imported Water

Water that is brought into an area from an external source. One of the primary sources of imported water in Southern California is the SWP, which conveys water to the region from Northern California through the California Aqueduct; said Aqueduct consists of storage reservoirs, power generating stations, pumping stations, canals, and pipelines.

m. In-Lieu Ground Water Recharge (also In-Lieu Recharge)

A method for decreasing the rate of ground water extractions. In-lieu ground water recharge (hereafter referred to as in-lieu recharge) consists of substituting other sources of water supply (such as imported water or reclaimed water) for ground water.

n. Natural Ground Water Outflow (also Natural Outflow)

The process by which ground water basins/subbasins are naturally depleted. Generally, natural ground water outflow (hereafter referred to as natural outflow) consists of seepage from one basin to an adjacent basin, the latter of which has a lower water level. Natural outflow also occurs when ground water reaches ground surface and evaporates, a common phenomena at dry lake beds in California deserts.

o. Natural Ground Water Recharge (also Natural Recharge)

The process by which ground water supplies are naturally replenished. Natural ground water recharge (hereafter referred to as natural recharge) consists of water infiltrating the ground surface and percolating to ground water. There are several sources of natural recharge, such as precipitation, rivers, and lakes. Natural recharge is depicted on Figure I-3.

p. Pumping Depression

A localized reduction in ground water levels that results from ground water extraction. A pumping depression is depicted on Figure I-4.

q. Reclaimed Water

Treated wastewater that is then filtered and disinfected (to remove disease-causing organisms such as bacteria, viruses, *cryptosporidium*, and *giardia lamblia*) to an extent that allows it to be used for any purpose other than domestic consumption, such as irrigation of food crops, golf courses, or greenbelts.

r. Service Level Storage

A water storage facility (e.g. welded steel tank) located at an elevation sufficient to provide service level pressure (e.g. 40 psi) within a water distribution system using gravity as the sole energy source. Service level storage is considered the only reliable source of emergency water storage, as it is not vulnerable to long term interruptions in power availability such as those likely to occur following a major disaster (e.g. high Richter magnitude earthquake, widespread flooding, large fire).

s. Specific Yield

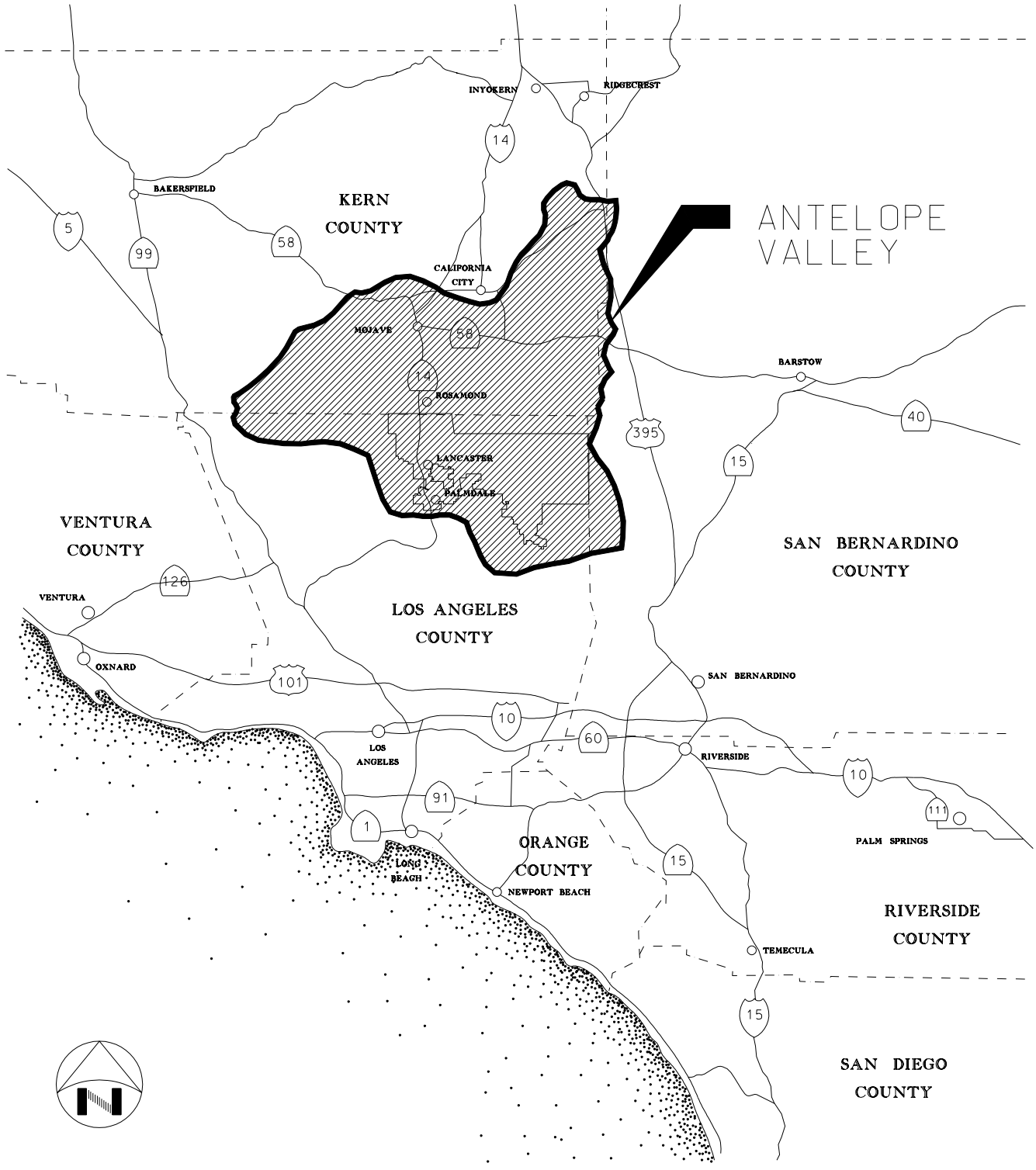
That portion of the water bearing geologic structure (referred to as the saturated zone) of a ground water basin or subbasin that consists of extractable water; usually expressed as a percentage. For example, if the saturated zone of a ground water subbasin consists of 1,000,000 AF of saturated geologic deposits (e.g. sands, gravels, boulders) and the estimated specific yield is 15%, the quantity of extractable ground water is estimated to be 150,000 AF (1,000,000 x .15 = 150,000). It should be noted that specific yield is always expressed as an average (since geologic conditions can vary considerably within basins and subbasins), and represents an estimate only.

t. Sphere of Influence

A plan for the probable physical boundaries and service area of a local agency, as determined by the Local Agency Formation Commission (LAFCO).

u. Zone of Influence

In the context of ground water production, the area within an aquifer that experiences some reduction in ground water levels as a result of the extraction of water from a well through the operation of a well pumping plant. The zone of influence is the entire area within a specific well's pumping depression (see Figure I-4).



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LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

WATERWORKS DISTRICT No. 40 WATER SYSTEM MASTER PLAN

VICINITY MAP

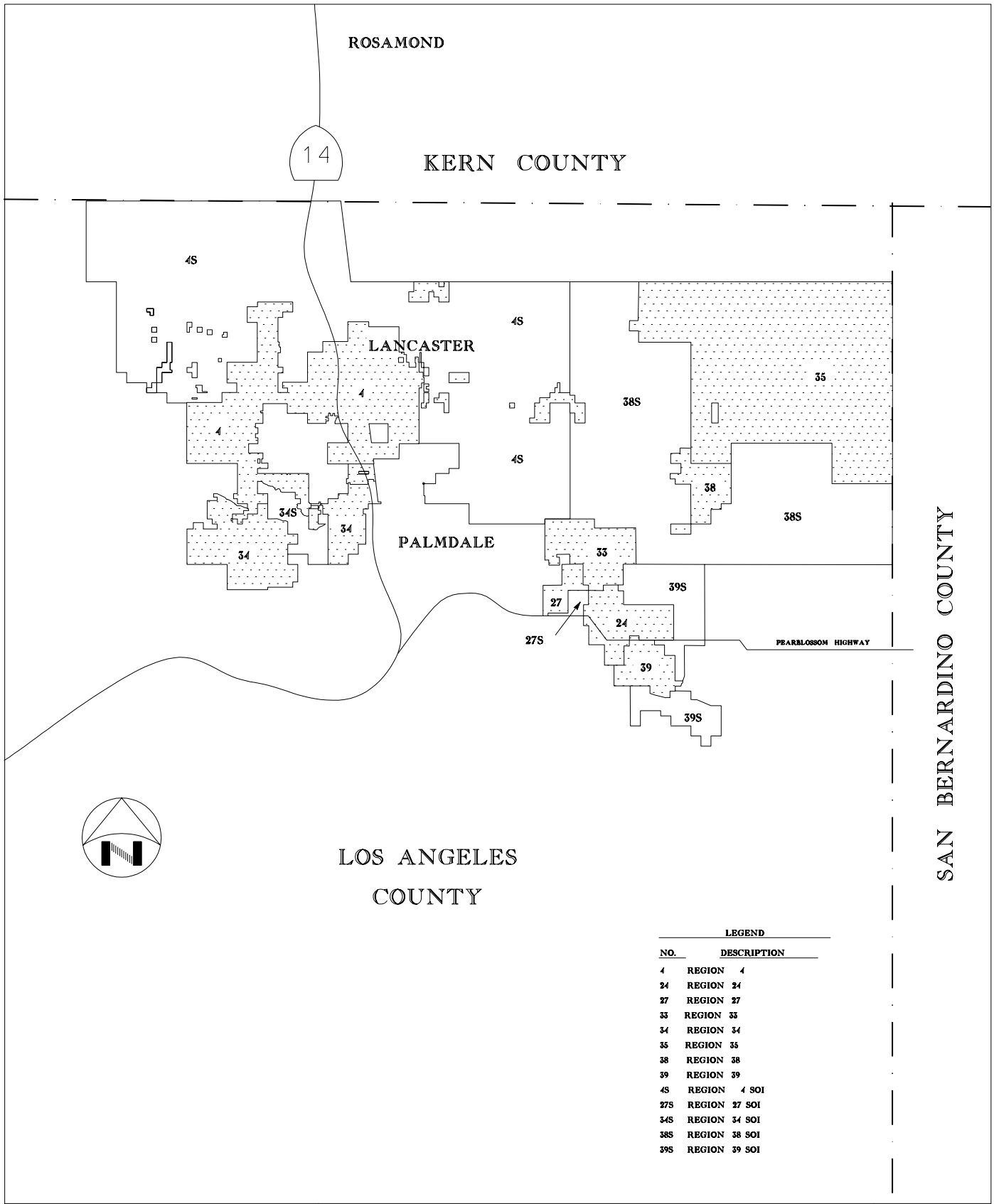
FIGURE

I-1

SCALE: N.T.S. DATE: 9/16/98 DRAWN BY: SFM CHECKED BY: RDF W.O.: 784-16.1

16f1

PWS-0204-0035



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WATERWORKS DISTRICT No. 40 WATER SYSTEM MASTER PLAN

REGION BOUNDARY MAP

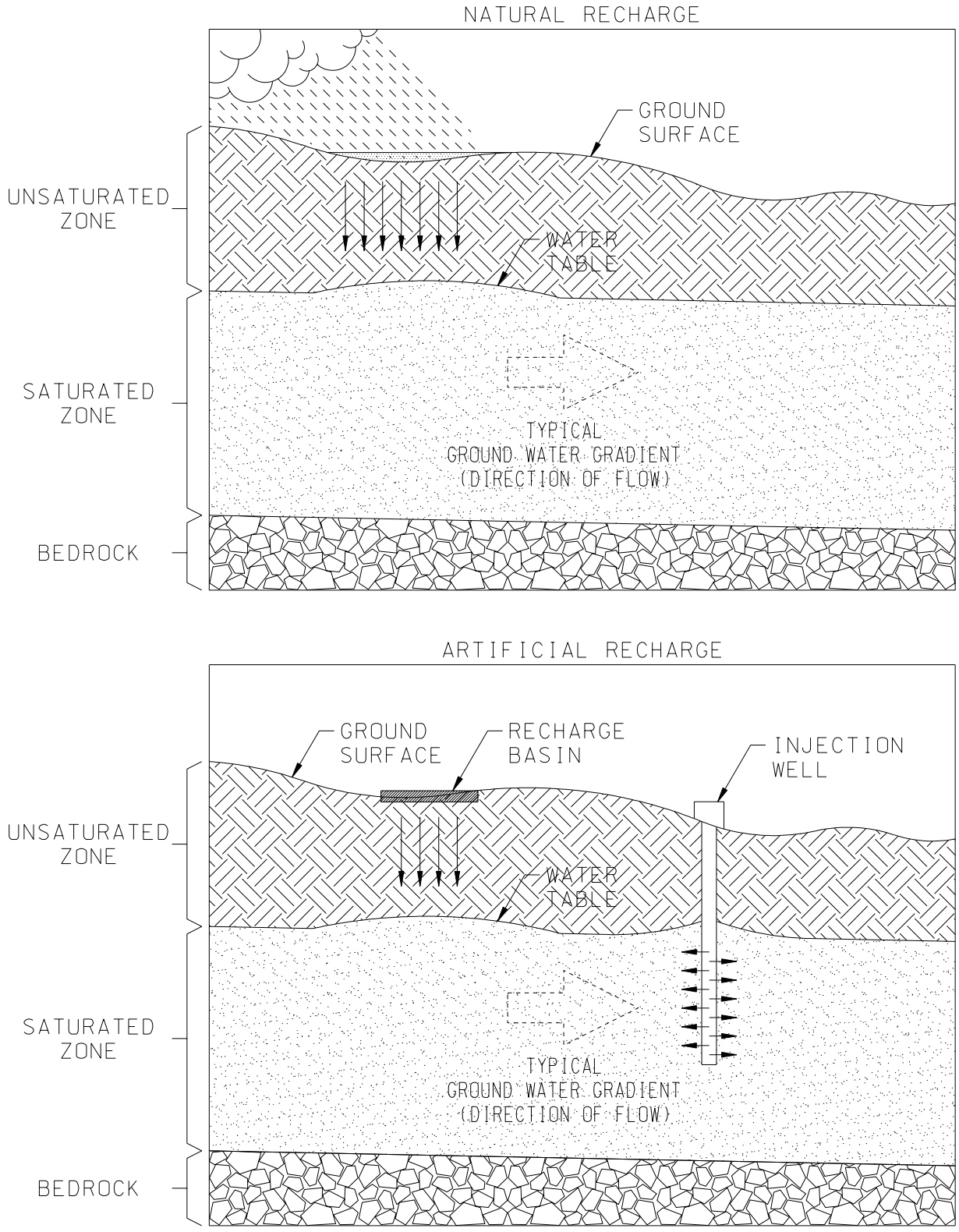
FIGURE

I-2

SCALE: N.T.S. DATE: 3/24/99 DRAWN BY: GJK CHECKED BY: PMW W.O.: 784-16.1

16f4

PWS-0204-0036



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WATERWORKS DISTRICT No. 40 WATER SYSTEM MASTER PLAN

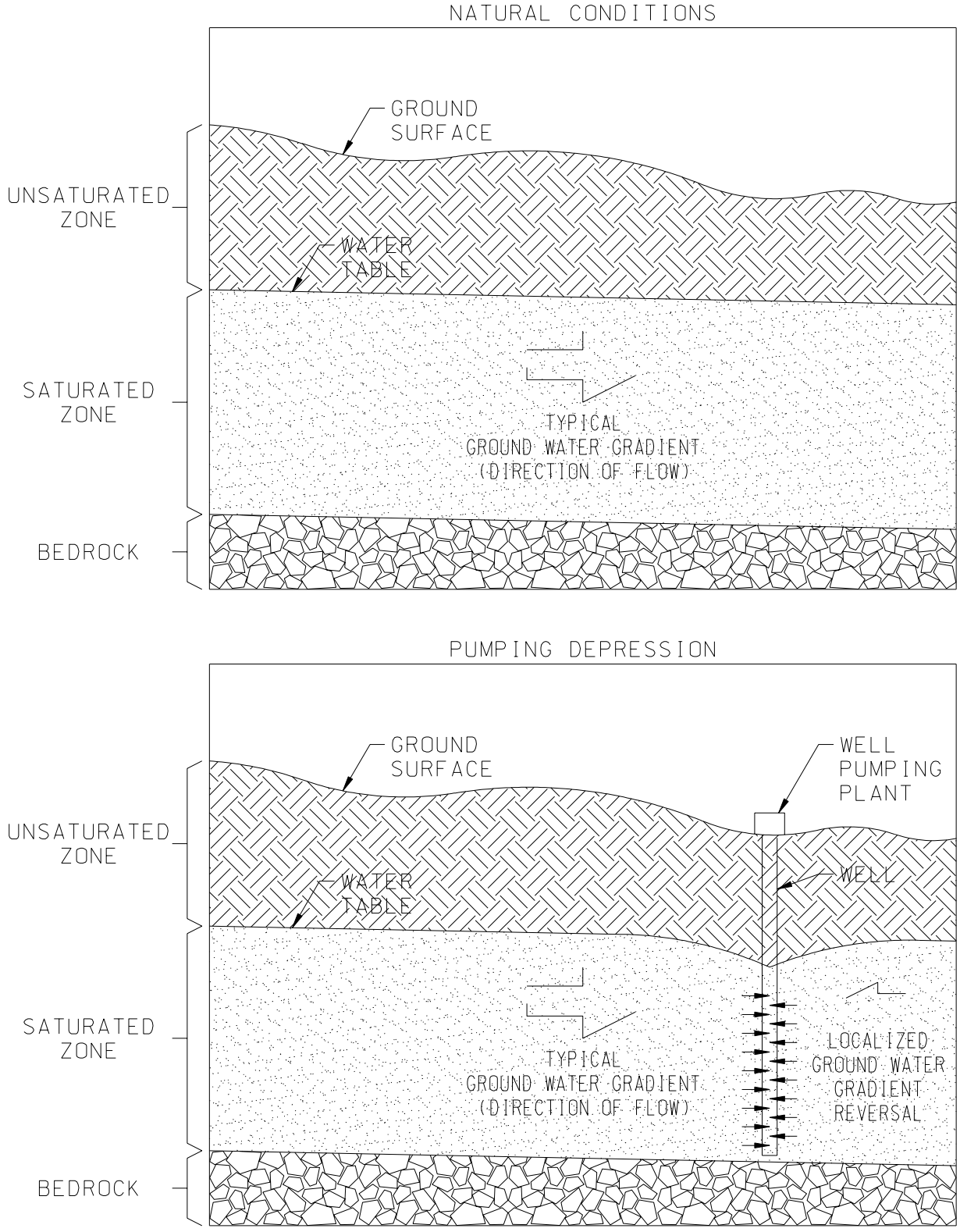
NATURAL AND ARTIFICIAL GROUND WATER RECHARGE

FIGURE

I-3

SCALE: N.T.S. DATE: 6/22/98 DRAWN BY: SFM CHECKED BY: RDF W.O.: 784-16.1

16F4A



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LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

WATERWORKS DISTRICT No. 40 WATER SYSTEM MASTER PLAN

GROUND WATER CONDITIONS AND EFFECTS OF PUMPING DEPRESSIONS

FIGURE

F-4

SCALE: N.T.S. DATE: 6/22/98 DRAWN BY: SFM CHECKED BY: RDF W.O.: 784-16.1

16F4A

CHAPTER II

CHAPTER II
WATER DEMANDS AND SUPPLY REQUIREMENTS

Annual water supply requirements within District No. 40's service area have grown steadily over the past twelve years, increasing from about 19,400 AF in 1985 to about 47,600 AF in 1997. The service area population increased from about 108,000 persons in 1990 to about 123,000 persons in 1997. The growth in water supply is generally illustrated by Table II-1, which sets forth water supply and population data within District No. 40 for 1990 and 1997.

The projected water demands and supply requirements that are set forth herein are based on projected populations, planned land uses, and pertinent water supply and consumption data. The projected water supply requirements, which are considered representative of expected water uses based on current development trends and current water use goals, were used to determine existing system deficiencies and to establish required system improvements, both present and future. Future water requirements within the Sphere of Influence (SOI) of each of District No. 40's eight regions were also established in anticipation of LACWWD annexing all areas within each region's current SOI by 2020.

A. SERVICE AREA PROFILE

District No. 40's present service area has about 123,000 residents, a growing commercial and industrial sector, and limited agricultural activity. There are also about 28,000 residents within its SOI. About 80% of the water served within District No. 40 is distributed to single family and multi-family residential services (LACWWD, 1995).

1. Residential Sector

Single family residential customers are estimated to average about 3.17 persons/connection (Los Angeles County Department of Regional Planning [LACDRP], 1994), with an average consumption rate ranging between 190 and 250 gallons/capita/day (gpcd). Multi-family residential customers are estimated to average about 2.3 persons/housing unit and seven units/multi-family complex, with an average consumption rate ranging between 130 and 175 gpcd. Growth in the residential sector is projected to

be considerable over the span of this Water System Master Plan, as indicated on Table II-2.

2. Commercial Sector

District No. 40 has a complex mix of commercial customers, ranging from family restaurants, insurance offices, beauty shops, and gas stations to hotels and motels, shopping centers, and high-volume restaurants and other facilities that serve the non-resident population. The commercial sector continues to expand each year, and growth is expected to continue to occur over the span of this Water System Master Plan in response to ongoing population increases. The average consumption rate for the commercial sector is estimated to be 2,000 gallons per acre per day.

3. Industrial Sector

District No. 40 serves a relatively small (in comparison to the area's population) industrial sector, primarily centered on aerospace and light manufacturing. The industrial sector has grown somewhat in the last decade or so, and is expected to continue to expand over the span of this Water System Master Plan. The average consumption rate for the industrial sector is estimated to be 3,000 gallons per acre per day.

4. Institutional/Governmental Sector

District No. 40 has a stable institutional/governmental sector, primarily local government, schools, visitor-serving public facilities, and medical facilities. This sector is expected to expand over the span of this Water System Master Plan in response to ongoing population increases. Consumption rates within this sector vary considerably depending upon the specific facility; however, for planning purposes, a consumption rate somewhere between commercial and industrial at 2,500 gallons per acre per day has been assumed.

5. Landscape/Recreational Sector

Landscape and recreational customer demand is expected to increase gradually over the span of this Water System Master Plan, due to continued growth in visitor-serving facilities. Increased efficiency and landscape conversions at existing parks, golf courses, and cemeteries should help offset new demand resulting from projected increases in this sector. The average consumption rate for the landscape/recreation sector is estimated to be 1,500 gallons per acre per day.

B. POPULATION AND SERVICE CONNECTION PROJECTIONS

The population within District No. 40's service area has increased steadily over the past several years, and is expected to increase significantly over the 20 year period addressed herein, particularly when taking into account the SOI for Regions 4, 24, 34, 38, and 39. The approximate area population has been established by the LACDRP, and is set forth in their report entitled Population Projections for the Antelope Valley Waterworks District No. 4 and Related Purveyors, 1990-2020 (LACDRP, 1994). Population projections are summarized in Table II-2, and current and projected service connections within both District No. 40 and the various Spheres of Influence are shown on Table II-3.

As indicated on Table II-2, all regions within District No. 40 are projected to experience considerable growth by 2020 relative to 1990 population levels; populations in each region are expected to increase by between 88% (in Region 38) and 460% (in Region 34). Similarly, the SOIs for Regions 4, 24, 34, 38, and 39 are projected to increase by between 150% and 454%. In real terms, the population within District No. 40's current boundaries is projected to reach 321,200 by 2020, while the population within the SOIs is projected to reach 138,800. Assuming that all current SOIs are annexed by LACWWD by 2020, District No. 40's population is projected to be 460,000 by that year, an increase of 325,000 (or 238%).

C. WATER SUPPLY REQUIREMENTS

The projected annual water supply requirements for this Water System Master Plan are based on projected populations and the demand factors set forth in the LACDPW's Water System Design

Manual (draft Manual dated November 1994). The Design Manual provides consumption factors that are to be utilized in determining future supply requirements. The design factors contained in the Design Manual were established utilizing historic consumption data for each dwelling unit in each region. Table II-4 summarizes the Design Manual consumption factors. The projected number of future dwelling units was established assuming 3.17 persons per dwelling unit. The supply requirements include water demands and unaccounted-for water; unaccounted-for water averaged about 8.5% of LACWWD's total supply within District No. 40 between 1993 and 1997. Unaccounted-for water is the difference between supply meter records and customer meter records, and includes water attributed to construction, line flushing, theft, and leakage, as well as inaccuracies of supply and consumption meters.

Projected water supply requirements by region are set forth in Table II-5. As population increases occur and long-term demand data becomes available by pressure zone, it will be possible to either confirm or revise demands according to pressure zone.

1. Monthly Water Supply Requirements

Monthly water supply requirements vary seasonably with changes in the weather. Temperatures in the Antelope Valley increase substantially in summer months and cause significant increases in water demands. Historically, high demands have occurred from June through September, with maximum demands normally occurring in July and August but occasionally in June. Low demands have normally occurred from December through March, with minimum demands normally occurring in January or February.

For analysis and design purposes, maximum month demands are estimated to be 13.3% of annual demands (160% of average monthly demand, based on recent historic supply records), while minimum monthly demands are estimated to be 5% of annual demand (60% of average monthly demand, based on recent historic supply records).

2. Daily Water Supply Requirements

Water demands vary with human activity and weather conditions. They are normally very low during early morning hours and very high during late morning and afternoon hours. Maximum daily demands normally occur during the months of maximum demand (i.e. July or August, and infrequently June), but occasionally they occur during months other than months of maximum demand.

For the most part, periods of extremely high temperatures ($\geq$110°F) are relatively short, lasting two to three days at most; however, at somewhat more moderate temperatures ($\geq$100°F), hot spells last for several days, perhaps a week or more.

Maximum day demands typically approximate 200% of average day demand. Maximum day demand therefore is about 120% of average day maximum month demand, and these relationships have been utilized for this Water System Master Plan. Maximum day water demands for each region are projected through 2020 in Table II-6.

The unit demand factors set forth by LACDPW's Design Manual for District No. 40 are summarized as follows:

Maximum Month Demand	=	1.60 Average Annual Monthly Demand
Maximum Day Demand	=	2.00 Average Annual Daily Demand
Peak Hour Maximum Day Demand	=	2.00 Maximum Day Average Hourly Demand
Minimum Hour Maximum Day Demand	=	0.35 Maximum Day Average Hourly Demand

D. FIRE FLOW REQUIREMENTS

The fire flow requirements for District No. 40 are presented by region and pressure zone on Table II-7; said requirements are based upon the Los Angeles County Fire Department's Fire Prevention Publication, Regulation #8. Where the number of residents within a zone is small and the zone is interconnected to higher zones, fire storage in the smaller lower zones may be reduced or eliminated and fire storage provided by the upper zones. The fire flows are considered conservative because building ordinances require developers to equip new commercial and

industrial developments with fire sprinklers; the requirement for sprinklers in new buildings greatly reduces potential fire flow demand on the water system. Regardless, adequate fire flows are needed for fire suppression in old commercial and industrial developments which are not equipped with fire sprinklers.

E. SUPPLY AND STORAGE REQUIREMENTS

Minimum supply requirements (in acre feet) based on projected annual water demands adjusted to include unaccounted-for water are set forth in Table II-5. The unaccounted-for water factor is based upon average unaccounted-for water over the period 1992 through 1996, which is approximately 8.5% of overall production. As shown in Table II-6, the current annual water supply requirement is 47,500 AF, the projected 2010 water supply requirement is 125,000 AF, and the projected 2020 water supply requirement is 152,600 AF.

The minimum storage requirement for each region has been established by LACWWD as one maximum day demand plus fire storage; storage requirements are set forth in Table II-8 (also arranged by region). 1998 storage requirements are based on actual maximum day demand documented by LACWWD. Future storage requirements are based on unit demand factors set forth in the LACDPW Design Manual. As shown in Table II-8, the current minimum storage requirement for all regions is 96 MG, the projected minimum storage requirement in 2010 is 215 MG, and the projected minimum storage requirement for 2020 is 260 MG.

TABLE II-1
WATER SUPPLY AND SERVICE
WITHIN DISTRICT NO. 40

YEAR	ACTIVE SERVICE CONNECTIONS	POPULATION SERVED	ANNUAL WATER SUPPLIED (AF/YR)	
			TOTAL	PER CONNECTION
1990	32,600	108,000	34,969	1.07
1997	39,200	120,000	47,553	1.21

TABLE II-2
CURRENT AND PROJECTED POPULATION
WITHIN DISTRICT NO. 40

REGION	1990	1997	2010	2020	% INCREASE 1990-2020
4	78,600	86,000	185,000	215,700	174
24	3,200	3,900	7,100	9,000	181
27	1,600	3,200	3,200	4,000	150
33	2,100	3,600	4,000	5,000	138
34	9,100	14,200	37,000	51,000	460
35	4,200	700	13,700	18,500	340
38	8,000	10,800	12,700	15,000	88
39	800	900	2,300	3,000	275
Subtotal:	107,600	123,300	265,000	321,200	199
4 SOI	19,900	DATA NOT AVAILABLE	85,000	105,000	428
24 SOI	400		900	2,000	400
34 SOI	2,300		8,000	12,800	454
38 SOI	4,500		12,000	16,000	256
39 SOI	1,200		2,200	3,000	150
Subtotal:	28,300	N/A	108,100	138,800	390
Total:	135,900	N/A	373,100	460,000	238

Source: Los Angeles County Department of Regional Planning (LACDRP)

TABLE II-3
CURRENT AND PROJECTED ACTIVE SERVICE CONNECTIONS
WITHIN DISTRICT NO. 40

REGION		1997	2010 [1]	2020 [1]
4		28,876	64,200	74,850
24		210	2,460	3,120
27		1,030	1,110	1,390
33		1,157	1,390	1,740
34		4,342	12,840	17,700
35		206	4,750	6,420
38		3,093	4,410	5,200
39		273	800	1,040
	Subtotal:	39,187	91,960	111,460
4	SOI [2]	DATA NOT AVAILABLE	24,500	36,440
24	SOI [2]		300	700
34	SOI [2]		2,770	4,420
38	SOI [2]		4,170	5,550
39	SOI [2]		760	1,040
	Subtotal:	N/A	32,500	48,150
	TOTAL:	N/A	124,460	159,610

[1] Residential service connections based on 3.17 persons per dwelling unit, plus 10% to account for commercial, industrial, and government/institutional connections.

TABLE II-4
DOMESTIC WATER DEMANDS
WITHIN DISTRICT NO. 40

REGION	SINGLE-FAMILY DWELLING MAXIMUM DAY WATER DEMAND PER DWELLING UNIT	SINGLE-FAMILY DWELLING MINIMUM DAY WATER DEMAND PER DWELLING UNIT	MULTI-FAMILY DWELLING MAXIMUM DAY WATER DEMAND PER DWELLING UNIT
4	1,500	600	750
24	1,250	600	625
27	1,250	600	625
33	1,250	600	625
34	1,600	600	800
35	944	472	472
38	1,200	600	600
39	834	417	417

ALL REGIONS	COMPUTED AVERAGE DEMAND (FLOW)
Heavy Commercial	3,000 gal/acre/day
Light Commercial	2,000 gal/acre/day
Parks, Green Belts	1,500 gal/acre/day
Schools, Hospitals	Specific Flow Requirements should be calculated (submitted by Developer)

Source: LACDPW Draft Water System Design Manual (11/94)

TABLE II-5
CURRENT AND PROJECTED WATER SUPPLY REQUIREMENTS
IN ACRE-FEET PER YEAR*
WITHIN DISTRICT NO. 40

REGION	1997	2010	2020
4 & 34	41,226	109,390	132,222
24, 27, & 33	2,780	4,958	6,366
35	285	2,509	3,366
38	3,009	7,590	9,671
39	253	734	979
Total:	47,553	125,183	152,604

* Including unaccounted-for water at 8.5% of water supplied

TABLE II-6
CURRENT AND PROJECTED WATER DEMANDS*
WITHIN DISTRICT NO. 40

AVERAGE DAY WATER DEMAND IN GALLONS PER MINUTE (GPM)

REGION	1997	2010	2020
4 & 34	25,560	61,980	74,930
24, 27, & 33	1,720	2,800	3,640
35	180	1,420	1,900
38	1,870	4,320	5,500
39	160	420	560

MAXIMUM DAY WATER DEMANDS IN GALLONS PER MINUTE (GPM)

REGION	1997	2010	2020
4 & 34	51,120	123,960	149,860
24, 27, & 33	3,440	5,600	7,280
35	360	2,840	3,800
38	3,740	8,640	11,000
39	320	840	1,120

MAXIMUM DAY WATER DEMANDS IN MILLION GALLONS PER DAY (MGD)

REGION	1997	2010	2020
4 & 34	73.6	178.5	215.8
24, 27, & 33	5.0	8.1	10.4
35	0.5	4.1	5.5
38	5.4	12.4	15.8
39	0.5	1.2	1.6

* Including respective Spheres of Influence

TABLE II-7
FIRE FLOW REQUIREMENTS
WITHIN DISTRICT NO. 40
(BY REGION AND PRESSURE ZONE)

REGION	PRESSURE ZONE		FIRE FLOW (GPM)	DURATION (HOURS)	STORAGE REQUIREMENT (MG)
4 & 34	2555		5,000	10	3.00
4 & 34	2600		1,500	2	0.18
4 & 34	2696		5,000	5	1.50
4 & 34	2837		2,000	2	0.24
4 & 34	2880		1,500	2	0.00
4 & 34	2911		5,000	5	1.50
4 & 34	2914		1,250	2	0.15
4 & 34	2970		1,500	2	0.00
4 & 34	2980		3,500	3	0.63
4 & 34	3050	(future)	1,500	2	0.00
4 & 34	3240		1,500	2	0.18
4 & 34	3430	(future)	1,500	2	0.00
4 & 34	3620	(future)	1,500	2	0.18
4 & 34	3810	(future)	1,500	2	0.00
4 & 34	4000	(future)	1,500	2	0.18
				Subtotal:	7.74
24, 27 & 33	2914		3,500	3	0.00
24, 27 & 33	3056		3,500	3	0.63
24, 27 & 33	3308		3,500	3	0.63
				Subtotal:	1.26
35	2620		1,500	2	0.00
35	2928		1,500	2	0.18
35	3302		1,500	2	0.18
				Subtotal:	0.36
38	2850		3,500	3	0.63
38	2992		3,500	3	0.63
				Subtotal:	1.26
39	3308		1,500	2	0.18
39	3440		2,000	2	0.24
39	3640		750	2	0.10
39	3852		750	2	0.10
				Subtotal:	0.62
				TOTAL:	11.24

* Where no storage requirement is shown, fire storage from the next higher zone is adequate for both zones (i.e. fire flows will be provided through PRVs)

TABLE II-8
CURRENT AND PROJECTED WATER STORAGE REQUIREMENTS
WITHIN DISTRICT NO. 40
IN MILLIONS OF GALLONS*

REGION	FIRE STORAGE	1997		2010		2020	
		MDD	TOTAL	MDD**	TOTAL	MDD**	TOTAL
4 & 34	7.7	73.6	81.3	178.5	186.2	215.8	223.5
24, 27, & 33	1.3	5.0	6.3	8.1	9.4	10.4	11.7
35	0.4	0.5	0.9	4.1	4.5	5.5	5.9
38	1.3	5.4	6.7	12.4	13.7	15.8	17.1
39	0.6	0.5	1.1	1.2	1.8	1.6	2.2
			96.3		215.6		260.4

* ONE DAY OF MAXIMUM DAY DEMAND PLUS FIRE STORAGE
** INCLUDING SPHERE OF INFLUENCE.

CHAPTER III

CHAPTER III
WATER SUPPLY

The Antelope Valley's water resources have been the subject of a number of studies and reports, and the information presented in this chapter is largely based upon certain of those reports. In particular, information has been derived from the Antelope Valley Water Resources Study (Kennedy/Jenks Consultants, 1995), Land Use and Water Use in the Antelope Valley, California (U.S. Geological Survey, 1995), and the District 40, Antelope Valley Urban Water Management Plan (Los Angeles County Waterworks Districts, 1995).

Although the Master Plan for Waterworks District No. 40 addresses only that portion of the Antelope Valley (Valley) within Los Angeles County, the following sections include descriptions of certain elements of the water resources situation (particularly ground water and imported water) within the Valley as a whole. Consideration of Valley-wide resources is made necessary by LACWWD's reliance upon ground water as a primary source of supply; the Valley's ground water body is a finite supply utilized by most of the Valley's water users, both public and private.

A. HISTORIC CONDITIONS AND REQUIREMENTS

Water supply (including ground water extractions, imported water deliveries, local surface water diversions, and reclaimed water deliveries) within the Antelope Valley totaled 225,600 AF in 1950, 192,600 AF in 1975, 168,000 AF in 1980, 152,000 AF in 1985, and 128,000 AF in 1990. Water demand decreased between 1950 and the late 1980's due to declines in the amount of irrigated acreage. In response to the significant population growth which began in the mid 1980s, water supply requirements within the Valley has been increasing over the past several years (USGS, 1995).

The Antelope Valley's historic water supplies consist of a combination of ground water, imported SWP water, local surface water diverted from Little Rock Creek into Little Rock Reservoir, and reclaimed water. Table III-1 shows the current water supplies available to all suppliers within the Valley; as indicated thereon, the potential current water supply ranges between 212,900 and 240,800 AF, depending upon the high and low ground water safe yield estimates. The water

supplies identified in Table III-1 do not reflect the considerable variability in SWP deliveries that can result from hydrologic conditions such as drought or flood (K/J, 1995).

Since 1985, LACWWD's annual water supply requirements within District No. 40 have ranged between approximately 19,400 AF in 1985 and 47,500 AF in 1997; see Table III-2, which indicates water supplied by LACWWD (including both imported water and ground water) between 1985 and 1997. Overall annual supply requirements within the Antelope Valley have ranged between about 225,600 AF in 1949 and 1950 (when agricultural uses within the Valley were near their peak) to about 127,000 AF in 1991; see Table III-3, which indicates overall water supply within the Valley. Table III-4 indicates reported water supplied by public suppliers and self suppliers between 1985 and 1991, and is organized by both type of supply and category of supplier; it should be noted that the data on Table III-4 does not reflect all water supplied, as not all suppliers provided supply records (USGS, 1995).

1. Ground Water

The Antelope Valley Ground Water Basin (hereafter Basin) is a closed basin. Surface water from the surrounding hills and the Valley floor flows northerly in the direction of three dry lakes (Rosamond Lake, Buckhorn Lake, and Rogers Lake) on Edwards AFB. The most significant streams are Big Rock Creek, Little Rock Creek, and Amargosa Creek. Except during the biggest rainfall events of a season, surface water from said streams (and other, smaller water courses) flows toward the Valley from the surrounding mountains, quickly percolating into stream beds and recharging the Basin. Surface water flows that reach the dry lakes are generally lost to evaporation. The Basin's natural recharge rate is estimated by USGS to be between 31,200 and 59,100 AF/Yr (USGS, 1995).

The Basin is comprised of two primary aquifers which are commonly referred to as the principal aquifer and the deep aquifer. The principal aquifer is considered to be unconfined, while the deep aquifer (which is separated from the principal aquifer by clay layers of varying thicknesses) is considered to be confined. The principal aquifer is

thickest in the southern portion of the Valley near the San Gabriel Mountains, while the deep aquifer is thickest in the vicinity of the dry lakes on Edwards AFB. The aquifer is essentially a single system near the base of the southerly mountains because the clay layer (lacustrine deposits) is believed to dissipate towards the southerly boundary of the basin (K/J, 1995).

The Basin is further divided into the following twelve subunits: Finger Buttes, West Antelope, Neenach, Willow Springs, Gloster, Chaffee, Oak Creek, Pearland, Buttes, Lancaster, North Muroc, and Peerless. The general configuration of the Basin is indicated on Figure III-1.

Ground water levels in the Lancaster area declined by as much as 200 feet between 1915 and 1988; however, well hydrographs maintained by AVEK and the USGS indicate that ground water levels in portions of the Valley have recovered in recent years, possibly in response to reduced production for agricultural uses. Declining ground water levels over a long period of time generally indicate ground water overdraft, while increasing ground water levels may result from the effects of artificial recharge, under-utilization of a basin, or recovery from over-extraction (K/J, 1995).

Potential problems attributable to declining ground water levels include increased pumping costs, subsidence, and reductions in aquifer storage capacity. Potential problems attributable to rising ground water levels include surface saturation, increased liquefaction potential, and water quality degradation. Each is described separately in the following subsections.

a. Declining Ground Water Levels

Increased pumping costs are a direct result of declining ground water levels. As pumping lifts increase, so do energy costs associated with ground water production. Also, additional pump bowls, larger motors, and other well pumping plant modifications are often required in order to maintain production capacities.

Damages resulting from subsidence can range from minor structural damage to major physical damage to the ground surface rendering land virtually useless. Subsidence is defined by USGS as the vertical lowering of the land surface over an area of many square miles, and may be the result of a variety of causes. The resulting damages are most pronounced when subsidence gradients (change in subsidence levels over a given distance) are high (K/J, 1995).

Subsidence levels up to seven feet have occurred in some areas of the Antelope Valley. The Lancaster and Edwards AFB areas have experienced problems or damages that appear to be related to land subsidence. USGS reported in 1992 that as much as two feet of land subsidence had affected the Antelope Valley by 1967, and that the subsidence had caused surface deformations at Edwards AFB; fissures, cracks, and depressions on the bed of Rogers Lake were severe enough to affect the use of the lakebed as a runway for airplanes and space shuttles (K/J, 1995).

b. Rising Ground Water Levels

Potential damages attributable to rising ground water levels include surface saturation, increased liquefaction potential, and water quality degradation. The effects of surface saturation are dependent upon the elevation of the ground water table and on the soil type; generally, the effects of surface saturation are most noticeable in granular soils. Water quality degradation can result from contaminants being drawn into the aquifer by rising ground water levels and then being spread by depressions caused from overpumping. For example, nitrates can be drawn into ground water bodies from sources such as fertilizer, poultry manure, or domestic wastewater; excessive nitrate concentrations in excess of 45 ppm can cause blue baby syndrome, which can be fatal to infants.

Ground water levels have risen in portions of the Valley; however, no damage related to these increases have been identified in most of said areas, due primarily to the fact that ground water levels are still significantly below ground surface. However, damages potentially attributable to increasing ground water levels were identified in April 1993 in the Leona Valley area in the southern portion of the Valley (K/J, 1995).

2. Imported Water

SWP deliveries to the Valley began in 1972. AVEK, the Palmdale Water District (PWD), and the Little Rock Creek Irrigation District (LCID) provide SWP water to the Antelope Valley. As shown in Table III-5, AVEK deliveries peaked in 1981 at approximately 79,400 AF, and overall SWP deliveries to the Valley peaked the same year at 80,600 AF. Since 1981, SWP deliveries to the Valley have ranged between 14,000 and 58,700 AF/Yr. Between 1976 and 1982, deliveries ranged between 19% and 92% of the total entitlements. Between 1983 and 1995, deliveries ranged between 9% and 69% of total entitlements (CDWR, 1997).

SWP entitlements for the Valley's State Water Contractors currently total 158,000 AF/Yr. The entitlements of AVEK, PWD, and LCID are 138,400, 17,300, and 2,300 AF/Yr, respectively; however, a small portion of AVEK's SWP entitlement has historically been delivered to areas outside the Valley. Based on information provided by AVEK, it is estimated that approximately 3% of historic deliveries made by AVEK did not serve the Antelope Valley; as a result, it should be assumed that 3% of AVEK's future deliveries will be made to areas outside the Valley. The total amount of SWP entitlement water available to the Valley is therefore about 153,800 AF/Yr (K/J, 1995).

California Department of Water Resources (CDWR) reports that existing SWP facilities have a 65% chance of making full deliveries for current demands and will have a 25% chance of making full deliveries for projected 2020 demands. Availability of SWP water varies from year to year, depending on a number of factors (precipitation, regulatory

restrictions, legislative restrictions, and operational considerations), and is especially unreliable during dry years. Therefore, LACWWD ground water supplies must be adequate to ensure customer demands can be met.

In addition to SWP availability fluctuations, LACWWD's ability to use AVEK supplies is currently limited to certain portions of District No. 40 due to transmission facility restrictions. The maximum quantity of water that can currently be purchased from AVEK for direct delivery to LACWWD customers is about 60% of District No. 40's demand.

3. Reclaimed Water

There are several water reclamation plants (WRP) currently operating in the Antelope Valley; however, there are only two operating within Los Angeles County that treat significant waste streams and that generate large quantities of reclaimed water. The plants, which are both operated by the County Sanitation Districts of Los Angeles County (CSDLAC), serve the City of Palmdale and the City of Lancaster. Each is described separately below.

a. Palmdale WRP

The CSDLAC's District 20 operates the Palmdale WRP, which is located on 30th Street East, southeast of the Palmdale Airport. The Palmdale WRP is an undisinfected secondary treatment facility with a capacity of 8.0 mgd. A portion of the effluent from the Palmdale WRP is currently used for irrigating farmland on Los Angeles County Department of Airports (DOA) property. The DOA has a contract for up to 12 mgd of effluent. The remaining effluent is spread over 2,600 acres of land owned by the DOA. To accommodate anticipated growth in the Antelope Valley, CSDLAC intends to expand the plant to a capacity of 15.0 mgd (K/J, 1995).

b. Lancaster WRP

CSDLAC's District 14 operates the Lancaster WRP, which is located southeast of the intersection of Antelope Valley Freeway (I-14) and Avenue C, near Edwards AFB. The Lancaster WRP is currently the only facility in Antelope Valley supplying tertiary treated water (0.6 mgd design capacity); however, the majority of the plant's flow is treated to a secondary treatment level. Total capacity of the plant is 10.0 mgd. Undisinfected secondary effluent from the WRP is used for irrigating farmland at Nebeker Ranch. Tertiary effluent is used at Apollo Lakes County Parks for lake and irrigation use. The remaining effluent is disinfected and then discharged to Paiute Ponds. To accommodate anticipated growth in the Antelope Valley, CSDLAC intends to expand the plant to a capacity of 16.0 mgd (K/J, 1995).

c. Historic Flows

Average daily flow rates for the WRPs during the period from 1970 through 1992 are summarized in Table III-6. Average daily flow rates have been steadily increasing over the past several years. The Palmdale WRP's average flow of 7.9 mgd in 1991 approached the plant's average daily flow design capacity of 8.0 mgd (K/J, 1995).

B. ANTICIPATED CONDITIONS AND REQUIREMENTS

Land uses within the Antelope Valley historically focused on agriculture, but have been transitioning from predominantly agricultural uses to residential, commercial, and industrial uses over the last several years. Growth in the Valley proceeded at a slow pace until 1985; however, between 1985 and 1990, the growth rate increased approximately 1,000% over the average growth rate between 1956 and 1985. Recent projections by the Southern California Association of Governments (SCAG) indicate that approximately 758,000 people will reside in the Valley by 2020, an increase of approximately 216% from the 1990 population. Areas of concentrated

population within the Valley include Lancaster, Palmdale, Littlerock, Lake Los Angeles, Edwards AFB, Rosamond, Mojave, and Boron.

Between 1985 and 1990, water supplied by LACWWD increased from 19,375 AF/Yr to 34,969 AF/Yr, an increase of about 80%. The trend toward steadily increasing supply has continued; between 1990 and 1997, water supplied by LACWWD increased from 34,969 AF/Yr to 47,553 AF/Yr, an increase of about 36%. Growing supply requirements continued throughout the recent recession, despite rapid declines in defense spending and reductions in the state's growth rate.

Tables III-7A and III-7B set forth current and projected water supply requirements for the eight regions (including associated spheres of influence), with contributions from ground water and imported water sources. Current supply requirements reflect actual recorded quantities of ground water production and imported water (AVEK) purchases. Projected contributions from ground water production and imported water purchases are based on LACWWD targeted ratios of 80% imported water (including any waters produced from the ASR program) and 20% ground water to meet total annual demand.

Table III-7A is based on imported water deliveries being made available to all regions at the targeted 80/20 ratio. Table III-7B is based on imported water deliveries being made available to Regions 4, 24, 27, 33, 35, and 38, due to the understanding that imported water is not, and likely will not be, available to Region 39.

In order to minimize impacts from uncertain SWP deliveries and limited transmission facilities for securing AVEK supplies, and to maximize the use of imported water, LACWWD is in the process of conducting a demonstration project (scheduled for completion December, 1999) in cooperation with AVEK and USGS to establish the guidelines to implement a full-scale ASR program. The ASR demonstration project takes treated water from AVEK and injects it to the principal aquifer underlying the Lancaster area. LACWWD monitors water quality impacts of the program in order to establish injection parameters and to ensure that extractions completely remove more than the injected quantity. It is LACWWD's intent to establish an ASR program of sufficient capacity to allow injection of treated AVEK water during low demand periods for

subsequent extraction during high demand periods. The ASR program is not only vital to enable LACWWD to achieve the targeted 80/20 production ratio, but will also help to mitigate ground water depressions in the areas where it is utilized. The results of the demonstration project will allow LACWWD to establish the potential annual quantities of injection, which will then be used to establish the capacities of AVEK treatment, conveyance, and turnout facilities.

Contributions from other sources/programs described in the following section are not included (e.g. use of reclaimed water, reductions in demands due to conservation efforts) because their implementation and/or resulting contributions cannot be accurately predicted. If and when any such program is implemented, the associated contribution to meeting supply requirements should be deducted from either the ground water or imported water component; LACWWD will have to perform an analysis of all factors (e.g. economic, resource condition, reliability) to determine which should be reduced.

C. ALTERNATIVES AND RECOMMENDATIONS FOR MEETING REQUIREMENTS

As indicated on Table III-8, LACWWD's approximate share of overall Antelope Valley water supply (including supply requirements by all sources) increased from about 18% in 1985 to about 29% in 1990. Likewise, as indicated on Table III-9, LACWWD's approximate share of overall ground water production within the Valley increased from about 15% in 1985 to over 21% in 1990. Because LACWWD serves most of the large (and growing) communities in the Valley, its relative share of both overall supply and ground water production is projected to increase throughout the planning period in response to ongoing population and demand increases.

If, in the future, ground water extractions are limited (by mandate or cooperatively) to approximate historic shares of overall production applied to the Valley's maximum safe yield (i.e. natural recharge, not artificial recharge), LACWWD will have an estimated 18,000 AF/Yr of ground water available. Said estimate is based upon a safe yield estimate of 59,100 AF/Yr and an estimated production share of about 30%; the estimated available ground water drops to 9,500 AF/Yr with the lower safe yield estimate of 31,200 AF/Yr. Should LACWWD's production share

increase to 40%, LACWWD would have nearly 24,000 AF/Yr of ground water available based on 59,110 AF/Yr safe yield (12,500 AF/Yr based on 31,200 AF/Yr safe yield).

Since demands within District No. 40 are projected to increase to 114,540 AF/Yr by 2010 and 139,630 AF/Yr by 2020, supplemental sources of supply will be required to ensure that an adequate supply is continuously available. LACWWD already receives treated SWP water from AVEK through a number of connections within Regions 4, 24, 33, 34, and 38; however, SWP supplies are subject to fluctuations in availability as a result of variations in climatic and hydrologic conditions, and of scheduled and unscheduled maintenance requirements within the SWP's delivery system and AVEK's treatment/delivery system.

There are a number of means available to LACWWD for meeting future water demands within District No. 40, several of which are described below. It should be noted that no one of the following methods can ensure a reliable supply in and of itself; rather, LACWWD will likely need to consider a range of methods which, taken together, can reduce demands per capita and increase (in relative and absolute terms) the available supply.

The recommended water supply strategy focuses on reducing per capita demands within each region, minimizing demand growth (e.g. mandating water conserving appliances), protecting existing water resources, and developing additional resources to meet future demands. Specific elements of the recommended strategy include the following:

- Improved utilization of available water supplies
- Ground water quality protection
- Long term water demand reductions
- State Water Project reliability improvements
- Purchases of additional imported water supplies

- Enhanced/expanded management of the Antelope Valley Ground Water Basin

To implement the strategy identified above, the LACWWD will need to join with the other water purveyors and producers in the Antelope Valley to evaluate and implement institutional, engineering, financial, and public education measures. Recommended actions are described in the following subsection.

1. Aquifer Storage and Recovery (ASR)

ASR includes the following methods of storing and recovering water from a ground water basin:

- Spreading – use of surface spreading basins to allow infiltration and percolation of water type (imported or reclaimed) into the aquifer

- Injection – use of new or existing wells for direct injection of water into the aquifer

- In-Lieu Recharge – use of an alternative source of water (e.g. imported water) when available, and use of groundwater when the alternative source is unavailable

The Antelope Valley Ground Water Basin is estimated to have a storage capacity of 68 million AF, of which at least 13 million AF is currently thought to be available for storage. Approximately 55 million AF of ground water was estimated to remain in storage as of 1975. The entire volume of stored water is not accessible due to excessive pumping depths, distances between the groundwater basin and users, and the potential for causing land subsidence (K/J, 1995).

The ASR program would function by storing water within the ground water basin at times when surface water supplies are plentiful (typically during winter months) and extracting the stored water during peak demand periods and/or times when surface water supplies are not available. The ASR program would serve to mitigate deterioration to the ground water body and would enable LACWWD to utilize some of the Basin's estimated 13 million AF of available storage capacity.

For District No. 40, the ASR programs would occur within (for injection) and southerly of (for spreading) the Lancaster, Buttes, and Pearland Subunits. The Lancaster Subunit has experienced the most significant impacts from historic pumping and underlies Regions 4 an 34, which currently (and will continue to) comprise the majority of demands within District 40.

The principal source of natural ground water recharge in the Antelope Valley is runoff, which is primarily recharged near the foothills of the mountains surrounding the Valley. Numerous studies have been conducted to estimate natural recharge, the most recent of which estimate that the Valley's natural recharge is between 31,200 and 59,100 AF/Yr (USGS, 1995).

There are a number of sources available for augmenting ground water recharge within the Antelope Valley, including (but not necessarily limited to) the following:

- State Water Project Water
    - Treated potable water delivered by AVEK (for injection, spreading, or in-lieu recharge)
    - Untreated water delivered directly from the California Aqueduct (for spreading only)

- Reclaimed Water (for spreading only)
  - Secondary treated effluent
  - Tertiary treated effluent
- Local Surface Water (for spreading only)
  - Little Rock Creek and Little Rock Reservoir
  - Big Rock Creek
  - Amargosa Creek
  - Storm water runoff (K/J, 1995)

Certain characteristics affect economic viability and technical feasibility and are a key to a successful ASR program; for example, if the aquifer is unsuitable for groundwater extraction, it is likely to be unsuitable for spreading or injection. The following characteristics are desirable for both spreading and injection programs:

- Suitable surface and subsurface hydrogeologic conditions
- Adequate storage capacity
- Proximity to potential recharge water sources
- Proximity to existing groundwater production sites
- Geologic barriers (e.g., faults, bedrock) that serve to impound ground water
- Compatible water quality (K/J, 1995)

Both spreading and injection require aquifer materials that have a high ability to accept and transmit water. Suitable materials include sands and gravels at the surface and in the

unsaturated zone for rapid infiltration and percolation, and in the saturated zone for rapid acceptance and dispersal of the recharged water. In order to have a cost-effective recharge program, the potential recharge sites should be located within a reasonable distance and hydraulic gradient of the potential source waters.

Potential spreading and injection sites should also be assessed relative to their proximity to existing facilities in order to minimize capital costs. In instances where it is deemed necessary to control the ultimate storage location of the recharged ground water, it may be necessary to identify sites with geologic features that control the flow of ground water (such as faults and shallow bedrock). In addition, it is important that each potential recharge site have good quality ground water that will not compromise the quality of the water to be recharged.

Based on the characteristics favorable to a good surface infiltration site and previous studies of potential infiltration sites, the following areas should be the subject of more detailed analyses:

- Groundwater recharge zones described in the LACDPW's June 1987 Final Report on the Antelope Valley Comprehensive Plan of Flood Control and Water Conservation
- Little Rock Creek
- Big Rock Creek
- Amargosa Creek
- West Antelope Subunit (K/J, 1995)

The sites with the highest potential for recharge by spreading appear to be:

- Amargosa Creek south of Avenue "N" between 10th Street West and Division Street (LACDPW Site)

- Little Rock Creek near Avenue "N" between 60th Street and 70th Street East (DOA Property)

- Amargosa Creek near Elizabeth Lake Road and 25th Street West (K/J, 1995)

Detailed water quality analyses should be conducted at the potential recharge sites to gather current information on the condition of the aquifer in each specific location; until the analyses have been completed, comparisons of water quality with the quality of potential recharge sources cannot be made. If recharge sites are selected that have water quality that is worse than the potential recharge water(s), the recharge program is likely to benefit the aquifer (K/J, 1995).

The potential formation of wetlands at the LACWWD site and the DOA site could result in increased wildfowl activity that could in turn interfere with airfield operations. Depending on the timing of the operation of spreading ponds at the sites, this concern could be mitigated or reduced by developing an operation plan that accounts for migration patterns (K/J, 1995).

A detailed investigation should be performed regarding each specific site; each investigation should establish the following:

- Quality of recharge water and ground water

- Availability of recharge water (quantity and scheduling)

- Hydrogeologic characteristics (e.g. transmissivity, storativity)

- Potential for wildfowl interference at airfields (where applicable)

- Location of production sites and travel times to those sites (K/J, 1995)

Based on LACWWD's past studies (1991, 1992) together with the recent demonstration project described earlier in this chapter, injection appears to be technically feasible. Certain wells in existing well fields could provide both the injection and extraction facilities, with new wells constructed as required, to implement an ASR program. Specific areas that should be explored further because of their proximity to existing facilities and sources of treated SWP water are:

- LACWWD wells located:

    - South of Avenue "K" between 10th Street West and Division Street (where the USGS and LACWWD have conducted an injection study)
    - South of Avenue "L" between 10th Street West and Division Street (adjacent to the area above)

- LACWWD wells south of Avenue "P" between 20th Street East and 40th Street East (K/J, 1995)

Treated SWP water should be acceptable for injection from a water quality perspective. The presence of trihalomethanes (THMs) in treated SWP water may require treatment and/or alternative disinfection methods; THMs are a byproduct of disinfection using chlorine. Although higher concentrations of THMs in injected water than in ground water could be considered a violation of the RWQCB's non-degradation policy for water quality, injection of treated SWP water has been allowed in other groundwater basins. Detailed water quality analyses will have to be conducted at the potential injection sites to gather current information on ground water quality at each specific location. If recharge areas were to be selected that have water quality that is worse than the recharge

water (e.g. higher TDS or nitrate concentrations), the recharge program would probably provide water quality benefits to the aquifer (K/J, 1995).

A detailed investigation should be performed regarding each potential injection site; each investigation should establish the following:

- Approximate volume that could be injected
- Aquifer behavior during injection and extraction, which would require determination of aquifer characteristics (e.g. transmissivity)
- Potential ground surface effects during injection and extraction
- Improvements that may be required at each well and booster pumping plant
- Operational requirements for the injection/extraction system based on the availability of treated SWP water
- Potential operational changes at AVEK's SWP treatment plant necessary to conduct long-term injection and extraction (K/J, 1995)

2. Imported Water

As noted in previous sections, conjunctive use consists of using ground water in conjunction with surface water to meet service area water requirements. The benefits of conjunctive use to LACWWD and the Antelope Valley are significant, in that it enables LACWWD to reduce its reliance upon ground water and thus help to arrest or reduce declining water levels within the Antelope Valley Ground Water Basin.

AVEK's overall SWP entitlement is 138,400 AF/Yr, of which a maximum of about 134,200 AF/Yr is considered to be available to the Antelope Valley. AVEK's treated water capacity for serving District No. 40 is currently about 75 mgd, or approximately

84,000 AF/Yr (not accounting for interruptions due to plant maintenance and failures). AVEK delivers treated water to LACWWD as requested; however, LACWWD does not have a fixed entitlement or allocation (nor do any of AVEK's other customers). Assuming that the full amount requested for direct customer consumption is delivered each year (which AVEK has historically been able to achieve, except in drought years like 1991), the imported water would decrease annual production from the Basin, thereby reducing concerns regarding ground water overdraft in the near term. Excessive reliance upon SWP water is not advisable, however, owing to the uncertain environmental (climatological), regulatory, and legislative conditions.

- Constraints on Availability

  In considering the potential associated with conjunctive use, one should keep in mind that deliveries of SWP water may fluctuate depending on a number of factors. For instance, recent legislative and regulatory changes have periodically resulted in significantly reduced SWP deliveries. In addition, the SWP is still essentially incomplete, and can only deliver approximately 50% of the supply originally anticipated when it was initiated; the conveyance facilities have a capacity of about 4.4 million AF/Yr, but the supply facilities can only provide about 2.2 million AF/Yr.

  The water supply limitation will be rectified when the San Francisco Bay/Sacramento Delta system is appropriately modified to allow maximum utilization of available supplies while simultaneously protecting the Bay/Delta's fragile environment. "Fixing" the Delta will probably require the construction of Delta conveyance facilities; one alternative for the construction of said facilities was once known as the Peripheral Canal, construction of which was defeated by California voters in 1982. Until regulatory actions become consistent and Delta conveyance facilities are constructed, SWP supplies will never be continuously available, and strict reliance upon same is not advisable.

3. Water Reclamation

As noted above, conjunctive use affords a number of benefits and advantages with regard to managing water resources and reducing reliance upon ground water. Along with SWP water, another source of supply for conjunctive use is available in the form of reclaimed water.

In order to determine the extent of the benefits that might be derived from water reclamation and to establish the costs associated therewith, it would be necessary to conduct an extensive study that is beyond the scope of this Plan; however, the commissioning of such a study is of considerable importance, and is related directly to LACWWD's water management efforts. LACWWD may have an evaluation of the potential benefits and costs of initiating a reclaimed water program prepared and, based on the results and recommendations of the evaluation, may in turn determine that the construction of the required facilities would represent a good investment in the protection of the area's ground water supplies.

The Palmdale WRP is a secondary treatment facility with a capacity of 8.0 mgd. The Lancaster WRP is currently the only facility in the Valley supplying tertiary treated water (0.6 mgd design capacity); however, the majority of the plant's flow is treated to a secondary treatment level, and the plant's overall capacity is 10.0 mgd. The average daily wastewater flow in 2020 is expected to be 37.2 mgd for the Palmdale WRP and 29.8 mgd for the Lancaster WRP (K/J, 1995).

Table III-10 presents a list of potential reclaimed water users. The estimated annual, peak month, peak day, and peak hour demands for potential reclaimed water users are also shown. The projected annual reclaimed water demand is approximately 35,600 AF/Yr. Peak month demand is projected to be approximately 6,300 AF, and peak day demand is estimated to be 74 mgd (216 AF) (K/J, 1995).

The tertiary system would serve tertiary treated reclaimed water to users in three service zones, with high water levels 2,620, 2,840, and 2,920 feet above sea level. The

secondary system would serve secondary treated reclaimed water to users in one service zone with a high water level of 2,680 feet. Booster pumping facilities would be located at each WRP. Each service zone would have its own elevated storage facilities and distribution pipelines (K/J, 1995).

4. Conservation/Demand Management

Water conservation programs in the Antelope Valley are primarily directed at urban areas, and are provided through agencies like LACWWD, the City of Lancaster, and the City of Palmdale. Urban water conservation programs in the Valley include ordinances, literature, advertising, and phased water conservation plans. Several categories of urban water conservation measures are identified in the September 1991 Memorandum of Understanding Regarding Urban Water Conservation in California (hereafter MOU), its 1997 amendment, and the Urban Water Management Planning Act (K/J, 1995).

The MOU was entered into in 1991 by urban water suppliers, public advocacy organizations, and other interested groups who recognized the need for conservation due to increasing water demands for urban, agricultural, and environmental uses. Urban water conservation practices or BMPs identified in the MOU are intended to reduce long-term urban water demands. In addition to identifying BMPs, the MOU also included Potential Best Management Practices (PBMPs). The intent of the MOU was to study and then determine whether or not the PBMPs met the criteria designated as BMPs (K/J, 1995).

The Urban Water Management Planning Act requires urban water retailers supplying more than 3,000 AF/Yr or serving more than 3,000 customers to prepare an Urban Water Management Plan (UWMP) to achieve conservation and efficient use of water. The Act requires the UWMP to evaluate specific water management practices.

Demand management is one of the most effective means of extending the useful life of water resources and provides many benefits; for instance, decreasing average demands

can enable the water purveyor to defer the construction of certain capital facilities, such as sources of supply (e.g. wells, water treatment facilities). Of course, the focus of demand management should remain on water conservation and extension of the life of the resource.

Many specific demand management measures are already codified in existing federal and state law. For instance, water efficient shower heads and toilets are required by building codes modified to account for federal and state efficiency requirements. Additional measures are also either mandated or allowed, such as the use of household gray water for residential irrigation purposes.

While certain demand management measures have already been implemented in various portions of District No. 40, additional measures and expanded implementation of existing measures are expected to increase efficiency. Because agricultural water use is expected to decline significantly during the planning period, the plan consists primarily of urban conservation programs developed for the City of Palmdale, the City of Lancaster, and developed areas within unincorporated Los Angeles County.

One of the least expensive, simplest, and most cost effective means for managing water is to reduce water use. Of the numerous means available to encourage water conservation by residents of the District No. 40 service area, several are outlined below.

When implementing water conservation measures, it is important to establish specific goals. Said goals are best established in terms of reducing water use per capita or per dwelling unit to a specified level. Establishing water conservation goals will enable LACWWD to evaluate the success of water conservation efforts, and will allow it to enhance existing measures and/or introduce new measures to increase the water conservation program's effectiveness. Water conservation goals should be reasonable in terms of both extent and schedule in order to avoid placing undue hardships upon District No. 40's customers. LACWWD should evaluate ordinances and regulations, education

programs, a toilet and shower head retrofit program, and a pipeline replacement program; each potential program is discussed separately below.

a. Public Education and Information

A water conservation education program can effectively promote customers' awareness of the need to use water wisely. Education programs make customers aware of measures that they can personally implement to conserve valuable resources and, at the same time, save money. Programs implemented at the elementary school level can produce positive changes in the life-long water use habits and attitudes of future water customers. LACWWD should consider implementing an education program, using newspaper articles and pamphlets to get the conservation message out to its water customers.

An extremely effective method for encouraging people to conserve water is to educate them as to both the importance of conserving water and the numerous methods available to accomplish water conservation. LACWWD should therefore implement a program designed to alert its customers to the potentially significant adverse effects associated with excessive water use and explain methods available to them to reduce water use.

The element of the education program intended to warn LACWWD customers about overuse should emphasize items of particular concern to individual customers, such as increased water rates and decreased water quality that result from excessive use of the resource. This portion of the education program should include exhibits which provide details regarding the effects of ground water overdraft and the projected extent of overdraft within the Valley.

The element of the education program concerned with educating LACWWD's customers about means for reducing water use should incorporate a number of suggestions relating to virtually every type of water use that the average customer may engage in.

LACWWD should consider conducting programs to inform residential and commercial customers of methods they can use to conserve and better manage water. Program implementation would entail the following:

- Preparation of an irrigation guide for distribution with utility bills.

- Promotion of water conservation by speaking to public groups regarding the importance of water conservation.

- Modification of water bills to show water use for the same month during the previous year.

The objective of the program would be to encourage LACWWD's customers to conserve water and to provide a means by which customers can measure the effectiveness of water conservation efforts.

b. Low Water Consumption Ordinance

LACWWD should encourage the County to adopt and enforce a low water consumption ordinance specific to the Antelope Valley; said ordinance, which should be prepared in cooperation with the LACWWD staff, could include some or all of the following measures:

- Review of landscape and irrigation designs for commercial, government, and industrial projects to ensure the use of water efficient planting and irrigation practices.

- Implementation and enforcement of a sprinkler overspray control program for private and public lands to prevent discharge to

impermeable surfaces. Corrective measures would consist of verbal requests to sprinkler operator, followed by a fine for failure to correct.

- A reporting system to limit instances of water running to waste in streets. Corrective measures would consist of verbal requests to the party, followed by a fine for failure to correct.

LACWWD staff would assist the County in enforcing the low water consumption ordinance, particularly by responding to reported or observed violations and educating and assisting the user in corrective action.

c. Ascending Rate Schedules

Rate schedules typically charge a per-unit rate for each unit of water consumption for the respective billing period (generally one or two months); units are measured in increments of one hundred cubic feet (ccf), which is equivalent to 748 gallons. Ascending rate schedules apply a different per-unit charge to each block of water use during the billing period. The first block of water use (e.g. 5 ccf) carries the same per-unit charge for all users. Consumption beyond the first block of water use carries a higher per-unit charge; however, increased consumption does not affect the unit rate applied to the first increment of use.

Ascending rate schedules have the effect of decreasing water waste and encouraging water conservation, as they carry a de facto penalty for excessive use. LACWWD can take an affirmative step toward increasing the efficiency of water use within each of District No. 40s' regions by implementing ascending rate schedules that are tailored to each region's specific revenue requirements and conservation goals. LACWWD should consider the performance of a detailed, focused rate study within District No. 40; such a study would identify specific revenue requirements necessary to fund capital and operations costs, and would also support efforts to introduce ascending rate schedules.

d. Xeriscape Regulations

LACWWD can take positive steps to ensure that the development of property occurring in the community includes aesthetically pleasing, safe, and environmentally sound landscapes by adopting Xeriscaping regulations. Key elements of effective regulations include:

- Irrigation systems must be designed to operate automatically and be vandal resistant;

- Contract documents (construction drawings and specifications) must be complete and detail all work to done, including complete specifications for plants (by size and botanical name) and piping and appurtenances (by size and class);

- Plants and turf must be compatible with the Antelope Valley area; and

- Landscapes must be environmentally sound.

In the context of water efficient landscapes, these elements translate to the following:

> *Landscape plantings shall be planned to be compatible with the local environment. The landscape plan shall clearly show the location and type of plants as well as the components of the irrigation system necessary to irrigate the entire planting.*

The term "Xeriscaping" has become a common term for water efficient landscapes. Many definitions of xeriscaping exist. For the purposes of this Plan, xeriscaping

will not be rigidly defined, but its principles will be demonstrated using the seven key elements developed by CDWR. These elements are:

- Good landscape planning and design;
- Limits on the size of turf areas;
- Use of low water using plants;
- Installation of appropriate irrigation systems and scheduling;
- Soil improvement;
- Use of mulches; and
- Appropriate maintenance.

A County ordinance should be enacted that requires that the design of new development incorporate the principles of xeriscaping. This would result in water savings and help to achieve LACWWD's water conservation goals.

e. Incentive Programs

Incentives are a positive way to encourage conservation of water. Common incentive programs include a rebate program for installation of water conserving devices in the home, replacement of landscape turf with water conserving plants or non-water using surfaces such as patios or decks, and a retrofit program. LACWWD should consider implementing an incentive program as a means to encourage its customers to make the most efficient possible use of water.

f. Demonstration Garden

LACWWD should consider constructing a demonstration garden, which would include examples of low water use plants and efficient irrigation systems. LACWWD should probably construct an irrigated garden in conjunction with a cooperative vegetation study with the United States Department of Agriculture (Soil Conservation Service) and/or the University of California or California

State University (state-wide or with a particular campus) to determine the most efficient plants for various purposes (e.g. ground cover, wind breaks, decorative landscaping) in the Antelope Valley. Combining the vegetation study with the demonstration garden would result in greatly reduced costs for plants, irrigation equipment, and landscape maintenance. LACWWD should also invite interested persons or organizations (such as landscape architects, landscape contractors, nurseries, and garden clubs) to participate.

g. Toilet and Shower Head Retrofit Program

A toilet and shower head retrofit program should be evaluated and (if found to be cost-effective) implemented to encourage LACWWD's customers to replace inefficient toilets and shower heads with ULF facilities; said facilities have been demonstrated to result in significant cumulative water savings. A similar ongoing program sponsored by the Metropolitan Water District of Southern California (MWD) has resulted in the replacement of tens of thousands of inefficient toilets and shower heads.

According to the Water Education Foundation, the amount of water conserved is considerable; for instance, ULF toilets discharge just 1.6 gallons per flush, as opposed to the 6 gallons or more expended per flush by conventional toilets and 3 gallons per flush for low flush toilets. ULF shower heads reduce water use by 50% or more, which equates to about 3 gallons per minute per shower.

h. Pipeline Replacement Program

In order to reduce water losses through leaks in its water conveyance and distribution system, LACWWD should continue with its pipeline replacement program, designed to replace as much aging and deteriorated pipeline as possible.

5. Water Resource Protection

Because the Antelope Valley Ground Water Basin is the primary local source of water supply within the Valley, its protection and enhancement are important to all Valley water interests. A number of measures can be adopted which will serve to protect the quantity and quality of the Basin, some of which are described below.

a. Ground Water Monitoring

A soundly designed, constructed, and operated system of monitoring wells is necessary to determine and monitor ground water quantity and quality conditions within ground water bodies. To fully determine the quantity and quality of ground water in a specific area, the ground water monitoring system should consist of a series of monitoring wells constructed within strategically selected areas. The monitoring wells (one piezometer per aquifer zone for separate measurements and samples) should be constructed to bedrock in order to provide information about the region's bedrock profile.

To provide potential cost savings and allow some monitoring to begin within one to two years, LACWWD may decide to examine some existing wells which are no longer in operation and determine their suitability to serve as interim monitoring wells. A number of wells lying within District No. 40's boundaries have been abandoned (but probably not destroyed) over the years, and some may be useful in determining water levels and water quality in various areas. In the event that an area of particular concern is identified by the monitoring of such wells, additional steps (such as constructing a dedicated monitoring well) can be implemented.

- Scheduling

Although it would be desirable to construct a complete monitoring well system immediately, fiscal constraints prevent construction on so large a scale. In recognition of same, LACWWD should use existing wells for

monitoring purposes until funds are available for constructing dedicated monitoring wells.

In order to ensure that useful information is gathered, it will be necessary to measure ground water levels and collect water quality samples on a regular basis, and LACWWD will have to establish a monitoring schedule that can be strictly adhered to on a continual basis. The recommended schedule consists of measuring ground water levels quarterly, and collecting and analyzing water quality samples annually; however, the schedule may need to be modified based upon observations as the monitoring system is developed and expanded.

- Mapping

To provide a visual representation of the information gathered by the monitoring wells, a Valley-wide ground water monitoring program map should be created which indicates the location of each well from which water level data and water quality samples are collected. The map may be prepared using computer aided design/drafting (CADD) software, which would enable it to be kept current as new information is gathered over the course of the monitoring program.

The map should indicate the following: the ground surface elevation of each well, referenced to mean sea level; the depth to ground water at each well and the date of measurement; and certain key ground water quality indicators (such as total dissolved solids and nitrates) and the date of sample collection. The ground water monitoring program map would enable interested parties to determine current ground water conditions within District No. 40's boundaries, and to compare same with past conditions to determine whether or not there have been any notable changes in ground water quantities or quality.

b. Ground Water Production

Spreading ground water production over as wide an area as possible can have beneficial effects upon ground water bodies; instead of creating pumping depressions, ground water levels decline more uniformly, resulting in a lesser but widespread lowering of the water table rather than a greater but localized lowering of same.

- Production Areas

  While it is important to spread production facilities over as great an area as possible, it is also important to keep capital and operations costs as low as practicable; therefore, new production facilities are proposed to be constructed as near as possible to existing conveyance facilities and within appropriate pressure zones in order to limit costs.

- Water Supply Well Locations

  To ensure that water supply wells are far enough apart to prevent them from creating excessive and undesirable overlapping pumping depressions, LACWWD should construct or permit the construction of new wells that are spaced in accordance with established (or estimated) aquifer behavior. Any ASR program would allow for closer spacing since the aquifer would be alternately replenished/depleted. At the same time, LACWWD should attempt to keep associated conveyance costs as low as possible by constructing new water supply wells in reasonable proximity to existing conveyance and storage facilities.

c. Ground Water Contamination Prevention/Response

The threatened or potential contamination of ground water is a matter of considerable concern in all areas of the country, but particularly so in areas like the Antelope Valley. Contamination can take many forms and be caused by

numerous factors; for instance, it can result from various types of pollution, such as disposal of petroleum products, or from the migration or percolation of physical materials such as total dissolved solids and nitrates. Should ground water in the Valley become contaminated, the area's sole reliable local source of domestic water would be threatened. It is therefore important that ground water resources in the area be protected from contamination to the greatest extent possible. Although contaminated ground water can be treated sufficiently to allow domestic consumption, the costs and operational difficulties associated with same are considerable.

The water quality of water produced by District No. 40's wells is generally high. The actions proposed below are intended to help ensure that: a) the possibility of ground water contamination is limited to the greatest practicable extent, and b) LACWWD is prepared to respond to any contamination that may occur.

- Well Construction and Abandonment Standards

  Since wells are direct conduits to and from ground water, they represent a significant potential means for transmitting contaminants (particularly pollutants) directly into ground water. In recognition of this potential, CDWR has prepared a highly specific and lengthy set of standards for the construction and abandonment of water wells. Said standards, which are included in CDWR Bulletins 74-81 and 74-90, Water Well Standards: State of California, contain rigidly defined specifications; for example, said Bulletins require that all wells to be abandoned be pressure grouted with cement grout throughout the perforated portions of the well casing to ensure that they are incapable of transmitting contaminants. Although CDWR's well construction and abandonment standards are theoretically in force state-wide, LACWWD should continue to ensure that they are enforced during the construction or abandonment of any well within District No. 40's boundaries.

LACWWD should also consider implementing a program for the location and proper destruction of area wells that have either been incorrectly constructed or inadequately abandoned. In order to accomplish same, LACWWD would have to secure well driller's logs from CDWR for all wells constructed within District No. 40's boundaries. In addition, LACWWD could solicit the participation and cooperation of individual well owners within its boundaries, and request that any individuals with knowledge of wells that may have been inadequately abandoned alert LACWWD staff regarding same so that they can be properly destroyed.

- Recharge Area Protection

Recharge area protection essentially consists of ensuring that land uses within watersheds or areas overlying ground water bodies do not pose a threat of ground water contamination. There are numerous types of developments and land uses which, if not constructed in compliance with applicable standards, pose direct and significant threats to ground water quality. In addition, unlawful activities (e.g. illegal garbage dumping, disposal of hazardous wastes, disposal of dead animals) can also result in ground water contamination.

The most effective means of preventing contamination is to interact and cooperate with agencies that have responsibility for land use planning and/or standards enforcement. As such, it will be necessary for LACWWD staff to establish a good working relationship with responsible staff members from various federal, state, and county agencies that have jurisdiction over areas of potential concern. The list of agencies that the District should involve includes, but is not limited to, the following: the U.S. Bureau of Land Management (U.S. BLM), the California Integrated Waste Management Board (CIWMB), the California Regional Water Quality Control Board (RWQCB), the State Water Resources Control Board (SWRCB), the Los Angeles County

Planning Department, and the Los Angeles County Public Health Department.

- Monitoring for Contamination

  As noted above, LACWWD should establish a ground water monitoring system that will enable it to monitor ground water levels and quality within its boundaries. One of the reasons that monitoring is important is that, in the absence of a carefully planned monitoring well grid, contamination could easily occur within a ground water body as large as the Antelope Valley Ground Water Basin and not be detected for months or years. Failure to detect contamination could result in a significant and widespread contaminant plume, which would have the potential to rob the area of at least a portion of its ground water supply. LACWWD should monitor for ground water quality on an annual basis, although the frequency of said monitoring may be increased, particularly in areas that are considered likely to be contaminated owing to overlying land uses.

- Responses to Contamination

  In the event that ground water contamination is detected, LACWWD should immediately assess the severity of the contamination and confer with various regulatory and enforcement agencies (e.g. U.S. EPA, SWRCB, RWQCB), and develop and implement a response plan. The response to any contamination that may be detected in the future would be dictated by its severity, and could range from blending the contaminated supply with untainted supplies to bring the product water to within federal and state drinking water standards, to constructing well head treatment facilities. Owing to the significant numbers of contaminated sites around the United States, a number of technologies have been developed that enable agencies to react rapidly to episodes of contamination in order to protect public health, and LACWWD would have to make use of same should the need arise.

Since remediation of ground water contamination is usually quite expensive, LACWWD should emphasize working with the aforementioned regulatory agencies in identifying the party(ies) responsible for any contamination that may be detected in the future, and take any steps necessary to ensure that cleanup activities are performed at no cost to LACWWD or its customers. There are a number of laws available to help ensure that responsible party(ies) are held accountable, particularly the Federal Comprehensive Environmental Response, Compensation, and Liability Act (better known as Superfund) and the Resource Conservation and Recovery Act, as well as the California Superfund. These laws are designed to ensure that contaminated environments are restored, and that those responsible for the contamination are held responsible and liable for cleanup activities.

TABLE III-1
ANTELOPE VALLEY WATER SUPPLIES
IN ACRE-FEET PER YEAR

SOURCE	SUPPLY (1)	SUPPLY (2)
1. Ground Water	31,200	59,100
2. State Water Project		
a. AVEK	134,200	134,200
b. PWD	17,300	17,300
c. LCID	2,300	2,300
3. Littlerock Reservoir	7,000	7,000
4. Reclaimed Water	20,900	20,900
TOTAL:	212,900	240,800

(1) Assuming Safe Yield of 31,200 AF/Yr.
(2) Assuming Safe Yield of 59,100 AF/Yr.

SOURCE: Antelope Valley Water Resource Study (K/J, 1995)

TABLE III-2
LACWWD WATER SUPPLIED
IN ACRE-FEET PER YEAR
1985-1997

YEAR	GROUND WATER	IMPORTED WATER	TOTAL
1985 (1)	9,791	9,584	19,375
1986 (1)	12,830	11,229	24,059
1987 (1)	14,127	11,968	26,095
1988 (1)	13,310	15,082	28,392
1989 (1)	16,619	17,626	34,245
1990 (1)	14,052	20,917	34,969
1991 (1)	17,093	12,940	30,033
1992 (2)	14,755	18,704	33,459
1993 (2)	14,357	24,409	38,766
1994 (2)	16,885	24,329	41,214
1995 (2)	19,742	21,692	41,433
1996 (2)	19,419	26,997	46,417
1997 (2)	19,460	28,093	47,553

(1) SOURCE: Land Use and Water Use in the Antelope Valley, California (USGS, 1995)
(2) SOURCE: LACDPW Production Reports

TABLE III-3
WATER SUPPLIED
WITHIN THE ANTELOPE VALLEY
IN ACRE-FEET PER YEAR
1949-1991

YEAR	PRODUCTION
1949-50	225,600
1975	192,600
1980	168,000
1985	152,000
1988	118,000
1989	130,600
1990	128,000
1991	127,400

SOURCE: Land Use and Water Use in the Antelope Valley, California (USGS, 1995)

TABLE III-4
WATER SUPPLIED BY PUBLIC SUPPLIERS AND
SELF SUPPLIERS WITHIN THE ANTELOPE VALLEY
IN ACRE-FEET PER YEAR
1985-1991

	LACWWD			NON-LACWWD PUBLIC SUPPLIERS				SELF SUPPLIERS				TOTAL ANTELOPE VALLEY SUPPLIES
YEAR	GROUND WATER	IMPORTED WATER	TOTAL	GROUND WATER	SURFACE WATER	IMPORTED WATER	TOTAL	GROUND WATER	SURFACE WATER	IMPORTED WATER	TOTAL	
1985	9,791	9,584	19,375	20,519	1,395	5,950	27,864	36,504	3,957	22,136	62,597	109,836
1986	12,830	11,229	24,059	22,415	961	7,935	31,311	34,079	3,338	15,040	52,457	107,827
1987	14,127	11,968	26,095	21,302	1,603	11,580	34,485	38,306	2,744	14,693	55,743	116,323
1988	13,310	15,082	28,392	11,604	1,491	6,663	19,758	9,083	3,166	15,274	27,523	75,673 *
1989	16,619	17,626	34,245	26,479	1,191	15,672	43,342	27,920	3,127	17,108	48,155	125,742
1990	14,052	20,917	34,969	25,348	46	16,805	42,199	27,306	2,120	15,499	44,925	122,093
1991	17,093	12,940	30,033	28,115	36	12,954	41,105	46,535	1,633	2,769	50,937	122,075

* Data for 1988 overall supply is not considered accurate due to excessive variation from supplies for preceding and subsequent years. Reported WWD supply is considered accurate.

NOTE: Not all suppliers/producers provided supply information; over the seven year reporting period, an average of 31 public suppliers (out of 40) and 72 self suppliers (out of 156) provided information. LACDPW reported all supplies from its various sources throughout the reporting period. Overall supply estimates are indicated on Table III-2.

SOURCE: Land Use and Water Use in the Antelope Valley, California (USGS, 1995)

TABLE III-5
STATE WATER PROJECT DELIVERIES
TO THE ANTELOPE VALLEY'S SWP CONTRACTORS
IN ACRE-FEET PER YEAR
1972-1995

YEAR	AVEK	PWD	LCID	TOTAL SWP DELIVERIES	PERCENT OF ENTITLEMENT	TOTAL ENTITLEMENT
1972	53	---	338	391	1.8%	21,790
1973	20	---	290	310	1.1%	28,230
1974	1,259	---	400	1,659	5.8%	34,660
1975	8,068	---	520	8,588	20.1%	41,100
1976	27,782	---	589	28,371	55.0%	51,540
1977	11,202	---	111	11,313	19.2%	58,950
1978	44,137	---	208	44,345	65.9%	67,260
1979	60,493	---	133	60,626	81.6%	74,300
1980	72,407	---	191	72,598	89.0%	81,530
1981	79,375	---	1,270	80,645	91.7%	87,970
1982	50,291	---	---	50,291	52.9%	95,000
1983	32,961	---	38	32,999	32.3%	102,140
1984	32,662	---	1	32,663	65.1%	50,170
1985	37,064	1,558	---	38,622	69.1%	55,910
1986	32,449	3,096	163	35,708	60.9%	58,640
1987	34,094	5,379	1,080	40,553	66.1%	61,380
1988	34,079	1,770	419	36,268	56.6%	64,110
1989	45,280	9,009	971	55,260	38.2%	144,550
1990	47,206	8,608	1,747	57,561	37.9%	151,700
1991	9,568	3,914	522	14,004	8.9%	158,000
1992	30,265	4,035	251	34,551	21.9%	158,000
1993	43,102	7,761	734	51,597	32.7%	158,000
1994	49,153	8,418	1,098	58,669	37.1%	158,000
1995	47,286	6,961	480	54,727	34.6%	158,000

SOURCE: CDWR Bulletin 132-96, Tables B-4 and B-5B.

TABLE III-6
AVERAGE WASTEWATER/RECLAIMED WATER FLOW
FOR THE PALMDALE AND LANCASTER WRPS
1975-1996

YEAR	PALMDALE WRP		LANCASTER WRP		TOTAL	
	MGD	AF/YR	MGD	AF/YR	MGD	AF/YR
1975	1.6	1,790	4.0	4,480	5.6	6,270
1976	1.6	1,790	4.0	4,480	5.6	6,270
1977	1.6	1,790	3.8	4,260	5.4	6,050
1978	1.7	1,900	3.8	4,260	5.5	6,160
1979	1.8	2,020	4.3	4,820	6.1	6,840
1980	1.9	2,130	4.7	5,260	6.6	7,390
1981	2.1	2,350	4.8	5,380	6.9	7,730
1982	2.2	2,460	4.9	5,490	7.1	7,950
1983	2.4	2,690	5.3	5,940	7.7	8,630
1984	2.8	3,140	5.7	6,380	8.5	9,520
1985	3.3	3,700	5.5	6,160	8.8	9,860
1986	3.8	4,260	5.8	6,500	9.6	10,760
1987	4.6	5,150	6.2	6,940	10.8	12,090
1988	4.8	5,380	6.5	7,280	11.3	12,660
1989	6.4	7,170	7.7	8,630	14.1	15,800
1990	7.2	8,070	8.3	9,300	15.5	17,370
1991	7.9	8,850	8.1	9,070	16.0	17,920
1992	7.4	8,290	8.4	9,410	15.8	17,700
1993	---		---		---	---
1994	---		---		---	---
1995	---		---		---	---
1996	---		---		---	---

SOURCE: Antelope Valley Water Resource Study (K/J, 1995)

TABLE III-7A
PROJECTED WATER SUPPLY REQUIREMENTS
WITHIN DISTRICT NO. 40
(INCLUDING SPHERES OF INFLUENCE)
IN ACRE-FEET PER YEAR*
(WITH AVEK DELIVERIES TO ALL REGIONS TO PROVIDE FOR 80% OF TOTAL WATER SUPPLIED)

	1997			2010			2020		
REGION(S)	Ground Water	AVEK	Total	Ground Water	AVEK	Total	Ground Water	AVEK	Total
4 and 34	17,604	23,621	41,226	21,878	87,513	109,390	26,445	105,777	132,222
24, 27, and 33	1,135	1,645	2,780	991	3,967	4,958	1,273	5,093	6,366
35	28	257	285	502	2,008	2,509	673	2,693	3,366
38	515	2,494	3,009	1,518	6,072	6,945	1,934	7,737	9,671
39	178	75	253	146	588	734	196	784	979
Total:	19,460	28,092	47,553	25,035	100,148	124,537	30,521	122,083	152,604

* Includes water loss at 8.5% of water supplied.

TABLE III-7B
PROJECTED WATER SUPPLY REQUIREMENTS
WITHIN DISTRICT NO. 40
(INCLUDING SPHERES OF INFLUENCE)
IN ACRE-FEET PER YEAR*
(WITH AVEK DELIVERIES TO REGIONS 4, 24, 27, 33, 34, AND 38 TO PROVIDE FOR 80% OF TOTAL WATER SUPPLIED)

	1997			2010			2020		
REGION(S)	Ground Water	AVEK	Total	Ground Water	AVEK	Total	Ground Water	AVEK	Total
4 and 34	17,604	23,621	41,226	19,549	89,842	109,390	23,344	108,878	132,222
24, 27, and 33	1,135	1,645	2,780	886	4,072	4,958	1,123	5,243	6,366
35	28	257	285	2,509	0	2,509	3,366	0	3,366
38	515	2,494	3,009	1,356	6,234	6,945	1,707	7,964	9,671
39	178	75	253	734	0	734	979	0	979
Total:	19,460	28,092	47,553	25,035	100,148	124,537	30,520	122,084	152,604

* Includes water loss at 8.5% of water supplied.

TABLE III-8
PERCENTAGE OF ANTELOPE VALLEY SUPPLY
ATTRIBUTABLE TO LACWWD
IN ACRE-FEET PER YEAR
1985-1991

YEAR	OVERALL SUPPLY	WWD SUPPLY	WWD PERCENTAGE OF OVERALL SUPPLY
1985	109,836	19,375	17.6
1986	107,827	24,059	22.3
1987	116,323	26,095	22.4
1988	75,673 *	28,392	37.5
1989	125,742	34,245	27.2
1990	122,093	34,969	28.6
1991	122,075	30,033	24.6

* Data for 1988 overall supply is not considered accurate due to excessive variation from supply for preceding and subsequent years. Reported LACWWD supply is considered accurate.

NOTE: Not all Antelope Valley suppliers/producers provided supply information; over the seven year reporting period, an average of 31 public suppliers (out of 40) and 72 self suppliers (out of 156) provided information. Estimated overall supply within the Valley is indicated on Table III-2.

SOURCE: Land Use and Water Use in the Antelope Valley, California (USGS, 1995)

TABLE III-9
PERCENTAGE OF ANTELOPE VALLEY GROUND WATER PRODUCTION ATTRIBUTABLE TO LACWWD IN ACRE-FEET PER YEAR 1985-1991

YEAR	OVERALL GROUND WATER PRODUCTION	WWD GROUND WATER PRODUCTION	DPW PERCENTAGE OF OVERALL GROUND WATER PRODUCTION
1985	66,814	9,791	14.7
1986	69,324	12,830	18.5
1987	73,735	14,127	19.2
1988	33,997 *	13,310	39.2
1989	71,018	16,619	23.4
1990	66,706	14,052	21.1
1991	91,743	17,093	18.6

* Data for 1988 overall production is not considered accurate due to excessive variation from production for preceding and subsequent years. Reported LACDPW production is considered accurate.

NOTE: Not all Antelope Valley suppliers/producers provided production information; over the seven year reporting period, an average of 31 public suppliers (out of 40) and 72 self suppliers (out of 156) provided information. Estimated overall production within the Valley is indicated on Table III-2.

SOURCE: Land Use and Water Use in the Antelope Valley, California (USGS, 1995)

TABLE III-10
POTENTIAL RECLAIMED WATER CUSTOMERS
WITHIN LOS ANGELES COUNTY

USER NAME	CURRENT STATUS	REQUIRED LEVEL OF TREATMENT	PROJECTED DEMAND (AF/YR)	PEAK DEMANDS (AF/MO)	(AF/DY)	(1,000 GPD)
PALMDALE/LANCASTER TERTIARY SYSTEM						
2840 ZONE						
PALMDALE HIGH SCHOOL	EXISTING	TERTIARY	138	25.3	0.82	265.9
DESERT AIRE GOLF COURSE	EXISTING	SECONDARY-D	120	22.0	0.71	231.2
MCADAM PARK	EXISTING	TERTIARY	72	13.2	0.43	138.7
COURSON PARK	EXISTING	TERTIARY	23	4.1	0.13	43.4
DESERT ROSE ELEMENTARY SCHOOL	EXISTING	TERTIARY	26	4.8	0.15	50.1
TUMBLEWEED ELEMENTARY SCHOOL	EXISTING	TERTIARY	26	4.8	0.15	50.1
CACTUS K-8 SCHOOL	EXISTING	TERTIARY	36	6.7	0.22	70.1
MESA INTERMEDIATE SCHOOL	EXISTING	TERTIARY	52	9.5	0.31	100.2
2840 ZONE TOTAL			493	90.4	2.92	949.7
2920 ZONE						
PALMDALE BUSINESS PARK	FUTURE	TERTIARY	118	16.6	0.54	174.6
PALMDALE BUSINESS PARK GOLF COURSE	FUTURE	SECONDARY-D	453	50.9	1.64	535.3
ANTELOPE VALLEY COUNTRY CLUB	EXISTING	SECONDARY-D	375	68.8	2.22	722.5
DESERT SANDS PARK	EXISTING	TERTIARY	68	12.5	0.40	131.0
YUCCA ELEMENTARY SCHOOL	EXISTING	TERTIARY	23	4.3	0.14	45.1
HIGHLANDS HIGH SCHOOL	EXISTING	TERTIARY	100	18.3	0.59	192.7

TABLE III-10
POTENTIAL RECLAIMED WATER CUSTOMERS
WITHIN LOS ANGELES COUNTY

USER NAME	CURRENT STATUS	REQUIRED LEVEL OF TREATMENT	PROJECTED DEMAND (AF/YR)	PEAK DEMANDS (AF/MO)	(AF/DY)	(1,000 GPD)
SUMMERWIND ELEMENTARY SCHOOL	FUTURE	TERTIARY	42	7.6	0.25	80.2
2920 ZONE TOTAL			1,179	179.0	5.78	1,881.4
2620 ZONE						
LANCASTER BUSINESS PARK	EXISTING	TERTIARY	55	10.0	0.32	105.6
SERRANO RANCH	FUTURE	TERTIARY	329	60.3	1.95	633.9
SERRANO RANCH GOLF COURSE	FUTURE	SECONDARY-D	633	116.1	3.74	1219.7
K&B DEVELOPMENT (TRACT 49864)	FUTURE	TERTIARY	47	8.6	0.28	90.2
FOX AIRFIELD COMMERCIAL DEVELOPMENT	FUTURE	TERTIARY	1,920	352.0	11.35	3699.5
LANCASTER CITY PARK	EXISTING	TERTIARY	150	23.5	0.91	295.0
LANCASTER CITY PARK	FUTURE	TERTIARY	32	5.9	0.23	73.5
JANE REYNOLDS PARK	EXISTING	TERTIARY	30	5.2	0.20	64.6
MARIPOSA PARK	EXISTING	TERTIARY	28	6.2	0.24	78.3
EASTSIDE PARK	EXISTING	TERTIARY	71	10.3	0.40	129.5
EL DORADO PARK	EXISTING	TERTIARY	40	6.5	0.25	81.0
SKYTOWER PARK	EXISTING	TERTIARY	48	8.8	0.34	110.3
APPOLLO LAKES COUNTY PARK	EXISTING	TERTIARY	129	30.1	1.44	470.0
ANTELOPE VALLEY HIGH SCHOOL	EXISTING	TERTIARY	130	23.8	0.77	250.5
DESERT WINDS HIGH SCHOOL	EXISTING	TERTIARY	8	1.4	0.05	14.8
PARKVIEW INTERMEDIATE HIGH SCHOOL	EXISTING	TERTIARY	65	11.9	0.38	124.9
MARIPOSA ELEMENTARY SCHOOL	EXISTING	TERTIARY	38	7.0	0.22	73.1
JOSHUA ELEMENTARY SCHOOL	EXISTING	TERTIARY	56	10.3	0.33	108.7
EL DORADO ELEMENTARY SCHOOL	EXISTING	TERTIARY	25	4.6	0.15	48.6

TABLE III-10
POTENTIAL RECLAIMED WATER CUSTOMERS
WITHIN LOS ANGELES COUNTY

USER NAME	CURRENT STATUS	REQUIRED LEVEL OF TREATMENT	PROJECTED DEMAND (AF/YR)	PEAK DEMANDS (AF/MO)	(AF/DY)	(1,000 GPD)
LINDA VERDE ELEMENTARY SCHOOL	EXISTING	TERTIARY	28	5.1	0.16	53.6
JOSHUA MEMORIAL PARK	EXISTING	SECONDARY-D	90	16.5	0.53	173.4
JOSHUA MEMORIAL PARK	FUTURE	SECONDARY-D	21	3.9	0.12	40.5
NEW VISTA ELEMENTARY SCHOOL	FUTURE	TERTIARY	43	7.9	0.26	83.2
2620 ZONE TOTAL			4,016	736	25	8,022
TERTIARY SYSTEM TOTAL			5,688	1,005	33	10,854
PALMDALE/LANCASTER SECONDARY SYSTEM						
ALFALFA FARM	EXISTING	SECONDARY-U	1,151	214.6	7.40	2,627.4
ALFALFA FARM	EXISTING	SECONDARY-U	1,306	243.6	8.40	2,982.4
GRAIN & ALFALFA FARM	EXISTING	SECONDARY-U	2,895	540.6	19.90	6,553.8
ALFALFA FARM	EXISTING	SECONDARY-U	2,706	504.6	17.40	6,177.9
ALFALFA FARM	EXISTING	SECONDARY-U	1,866	348.0	12.00	4,260.6
ALFALFA FARM	EXISTING	SECONDARY-U	1,120	208.8	7.20	2,556.4
NEBEKER RANCH	EXISTING	SECONDARY-U	4,229	788.8	27.20	9,657.3
ALFALFA FARM	EXISTING	SECONDARY-U	1,617	301.6	10.40	3,692.5
ALFALFA FARM	EXISTING	SECONDARY-U	746	139.2	4.80	1,704.2
ALFALFA FARM	EXISTING	SECONDARY-U	1,244	232.0	8.00	2,840.4
CHRISTMAS TREE & LANDSCAPE FARM	EXISTING	SECONDARY-U	81	18.8	0.80	233.9
ALFALFA FARM	EXISTING	SECONDARY-U	995	185.6	6.40	2,272.3
ALFALFA FARM	EXISTING	SECONDARY-U	622	116.0	4.00	1,420.2
ALFALFA FARM	EXISTING	SECONDARY-U	995	185.6	6.40	2,272.3

TABLE III-10
POTENTIAL RECLAIMED WATER CUSTOMERS
WITHIN LOS ANGELES COUNTY

USER NAME	CURRENT STATUS	REQUIRED LEVEL OF TREATMENT	PROJECTED DEMAND (AF/YR)	PEAK DEMANDS (AF/MO)	(AF/DY)	(1,000 GPD)
ALFALFA FARM	EXISTING	SECONDARY-U	373	69.6	2.40	852.1
DOA TEST FARM	EXISTING	SECONDARY-U	32	7.5	0.32	93.6
DOA PISTACHIO FARM	EXISTING	SECONDARY-U	112	29.4	0.90	338.3
DOA CHESTNUT FARM	EXISTING	SECONDARY-U	149	39.2	1.20	451.1
DOA BARLET FARM	EXISTING	SECONDARY-U	304	57.2	2.20	643.3
SOD FARM	EXISTING	SECONDARY-D	684	126.1	5.20	1,683.4
PAIUTE PONDS	EXISTING	SECONDARY-D	1,456	228.4	7.37	2,400.0
WAGAS LAND DUCK PONDS	EXISTING	SECONDARY-D	1,558	186.0	6.00	1,954.8
YOUNG RANCH	EXISTING	SECONDARY-D	253	43.1	1.39	453.0
SECONDARY SYSTEM TOTAL			26,494	4,814	167	58,121

SOURCE: Antelope Valley Water Resource Study (K/J, 1995)

EXPLANATIONS

SECONDARY-D:	Secondary Treatment With Disinfection
SECONDARY-U:	Secondary Treatment Without Disinfection
AF/YR:	Acre Feet Per Year
AF/MO:	Acre Feet Per Month
AF/DY:	Acre Feet Per Day
GPD:	Gallons Per Day

RDF/jdh
C700/78416TBL.xls

CHAPTER IV

CHAPTER IV
EXISTING WATER SYSTEM FACILITIES

The existing water system within District No. 40 consists of 42 wells, 17 well site booster pumping plants, 13 interzone booster pumping plants, 13 connections with AVEK's treated water transmission system, 51 water storage reservoirs (of which 29 are service level reservoirs and the remaining 22 are well forebays), and approximately 800 miles of water transmission and distribution pipelines. District No. 40's water supply and storage facilities are described in Tables IV-1 through IV-6. District No. 40's existing systems are shown on Maps VI-1 through VI-6 (attached in drawing pockets at the end of this document).

A. REGIONS

District No. 40 is organized into eight regions, each of which serves a distinct geographic area. The eight regions, which are shown graphically on Figure I-2, consist of the following:

1. Region 4, which serves the Lancaster area.
2. Region 24, which serves the Pearblossom area.
3. Region 27, which serves the Littlerock area.
4. Region 33, which serves the Sun Village area.
5. Region 34, which serves the Desert View Highlands area.
6. Region 35, which serves the Hi Vista area.
7. Region 38, which serves the Lake Los Angeles area.
8. Region 39, which serves the Rock Creek area.

Each region is further organized into pressure zones. Also, it should be noted that five of the regions are structured such that they function essentially as two systems. The regions that are operated jointly are Regions 4 and 34, and Regions 24, 27, and 33. The other regions operate independently, even though a number of them have interconnections that are necessary to supply water to zones without dependable well plants or AVEK connections.

B. SYSTEM DESCRIPTIONS

The facilities within District No. 40's regions are described in the following subsections. Since their systems are operated jointly, Regions 4 and 34 are described together; likewise, Regions 24, 27, and 33 are described in the same subsection. All zones throughout the District are referred to by a number that indicates either the high water level (HWL) of the reservoir(s) that provide a zone with service level storage, or the hydraulic grade setting of the pressure reducing valve(s) that maintain a zone's service pressure.

1. Regions 4 and 34

Regions 4 and 34 are operated together as one water system. There are currently 10 pressure zones within the two regions, and a total of 34 wells, 15 well site booster pumping plants, 9 AVEK connections, 6 interzone booster pumping plants, and 17 service level storage reservoirs.

a. Pressure Zone 2555

Pressure Zone 2555 has approximately 25,000 service connections, and is supplied from 32 wells and two AVEK connections. Nearly every well site has a forebay that water is pumped into and a booster pumping plant that boosts the water from the forebay into the distribution system. There are two service level storage reservoir sites in the pressure zone: Avenue M/7th Street West with 7.9 MG of storage and Avenue M/5th Street East with 9.0 MG of storage.

b. Pressure Zone 2600

Pressure Zone 2600 has approximately 540 service connections, and is supplied from an AVEK connection through a pressure reducing valve. There are no storage reservoirs or wells in this zone.

c. Pressure Zone 2696

Pressure Zone 2696 has approximately 520 service connections. Under normal operating conditions, it is supplied from AVEK connections since there are no wells within this zone. When AVEK supplies are not available or deliveries are reduced, the zone is supplied from Pressure Zone 2555 through a booster pumping plant located at the Avenue M/7th Street West reservoir site. There are two 1.0 MG service level storage reservoirs at the Avenue P/10th Street West site in the pressure zone.

The Avenue P/10th Street West reservoirs are not used during normal operating conditions due to the significant quantities delivered through the AVEK connection, which results in a hydraulic grade line greater than the overflow elevation of the reservoirs. The reservoirs are used when the pressure zone is being supplied solely by the Pressure Zone 2555 booster pumping plant.

In order to remedy low service pressures in portions of 2555 Zone, LACWWD staff recently adjusted the zone boundaries by constructing additional transmission/distribution pipelines and by operating valves between the zones. LACWWD staff will continue to adjust the zone boundaries as necessary to provide adequate service.

d. Pressure Zone 2837

Pressure Zone 2837 has approximately 320 service connections, and is supplied from an AVEK connection through a pressure reducing valve. There are two service level storage reservoirs with 4.5 MG of storage capacity in this zone; however, there are no wells in this zone.

e. Pressure Zone 2880

Pressure Zone 2880 has approximately 690 service connections, and is supplied from Pressure Zone 2980 through four pressure reducing valves. There are no storage reservoirs or wells in this zone.

f. Pressure Zone 2911

Pressure Zone 2911 has approximately 4,100 service connections, and is supplied by two booster pumping plants that pump water delivered from two AVEK connections (note: even though the nominal hydraulic grade line of AVEK's treated water supply system is 2914', delivery pressure at these two locations is about 2850' due to their remote locations). There is also one well that supplies this zone when the AVEK connections are not in use. There are three service level reservoir sites with a total storage capacity of 7.8 MG in this zone.

g. Pressure Zone 2914

Pressure Zone 2914 has approximately 520 service connections, and is supplied directly from an AVEK connection. There are no service level storage reservoirs or wells in this zone.

h. Pressure Zone 2970

Pressure Zone 2970 has approximately 50 service connections, and is supplied from the 3240 Pressure Zone through one pressure reducing valve. There are no service level storage reservoirs or wells in this zone.

i. Pressure Zone 2980

Pressure Zone 2980 has approximately 2,280 service connections, and is supplied by a booster pumping plant that pumps water delivered from an AVEK connection. There are two service level storage reservoirs with a total capacity of 7.6 MG in this zone; however, there are no wells in this zone.

j. Pressure Zone 3240

Pressure Zone 3240 has approximately 420 service connections. It is served by a hydropneumatic system (booster plant and hydropneumatic tank) that is supplied from the 2911 Zone. The pressure tank supplying the system has a capacity of 5,000 gallons. The zone has no service level storage.

2. Regions 24, 27, and 33

Regions 24, 27, and 33 are operated together as one water system. There are currently three pressure zones within the three regions, and a total of four wells, one well site booster pumping plant, two AVEK connections, two interzone booster pumping plants, and three service level storage reservoirs.

a. Pressure Zone 2914

Pressure Zone 2914 has approximately 1,740 service connections and is supplied by two AVEK connections and one well. Pressure Zone 2914 serves a portion of Region 27 (north of Avenue S-14) and all of Region 33.

In 1997, the District participated in constructing a 3.0 MG tank (Sun Village/AVEK) with AVEK; each entity was originally allocated 1.5 MG of storage; however, the District is now purchasing the AVEK allocation. LACWWD has not yet completed construction of the planned pipeline that will

connect the tank to the 2914 Zone service area; construction of the pipeline is scheduled for the near future. The 3.0 MG Sun Village/AVEK tank is currently utilized as part of 3308 Zone supply system.

b. Pressure Zone 3056

Pressure Zone 3056 has approximately 560 service connections, and is supplied by three wells. The pressure zone has one 1.0 MG service level storage reservoir.

Pressure Zone 3056 supplies water to that portion of Region 27 not served by Pressure Zone 3056 (i.e. south of Avenue S-14). This zone also extends to the portion of Region 24 north of Avenue U-4; however, there are currently no customers within this area.

c. Pressure Zone 3308

Pressure Zone 3308 has approximately 220 service connections, and is supplied by one AVEK connection and one well. The zone has one 0.5 MG service level storage reservoir which is supplied by a booster pumping plant at the Pressure Zone 2914 storage reservoir site (Sun Village/AVEK tank). Pressure Zone 3308 supplies water to customers in Region 24, south of Avenue U-4.

3. Region 35

Region 35 is operated independently from other regions. There are three pressure zones within Region 35, and a total of one well, no AVEK connections, one booster pumping plant, and three service level storage reservoirs.

a. Pressure Zone 3302

Pressure Zone 3302 has approximately 175 service connections, and is supplied by a booster pumping plant that pumps water delivered from a six inch service connection with Region 38. There are two service level storage reservoir sites with a total storage capacity of 1.0 MG in this zone.

In order to augment the Zone's supply, LACWWD is currently equipping a new well (Well 35-2) with a booster pumping plant designed to produce about 500 gpm.

b. Pressure Zone 2928 (Sunshine Rancho)

Pressure Zone 2928 has only three service connections, and is supplied from Pressure Zone 3302 through a pressure reducing valve. There are no wells within this zone, and one storage reservoir with a storage capacity of 0.10 MG.

c. Pressure Zone 2620

Pressure Zone 2620 has only 40 service connections, and is supplied from Pressure Zone 2928 through a pressure reducing valve.

4. Region 38

Region 38 is operated independently from other regions. There are two pressure zones within Region 38, and a total of two wells, one well site booster pumping plant, two AVEK connections, two booster pumping plants, and three service level storage reservoirs.

a. Pressure Zone 2992

Pressure Zone 2992 has approximately 1,130 service connections, and is supplied by two wells and two AVEK connections. There are three service level storage reservoir sites with a total storage capacity of 3.2 MG in this zone.

b. Pressure Zone 2850

Pressure Zone 2850 has approximately 2,340 service connections, and is supplied from the 2992 pressure zone through two pressure reducing valves. There are no storage reservoirs or wells in this zone.

5. Region 39

Region 39 is operated independently from the other regions. There are four pressure zones with only one well, and no AVEK connections (Region 39 is not within AVEK's boundary and therefore must depend on well water and inter-region interconnections for its supply), two booster pumping plants, and three service level storage reservoirs.

a. Pressure Zone 3440

Pressure Zone 3440 has approximately 65 service connections, and is supplied from both Pressure Zone 3540 and Region 24's Pressure Zone 3308 (via an emergency interconnection) through pressure reducing valves. It is important to note that even though the zone's designation is 3440, the actual hydraulic grade approximates 3240 when water from Pressure Zone 3308 is delivered. Water is needed from Pressure Zone 3308 during periods when Region 39's single well cannot accommodate demands (see discussion regarding Pressure Zone 3640 below).

b. Pressure Zone 3540

Pressure Zone 3540 has approximately 95 service connections, and is supplied by Pressure Zone 3640 through a pressure reducing valve. There are no storage reservoirs or wells in this zone.

c. Pressure Zone 3640

Pressure Zone 3640 has approximately 120 service connections, and is supplied by one shallow well in the Big Rock Creek bed. During summer and fall months, the well is dry and LACDPW depends on an emergency interconnection with Region 24; said interconnection delivers water to the 3440 Zone from which it is boosted to the 3640 Zone. There are two service level reservoirs with a combined storage capacity of 0.2 MG in this zone.

d. Pressure Zone 3852

Pressure Zone 3852 has approximately 35 service connections, and is supplied by a booster pumping plant that pumps water from Pressure Zone 3640. There is one reservoir with a storage capacity of 0.2 MG in this zone.

C. WELLS

LACWWD currently operates 42 wells, which are described in summary form on Table IV-2. The table indicates which wells pump directly to the system and which wells pump to a forebay reservoir; under the latter scenario, the water must be pumped into the system by a booster pumping plant. Table IV-2 sets forth each well plant's capacity, which is the capacity of either the well pump or the booster pump(s), whichever is less.

Wells in Regions 4 and 34 have an average pumping capacity of about 1,000 gpm, while wells in Regions 24, 27, 33, 34, 35, 38, and 39 have an average pumping capacity of about 500 gpm.

Therefore, the number of proposed wells described in Chapter VI is based on a projected production capacity of 1,000 gpm each for wells in Regions 4 and 34 and 500 gpm each in the remaining regions.

D. AVEK CONNECTIONS

LACWWD currently has thirteen connections with AVEK's treated water distribution system, which are described in summary form on Table IV-3. The table sets forth each connection's identification number (one for LACWWD, one for AVEK), location, and capacity.

Treated water delivered to District No. 40 is produced at AVEK's Quartz Hill Treatment Plant (current capacity of 65 MGD) and Eastside Treatment Plant (current capacity of 10 MGD) at a nominal hydraulic grade line of 2914'. The majority of the AVEK connections require that LACWWD use a pressure reducing valve (or valves) in order to approximate the hydraulic grade line of the zone served and prevent overflowing reservoirs. However, some of the more remote connections (e.g. east end of Quartz Hill Plant distribution system, north end of Eastside Plant distribution system) provide deliveries at a reduced pressure, which requires LACWWD to boost the AVEK water into the distribution system.

E. BOOSTER PUMPING PLANTS

LACWWD currently operates 30 booster pumping plants; 17 well site booster pumping plants, and 13 interzone booster pumping plants. The 17 well site booster pumping plants are included in Table IV-2; the 13 interzone booster pumping plants are described in summary form on Table IV-4.

LACWWD operates its well site booster pumping plants to convey water from well site forebays to distribution systems; it operates its interzone booster pumping plants to convey water from one pressure zone to another. Booster pumping plants draw water either from the lower zone's service level storage reservoir or from the lower zone's distribution system.

F. STORAGE RESERVOIRS

LACWWD currently utilizes 51 water storage reservoirs, which are described in summary form on Tables IV-5 and IV-6. The tables differentiate between reservoirs that provide service level storage and those that provide well forebay storage. The differentiation is important in that only service level storage reservoirs can enable continued service to customers in the event of loss of power to booster pumping plants. Well forebay storage is only available during power outages if booster pumping plants are equipped with standby emergency power (e.g. engine drivers or generators).

G. PIPELINE SYSTEM

There are approximately 800 miles of pipelines within District No. 40's existing domestic water system. LACWWD currently requires new pipelines to be at least 8 inches in diameter, and is systematically eliminating pipelines smaller than 8 inches in diameter from its inventory in order to improve operating conditions and increase fire flow capability.

TABLE IV-1
DISTRICT NO. 40
EXISTING WATER SUPPLY FACILITIES
(BY REGION)

REGION	NUMBER OF WELLS	WELL PRODUCTION CAPACITY (GPM)	NUMBER OF AVEK CONNECTIONS	AVEK DELIVERY CAPACITY (GPM)	OVERALL CAPACITY (GPM)
4	33	33,674	7	33,672	67,346
24	1	256	1	1,795	2,051
27	3	1,311	0	0	1,311
33			1	1,795	1,795
34	1	769	2	11,210	11,979
35	1	500	0	0	500
38	2	1,615	2	5,385	7,000
39	1	367	0	0	367
TOTAL:	42	38,492	13	53,857	92,349

TABLE IV-2
DISTRICT NO. 40
EXISTING WELL PLANT CAPACITY

Region	Well				Booster			Plant[1]
	No.	Well Capacity (gpm)	Pumps to	Forebay Capacity (MG)	Pump No.	Pump Capacity (gpm)	Pumps to	Capacity (gpm)
4	39	35	Beverly Forebay	0.05	A	24	2425 Zone	34
					B	10		
		35				**34**		
4	41	119	Old Timers	0.20	A	64	Old Timers System	119
					B	1619		
		119				**1683**		
4	FOX	520	Fox Field	0.50		?	Fox System	520
		520						
4	5	1057	Avenue J Forebay	1.00	A	2167	2555 Zone	3347
	9	612	Avenue J Forebay		B	2446	2555 Zone	
	17	611	Avenue J Forebay		C	0	2555 Zone	
	26	1067	Avenue J Forebay					
		3347				**4613**		
4	12	541	Hospital Forebay	1.00	A	600	2555 Zone	2144
	25	678	Hospital Forebay		B	600	2555 Zone	
	38	925	Hospital Forebay		C	1000	2555 Zone	
					D	1000	2555 Zone	
		2144				**3200**		
4	32	993	K-8 & 5th Street Forebay	1.00	A	1500	2555 Zone	6000
	34	1146	K-8 & 5th Street Forebay		B	1500	2555 Zone	
	43	2055	K-8 & 5th Street Forebay		C	1500	2555 Zone	
	44	2220	K-8 & 5th Street Forebay		D	1500	2555 Zone	
		6414				**6000**		
4	13	441	K-8 & Division Forebay	2.00	A	1700	2555 Zone	2322
	33	711	K-8 & Division Forebay		E	1700	2555 Zone	
	42	1170	K-8 & Division Forebay					
		2322				**3400**		
4	15	461	Fairgrounds Forebay	2.00	C	1000	2555 Zone	1000
	52	748	Fairgrounds Forebay					
		1209				**1000**		
4	22	350	J-12 & 50W Forebay	0.50	A	867	2555 Zone	745
	27	395	J-12 & 50W Forebay		B	683	2555 Zone	
					C	692	2555 Zone	
		745				**2242**		
4	29	895	System (2555 Zone)					1800
	30	905	System (2555 Zone)					
		1800						
4	36	1010	Waterbag Forebay	2.00	A	1094	2555 Zone	1010
		1010				**1094**		
4	37	1105	System (2555 Zone)		A	2000	2555 Zone	1105
					B	2000	2555 Zone	
		1105				**4000**		

TABLE IV-2
DISTRICT NO. 40
EXISTING WELL PLANT CAPACITY

Region	Well				Booster			Plant[1]
	No.	Well Capacity (gpm)	Pumps to	Forebay Capacity (MG)	Pump No.	Pump Capacity (gpm)	Pumps to	Capacity (gpm)
4	48	1950	Landmark Forebay	0.34	A	1550	2555 Zone	1724
	49	1724	Landmark Forebay		B	1550	2555 Zone	
					C	1550		
		3674				**4650**		
4	50	1267	Centennial Forebay	0.29	A	1000	2555 Zone	2321
	51	1054	Centennial Forebay		B	1000	2555 Zone	
					C	1000	2555 Zone	
		2321				**3000**		
4	54	2005	Eastside I Forebay	0.29	A	1130	2555 Zone	3452
	55	2161	Eastside I Forebay		B	1170	2555 Zone	
					C	1152	2555 Zone	
		4166				**3452**		
4	58	1346	Eastside II Forebay	0.50	A	1000	2555 Zone	2743
	59	1397	Eastside II Forebay		B	1000	2555 Zone	
					C	1000	2555 Zone	
					D	1000	2555 Zone	
		2743				**4000**		
				Region 4 Subtotal				**30386**
34	6	769	O4 & Division Forebay	0.96	A	1000	2911 Zone	769
					B	1000		
		769				**2000**		
				Region 34 Subtotal				**769**
24	4	256	System (3308 Zone)		A	1000	3308 Zone	256
	5	0	(Under Construction)		B	750		
		256				**1750**		
				Region 24 Subtotal				**256**
27	2	392	System (3056 Zone)					1311
	3	446	System (3056 Zone)					
	4	473	System (3056 Zone)					
		1311						
				Region 27 Subtotal				**1311**
35	1	61	OUT OF SERVICE[2]					
38	1	1288	177th Street	0.10	A	1350	2992 Zone	1615
	3	327	177th Street		B	1408	2992 Zone	
					C	1305	2992 Zone	
		1615				**4063**		
				Region 38 Subtotal				**1615**
39	1	367	Rock Creek Tank				3640 Zone	367
		367						
				Region 39 Subtotal				**367**
TOTAL		**37992**				**46431**		**34704**

1. Capacity of sum of wells or boosters, whichever is less.
2. New well under construction with approximate capacity of 500 gpm.

TABLE IV-3
DISTRICT NO. 40
EXISTING AVEK CONNECTIONS

REGION	DPW NO.	AVEK NO.	LOCATION	NOMINAL DELIVERY CAPACITY (GPM)
4	4-50	853-1	AVE N & 10TH ST W	5,000
4	4-53	853-2	AVE L-12 & 60TH ST W	6,200
4	4-56	853-9	AVE M-8 & 60TH ST W	4,000
4	4-59	853-8	AVE N-2 & 60TH ST W	2,800
4	4-66	854-1	AVE M & 5TH ST E	6,700
4	4-70	853-3	AVE M-11 & 60TH ST W	6,300
4	4-71	854-7	AVE M-8 & SIERRA HWY	2,700
24	24-4	853-4	116TH ST E/WELL 24-4	1,800
33	33-3	853-5	AVE R & 110TH ST E	1,800
34	34-7	854-2	AVE O-4 & 10TH ST W	8,500
34	34-9	854-4	AVE O-4 & DIVISION	2,700
38	38-4	853-6	AVE N-12 & 177TH ST E	1,800
38	38-6	854-3	AVE O & 165TH ST E/ COOLWATER	3,600
			TOTAL:	53,900

SOURCE: Antelope Valley-East Kern Water Agency

TABLE IV-4
DISTRICT NO. 40
EXISTING BOOSTER PUMPING PLANTS

Region	Booster Plant Name/Number	Pumping Unit Designation	Nominal Capacity	Pumps from	Pumps to
4	L-12 & 60 Pump Station	A	1500	2555 Zone	2837 Zone
4	L-12 & 60 Pump Station	B	1221	2555 Zone	2837 Zone
4	L-12 & 60 Pump Station	C	995	2555 Zone	2837 Zone
4	M & 7W Pump Station	A	940	2555 Zone	2696 Zone
4	M & 7W Pump Station	B	880	2555 Zone	2696 Zone
4	Rancho Vista, M-11 & 60W Pump Station	A	3234	2837/AVEK	2990 Zone
4	Rancho Vista, M-11 & 60W Pump Station	B	3169	2837/AVEK	2990 Zone
4	Rancho Vista, M-11 & 60W Pump Station	C	1433	2837/AVEK	2990 Zone
34	P10W Pump Station	D	1800	AVEK	2911 Zone
34	P10W Pump Station	E	1800	AVEK	2911 Zone
34	P10W Pump Station	F	1900	2696 Zone	2911 Zone
34	P10W Pump Station	G	1900	2696 Zone	2911 Zone
34	P10W Pump Station	H	1900	2696 Zone	2911 Zone
34	P10W Pump Station	I	1900	2696 Zone	2911 Zone
34	P10W Pump Station	J	1900	2696 Zone	2911 Zone
34	O-4 & Division Pump Station	A	1000	AVEK	2911 Zone
34	O-4 & Division Pump Station	B	1000	AVEK	2911 Zone

TABLE IV-4
DISTRICT NO. 40
EXISTING BOOSTER PUMPING PLANTS

Region	Booster Plant Name/Number	Pumping Unit Designation	Nominal Capacity	Pumps from	Pumps to
34	Tierra Subida Hydro Pump Station	A	600	2911 Zone	3240 Hydro
34	Tierra Subida Hydro Pump Station	B	600	2911 Zone	3240 Hydro
34	Tierra Subida Hydro Pump Station	C	600	2911 Zone	3240 Hydro
27	T & 106E Pump Station	A	500	Region 24	Region 27
35	G-168E Pump Station	B	70	Sunshine Rancho	3302 Zone
35	175th St E & Nugent Pumping Station	A	190	2992 Zone	3302 Zone
35	175th St E & Nugent Pumping Station	B	225	2992 Zone	3302 Zone
38	Coolwater Pump Station	A	1200	AVEK	2992 Zone
38	Coolwater Pump Station	B	1200	AVEK	2992 Zone
38	Coolwater Pump Station	C	1200	AVEK	2992 Zone
39	W-2 Pump Station	A	60	3440 Zone	3640 Zone
39	X-8 & 121 Pump Station	A	90	3640 Zone	3852 Zone
39	X-8 & 121 Pump Station	B	90	3640 Zone	3852 Zone
39	X-3 Hydro Pump Station	A	15		

TABLE IV-5
DISTRICT NO. 40
EXISTING RESERVOIR CAPACITY
(BY REGION AND PRESSURE ZONE)

		Service Level Storage		Well Forebay Storage	
Region	Pressure Zone	Number of Reservoirs	Capacity (MG)	Number of Reservoirs	Capacity (MG)
4	2425	0	0.0	1	0.05
4	2525	0	0.0	1	0.20
4	2555	6	16.7	18 [5]	11.12
4	2600 [1]	0	0.0	0	0.00
4	2696	2	2.0	0	0.00
4	2837	2	4.5	0	0.00
4	2880 [2]	0	0.0	0	0.00
4	2914 [1]	0	0.0	0	0.00
4	2980	2	7.6	0	0.00
	Subtotal:	12	30.8	20	11.37
34	2911	5	8.3	1	0.96
34	2970	0	0.0	0	0.00
34	3240 [3]	0	0.0	0	0.00
	Subtotal:	5	8.3	1	0.96
24	3308	1	0.5	0	0.00
27	3056 [1,2]	1	1.0	0	0.00
33	2914	1 [4]	3.0	0	0.00
	Subtotal:	3	4.5	0	0.00
35	2620 [2]	0	0.0	0	0.10
35	2928	1	0.1	0	0.00
35	3302	2	1.0	0	0.00
	Subtotal:	3	1.1	0	0.10
38	2667	0	0.0	1	0.10
38	2850 [2]	0	0.0	0	0.00
38	2992	3	3.2	0	0.00
	Subtotal:	3	3.2	1	0.10
39	3440 [2]	0	0.0	0	0.00
39	3540 [2]	0	0.0	0	0.00
39	3640	2	0.2	0	0.00
39	3852	1	0.2	0	0.00
	Subtotal:	3	0.4	0	0.00
	TOTAL:	**29**	**48.3**	**22**	**12.53**

[1] Served by PRV from AVEK
[2] Served by PRV from higher zone
[3] Served by hydropneumatic system
[4] Constructed jointly w/AVEK; not yet in service.
[5] Includes Beech, which is abandoned.

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TABLE IV-6
DISTRICT NO. 40
EXISTING WATER STORAGE FACILITIES
DESCRIPTIVE DATA

REGION	SITE NAME	TANK NUMBER	PRESSURE ZONE SERVED	TYPE OF CONSTRUCTION	DIMENSIONS (DIA X HGT)	STORAGE CAPACITY (MG)	YEAR CONSTRUCTED
4	Beech (abandoned)	1	N/A	Welded Steel	46' x 12'	0.15	Unknown
4	Avenue J	1	N/A	Welded Steel	69' x 18'	0.50	1964
4		2	N/A	Welded Steel	69' x 18'	0.50	Unknown
4	K-8 Div	1	N/A	Welded Steel	97' x 18'	1.00	Unknown
4		2	N/A	Welded Steel	69' x 18'	0.50	Unknown
4		3	N/A	Welded Steel	69' x 18'	0.50	Unknown
4	J4-15W, Hospital	1	N/A	Welded Steel	69' x 18'	0.50	1957
4		2	N/A	Welded Steel	69' x 18'	0.50	Unknown
4	H8-Div, Fairground	1	N/A	Welded Steel	75' x 30'	1.00	Unknown
4		2	N/A	Welded Steel	75' x 30'	1.00	Unknown
4	Ave. M & 7th St.	1 *	2555	Welded Steel	73' x 32'	1.00	1965
4		2 *	2555	Welded Steel	134' x 33'	3.40	Unknown
4		3 *	2555	Welded Steel	131' x 34'	3.25	1973
4	Old Timers	1	N/A	Welded Steel	38' x 24'	0.20	1982
4		2	N/A	Pressure Tank	N/A	0.01	1950
4	M8-75W	1 *	2837	Welded Steel	103' x 24'	1.50	1963
4		2 *	2837	Welded Steel	121' x 35'	3.00	1993
4	Waterbag	1	N/A	Concrete	27'L x 77'W x 32'	2.00	1959
4	J12-50W	1	N/A	Welded Steel	65' x 20'	0.50	1959
4	Old Beverly	1	N/A	Welded Steel	22' x 18'	0.05	Unknown
4		2	N/A	Pressure Tank	N/A	0.01	Unknown
4	K8-5W	1	N/A	Bolted Steel	103' x 16'	1.00	1988
4	Landmark	1	N/A	Bolted Steel	90' x 9'	0.34	1989
4	Eastside I	1	N/A	Welded Steel	55' x 16'	0.29	1990
4	Centennial	1	N/A	Welded Steel	55' x 16'	0.29	1990
4	Eastside II	1	N/A	Welded Steel	79' x 8'	0.29	1989
4	Rancho Vista	1 *	2980	Welded Steel	108' x 56'	3.80	1988
4		2 *	2980	Welded Steel	108' x 56'	3.80	1988
4	Ave. M & 5th St. E	1 *	2555	Welded Steel	113' x 40'	3.00	1993
4		2 *	2555	Welded Steel	113' x 40'	3.00	1993
4		3 *	2555	Welded Steel	113' x 40'	3.00	1993
4	Fox Field	1	N/A	Welded Steel	53' x 12'	0.20	Unknown
4		2	N/A	Pressure Tank	N/A	0.01	Unknown
4	P-10W	1 *	2696	Welded Steel	84' x 24'	1.00	1971
4		2 *	2696	Welded Steel	84' x 24'	1.00	1988
24	116TK	1 *	3308	Welded Steel	53' x 30'	0.50	Unknown
27	Littlerock	1 *	3056	Welded Steel	73' x 32'	1.00	1996
33		1 *	2914	Welded Steel	N/A	3.00	Unknown
34	Ave. O4-Div	1	N/A	Bolted Steel	83' x 24'	0.96	1988
34	Tierra Subida Hydro	1	N/A	Pressure Tank	N/A	0.01	1988
34	Tierra Subida Tank	1 *	2911	Welded Steel	110' x 39.5'	2.80	1988
34		2 *	2911	Welded Steel	93' x 39.5'	2.00	Unknown
34	Q9-10W	1 *	2911	Welded Steel	46' x 24'	0.50	Unknown
34		2 *	2911	Welded Steel	38' x 24'	0.45	Unknown
34	City Ranch North	1 *	2911	Welded Steel	119' x 30'	2.50	1991
35	Well 35-1	1	N/A	Welded Steel	10' x 8'	0.01	Unknown
35	G168E Tank, KSTA1	1 *	2620	Bolted Steel	27' x 24'	0.10	Unknown
35	Bluerock Tank	1 *	3302	Welded Steel	46' x 40'	0.50	1966
35	Adobe Mt. Tank	1 *	3302	Welded Steel	52' x 32'	0.50	1977
38	Buttes Tank	1 *	2992	Welded Steel	80' x 32'	1.20	1968/88
38		2 *	2992	Welded Steel	73' x 32'	1.00	Unknown
38		3 *	2992	Welded Steel	73' x 32'	1.00	Unknown
38	177th St. E (Well 38-3)	1	N/A	Welded Steel	38' x 12'	0.10	1968
39	Rock Creek Tank	1 *	3640	Welded Steel	27' x 24'	0.10	Unknown
39		2 *	3640	Welded Steel	27' x 24'	0.10	Unknown
39	48-125th St. E	1 *	3852	Welded Steel	38' x 24'	0.20	1993

* Service Level Storage

CHAPTER V

CHAPTER V
WATER SYSTEM MODELS

The following chapter describes the process that was followed in evaluating LACWWD's existing and future water system(s) within the Antelope Valley. The process included preparing and calibrating computer models of District No. 40's eight regions, estimating and distributing existing and anticipated water demands, operating the computer models, and identifying system deficiencies.

The models were used to: 1) evaluate the effectiveness of the existing system within each zone; 2) identify deficiencies in meeting existing and anticipated water demands; and 3) evaluate the effectiveness of proposed system improvements in remedying said deficiencies. The results of these analyses serve as the basis for the proposed system improvements set forth in Chapter VI. Each phase of the modeling process is described in the following sections.

A. COMPUTER MODEL DESCRIPTIONS

Hydraulic network models were developed for District No. 40's domestic water systems using CYBERNET, an AutoCAD based hydraulic network analysis program developed by Haestad Methods, Inc. The models, which were prepared using water system facilities and demand information provided by LACDPW staff, include all of District No. 40's significant facilities and reflect all pressure zones within Regions 4, 24, 27, 33, 34, 35, 38, and 39; Regions 4 and 34 were modeled as a single system, as were Regions 24, 27, and 33.

All input data for the base hydraulic network models was derived from the WATERWORKS (Regions 24, 27, 33, 35, 38, and 39) and CYBERNET (Regions 4 and 34) models prepared by LACDPW staff. The WATERWORKS models for Regions 24, 27, 33, 35, 38, and 39 were converted into CYBERNET models for consistency. The CYBERNET model developed by LACDPW for Regions 4 and 34 was used as a base model, and was revised as necessary to reflect changes made to the system since it was developed; it was also used as the base for the future system models.

The hydraulic network models were structured to perform evaluation under steady state conditions only, using CYBERNET's Standard Analysis Mode (STD). The STD mode is helpful in evaluating the system under circumstances based on actual demand scenarios, thereby identifying system response to various operating parameters. Through the use of a color plotter, the CYBERNET program can produce color-coded schematics which show not only system pressure contours and hydraulic grade line contours (or individual node pressures), but also pipeline diameters and velocities.

The hydraulic network models were prepared based upon existing water distribution system dimensions (pipe sizes and lengths), the pumping capacities of existing well and booster pumping facilities, the storage capacities of existing reservoirs, and documented system demands. Each component of the computer models is described separately in the following subsections.

1. Pipe and Node Data

The pipe data used for input in the hydraulic network models was obtained from LACDPW's existing models, atlas maps, and construction drawings. Pipe diameters in the model range from 4" to 48". Generally, pipelines with diameters of 8" or larger were used, except in those portions of each respective system where smaller diameter pipelines had the potential to significantly affect the results of the model runs.

According to AWWA, the typical C-value for new lined steel pipe is 140; however, a C-value of 120 was assigned to account for pipeline age and for some deterioration. In those portions of the system containing significant quantities of older cast iron or other types of typically rough pipelines, lower C-values were assigned.

Junction node elevations were based on elevations taken from USGS topographic maps. Pipelines and junction nodes were systematically designated to enhance ease of operations. Numbers 1 through 100 were reserved for system parameters such as reservoirs, wells, AVEK turnouts, pumping stations, and normally closed valves (this numbering scheme enables simple manipulation of primary components when modeling

various operational scenarios). Designation of nodal demands are described in detail in Section B, Estimating and Distributing Water Demands.

2. Pumping Unit Characteristics

In order to ensure accurate modeling of well pumping plants and booster pumping plants, pump performance curves provided by LACWWD were used to define pump behavior. Most of the pump curves used in the model were generated using field pump performance test results from Southern California Edison testing. In cases where curves or performance points were not available, either a fixed flow introduced at the pump's location (i.e. the listed historic capacity) or useful horsepower (which is based on existing pump equipment) was used instead of pump test results.

3. Operations Data

Historic records and operations data provided by LACWWD that described actual system operational characteristics at given conditions (e.g. time-of-day and level of demand) were used to accurately model reservoirs, pumping plants, pressure regulating valves, and pipe flows, and to calibrate the hydraulic network models (see Section E). In addition, LACWWD's Supervisory Control and Data Acquisition (SCADA) reports and other data provided some of the information (particularly production records and reservoir level fluctuations) used in calibrating and running the models.

4. Demand Fluctuation Data

As with all water systems, domestic water consumption within District No. 40 varies throughout the day. LACDPW staff provided Krieger & Stewart a copy of their Design Manual, which sets forth factors for adjusting average annual demands to reflect fluctuations in monthly and daily demands (see Chapter II).

B. ESTIMATION AND DISTRIBUTION OF WATER DEMANDS

The following subsections describe the means by which current and future demands were estimated and distributed. It should again be noted that the bulk of demands for each period modeled (i.e. current, 2010, and 2020) occur within Regions 4 and 34, although considerable growth (in relative terms) is expected to occur within all eight regions.

1. Basis and Method for Establishing/Distributing Current Demands

System demands were initially established and distributed throughout each region by LACWWD personnel using meter readings and billing records. Demand distribution was uniformly increased to match total maximum day demands in each region as documented by LACWWD's consumption records (water production and sales) for the years 1995 through 1997. The demands were then assigned to the nearest node point in each region's CYBERNET model.

2. Basis and Method for Establishing/Distributing Future Demands

a. Regions 24, 27, 33, 35, 38, and 39

Since Regions 24, 27, 33, 35, 38, and 39 have relatively few service connections, and projected growth in each of these regions is low compared to Regions 4 and 34 (average population increase per region over the next 22 years of 5,000 persons), anticipated growth is expected to occur as infill within and around existing homes and businesses. Therefore, future demands were determined based on projected growth and then assigned to nodes with existing demands in the current models (transmission facilities were revised accordingly) to create models for the years 2010 and 2020. Appendix B contains tables that outline the demand and growth factors utilized to establish future demands, and list the demands assigned to each node.

b. Regions 4 and 34

The projected growth for Regions 4 and 34 is extensive (from approximately 100,000 persons in 1997 to 265,000 persons in 2020). In order to determine where this growth would likely occur, Krieger & Stewart staff met with representatives of the planning departments of the City of Palmdale and City of Lancaster. The planners described major commercial and residential developments currently in the planning stages, and were able to locate them on system maps; they also advised that the growth was generally going to occur as infill within the City limits and to the west/southwest. They provided developer agreements and specific plans (such as the Fox Field Industrial Corridor Specific Plan) from which projected water demands could be determined.

With the information provided by each city's planners, demand locations were estimated by projecting growth as a percentage of total buildout for areas within Regions 4 and 34 and their SOI's, assuming densest populations at the centers of each city, and reducing densities while moving west. Specific demands were also located where specific plans dictated.

To accurately match projected populations and assign demands to the most likely locations, each of the City's General Plan Land Use Maps and the Los Angeles County Land Use Map were used to determine the area and buildout density for each land use designation (e.g. single family residential, multi family residential, commercial, industrial) shown on the maps. The smaller land use areas were then grouped into three larger areas and a buildout percentage was assigned to each area. Based on the buildout percentage assigned, the number of dwelling units in each area and the corresponding population were determined. When the sum of the populations equaled the County population projections for that year, the percentage was held and used to calculate all demands (e.g. residential, commercial, industrial, public facilities, green belts) using the demand factors for dwelling units or acreage set forth in LACDPW's Design Manual.

Since neither the City of Lancaster General Plan nor the City of Palmdale General Plan assigns water demands to land use designations, an equivalent County land use designation was assigned to determine demands based on LACDPW's Design Manual for areas within the each city's Sphere of Influence.

Appendix C contains tables and an accompanying map that show the areas and indicate the percentage of buildout within each area used to calculate demands and demand distribution in the regions.

C. COMPUTER MODEL OPERATION

The following subsections describe in detail the procedures followed in calibrating and operating the computer model of each water system within District No. 40.

1. Model Calibration

Before any analyses were performed, the hydraulic network models were calibrated in order to match actual system response as closely as possible. Krieger & Stewart staff, with the assistance of LACWWD staff, conducted several types of tests to calibrate the models. Various operating scenarios were used, including opening fire hydrants and measuring flow (up to 3,000 gpm), shutting off pumping station(s) during a high demand period, and combining types of operational changes as necessary to cause measurable system changes.

Before, during, and after the testing, several pressure measurements were recorded at random locations in each pressure zone of each region. At the end of the testing period, pumping plant operation and AVEK flows were obtained to estimate inflow into the system. Simulation of the model under the same production and demand fluctuations yielded pressures generally within 10% of field measurements, which is within accepted industry standards.

2. Model Operation

Water demands were allocated among the nodes throughout the transmission system. All zones were analyzed for maximum day demand, minimum hour maximum day demand, and peak hour maximum day demand for existing and future demand conditions. Fire flow requirements were imposed at various locations within each system with the entire system under maximum day demand to evaluate fire flow conditions.

Evaluation of the water system required comparing analyses with specific design guidelines indicative of an efficiently constructed and operated water distribution system. Pressure, headloss, and velocity data generated under different demand conditions were compared with design criteria to identify system deficiencies. Since only static conditions were analyzed, operation of the models only identified deficiencies related to pipeline parameters (diameters, condition, lengths). Chapter VI sets forth a discussion of model operation and design criteria for proposed system improvements evaluation.

D. IDENTIFICATION OF SYSTEM DEFICIENCIES

A distribution system's deficiencies are generally indicated by either excessive pipeline velocities/headlosses and low or high system pressures. For the purposes of analyzing the systems within District No. 40, a pipeline velocity greater than five feet per second (fps) is considered a deficiency, with some exceptions (e.g. pumping plant discharge lines and during fire events), in which case 10 fps is considered the maximum velocity. Likewise, a nodal pressure of less than 40 psi during peak hour/maximum day demand is considered a deficiency, as is a nodal pressure greater than 120 psi during minimum hour/maximum day demand. A nodal pressure of less than 20 psi during fire and maximum day demand at any point in the service area is considered a deficiency.

In addition, a system is considered deficient if it is dependent upon active AVEK connections or the operation of well or booster pumping plants to provide adequate service pressure. A system

should be able to provide adequate service pressure by gravity service level storage only (or through a pressure reducing station from a zone with service level storage).

The analyses identified a number of deficiencies in the water system within each region with respect to 1997 water demands, as described in the following subsections:

1. Regions 4 and 34

Region 34's distribution system is able to provide maximum day demand, peak hour demand, and fire protection with no apparent deficiencies.

Region 4's Zone 2555 distribution system is unable to provide peak hour demand, maximum day demand, or fire flows without operating pumps at the majority of the well site pumping plants. Transmission pipelines from 2555 Zone storage reservoirs to the zone's distribution system have insufficient capacity (i.e. are too few in number and/or too small in diameter). Water cannot flow freely in an easterly/westerly direction across the zone because of insufficient pipeline capacity under the railroad and highways.

Region 4's Zone 2696 distribution system is unable to provide peak hour demand without AVEK supply. Transmission pipelines from 2696 Zone storage reservoirs to the zone's distribution system have insufficient capacity.

2. Regions 24, 27, and 33

Region 24's distribution system is unable to provide fire flows to the commercial region along Pearblossom Highway. The transmission pipeline from the Region 24 storage reservoir to the region's distribution system has insufficient capacity.

Region 27's distribution system is able to provide maximum day demand, peak hour demand, and fire flows with no apparent deficiency.

Region 33's distribution system is unable to provide peak hour demands or fire flows without AVEK supply. There is currently no service level storage directly serving this region, and the interconnections and transmission facilities to neighboring regions have insufficient capacity.

3. Region 35

Region 35's distribution system is able to provide peak hour demand flows, but is unable to provide fire flows to the northern half of the region (along Avenue G). The transmission pipeline from the 3302 Zone storage reservoir to the north half of the region has insufficient capacity.

4. Region 38

Region 38's 2992 Zone distribution system is able to provide maximum day demand, peak hour demand, and fire flows with no apparent deficiencies.

Region 38's 2850 Zone distribution system is able to provide maximum day demand and residential fire flows, but is unable to provide peak hour demand (particularly on the southern half along Avenue O) and commercial fire flows. There is no service level storage directly serving the 2850 Zone, and the pressure reducing stations and transmission facilities between zones have insufficient capacity.

5. Region 39

Region 39's distribution system is able to provide maximum day demand, peak hour demand, and fire flows with no apparent deficiencies.

E. FUTURE USE OF MODELS

The system models are current through the middle of 1998. As LACWWD continues to make improvements to their water system, changes should be reflected in the existing models to keep them current. Models should be utilized to determine required system upgrades as growth and development occurs. When new development is proposed, the models should be operated under maximum day, peak hour, and fire flow conditions to determine the affect of the new demands on the existing system, and to establish optimum reservoir locations and pipeline size requirements.

CHAPTER VI

CHAPTER VI
RECOMMENDED WATER SYSTEM IMPROVEMENTS

As a result of the deficiencies in District No. 40's existing system coupled with the significant growth expected to occur within the Antelope Valley over the next 10 to 20 years, the improvements recommended in this chapter are considerable. There are a number of improvements that LACWWD needs to construct, particularly supply and storage facilities. The water system improvements presented in this chapter are intended to enable LACWWD to meet current and anticipated water demands within District No. 40 over the next 10 to 20 years.

The District No. 40 telemetry system will need to be expanded as water system improvements are constructed. As ground water issues within the Antelope Valley become more critical, real time water level measurements and modeling of monitoring and production wells may become desirable or necessary, at which time the telemetry system will need to be further expanded and improved.

A. IMPROVEMENT CRITERIA

The recommended improvements are based on the following design criteria:

- The District No. 40 ratio of AVEK supply to well supply will increase from 60% AVEK/40% ground water presently to 80% AVEK/20% ground water ultimately (on an annual basis).

- To ensure service during periods of unanticipated AVEK interruptions (e.g. reductions in AVEK deliveries due to drought, unscheduled maintenance of SWP facilities), wells within each region should have sufficient combined capacity to meet maximum day demands.

- New District No. 40 production wells should have a minimum casing diameter of 16 inches, should be perforated or screened at lower depths within the primary aquifer, and should be equipped with pumping plants having the capacity to produce the maximum

capability of the well, which is anticipated to be approximately 1,000 gpm for wells in Regions 4 and 34 and 500 gpm in the other regions.

- Booster pumping plants should be capable of meeting maximum day demands, and each plant should have at least two pumping units. In booster pumping plants with only two units, each unit should be capable of meeting maximum day demands.

- Pumping units should be automatically controlled through telemetered reservoir levels. Pumping unit controls should be capable of being operated manually or automatically.

- Pipelines should have sufficient capacity to meet maximum day demands and simultaneous fire flows while maintaining a residual pressure of 20 psi, meet peak hour demands while maintaining a 20 psi residual pressure (although 40 psi is preferred), and meet maximum day demands while maintaining a 40 psi residual. Pipeline velocities should not exceed 5 fps during maximum day demand, or 10 fps at any time. In order to meet these demands under emergency situations, the pipelines should be capable of providing the above flows and pressures with booster pumps and AVEK shut down (i.e. gravity flow only).

- As stipulated by LACWWD, storage reservoirs in each zone should be capable of providing at least one day of maximum day demand (for emergency and equalization) plus fire storage.

- Pressure reducing or pressure regulating valves (PRVs) should be used only when necessary (e.g. for emergency service), except in small isolated areas that can only be served economically through PRVs.

- Hydropneumatic booster pumping installations should be avoided because of their relatively limited capacity, high operating cost, and limited service capability.

B. REGIONS

District No. 40's water system will continue to be comprised of eight regions, namely: Region 4 (Lancaster), Region 24 (Pearblossom), Region 27 (Littlerock), Region 33 (Sun Village), Region 34 (Desert View Highlands), Region 35 (Hi Vista), Region 38 (Lake Los Angeles), and Region 39 (Rock Creek). The regions are shown on the Proposed Improvements Maps. Development within the regions is not expected to occur proportionally; in other words, the regions are not expected to grow at the same rate (see Section II, Water Demands and Section V, Water System Models). Development will be monitored and plans altered accordingly. Region and pressure zone data are both set forth in Chapter IV, Existing Water System Facilities.

As noted in Chapter IV, five of the regions within District No. 40 function essentially as two water systems. The regions that are currently operated jointly are Regions 4 and 34, and Regions 24, 27, and 33; as development continues, even more joint operation will occur (e.g. District is currently constructing facilities to serve a portion of Region 39 from the Region 24 storage reservoir).

C. PRESSURE ZONES

The District's water system will continue to be comprised of the pressure zones as listed in Chapter IV (existing water system facilities) with a few minor changes or additions as follows:

1. Region 34

As development extends into the hills in the southern portion of Region 34, zones will be added at the upper elevations in approximate 190' intervals (i.e. 3430, 3620, 3810, 4000). Zone 3050 shall also be added to transition between the 2911 and 3240 Zones.

2. Region 39

The existing 3440 Zone will be changed to a 3308 Zone in order to better utilize ground surface topography to provide adequate service pressures.

The existing 3540 Zone will be changed to a 3440 Zone in order to better utilize ground surface topography to provide adequate service pressures.

D. WATER SUPPLY FACILITIES

Although improved water conservation and management efforts may offer some help in meeting demands, District No. 40's water supply requirements are going to increase for at least the next twenty years.

1. Imported Water Facilities

LACWWD will continue to utilize treated water delivered by AVEK, either by direct delivery to various regions' customers, or by injection into the aquifer for subsequent extraction with their well pumping plants (ASR program). In addition, LACWWD should pursue evaluation of purchasing raw SWP water from AVEK for open basin recharge of the aquifer (see Chapter III, Water Supply).

To meet the design criteria of utilizing AVEK water to provide 80% of annual District demand, AVEK will have to make average annual deliveries of 89 MGD in 2010, and 109 MGD in 2020, provided the District can accept and store delivered water in excess of demands in off peak months (ASR program). AVEK's current plant capacity (for both plants) is 75 MGD; AVEK will have to expand their Quartz Hill Plant and associated transmission facilities (50% expansion by 2020) and construct additional turnouts to the District's distribution system. Depending upon the ultimate capacity of the District's ASR program, the AVEK treatment plant, transmission facilities, and connection capacities may have to be even larger to meet the 80% goal.

Required AVEK capacities are shown by region in Table VI-1. Note that all AVEK expansion should occur in Regions 4 and 34.

2. Reclaimed Water Facilities

LACWWD does not currently distribute reclaimed water; however, as the Valley develops and water demands increase, the use of reclaimed water may become necessary, perhaps even mandatory. Reclaimed water can be used to irrigate areas accessible to the public (e.g. municipal parks, golf courses, and green belts), provided it has been sufficiently treated; Chapter III addresses this subject in depth. For purposes of this report and the facilities recommended herein, reclaimed water has not been included as a source of supply. If LACWWD does construct reclaimed water facilities to augment the potable system, the facilities recommended in this chapter should be adjusted accordingly.

Reclaimed water treatment criteria are specified in Title 22 of the California Code of Regulations. If reclaimed water is used for golf course irrigation in areas where the public has access or exposure (where private dwellings are located adjacent to golf courses, for instance), it must be adequately oxidized, coagulated, clarified, filtered, and disinfected, or treated by a sequence of other processes that will provide an equivalent degree of treatment and reliability.

3. Wells

Because of the uncertainty of AVEK deliveries, LACDPW staff has stipulated that wells shall be capable of supplying 100% of maximum day demand. Based on the performance of existing well plants, the number of additional wells required in each region has been determined; note that the determinations assume that wells in Regions 4 and 34 will be able to produce 1,000 gpm, and wells in the remaining regions will be able to produce 500 gpm.

A well site typically consists of a well, a chlorination station, a forebay (for chlorine contact time requirements), and a booster pumping plant. Where possible, recommended wells are placed at existing well sites to utilize existing forebays and booster pumping plants (for 1998 demands only), or in groups (of either two, four, or eight) so that single forebays, chlorination stations, and booster pumping plants can be constructed for multiple wells (thus reducing the per well construction cost). Where new wells are constructed on existing well sites, the capacity of existing booster pumping plants must be increased to match the capacities of all the wells at the site. Recommended wells are set forth by region in Table VI-2. Recommended improvements to existing well site booster pumping plants are shown in Table VI-4B.

E. WATER STORAGE FACILITIES

Recommended storage reservoirs are set forth by region and zone in Tables VI-3A through VI-3E and are shown on Maps VI-1 through VI-6, the Proposed Improvements Maps. Required storage consists of the following three components: equalization storage, which equals 25% of maximum day demand; emergency storage, which provides for continuous storage during periods when production has been interrupted and is equal to 18 hours of maximum day demand; and fire storage, which equals the volume required for a specified fire flow and flow duration.

Presently, District No. 40's storage capacity does not meet equalization, fire, and emergency storage requirements in many zones (see Tables VI-3A through VI-3E); by 2010, District No. 40's storage capacity will not meet storage requirements in essentially any zone. Construction of the reservoirs listed in Table VI-3 would enable LACWWD to meet its storage capacity objectives.

Although additional storage capacity is needed now, certain storage improvements must be deferred because of funding limitations in order to address the more pressing matters of increasing water production. The most storage deficient regions and pressure zones have the

highest priority in proposed reservoir construction, with the 2555 Zone of Region 4 and the 2850 Zone of Region 38 being the most deficient.

F. INTERZONE BOOSTER PUMPING FACILITIES

Except for Regions 4 and 34, the majority of the service zones throughout District No. 40 are directly supplied by well pumping plants (boosting is not required between zones). The only recommended booster pumping plant is located within Region 39 and would boost water from the 3440 Zone to the 3640 Zone. If a replacement well is constructed in the 3640 Zone that operates year around, this proposed booster facility is not necessary (except for emergency purposes).

In Regions 4 and 34, the recommended location of all proposed wells is north of Avenue M (see Chapter III, Water Supply). Consequently, all water required for zones above the 2555 Zone in Regions 4 and 34 must be boosted from the 2555 Zone. Recommended booster pumping facilities are set forth in Table VI-4; the recommended facilities are a combination of new booster pumping plants and upgrading/expanding existing booster pumping plants.

G. TRANSMISSION AND DISTRIBUTION FACILITIES

Recommended pipeline improvements are set forth in Table VI-5A through VI-5C and shown on Maps VI-1 through VI-6, the Proposed Improvements Maps. The recommended improvements are scheduled to accommodate recommended production and storage facilities when completed and to meet distribution demands.

The recommended pipelines are based on hydraulic network analyses performed for this 1998 Water System Master Plan. The pipeline systems were analyzed using a hydraulic network model that was developed starting in 1995 and was recently expanded to reflect current conditions (see Chapter V). The hydraulic network model was used to analyze existing conditions as well as future conditions at scheduled intervals.

Evaluation of the water system required comparing analyses with specific design guidelines indicative of a properly sized, efficient water system. Pressure, headloss, and velocity data generated under different demand conditions were compared with design criteria to identify system deficiencies.

The design criteria listed below and the demand criteria listed in Chapters II and V were used to develop requirements for water production facilities, storage facilities, pipelines, and other facilities to meet current and future demands.

Design Pipeline Velocity	=	5 fps
Maximum Pipeline Velocity	=	10 fps
Maximum Nodal Pressure (Normal)	=	120 psi
Minimum Nodal Pressure (Normal)	=	40 psi
Residual Nodal Pressure (Fire)	=	20 psi

Water demands were allocated among the nodes throughout the transmission system, which were analyzed for maximum day demand, minimum hour maximum day demand, and peak hour maximum day demand for existing and future demand conditions. Fire flow requirements were imposed at various locations within the system with the entire system under maximum day demand to evaluate fire flow conditions.

H. WATER TREATMENT FACILITIES

Water treatment requirements are becoming more stringent, since both EPA and CDHS are applying current regulations more rigorously and promulgating more restrictive regulations. For instance, EPA and CDHS are currently considering regulations that will require, in some cases, disinfecting ground water prior to domestic use. EPA is also considering regulations that will require water distribution system samples to be analyzed by the standard plate count bacteriological method rather than the total coliform bacteriological method, the results being more restrictive and stringent. Future regulations are expected to require that ground water be disinfected before it is distributed through potable water systems.

CDHS currently requires well pumping facilities to be designed and constructed to be readily capable of accommodating chlorination (or equivalent) equipment. However, chlorination equipment must be installed only if the results of water quality analyses indicate that disinfection is necessary to protect the public's health and welfare. LACWWD currently disinfects all produced ground water in District No. 40.

In the event that future EPA and CDHS regulations require disinfection of ground water supplies, it is expected that an exception procedure will be established. In order to be granted an exception, LACWWD would have to demonstrate that disinfection is not required in order to maintain compliance with bacteriological limits within its distribution system. In anticipation of these future requirements, the District has decided that it will construct chlorination facilities and detention tanks (forebays) at all proposed well plant sites, similar to those currently in place.

I. ESTIMATED COSTS AND PROPOSED SCHEDULE

Estimated project costs and related construction schedules for the proposed water system facilities are set forth in Table VI-6. Estimated project costs include a 10% allowance for construction contingencies and a 20% allowance for administrative, legal, and engineering costs. The estimated project costs are based on recent construction costs for similar projects; all costs are shown in 1998 dollars. Proposed facilities are basically comprised of existing system reinforcements and proposed system expansions, and are shown on Maps VI-1 through VI-6, the Proposed Improvements Maps, which are enclosed in envelopes at the end of this report. The facilities shown correlate with those set forth in Table VI-6, which are based on the growth in water demands and production requirements established utilizing the Los Angeles County Department of Regional Planning population growth projections; LACWWD will revise the schedule of construction based on actual changes in demand.

Generally, facilities required to meet 1998 demands and storage requirements will be financed by LACWWD. Facilities required for future development should be financed by developers or new

users as growth occurs. Facilities are scheduled for construction based on water production, transmission, storage, and distribution needs.

J. SUMMARY OF RECOMMENDED IMPROVEMENTS

The improvements recommended in this chapter are considerable. If growth occurs as projected, by the year 2020 the District (and/or District developers) will have to construct 213 million gallons of storage, 168 wells (with associated forebays and booster pumping plants), 15 interzone booster pumping plants, 916,000 lineal feet of 12" to 48" transmission pipelines, and implement its ASR program. The District will also have to coordinate with AVEK to have the Quartz Hill Plant expanded (by at least 50%), construct new AVEK transmission facilities, and construct several new AVEK turnouts into the Region 4 system. Of those facilities listed above, 54 MG of storage, 32 new wells, 130,000 lineal feet of 12" to 48" transmission pipelines, and one interzone booster pumping plant must be constructed to eliminate existing system deficiencies.

If the District decides to fund the recommended improvements through direct financing, facility priorities must be established. Since District 40 is heavily dependent on AVEK deliveries, production facilities (i.e. wells) should be given highest priority in order to provide some redundancy should AVEK stop deliveries for an extended period of time. Once sufficient production facilities have been constructed, storage facilities should be given priority. This will provide short term emergency storage even if it is provided at reduced pressures.

TABLE VI-1
DISTRICT NO. 40
AVEK SUPPLY FACILITIES
CAPACITIES AND REQUIREMENTS
IN ACRE-FEET PER YEAR (AF/YR)

REGION	1998	2010	2020
4 & 34			
CURRENT CAPACITY	72,437	72,437	72,437
REQUIRED CAPACITY	32,980	89,842	108,878
NEW/PROPOSED CAPACITY	0	17,405	36,441
24, 27, & 33			
CURRENT CAPACITY	5,808	5,808	5,808
REQUIRED CAPACITY	2,224	4,072	5,243
NEW/PROPOSED CAPACITY	0	0	0
35			
CURRENT CAPACITY	0	0	0
REQUIRED CAPACITY	228	0	0
NEW/PROPOSED CAPACITY	0	0	0
38			
CURRENT CAPACITY	8,712	8,712	8,712
REQUIRED CAPACITY	2,407	6,234	7,964
NEW/PROPOSED CAPACITY	0	0	0
39			
CURRENT CAPACITY	0	0	0
REQUIRED CAPACITY	202	0	0
NEW/PROPOSED CAPACITY	0	0	0

TABLE VI-2
DISTRICT NO. 40
WELL PUMPING PLANTS
PRODUCTION REQUIREMENTS
IN GALLONS PER MINUTE [1]

REGION	1998	2010	2020
4 & 34			
CURRENT PRODUCTION	34,443	34,443	34,443
REQUIRED PRODUCTION	55,870	135,480	163,780
PROPOSED PRODUCTION	21,427	101,037	129,337
NO. NEW WPP REQUIRED[2]	22	101	130
24, 27, & 33			
CURRENT PRODUCTION	1,567	1,567	1,567
REQUIRED PRODUCTION	3,760	6,120	7,960
PROPOSED PRODUCTION	2,193	4,553	6,393
NO. NEW WPP REQUIRED[3]	4	9	13
35			
CURRENT PRODUCTION	500[4]	500	500
REQUIRED PRODUCTION	400	500 [6]	800 [6]
PROPOSED PRODUCTION	0	0	300
NO. NEW WPP REQUIRED[3]	0	0	1
38			
CURRENT PRODUCTION	1,615	1,615	1,615
REQUIRED PRODUCTION	4,090	9,440	12,020
PROPOSED PRODUCTION	2,475	7,825	10,405
NO. NEW WPP REQUIRED[3]	5	16	21
39			
CURRENT PRODUCTION	367 [5]	0 [5]	0
REQUIRED PRODUCTION	350	918	1,224
PROPOSED PRODUCTION	0	918	1,224
NO. NEW WPP REQUIRED[3]	1	2	3

1. Based on 100% of MDD plus unaccounted for water at 8.5%.
2. Assumes new well capacity of 1000 gpm.
3. Assumes new well capacity of 500 gpm.
4. Under construction
5. Existing well needs replacement.
6. Recommended production shown in this table is based on LACDPW population projections for Region 35 which are significantly less than LACDRP population projections.

TABLE VI-3A
DISTRICT NO. 40
REGIONS 4 AND 34
SERVICE LEVEL GRAVITY STORAGE CAPACITIES & REQUIREMENTS
BY PRESSURE ZONES
IN MILLIONS OF GALLONS

	1998	2010	2020
Pressure Zone 2555			
Current Storage Capacity	16.7	16.7	16.7
Storage Requirement	57.7	109.5	128.3
New/Proposed Storage Capacity	41.0	92.8	111.6
Pressure Zone 2696			
Current Storage Capacity	2.0	2.0	2.0
Storage Requirement	7.6	17.6	18.8
New/Proposed Storage Capacity	5.6	15.6	16.8
Pressure Zone 2837 (West)			
Current Storage Capacity	4.5	4.5	4.5
Storage Requirement	1.3	2.2	3.3
New/Proposed Storage Capacity	0.0	0.0	0.0
Pressure Zone 2837 (East)			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.0	3.7	4.5
New/Proposed Storage Capacity	0.0	3.7	4.5
Pressure Zone 2911			
Current Storage Capacity	8.3	8.3	8.3
Storage Requirement	6.7	13.6	18.4
New/Proposed Storage Capacity	0.0	5.3	10.1
Pressure Zone 2980			
Current Storage Capacity	7.6	7.6	7.6
Storage Requirement	3.3	9.2	10.4
New/Proposed Storage Capacity	0.0	1.6	2.8
Pressure Zone 2600			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.9	4.8	6.7
New/Proposed Storage Capacity*	0.0	2.5	6.7
Pressure Zone 2880			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	1.8	5.0	5.3
New/Proposed Storage Capacity**	0.0	5.0	5.3
Pressure Zone 2914			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.9 **	0.9	0.9
New/Proposed Storage Capacity	0.0	0.9	0.9

TABLE VI-3A (cont.)
DISTRICT NO. 40
REGIONS 4 AND 34
SERVICE LEVEL GRAVITY STORAGE CAPACITIES & REQUIREMENTS
BY PRESSURE ZONES
IN MILLIONS OF GALLONS

	1998	2010	2020
Pressure Zone 2970			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.1	0.1	0.1
New/Proposed Storage Capacity	0.1	0.1	0.1
Pressure Zone 3050			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.0	2.4	3.5
New/Proposed Storage Capacity	0.0	2.4	3.5
Pressure Zone 3240			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.7	14.0	19.3
New/Proposed Storage Capacity	0.7	14.0	19.3
Pressure Zone 3430			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.0	2.9	3.8
New/Proposed Storage Capacity	0.0	2.9	3.8
Pressure Zone 3620			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.0	1.0	1.2
New/Proposed Storage Capacity	0.0	1.0	1.2
Pressure Zone 3810			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.0	0.4	0.5
New/Proposed Storage Capacity	0.0	0.4	0.5
Pressure Zone 4000			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	0.0	0.6	0.7
New/Proposed Storage Capacity	0.0	0.6	0.7
TOTAL PROPOSED STORAGE	47.4	148.8	187.8

* SUPPLEMENT WITH EXCESS ZONE 2837 WEST STORAGE
** INCLUDE WITH ZONE 2980 STORAGE

TABLE VI-3B
DISTRICT NO. 40
REGIONS 24, 27, & 33
SERVICE LEVEL GRAVITY STORAGE CAPACITIES & REQUIREMENTS
BY PRESSURE ZONES
IN MILLIONS OF GALLONS

	1998	2010	2020
Pressure Zone 2914			
Current Storage Capacity	3.0 (1)	3.0 (1)	3.0 (1)
Storage Requirement	2.7	3.5	4.4
New/Proposed Storage Capacity	0.0	0.5	1.4
Pressure Zone 3056			
Current Storage Capacity	1.0	1.0	1.0
Storage Requirement	1.3	1.7	2.2
New/Proposed Storage Capacity	0.3	0.7	1.2
Pressure Zone 3308			
Current Storage Capacity	0.5	0.5	0.5
Storage Requirement	1.1	4.2	5.1
New/Proposed Storage Capacity	0.6	3.7	4.6 (2)
TOTAL PROPOSED STORAGE	0.9	4.9	7.2

1. LACDPW portion of shared AVEK reservoir.
2. LACDPW will serve a portion of Region 39 from the Region 24 storage reservoirs; therefore, the storage shown on the Proposed System Improvements maps is 6.2 MG.

TABLE VI-3C
DISTRICT NO. 40
REGION 35
SERVICE LEVEL GRAVITY STORAGE CAPACITIES & REQUIREMENTS[1]
BY PRESSURE ZONES
IN MILLIONS OF GALLONS

	1998	2010	2020
Pressure Zone 2620			
Current Storage Capacity	0.10 [2]	0.10 [2]	0.10 [2]
Storage Requirement	0.23	0.30	0.36
New/Proposed Storage Capacity	0.13	0.20	0.26
Pressure Zone 3302			
Current Storage Capacity	1.00	1.00	1.00
Storage Requirement	0.40	0.72	1.00
New/Proposed Storage Capacity	0.00	0.00	0.00
TOTAL PROPOSED STORAGE	0.13	0.2	0.26

(1) Recommended storage capacities shown in this table are based on LACDPW population projections for Region 35 which are significantly less than LACDRP population projections.

(2) Sunshine Rancho Tank (HWL 2928)

TABLE VI-3D
DISTRICT NO. 40
REGION 38
SERVICE LEVEL GRAVITY STORAGE CAPACITIES & REQUIREMENTS
BY PRESSURE ZONES
IN MILLIONS OF GALLONS

	1998	2010	2020
Pressure Zone 2850			
Current Storage Capacity	0.0	0.0	0.0
Storage Requirement	4.1	8.7	10.9
New/Proposed Storage Capacity	4.1	8.7	10.9
Pressure Zone 2992			
Current Storage Capacity	3.2	3.2	3.2
Storage Requirement	2.4	5.0	6.1
New/Proposed Storage Capacity	0.0	1.8	2.9
TOTAL PROPOSED STORAGE	4.1	10.5	13.8

TABLE VI-3E
DISTRICT NO. 40
REGION 39
SERVICE LEVEL GRAVITY STORAGE CAPACITIES & REQUIREMENTS
BY PRESSURE ZONES
IN MILLIONS OF GALLONS

	1998	2010	2020
Pressure Zone 3308			
Current Storage Capacity	0.00	0.00	0.00
Storage Requirements -	0.25	0.9	1.2
New/Proposed Storage Capacity	0.25	0.9	1.2 *
Pressure Zone 3440			
Current Storage Capacity	0.00	0.00	0.00
Storage Requirements -	0.39	0.58	0.70
New/Proposed Storage Capacity	0.39	0.58	0.70
Pressure Zone 3640			
Current Storage Capacity	0.20	0.20	0.20
Storage Requirements -	0.18	0.27	0.33
New/Proposed Storage Capacity	0.00	0.07	0.13
Pressure Zone 3852			
Current Storage Capacity	0.20	0.20	0.20
Storage Requirements -	0.12	0.14	0.15
New/Proposed Storage Capacity	0.00	0.00	0.00
TOTAL PROPOSED STORAGE	0.64	1.55	2.03 *

*LACDPW will serve zone 3308 of Region 39 from the Region 24 storage reservoirs; therefore, no storage is shown on the Proposed System Improvements maps for zone 3308.

TABLE VI-4A
DISTRICT NO. 40
INTERZONE BOOSTER PUMPING FACILITIES
CAPACITIES AND REQUIREMENTS

NAME	CURRENT CAPACITY (GPM)	BOOSTED		REQUIRED CAPACITY (GPM)	
		from zone	to zone	2010	2020
REGIONS 4 & 34					
L-12 & 60TH	3720	2555	2837	21000	26000
M & 7TH	1820	2555	2696	6000	8000
P & 10W	9500	2555	2696	13000	18000
M & 5TH	--	2555	2696	20000	25000
P & 10W	--	2696	2837	2600	3200
RANCHO VISTA, M-11 & 60	7840	2837	2980	20000	24000
TIERRA SUBIDA	1800	2911	3240	2400	3400
CITY RANCH NORTH	--	2911	3240	2400	3400
N-4 & 60 W	--	2980	3240	9500	13000
P-10 & 75 W	--	3240	3430	1550	2050
RITTER RIDGE	--	3240	3430	1550	2050
RITTER RIDGE	--	3430	3620	1100	1500
RITTER RIDGE	--	3620	3810	600	800
RITTER RIDGE	--	3810	4000	300	400
REGION 39					
--	--	3440	3640	150	200

TABLE VI-4B
DISTRICT NO. 40
EXISTING WELL SITE BOOSTER PLANT
PROPOSED CAPACITY INCREASE

Region	Existing Well Site				Existing Booster			Required
	Existing Well No.	# Proposed Wells	Pumps to	Well Capacity[1] (gpm)	Pump No.	Pump Capacity (gpm)	Pumps to	Booster Plant Capacity Increase (gpm)
4	5		Avenue J Forebay	1057	A	2167	2555 Zone	
	9		Avenue J Forebay	612	B	2446	2555 Zone	
	17		Avenue J Forebay	611	C	0	2555 Zone	
	26		Avenue J Forebay	1067				
		2	Avenue J Forebay	**2000**				
				5347		4613		**740**
4	32		K-8 & 5th Street Forebay	993	A	1500	2555 Zone	
	34		K-8 & 5th Street Forebay	1146	B	1500	2555 Zone	
	43		K-8 & 5th Street Forebay	2055	C	1500	2555 Zone	
	44		K-8 & 5th Street Forebay	2220	D	1500	2555 Zone	
		3	K-8 & 5th Street Forebay	**3000**				
				9414		6000		**3420**
4	13		K-8 & Division Forebay	441	A	1700	2555 Zone	
	33		K-8 & Division Forebay	711	E	1700	2555 Zone	
	42		K-8 & Division Forebay	1170				
		2	K-8 & Division Forebay	**2000**				
				4322		3400		**930**
4	15		Fairgrounds Forebay	461	C	1000	2555 Zone	
	52		Fairgrounds Forebay	748				
		1	Fairgrounds Forebay	**1000**				
				2209		1000		**1210**
4	36		Waterbag Forebay	1010	A	1094	2555 Zone	
		2	Waterbag Forebay	**2000**				
				3010		1094		**1920**
4	None		Beech Forebay	0		0	2555 Zone	
		1	Beech Forebay	**1000**				
				1000		0		**1000**

1. Assumes proposed well capacity of 1000 gpm.

TABLE VI-5A
DISTRICT NO. 40
TRANSMISSION AND DISTRIBUTION PIPELINES
1998 REQUIREMENTS

REGION	LOCATION	DIAMETER (IN.)	LENGTH (L.F.)
REGIONS 4 & 34			
	AVENUE P	24	4,000
	10TH STREET WEST	24	5,800
	TOTAL 24"		**9,800**
	10TH STREET WEST	30	8,000
	AVENUE K		10,800
	TOTAL 30"		**8,000**
	10TH STREET WEST	36	9,400
	60TH STREET WEST	36	9,300
	AVENUE H	36	15,800
	AVENUE K	36	21,120
	TOTAL 36"		**55,620**
REGIONS 24, 27, & 33			
	116TH STREET EAST	12	5,000
	PEARBLOSSOM HWY	12	10,000
	TOTAL 12"		**15,000**
	116TH STREET EAST	16	3,000
	106TH STREET EAST	16	5,500
	AVENUE S	16	6,000
	TOTAL 16"		**14,500**
REGION 38			
	160TH STREET EAST	16	3,000
	170TH STREET EAST	16	5,300
	TOTAL 16"		**8,300**
	AVENUE O	24	5,300
	TOTAL 24"		**5,300**
REGION 39			
	LONGVIEW	12	3,000
	TOTAL 12"		**3,000**

TABLE VI-5B
DISTRICT NO. 40
TRANSMISSION AND DISTRIBUTION PIPELINES
2010 REQUIREMENTS

REGION	LOCATION	DIAMETER (IN.)	LENGTH (L.F.)
REGIONS 4 & 34			
	30^{TH} STREET EAST	12	6600
	10^{TH} STREET EAST	12	9900
	DIVISION	12	5280
	10^{TH} STREET WEST	12	16280
	20^{TH} STREET WEST	12	5280
	30^{TH} STREET WEST	12	5280
	40^{TH} STREET WEST	12	15840
	50^{TH} STREET WEST	12	14560
	70^{TH} STREET WEST	12	15840
	75^{TH} STREET WEST	12	2640
	80^{TH} STREET WEST	12	21120
	85^{TH} STREET WEST	12	2640
	90^{TH} STREET WEST	12	25080
	95^{TH} STREET WEST	12	2640
	100^{TH} STREET WEST	12	13200
	AVENUE G	12	26400
	AVENUE I-8	12	2640
	AVENUE J	12	15840
	AVENUE I	12	15840
	AVENUE J	12	13000
	AVENUE K	12	13200
	AVENUE K-8	12	5280
	AVENUE L	12	6500
	3050 ZONE	12	15500
	TOTAL 12"		**276380**
	10^{TH} STREET WEST	16	9500
	AVENUE H	16	10560
	AVENUE I	16	6600
	AVENUE J	16	6100
	CITY RANCH	16	23400
	3240 ZONE	16	7920
	3050 ZONE	16	1500
	TOTAL 16"		**65580**
	AVENUE I	20	14500
	AVENUE J	20	9900
	RANCHO VISTA	20	9000
	CITY RANCH	20	10750
	RITTER RIDGE	20	8000
	TIERRA SUBIDA PS	20	12000
	TOTAL 20"		**64150**

TABLE VI-5B
DISTRICT NO. 40
TRANSMISSION AND DISTRIBUTION PIPELINES
2010 REQUIREMENTS

REGION	LOCATION	DIAMETER (IN.)	LENGTH (L.F.)
REGIONS 4 & 34 (CONT.)			
	60TH STREET WEST	24	1,800
	AVENUE M	24	4,000
	AVENUE N	24	5,280
	RANCHO VISTA	24	5,600
	ELIZABETH LAKE	24	8,300
	RANCH CENTER DRIVE	24	11,400
	TOTAL 24"		**36,380**
	10TH STREET WEST	30	7,920
	ELIZABETH LAKE	30	16,000
	TOTAL 30"		**23,920**
	20TH STREET EAST	36	5,280
	60TH STREET WEST	36	11,500
	75TH STREET WEST	36	2,640
	AVENUE H	36	31,680
	AVENUE M	36	7,920
	GODDE HILL	36	12,300
	TOTAL 36"		**71,320**
	DIVISION	42	15,840
	AVENUE M	42	4,800
	AVENUE P	42	13,200
	TOTAL 42"		**33,840**
	AVENUE H	48	12,000
	TOTAL 48"		**12,000**
REGIONS 24, 27, & 33			
	104TH STREET EAST	8	5,300
	TOTAL 8"		**5,300**
	AVENUE U	12	4,100
	TOTAL 12"		**4,100**
	116TH STREET EAST	16	10,000
	PEARBLOSSOM	16	18,000
	TOTAL 16"		**28,000**

TABLE VI-5B
DISTRICT NO. 40
TRANSMISSION AND DISTRIBUTION PIPELINES
2010 REQUIREMENTS

REGION	LOCATION	DIAMETER (IN.)	LENGTH (L.F.)
REGION 35			
	180TH STREET EAST	12	5,300
	AVENUE G	12	15,000
	AVENUE H	12	800
	AVENUE I	12	5,000
	TOTAL 12"		**26,100**
REGION 38			
	150TH STREET EAST	12	10,560
	175TH STREET EAST	12	3,700
	180TH STREET EAST	12	2,500
	190TH STREET EAST	12	8,000
	200TH STREET EAST	12	8,000
	AVENUE Q	12	5,200
	TOTAL 12"		**37,960**
	160TH STREET EAST	16	2,600
	AVENUE Q	16	5,300
	TOTAL 16"		**7,900**
	AVENUE O	24	31,000
	TOTAL 24"		**31,000**
REGION 39			
	PEARBLOSSOM	12	8,500
	TOTAL 12"		**8,500**

TABLE VI-5B
DISTRICT NO. 40
TRANSMISSION AND DISTRIBUTION PIPELINES
2010 REQUIREMENTS

REGION	LOCATION	DIAMETER (IN.)	LENGTH (L.F.)
REGIONS 4 & 34			
	30TH STREET EAST	12	6600
	10TH STREET EAST	12	9900
	DIVISION	12	5280
	10TH STREET WEST	12	16280
	20TH STREET WEST	12	5280
	30TH STREET WEST	12	5280
	40TH STREET WEST	12	15840
	50TH STREET WEST	12	14560
	70TH STREET WEST	12	15840
	75TH STREET WEST	12	2640
	80TH STREET WEST	12	21120
	85TH STREET WEST	12	2640
	90TH STREET WEST	12	25080
	95TH STREET WEST	12	2640
	100TH STREET WEST	12	13200
	AVENUE G	12	26400
	AVENUE I-8	12	2640
	AVENUE J	12	15840
	AVENUE I	12	15840
	AVENUE J	12	13000
	AVENUE K	12	13200
	AVENUE K-8	12	5280
	AVENUE L	12	6500
	3050 ZONE	12	15500
	TOTAL 12"		**276380**
	10TH STREET WEST	16	9500
	AVENUE H	16	10560
	AVENUE I	16	6600
	AVENUE J	16	6100
	CITY RANCH	16	23400
	3240 ZONE	16	7920
	3050 ZONE	16	1500
	TOTAL 16"		**65580**
	AVENUE I	20	14500
	AVENUE J	20	9900
	RANCHO VISTA	20	9000
	CITY RANCH	20	10750
	RITTER RIDGE	20	8000
	TIERRA SUBIDA PS	20	12000
	TOTAL 20"		**64150**

TABLE VI-5B
DISTRICT NO. 40
TRANSMISSION AND DISTRIBUTION PIPELINES
2010 REQUIREMENTS

REGION	LOCATION	DIAMETER (IN.)	LENGTH (L.F.)
REGIONS 4 & 34 (CONT.)			
	60TH STREET WEST	24	1,800
	AVENUE M	24	4,000
	AVENUE N	24	5,280
	RANCHO VISTA	24	5,600
	ELIZABETH LAKE	24	8,300
	RANCH CENTER DRIVE	24	11,400
	TOTAL 24"		**36,380**
	10TH STREET WEST	30	7,920
	ELIZABETH LAKE	30	16,000
	TOTAL 30"		**23,920**
	20TH STREET EAST	36	5,280
	60TH STREET WEST	36	11,500
	75TH STREET WEST	36	2,640
	AVENUE H	36	31,680
	AVENUE M	36	7,920
	GODDE HILL	36	12,300
	TOTAL 36"		**71,320**
	DIVISION	42	15,840
	AVENUE M	42	4,800
	AVENUE P	42	13,200
	TOTAL 42"		**33,840**
	AVENUE H	48	12,000
	TOTAL 48"		**12,000**
REGIONS 24, 27, & 33			
	104TH STREET EAST	8	5,300
	TOTAL 8"		**5,300**
	AVENUE U	12	4,100
	TOTAL 12"		**4,100**
	116TH STREET EAST	16	10,000
	PEARBLOSSOM	16	18,000
	TOTAL 16"		**28,000**

TABLE VI-5B
DISTRICT NO. 40
TRANSMISSION AND DISTRIBUTION PIPELINES
2010 REQUIREMENTS

REGION	LOCATION	DIAMETER (IN.)	LENGTH (L.F.)
REGION 35			
	180TH STREET EAST	12	5,300
	AVENUE G	12	15,000
	AVENUE H	12	800
	AVENUE I	12	5,000
	TOTAL 12"		**26,100**
REGION 38			
	150TH STREET EAST	12	10,560
	175TH STREET EAST	12	3,700
	180TH STREET EAST	12	2,500
	190TH STREET EAST	12	8,000
	200TH STREET EAST	12	8,000
	AVENUE Q	12	5,200
	TOTAL 12"		**37,960**
	160TH STREET EAST	16	2,600
	AVENUE Q	16	5,300
	TOTAL 16"		**7,900**
	AVENUE O	24	31,000
	TOTAL 24"		**31,000**
REGION 39			
	PEARBLOSSOM	12	8,500
	TOTAL 12"		**8,500**

TABLE VI-5C
DISTRICT NO. 40
TRANSMISSION AND DISTRIBUTION PIPELINES
2020 REQUIREMENTS

REGION	LOCATION	DIAMETER (IN.)	LENGTH (L.F.)
REGIONS 4 & 34			
	75TH STREET WEST	12	2,640
	80TH STREET WEST	12	2,640
	95TH STREET WEST	12	2,640
	90TH STREET WEST	12	2,640
	AVENUE K	12	2,640
	AVENUE K-8	12	2,640
	AVENUE L	12	5,280
	AVENUE L-8	12	2,640
	TOTAL 12"		**23,760**
	AVENUE Q	20	3,480
	TOTAL 20"		**3,480**
	60TH STREET WEST	24	4,200
	AVENUE P	24	7,900
	TOTAL 24"		**12,100**
	60TH STREET WEST	36	9,300
	TOTAL 36"		**9,300**
REGIONS 24, 27, & 33			
	AVENUE T	12	5,500
	AVENUE U	12	5,300
	116TH STREET EAST	12	1,700
	TOTAL 12"		**12,500**
REGION 38			
	195TH STREET EAST	12	8,000
	150TH STREET EAST	12	10,000
	TOTAL 12"		**18,000**
	AVENUE N	20	5,000
	175TH STREET EAST	20	500
	180TH STREET EAST	20	500
	TOTAL 20"		**6,000**

TABLE VI-6
DISTRICT NO. 40
SUMMARY OF RECOMMENDED IMPROVEMENTS

ITEM	1998 QUANTITY REQUIRED	1998 UNIT COST	1998 ESTIMATED PROJECT COST	2010 QUANTITY REQUIRED	2010 UNIT COST	2010 ESTIMATED PROJECT COST	2020 QUANTITY REQUIRED	2020 UNIT COST	2020 ESTIMATED PROJECT COST
REGIONS 4 & 34									
WELL W/ BPP & FB (AVG EA)	11	$800,000 EA	$8,800,000	79	$800,000 EA	$63,200,000	29	$800,000 EA	$23,200,000
WELL AT EXISTING SITE (EA)	11	$350,000	$3,850,000						
BOOSTER PUMPING PLANTS (HP)									
AVENUE J	40 HP	$4,000.00 /HP	$160,000						
K-8 & 5TH	110 HP	$3,800.00 /HP	$418,000						
K-8 & DIVISION	30 HP	$4,000.00 /HP	$120,000						
FAIRGROUNDS	80 HP	$4,000.00 /HP	$320,000						
WATERBAG	160 HP	$2,800.00 /HP	$448,000						
BEECH	80 HP	$4,000.00 /HP	$320,000						
L-12 & 60TH				1760 HP	$900 /HP	$1,584,000	510 HP	$1,400 /HP	$714,000
M & 7TH				210 HP	$2,200 /HP	$462,000	100 HP	$4,000 /HP	$400,000
P & 10W				180 HP	$2,500 /HP	$450,000	250 HP	$1,900 /HP	$475,000
M & 5TH				1020 HP	$900 /HP	$918,000	250 HP	$1,900 /HP	$475,000
P & 10W				130 HP	$3,400 /HP	$442,000	30 HP	$4,000 /HP	$120,000
RANCHO VISTA, M-11 & 60TH				630 HP	$1,300 /HP	$819,000	210 HP	$2,200 /HP	$462,000
TIERRA SUBIDA				70 HP	$4,000 /HP	$280,000	120 HP	$3,600 /HP	$432,000
CITY RANCH NORTH				280 HP	$1,750 /HP	$490,000	120 HP	$3,600 /HP	$432,000
N-4 & 60 W				890 HP	$1,000 /HP	$890,000	330 HP	$1,750 /HP	$577,500
P-10 & 75 W				110 HP	$3,800 /HP	$418,000	30 HP	$4,000 /HP	$120,000
RITTER RIDGE				110 HP	$3,800 /HP	$418,000	30 HP	$4,000 /HP	$120,000
RITTER RIDGE				80 HP	$4,000 /HP	$320,000	30 HP	$4,000 /HP	$120,000
RITTER RIDGE				40 HP	$4,000 /HP	$160,000	10 HP	$4,000 /HP	$40,000
RITTER RIDGE				20 HP	$4,000 /HP	$80,000	10 HP	$4,000 /HP	$40,000
STORAGE FACILITIES (MG)									
2555 ZONE	41.0 MG	$0.75 /GAL	$30,750,000	50.0 MG	$0.75 /GAL	$37,500,000	20.0 MG	$0.75 /GAL	$15,000,000
2600 ZONE				2.5 MG	$0.80 /GAL	$2,000,000	3.0 MG	$0.75 /GAL	$2,250,000
2696 ZONE	5.6 MG	$0.75 /GAL	$4,200,000	10.0 MG	$0.75 /GAL	$7,500,000	1.0 MG	$1.00 /GAL	$1,000,000
WEST 2837 ZONE									
EAST 2837 ZONE				3.7 MG	$0.75 /GAL	$2,775,000	0.8 MG	$1.10 /GAL	$880,000
2880 ZONE				5.3 MG	$0.75 /GAL	$3,975,000			
2911 ZONE				6.0 MG	$0.75 /GAL	$4,500,000	4.1 MG	$0.75 /GAL	$3,075,000
2914 ZONE				1.0 MG	$1.00 /GAL	$1,000,000			
2980 ZONE				1.2 MG	$1.00 /GAL	$1,200,000	2.2 MG	$0.80 /GAL	$1,760,000
3050 ZONE				2.4 MG	$0.80 /GAL	$1,920,000	1.1 MG	$1.00 /GAL	$1,100,000
3240 ZONE	0.7 MG	$1.10 /GAL	$770,000	14.0 MG	$0.75 /GAL	$10,500,000	6.0 MG	$0.75 /GAL	$4,500,000
3430 ZONE				3.0 MG	$0.75 /GAL	$2,250,000	1.0 MG	$1.00 /GAL	$1,000,000
3620 ZONE				1.2 MG	$1.00 /GAL	$1,200,000			
3810 ZONE				0.5 MG	$1.10 /GAL	$550,000			
4000 ZONE				0.7 MG	$1.10 /GAL	$770,000			

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TABLE VI-6
DISTRICT NO. 40
SUMMARY OF RECOMMENDED IMPROVEMENTS

ITEM	1998 QUANTITY REQUIRED	1998 UNIT COST	1998 ESTIMATED PROJECT COST	2010 QUANTITY REQUIRED	2010 UNIT COST	2010 ESTIMATED PROJECT COST	2020 QUANTITY REQUIRED	2020 UNIT COST	2020 ESTIMATED PROJECT COST
TRANSMISSION PIPELINES (LF)									
12"				276380 LF	$70 /LF	$19,346,600	23760 LF	$70 /LF	$1,663,200
16"				65580 LF	$80 /LF	$5,246,400			
20"				64150 LF	$95 /LF	$6,094,250	3480 LF	$95 /LF	$330,600
24"	9800 LF	$115 /LF	$1,127,000	36380 LF	$115 /LF	$4,183,700	12100 LF	$115 /LF	$1,391,500
30"	18800 LF	$140 /LF	$2,632,000	23920 LF	$140 /LF	$3,348,800			
36"	55620 LF	$170 /LF	$9,455,400	71320 LF	$170 /LF	$12,124,400	9300 LF	$170 /LF	$1,581,000
42"				33840 LF	$200 /LF	$6,768,000			
48"				12000 LF	$225 /LF	$2,700,000			
SUBTOTAL			$63,370,400			$208,383,150			$63,258,800
REGIONS 24, 27, & 33									
WELL PLANTS (EA.)	4	$850,000 EA	$3,400,000	5	$850,000 EA	$4,250,000	4	$850,000 EA	$3,400,000
STORAGE FACILITIES (MG)									
2914 ZONE				0.5 MG	$1.10 /GAL	$550,000	0.9 MG	$1.00 /GAL	$900,000
3056 ZONE	0.3	$1.10 /GAL	$330,000	1.1 MG	$1.00 /GAL	$1,100,000			
3308 ZONE	0.6 MG	$1.10 /GAL	$660,000	3.0 MG	$0.75 /GAL	$2,250,000	1.0 MG	$1.00 /GAL	$1,000,000
TRANSMISSION PIPELINES (LF)									
8"		$50 /LF		5300 LF	$50 /LF	$265,000			
12"	15,000 LF	$70 /LF	$1,050,000	4100 LF	$70 /LF	$287,000	12500 LF	$70 /LF	$875,000
16"	14,500 LF	$80 /LF	$1,160,000	28000 LF	$80 /LF	$2,240,000			
SUBTOTAL			$6,600,000			$10,942,000			$6,175,000
REGION 35									
WELL PUMPING PLANTS (EA.)							1	$1,100,000 EA	$1,100,000
STORAGE FACILITIES (MG)									
2928 ZONE	0.1 MG	$1.10 /GAL	$143,000	0.1 MG	$1.10 /GAL	$143,000			
TRANSMISSION PIPELINES (LF)									
12"				26100 LF	$70 /LF	$1,827,000			
SUBTOTAL			$143,000			$1,970,000			$1,100,000

TABLE VI-6
DISTRICT NO. 40
SUMMARY OF RECOMMENDED IMPROVEMENTS

ITEM	1998 QUANTITY REQUIRED	1998 UNIT COST	1998 ESTIMATED PROJECT COST	2010 QUANTITY REQUIRED	2010 UNIT COST	2010 ESTIMATED PROJECT COST	2020 QUANTITY REQUIRED	2020 UNIT COST	2020 ESTIMATED PROJECT COST
REGION 38									
WELL PLANTS (EA.)	5	$850,000 EA	$4,250,000	11	$800,000 EA	$8,800,000	5	$850,000 EA	$4,250,000
STORAGE FACILITIES (MG)									
2850 ZONE	4.1 MG	$0.75 /GAL	$3,075,000	4.6 MG	$0.75 /GAL	$3,450,000	2.2 MG	$0.90	$1,980,000
2992 ZONE				3.0 MG	$0.75 /GAL	$2,250,000			
TRANSMISSION PIPELINES (LF)									
12"				37960 LF	$70 /LF	$2,657,200	18000 LF	$70 /LF	$1,260,000
16"	8,300 LF	$80 /LF	$664,000	7900 LF	$80 /LF	$632,000			
20"							6000 LF	$95 /LF	$570,000
24"	5,300 LF	$115 /LF	$609,500	31000 LF	$115 /LF	$3,565,000			
SUBTOTAL			$8,598,500			$21,354,200			$8,060,000
REGION 39									
WELL PLANTS (EA.)	1	$1,100,000 EA	$1,100,000	2	$850,000 EA	$1,700,000			
BOOSTER PUMPING PLANTS (HP)	15 HP	$4,000 /HP	$60,000						
STORAGE FACILITIES (MG)									
3308 ZONE				1.0 MG	$1.00 /GAL	$1,000,000			
3440 ZONE	0.6 MG	$1.10 /GAL	$704,000						
3640 ZONE				0.1 MG	$1.10 /GAL	$143,000			
TRANSMISSION PIPELINES (LF)									
12"	3,000 LF	$70 /LF	$210,000	8500 LF	$70 /LF	$595,000			
SUBTOTAL			$2,074,000			$3,438,000			$0
MISCELLANEOUS*			$19,582,000						
TOTALS			**$100,370,000**			**$246,090,000**			**$78,600,000**

*AS IDENTIFIED BY COUNTY STAFF - SEE COUNTY LIST OF EXISTING DEMAND IMPROVEMENTS

PWS-0204-0165

CHAPTER VII

CHAPTER VII
PROJECT FINANCING

There are numerous loan and grant programs and other funding mechanisms available to public agencies for funding the construction of water system capital improvements, some of which offer considerable cost saving opportunities to those agencies which choose to participate. The following list is by no means comprehensive, as there are often programs offered by obscure agencies which go largely unpublicized.

A. POTABLE WATER SYSTEM CAPITAL IMPROVEMENTS

There are a number of government sponsored programs for the funding of improvements to local water supply systems. Funding generally takes the form of loans; however, grants are available to qualified applicants for certain types of projects. The following are brief descriptions of several State and Federal programs, including application processes, loan terms, maximum grant or loan amount, and our evaluation of the program's potential for use by LACWWD.

1. Water and Wastewater Loan/Grant Program

The U.S. Department of Agriculture, Rural Development (USDA-RD) provides grants and low interest loans for the construction of water, reclaimed water, and wastewater projects in rural areas through its Water and Wastewater Loan/Grant Program. Rural areas are defined as communities with a population of 10,000 or less, and can be either cities or unincorporated areas. The purpose of the program is the improvement of core infrastructure in underdeveloped (though not necessarily agricultural) areas, which is intended to result in enhanced economic conditions and the protection of the health, safety, and welfare of project area residents.

a. Application Process

The application process is initiated by the submittal of a pre-application, which USDA-RD uses to determine applicant eligibility. Once found eligible, the

applicant must prepare and submit a number of supporting documents, the most important of which are a Preliminary Engineer's Report and CEQA/NEPA environmental documents. Once the supporting documents have been reviewed and accepted, USDA-RD issues a Letter of Conditions; after the conditions have been met, the funds are immediately available. The process typically takes nine to twelve months to complete.

b. Loan and Grant Terms

Loans under the program are made at various interest rates, which are dependent upon the economic status of the project area and upon the amount of the grant portion of funding package (if any); interest rates for recent projects have ranged between 4-1/2% and 5-1/8%. The maximum repayment period is 40 years. If eligible, up to 50% of the funding package can be in the form of a grant, with the percentage of grant funding based upon median household income data for the project area derived from the most recent Federal census.

c. Potential for Use

The program has good potential for use by LACWWD, particularly for funding projects in those regions of District No. 40 that have relatively small and/or low income populations. USDA-RD representatives have experienced some difficulty in securing sufficient applications to exhaust each year's funding allocation within Southern California, and are generally searching for projects to fund.

2. Drinking Water State Revolving Fund Loan/Grant Program

The Drinking Water State Revolving Fund Loan/Grant Program is funded jointly by the State of California and the Federal Government, and is administered by the California Department of Health Services (CDHS). The program was created by the 1996

reauthorization of the Federal Safe Drinking Water Act, and is intended to fund projects which will eliminate threats to human health resulting from inadequate or dilapidated potable water system facilities.

a. Application Process

The application process is commenced by the submittal of a relatively simple pre-application form, which is used by CDHS (together with other, competing pre-applications) to assemble a priority list for funding. In order to be ranked, the applicant's pre-application must present a clearly defined water quality problem within the specific system, and must also indicate the type and size of the facilities necessary to address the problem(s). The program is relatively new and still being established, meaning that the application process is quite lengthy; however, it is anticipated that the process will eventually be shortened to twelve months or less.

b. Loan and Grant Terms

The maximum funding package available under the program is $30,000,000 per system (not applicant), although most recipients will receive far less. Most loans will be made at an interest rate one-half that of the State's most recent sale of General Obligation Bonds; however, lower interest rates (down to 0%) will be available to projects benefiting extremely low income customers. A limited number of grants will also be available.

c. Potential for Use

The program has moderate to low potential for use, owing primarily to the difficulties inherent in identifying projects meeting the eligibility criteria specified in the program's regulations. LACWWD staff would have to identify new or replacement water system facilities necessary to address water quality

problems within specific portions of any of District No. 40's systems (e.g. distribution pipelines with pressures too low to prevent the infiltration of contaminants).

3. Water Conservation Loan Program

The Water Conservation Loan Program is administered by the California Department of Water Resources (CDWR). Water Conservation Loan Program funds can be used for ground water recharge projects (including both actual recharge projects [e.g. spreading grounds] and in-lieu recharge projects [e.g. importing water to avoid pumping water from an overdrawn aquifer]), water conservation projects, and local water supply facilities projects which will either result in reductions in water use or water system losses, or remedy existing water supply problems.

a. Application Process

The application process is fairly straightforward; a pre-application is submitted first which is used to establish the project's eligibility, after which a comprehensive application package is submitted that includes considerable information regarding the project's details and expected benefits. The application process usually takes six to twelve months to complete.

b. Loan Terms

There are three separate construction loan programs: the Water Conservation Project Construction Program, the Ground Water Recharge Program, and the Local Water Supply Project Construction Program. Loans under the first two programs are made at an interest rate one-half that of the most recent sale of General Obligation Bonds by the State of California, while those under the latter program are made at an interest rate equivalent to the most recent General

Obligation Bond sale. The maximum loan available under any of the construction programs is $5,000,000, with a repayment period of 20 years.

It should be emphasized that all loans under the Water Conservation Program must result in demonstrable water conservation, and that the facilities to be constructed must be more cost effective than an alternative project (e.g. replacement of an existing conveyance pipeline as opposed to construction of a local water supply system).

c. Potential for Use

The program has good potential for use by LACWWD, particularly if it can be demonstrated that the specific project will result in reductions in water use or reductions in water system losses, or will remedy existing water supply problems. Eligibility can only be established by submitting a pre-application, which CDWR personnel use to establish whether or not a specific project qualifies under the loan program's requirements.

4. Safe Drinking Water Loan and Grant Program

CDHS and CDWR jointly administer the Safe Drinking Water Loan and Grant Program. The program is intended to fund projects which will improve domestic water supply system deficiencies related to threats to the system's ability to provide safe and reliable water service.

a. Application Process

The application process consists of submitting information describing water system deficiencies to CDHS, which then ranks eligible applicants according to a priority system. The applicants with the highest rankings receive funding for their projects. CDWR is responsible for administering loans and grants under the

Safe Drinking Water program. The process usually takes six to twelve months to complete.

b. Loan and Grant Terms

Loans and grants under this program must be used to rectify deficiencies in water systems which may result in adverse health impacts upon the community; examples of eligible projects include replacement of existing non-pressure pipelines with new pipelines, construction of water treatment facilities, and construction of new wells to replace wells threatened with contamination.

The maximum loan available under the Safe Drinking Water Loan Program is $5,000,000; eligible communities can replace up to $400,000 of the loan funding with a grant if they can prove that the loan funding will have a severe adverse economic impact upon the community. Loans are made at an interest rate one-half that of the most recent sale of General Obligation Bonds. Safe Drinking Water Loans must be repaid within 30 years.

c. Potential for Use

The program has moderate potential for use by LACWWD, particularly if new or replacement water system facilities are required to remediate water quality deficiencies (e.g. violations of maximum contaminant levels for various constituents in existing water supply wells).

5. Economic Development Administration Grants

The U.S. Economic Development Administration (EDA) provides grants for public works projects that will result in the creation or retention of long-term private sector jobs and to alleviate chronic economic stagnation resulting from deficient facilities. An example would be the extension of water service to an area with potential for commercial

or industrial development which does not currently receive service and which, if developed, would offer an increase in private sector employment.

a. Application Process

The application process is initiated by submittal of a pre-application to demonstrate applicant eligibility. Once found eligible, the applicant must submit a long and complex formal application which describes both the project and the community. The formal application takes a considerable amount of time to prepare (three months is not uncommon) and additional time for EDA to review; among other elements, the application package must include economic projections and letters of commitment from potential employers regarding their intent to construct facilities in the area. The process usually takes between twelve and eighteen months to complete.

b. Grant Terms

Grants of up to $1,200,000 are available, but EDA's participation must not exceed 50% of total project costs.

c. Potential for Use

EDA's grant program has moderate to low potential for use. In order to qualify, LACWWD would have to demonstrate how the specific project would result in identifiable and significant increases in the number of private sector jobs or otherwise contribute to the economic development of the project area.

B. RECLAIMED WATER SYSTEM CAPITAL IMPROVEMENTS

There are a number of financing programs available for funding the construction of reclaimed water treatment and distribution systems, some of which are government sponsored and one of

which is sponsored by the WateReuse Association. The following are brief descriptions of two programs, including application processes, terms, maximum funding amount, and our evaluation of the program's potential for use by LACWWD.

1. Clean Water State Revolving Fund Loan Program

The Clean Water State Revolving Fund Loan Program is funded through the U.S. Environmental Protection Agency, which makes monies available to individual states so that they can fund a State Revolving Fund Program for the construction of wastewater treatment (including water reclamation) facilities; the program is managed in California by the State Water Resources Control Board (SWRCB). The Clean Water State Revolving Fund Loan Program was created by the 1987 amendments to the Federal Clean Water Act, and is intended to result in the protection of water quality from degradation resulting from disposal of inadequately treated wastewater; advanced levels of treatment, such as those involved in water reclamation, are both eligible and encouraged.

a. Application Process

The application process consists of the submittal of a relatively simple loan pre-application form, which is used by SWRCB (together with other, competing pre-applications) to assemble a priority list for funding. Once the prospective applicant has been assigned a priority number, it must proceed with the completion of the facilities planning (i.e. Project Report, Revenue Program, and Water Conservation Plan) and CEQA processes; it should be noted that both facilities planning and CEQA compliance must be performed by the applicant without financial assistance from the program. Once the application, planning documents, and CEQA documents have been completed and submitted, the SWRCB reviews and either approves or denies the application. The application process can take twelve months or more to complete.

b. Loan Terms

Loans under the State Revolving Fund Loan Program are made at an interest rate one half that of the most recent sale of general obligation bonds by the State of California. The maximum loan to any one public agency under the State Revolving Fund Loan Program is $5,000,000 in a single fiscal year; however, funds can be received in successive fiscal years if needed, with no maximum overall loan amount currently specified. State Revolving Fund loans must be repaid within 20 years.

c. Potential for Use

The program has good to moderate potential for use by LACWWD, as it is intended to fund projects such as the ones that LACWWD would likely propose in the event that it decides to become a producer and purveyor of reclaimed water. LACWWD would most likely be eligible for funding, since the project would help to realize the Clean Water Act's intentions with regard to water quality protection.

2. WateReuse Association Funding Program

The WateReuse Association Funding Program was set up in response to problems that WateReuse Association members have had with State Revolving Fund loans, and was established in 1992 with the formation of the California WateReuse Finance Corporation. The program functions by combining the projects of various public agencies into a single pool, after which the California WateReuse Finance Corporation issues Certificates of Participation on behalf of the participants; the project is then funded through a tax-exempt lease/purchase agreement. The primary savings under the program are offered by economy of scale; since the California WateReuse Finance Corporation has already assembled the financing team (e.g. bond counsel, underwriter) participants avoid the

necessity of securing and paying for these services individually. All water recycling/reuse projects are eligible to be financed.

a. Application Process

The application process under the WateReuse Association Funding Program is extremely simple, as most of the technical issues relating to the financing are dealt with by members of the California WateReuse Finance Corporation's financing team. The initial step consists of an evaluation of the proposed project by said financing team, which will also evaluate alternative financing programs. Once the initial evaluation is completed, the anticipated project costs are presented to the public agency's legislative body, which can retain the California WateReuse Finance Corporation through a resolution. From that point forward, the primary responsibility of the applicant is to follow through with design and construction of the actual facilities, while concurrently providing project information and details to the financing team. Unlike government sponsored programs, the WateReuse Association Funding Program can generally fund projects in relatively short order.

b. Funding Program Terms

The terms under the WateReuse Association Funding Program will vary depending upon conditions in the bond market at the time the Certificates of Participation are issued. The repayment term is not specified, and will be agreed upon through the application process. No maximum amount is specified in available literature; however, the City of Oceanside financed a project through the program in the amount of $23,000,000.

c. Potential for Use

The program has good to moderate potential for use by LACWWD, if the Board of Supervisors determines that a lease/purchase agreement form of financing is to LACWWD's advantage. The California WateReuse Finance Corporation is willing to make presentations to LACWWD representatives in order to better acquaint them with the funding program, and it may be in LACWWD's best interest to arrange such a presentation.

C. SOURCE WATER QUALITY PROTECTION

There are a small number of funding programs available for source water quality protection; said programs are largely a result of growing concern over the gradual decline in the quality of water available for domestic service, which has caused some government agencies charged with protecting water quality to offer grant and/or loan funding for the evaluation of potential source-water quality problems and for the implementation of remedial actions.

1. Water Quality Management Planning Grant Program

The SWRCB's Water Quality Management Planning Grant Program, which is authorized by Subsection 205(j) of the Federal Clean Water Act and is commonly referred to as the 205(j) Program, is intended to fund water quality assessment and planning projects performed by local agencies which are designed to result in recommendations for the remediation of water quality problems. 205(j)-funded programs are supposed to evaluate and recommend solutions to pollution-caused water quality problems, particularly those stemming from nonpoint source pollution; the application states in part that "Projects should focus on water quality in water bodies impacted by pollutants such as pesticides, metals, other toxic substances, bacteria, nutrients, siltation, or salinity". The 205(j) Program cannot be used to fund physical projects, but rather must fund the preparation of a plan for remedial projects.

a. Application Process

The application process is initiated by submittal of a detailed project work plan which SWRCB evaluates and then ranks in relation to project work plans submitted by competing agencies. The project work plan must outline the proposed project and its background, and also explain the local agency's organization and project team. Other required elements include a budget summary, a schedule, and a quality assurance plan.

Applications are ranked according to the condition of the specific water body associated with the project, the project's feasibility, the potential benefits of the project, the applicant's commitment to implementing the recommended remedial measures, the ability of the applicant to successfully complete the work plan, and the project's consistency with the concept of watershed protection.

It is important to confer with SWRCB staff during preparation of the application and work plan in order to acquaint them with the project's details and gain their support for the application. Failure to involve SWRCB staff during the application preparation process significantly decreases the chances that an application will be successful, according to SWRCB representatives.

b. Grant Terms

SWRCB requires that applicants provide 25% of the grant in local match funding; the budget section of the work plan must reflect the matching funds. There is no maximum grant amount stated in the application guidelines, but the 205(j) Program receives limited funding (1% of the State's annual Clean Water Construction Grant allotment) each year. All funding is in the form of grants, and no repayment terms or schedule are therefore necessary.

c. Potential for Use

The program has moderate potential for use by LACWWD. The Antelope Valley Ground Water Basin has a number of potential water quality threats (e.g. subsidence, illegal dumping, hazardous waste sites), and LACWWD should be eligible for grant funding provided that a well structured and detailed work plan could be prepared.

2. Watershed Management Implementation Grant Program

SWRCB's Watershed Management Implementation Grants are funded pursuant to Section 319(h) of the Federal Clean Water Act. The grants, which are commonly referred to as Section 319 funds, are intended to be used for the implementation of nonpoint source pollution management; Section 319 funds are often used to pay for implementation of remediation efforts recommended at the end of Section 205(j)-funded planning and assessment projects.

Section 319 funds can also be used for planning and assessment activities with regard to ground water nonpoint source pollution, although there would likely be some overlap with planning activities funded by a 205(j) grant. A more viable use of Section 319 funds would likely be the implementation of ground water quality protection and improvement measures recommended by an evaluation of threats to the ground water supply within the Antelope Valley. It is important to note that SWRCB will not fund Section 319 projects that are not endorsed by all interested parties in the region.

a. Application Process

The application process consists of the submittal of a proposal which offers a detailed outline of the proposed project, and includes a detailed budget and schedule for project implementation. SWRCB generally receives a number of proposals (70 in 1993, of which ten received funds); the proposals are then

ranked, and the applying agencies projects are funded in order of ranking until all funds are committed.

Throughout the proposal preparation process, it is imperative that SWRCB staff be conferred with to ensure that they are aware of the proposal's content and are willing to support the proposed project. SWRCB representatives advise that any project which does not have their support has extremely limited potential for receiving funding.

b. Grant Terms

The maximum grant amount allowed under the Section 319 program is $300,000, and the recipient is required to provide 40% matching funds. An additional 10% grant (i.e. $30,000 maximum) is available to each grant recipient if that amount will be used for public education programs, such as citizen monitoring of the project area or information programs for school children. Since the SWRCB funds are provided in the form of a grant, no repayment is required.

c. Potential for Use

The Section 319 grant program has moderate potential for use by LACWWD if it is successful in securing a 205(j) grant and/or in preparing a detailed plan that SWRCB staff thinks worthy of support. Chances of success are limited if LACWWD is unable to either secure 205(j) funds or otherwise develop a work plan that will result in direct and identifiable improvements in ground water quality that will in turn result from reductions in nonpoint source pollution.

3. Water Conservation Loan Program

Funds from CDWR's Water Conservation Loan Program are available for feasibility studies for both ground water recharge projects and local water supply projects. The

specific feasibility study must demonstrate whether a proposed project is feasible in its engineering, environmental, economic, and financial aspects. The feasibility study must also identify measures which will result in reductions in water use or water system losses, will remedy existing water supply problems, or will result in recharge of an overdrafted ground water body.

a. Application Process

The application process consists of the submittal of an application which includes detailed information regarding the applying agency, a work plan and schedule regarding the feasibility study, and a demonstration of both financial and physical need for the proposed project. The application process generally takes four to eight months to complete.

b. Loan Terms

Loans for ground water recharge project feasibility studies are limited to $100,000 for each feasibility study; the interest rate is one-half that of the most recent sale of general obligation bonds by the State of California. Feasibility studies for local water supply projects are limited to $500,000 for a single study, and the interest rate is equal to that of the most recent general obligation bond sale.

c. Potential for Use

Both of the feasibility study loan programs have moderate potential for use by LACWWD, particularly in the event that LACWWD's proposed aquifer storage and recovery project is pursued.

D. ADDITIONAL STATE AND FEDERAL PROGRAMS

Additional funding sources for public works projects become available periodically; for example, bond laws are occasionally placed on the ballot by the State of California in an effort to raise funds for various types of infrastructure. Similarly, various Federal agencies periodically create new funding programs as financial resources become available. It is important to keep up to date on new programs that may become available and to apply early to existing programs to ensure that the applicant is placed high on funding priority lists, and thus take advantage of low-cost government funding programs as opportunities arise. The cost-saving advantages offered by said programs are so dramatic that competition is often fierce (witness the initial response to the Drinking Water State Revolving Fund Loan/Grant Program, which drew over 3,500 preapplications), and early application submittal can result in a significant advantage.

E. LOCAL FUNDING

Both the County of Los Angeles and the County Water Works District have the authority to issue assessment bonds, improvement bonds, community facilities district special tax bonds, revenue bonds, or certificates of participation, each of which is described below:

- Assessment bonds require the formation of an assessment district, which can be defeated by a simple majority protest of landowners based on land area. Typically, substantial expenditures must be made for preparation of the engineer's report (including plans and specifications, cost estimates, and a proposed assessment) before the assessments can be levied and assessment bonds issued. The cost of improvements providing general benefits must be separated and funded from other sources. The cost of the improvements to be assessed must be allocated to the land in proportion to the special benefits each parcel of land receives. Publicly owned parcels must also be assessed unless it can be demonstrated that such parcels do not receive special benefits.

- Improvement bonds (general obligation bonds) require approval by a two-thirds vote of registered voters residing within a County Water Works District or its improvement

service areas. Improvement bonds are typically secured by the authority and obligation of the issuer to levy ad valorem property taxes in an amount sufficient to pay debt service; however, the tax need not be levied if revenues from other sources are available to pay debt service.

- Revenue bonds require approval by a simple majority vote of registered voters. Revenue bonds are secured by a lien on the revenues of the enterprise and by a pledge of the issuer to maintain revenues in excess of debt service and operation and maintenance costs.

- Certificates of participation are not subject to protest hearing or voter approval. Certificates of participation represent an interest in an installment purchase agreement or lease purchase agreement. Installment payments of principal and interest made under the agreement are secured by a pledge of revenues of the enterprise. Certificates of participation are similar to revenue bonds.

Debt service on indebtedness incurred to finance improvements can be paid with the portion of the one-percent general ad valorem property taxes apportioned to the County Water Works District, water charges and fees (including services and quantity charges and connection fees), and water standby/availability charges or assessments.

Because any portion of the one-percent general ad valorem property tax may be withdrawn from enterprise operations by legislative action, property taxes may not be considered a reliable source for payment of debt service. However, some agencies have pledged their portion of the one-percent general ad valorem property taxes to the payment of lease purchase agreements. The legislature has in the past exempted property taxes pledged to lease payment obligations from legislation diverting property taxes from special districts.

Water rates (including reclaimed water rates) can be increased, but that action places the full burden for the cost of improvements on existing users. Connection fees can be increased to pay for the cost of improvements, but that would put the full burden on new development; in addition, since it would be dependent upon development, it would not provide a reliable revenue stream.

Water standby/availability charges currently are limited to $30 per year per acre or parcel (whichever is smaller). Water standby/availability charges are generally used for financing design and construction of water system improvements or for retiring indebtedness incurred in financing improvements. Water standby/availability charges are subject to the provisions of SB 919 (which was adopted in 1997 and entitled the "Proposition 218 Omnibus Implementation Act") and of Proposition 218 (Article XIIID of the California Constitution).

F. RATES, FEES, AND CHARGES

The primary mechanisms available to LACWWD to recover costs associated with operating, maintaining, and improving the water systems within each of District No. 40's eight regions are the collection of water rates, fees, and charges. Water rates are typically established based upon the approximate direct cost of providing water to each customer at the point of delivery (e.g. water meter) and are generally tied to consumption as measured in units of one hundred cubic feet (ccf) or 748 gallons, of water. Fees and charges are typically established based upon the various costs associated with constructing and replacing capital facilities, and fall into three broad categories: meter fees, capital facility charges, and distribution facility charges. Each type of charge (and its potential use for constructing capital facilities planned for construction pursuant to this Water Master Plan) is described individually in the following subsections.

1. Meter Fees

Meter fees are usually charged to existing customers (along with water rates) on a monthly or bi-monthly basis, and are used to recover a portion of the costs associated with constructing and maintaining the specific system. Meter fees are considered to be one means of paying for the facilities (existing and replacement) necessary to provide service to existing customers, and are typically based on the capacity of the meter; for example, the cost of facilities necessary to serve a customer needing a 2" meter are considered greater than those necessary to serve a customer with 5/8" x 3/4" meter. Meter fees are an important source of revenue for the rehabilitation or replacement of

existing facilities, and can be used to establish or enhance the jurisdiction's depreciation reserve.

2. Capital Facility Charges

Capital facility charges are charged to new connections to a specific system, and are used to recover the approximate costs associated with constructing new or expanded source-of-supply, storage, and transmission facilities necessary to serve demands associated with new development; AWWA refers to such charges as System-Development Charges (AWWA, 1986). Because it is impractical to require each new applicant for service to construct facilities necessary to provide their share of the system's expanded capacity, the charges are generally imposed in a manner that equitably allocates the costs to each applicant at the time they create the need. The jurisdiction (e.g. LACWWD) accumulates the funds in order to ensure that it has the economic resources necessary to construct the facilities as a series of incremental projects, thus allowing the jurisdiction to realize reasonable economies of scale. In essence, a capital facility charge amounts to a policy whereby growth pays for (system) growth.

One of the most important purposes of a capital facility charge is the prevention or reduction of inequities to the jurisdiction's existing customers that would result if said customers were compelled to pay higher rates and meter charges in order to finance the construction of facilities that will primarily benefit new customers. Capital facility charges can be used to retire debts (such as those incurred through the financing mechanisms described earlier in this chapter) associated with the new facilities, or they can be accumulated and used to pay for said facilities directly (for example, from a capital facilities reserve account).

It is important to note that, in establishing a schedule of capital facility charges, the jurisdiction is not limited to costs associated with future facilities; rather, the charge can (and probably should) take into account the costs associated with existing facilities as well, particularly to the extent to which new connections will benefit from existing

facilities. At the same time, the jurisdiction must not set capital facility charges that exceed the approximate costs associated with serving new development. §66013(a) of the California Government Code reads in part, "Notwithstanding any other provision of law, when a local agency imposes fees for water connections or sewer connections, or imposes capacity charges, those fees or charges shall not exceed the estimated reasonable cost of providing the service for which the fee or charge is charged". The Government Code defines a "water connection" as the connection of a building to a public water system, and a "capacity charge" as the charge(s) for facilities in existence at the time the charge is imposed or charge(s) for new facilities to be constructed in the future that are of benefit to the person or property being charged.

The passage of Assembly Bill 1600 (codified as §66000 et seq. of the California Government Code) resulted in clarification of the regulations and requirements regarding the collection and use of capital facility charges. Specifically, §66000 et seq. require that the jurisdiction accomplish the following:

a. Establish a direct connection (or nexus) between the capital facility charge and the facility(ies) it will fund;

b. Segregate the capital facility charges from funds used for operations (e.g. water rates) and funds used for rehabilitation or replacement of facilities serving existing development (e.g. meter fees, depreciation account); and

c. Commit or assign the funds collected to a project (or projects) within five years.

Based on the foregoing requirements, it is apparent that the jurisdiction must establish a separate, well documented accounting system regarding the collection and use of capital facility charges. Also, the jurisdiction should devise a method for clearly demonstrating the relationship between the capital facility charges collected and the facilities actually constructed. Nevertheless, said charges provide an important revenue source for constructing facilities necessary to serve new development.

3. Distribution Facilities Charges

Distribution facilities charges are charged to new connections on the basis of the capital cost for the distribution pipeline that makes water directly available to the parcel receiving new service, and are intended to allow the jurisdiction to recover the capital costs associated with constructing only that segment of pipeline that directly benefits the parcel. Distribution facilities charges therefore do not contribute funds towards defraying the costs of those major facilities (capital facilities) that supply, store, and convey potable water supplies.

G. RECOMMENDATIONS

Because new development will presumably be required to pay for the construction of required capital facilities through capital facilities charges, the following recommendations apply to funding the construction of facilities necessary to correct deficiencies in the existing systems within District No. 40. Because the eight regions vary considerably in population, the recommendations are organized into subsections dealing with the more populated regions (i.e. Regions 4, 34, and 38) and the less developed regions (i.e. Regions 24, 27, 33, 35, and 39). The various alternatives are ranked by their potential for use within each region on Table VII-1.

1. Regions 4, 34, and 38

Because the population within Regions 4, 34, and 38 exceeds 10,000 persons per region, these regions are likely not eligible for certain funding programs intended primarily for rural areas. Further, the scale of the improvements necessary within the three regions (see Chapter VI) is significant enough to exceed the limits of most remaining financing programs, particularly those intended for potable water system improvements; however, low-cost financing could be arranged for some individual projects, which would have the effect of incrementally reducing long-term capital expenditures.

Since most of the facilities will have to be constructed using funds collected by LACWWD, it is worthwhile to consider various means of assembling the necessary capital. There are two major categories available, which can be described as direct financing (i.e. paying for improvements through the collection and expenditure of rates, fees, and charges) and bond financing. The characteristics, advantages, and disadvantages of each are described below:

- Direct financing – As its name implies, this method consists of collecting funds directly from existing customers and using the money to construct facilities as sufficient amounts are collected. Rates and/or fees generally have to be increased to generate the required income; the amount of the increase is tied to the pace at which the facilities need to be constructed.

  An advantage of this means of financing is the lack of debt generation and consequent interest expenses. Also, because the funds don't have to be secured, administration and other expenses (such as those associated with bond issues) are reduced or eliminated.

  Disadvantages associated with financing facilities directly include potentially strong customer resistance to rate and/or fee increases, and the relatively slow pace of constructing facilities that are meant to eliminate existing deficiencies. Customer opposition can result in reluctance on the part of governing bodies to approve the necessary increase, in part or in full.

- Bond Financing – This method consists of the sale of bonds in an amount estimated to be sufficient to fund the construction of most or all of the facilities needed to eliminate the existing deficiencies. Rates and/or fees generally must be increased in order to service the bonded indebtedness and associated expenses; the amount of the increase is dictated by the dollar value of the bond sale, the interest rate to be paid on the bonds, and the term of the bonds (which typically ranges between 20 and 40 years).

The greatest advantage conferred by a bond sale is the ability to make considerable amounts of capital available almost immediately. Also, because the interest rate currently (as of late 1998) being paid on bonds is relatively low, the interest expense component of raising capital through bond sales is limited.

The primary disadvantage of amassing funds through a bond sale is the cost and complexity of the sale itself. Costs vary, but a portion of the proceeds must typically be used to pay for the services of the bond issuance team (e.g. bond counsel, underwriter). The process requires the issuing agency's staff to devote substantial amounts of time to the issuance. Also, to ensure that adequate funds are raised through the bond sale, it is necessary to have relatively detailed and accurate project cost estimates for the facilities to be constructed; said estimates should take into account all project costs (e.g. engineering, land acquisition, construction).

Because the extent and cost of the facilities needed to eliminate the deficiencies within Regions 4, 34, and 38 are significant and will take some time to plan and construct, the recommended financing strategy consists of the following:

- Preparation of a priority list reflecting those facilities in most urgent need of construction and those that can be deferred;

- Issuance of bonds in amounts sufficient to both fund the urgently needed facilities and realize economics of scale with regard to bond issuance costs;

- Determination of the amount of additional revenue that will have to be collected from customers within the three regions initially (to repay the bonds) and ultimately (to pay for the facilities to be financed directly); and

- Implementation of a phased series of rate and/or fee increases that will be adequate to collect the necessary revenue.

By following this strategy, LACWWD would be able to construct the facilities judged to be the most important immediately, without having to wait for funds to accumulate following rate and/or fee increases. Because customers would not be faced with immediate (and significant) cost increases, and would have time to adjust between each of the phased increases, opposition to said increases may be reduced.

2. Regions 24, 27, 33, 35, and 39

Unlike the other three regions, the population within Regions 24, 27, 33, 35, and 39 is less than 10,000 persons per region, making each eligible for funding not available to more populous areas. Also, because the scale of improvements necessary to eliminate system deficiencies within these regions is relatively limited (see Chapter VI), project financing might be available in amounts sufficient to allow LACWWD to pay essentially all project costs through low interest rate loans and grants.

Perhaps the most appealing funding program available for rural areas is USDA-RD's Water and Wastewater Loan/Grant Program (see Section A.1. above). Indeed, the program appears to be almost tailor-made for District No. 40's five smaller regions. Interest rates offered through the program are quite reasonable, and grants are routinely made to low income areas. It is therefore recommended that LACWWD determine which system improvements should be packaged together within each region (based on the recommendations presented in Chapter VI), and that applications be submitted as soon as possible to USDA-RD. To ensure the support of USDA-RD staff for the applications, LACWWD should schedule meetings with USDA-RD representatives to discuss the proposed projects, with an emphasis placed on the background of and need for each specific facility.

As with the larger regions, LACWWD will have to increase revenues in order to repay the loan portion of any funding received from USDA-RD (or other sources); a phased rate and/or fee increase will therefore be necessary. Also, because LACWWD may not be able to finance all necessary facilities through USDA-RD, or may wish to package some improvements in the smaller regions together with improvements in the larger regions, the discussion presented in Section G.1. above regarding direct financing and bond financing applies to the smaller regions as well.

3. Rate and Fee Increases

Regardless of the strategy employed to amass the funds necessary to construct the facilities required to eliminate the deficiencies within each region's system, LACWWD will have to increase revenues over current levels. Because the facilities will benefit current users, the most appropriate means of realizing the required rise in revenues is an increase in water rates and fees. However, since rate and fee increases often generate opposition (the strength of which is usually related to the amount of the increase), it is desirable to limit the amount of any increase to the greatest practicable extent.

As noted in Chapter VI, District No. 40's existing system needs approximately $100,400,000 in improvements. Since it is impractical to construct all of the facilities at once (or even over a three or four year period), it is anticipated that the facilities would be constructed over a period of not less than five years and not more than ten years, with the capital improvement program valued at between $20,080,000 and $10,040,000 per year in 1998 dollars.

Table VII-2 presents several alternative rate and/or fee increase scenarios, each of which would generate sufficient revenues to fund the necessary improvements. It should be noted that the alternatives are based on 1998 dollars and minimal inflation rates. While the figures presented are considered to be generally accurate, it is strongly recommended that LACWWD commission a formal rate study at the earliest opportunity; said study

would result in a far more detailed analysis of the various means that are available for increasing revenues.

As indicated on Table VII-2, LACWWD will likely need to increase rates by an average of between $0.13/ccf and $0.40/ccf. However, as indicated in Chapter III, rate structures can be introduced that both increase revenues and encourage water conservation, and LACWWD should consider implementing such a rate structure.

TABLE VII-1
RATINGS OF PROJECT FINANCING ALTERNATIVES
BY REGION

FINANCING MECHANISM	REGION NUMBER							
	4	24	27	33	34	35	38	39
A. POTABLE WATER LOANS AND GRANTS								
1. USDA-RD Water and Wastewater Program	F	A	A	A	C	A	C	A
2. CDHS Drinking Water State Revolving Fund Program	D	D	D	D	D	D	D	D
3. CDWR Water Conservation Program	B	C	C	C	B	C	B	C
4. CDHS Safe Drinking Water Program	C	C	C	C	C	C	C	C
5. EDA Grant Program	C	D	D	D	C	D	D	D
B. RECLAIMED WATER LOANS AND GRANTS								
1. SWRCB Clean Water State Revolving Fund	B	D	F	F	B	C	C	F
2. WateReuse Association Funding Program	B	D	F	F	B	C	C	F
C. SOURCE WATER QUALITY PROTECTION LOANS AND GRANTS								
1. SWRCB Water Quality Management Program	C	D	F	F	C	D	C	F
2. SWRCB Watershed Management Implementation Program	C	D	F	F	C	D	C	F
3. CDWR Water Conservation Program	C	D	F	F	C	D	C	F
D. LOCAL FUNDING SOURCES								
1. Bond Issues	A	C	D	D	B	B	B	D
2. Assessment Districts	D	D	D	D	D	D	D	D
3. Water Rate Surcharges	B	C	C	C	B	B	B	C
E. RATES, FEES, AND CHARGES								
1. Meter Fees	A	C	C	C	B	B	B	C
2. Capital Facility Charges	A	D	D	D	A	B	C	D
3. Distribution Facilities Charges	A	C	C	C	A	C	C	C

GUIDE TO RATINGS:

A = High Potential
B = Moderate to High Potential
C = Moderate Potential
D = Low Potential
F = No Potential

TABLE VII-2
ESTIMATED RATE AND/OR FEE INCREASES FOR
CAPITAL FACILITIES CONSTRUCTION PROGRAM

A. Alternative 1 – Direct Financing Over 10 Years Through Water Rates

- $10,040,000/Year in Capital Facilities Construction
- $6,840,000/Year Additional Revenue Requirement [1]
- Required Rate Increase Calculation:

$$\frac{\$6,840,000}{(47,000\ AF/Yr)\ (43,560 / 100)} = \$0.34/ccf\ ^{(2)}$$

B. Alternative 2 – Direct Financing Over 10 Years Through Meter Fees and Water Rates

- $10,040,000/Year in Capital Facilities Construction
- $6,840,000/Year Additional Revenue Requirement [1]
- $2/Month Meter Fee Increase = $940,000/Year
- Required Rate Increase Calculation:

$$\frac{\$5,900,000}{(47,000\ AF/Yr)\ (43,560 / 100)} = \$0.29/ccf\ ^{(2)}$$

C. Alternative 3 – Direct Financing Over 15 Years Through Water Rates

- $6,694,000/Year in Capital Facilities Construction
- $3,494,000/Year Additional Revenue Requirement [1]
- Required Rate Increase Calculation:

$$\frac{\$3,494,000}{(47,000\ AF/Yr)\ (43,560 / 100)} = \$0.17/ccf\ ^{(2)}$$

D. Alternative 4 – Direct Financing Over 15 Years Through Meter Fees and Water Rates

- $6,694,000/Year in Capital Facilities Construction
- $3,494,000/Year Additional Revenue Requirement [1]
- $2/Month Meter Fee Increase = $940,000/Year
- Required Rate Increase Calculation:

$$\frac{\$2,554,000}{(47,000\ AF/Yr)\ (43,560 / 100)} = \$0.13/ccf\ ^{(2)}$$

E. Alternative 5 – Bond Financing @ 6% Interest Over Various Terms

- Bond Issue: $112,448,000 [3]

Repayment Period	Required Rate Increase
15 Years	$0.40/ccf
20 Years	$0.32/ccf
30 Years	$0.24/ccf
40 Years	$0.21/ccf

[1] Additional revenue calculation based upon current ACO revenues of approximately $3,200,000/Yr.
[2] Based upon metered water sales of 47,000 AF/Yr.
[3] Includes 10% bond reserve funded through bond sale and 2% cost of bond issuance.

Note: All figures based upon 1998 dollars. To account for inflation, rates will have to be increased by an average of approximately $0.005/ccf/Yr for each 1% in the annual rate of inflation throughout the construction period for each specified Direct Financing Alternative. If inflation averages 4%/Yr during the ten year construction period, water rates would have to be increased by $0.02/ccf/Yr from $0.28/ccf in the first year to $0.48/ccf in the tenth year. For a 15 year construction program, water rates would have to increase from $0.13/ccf in the first year to $0.35/ccf in the 15th year, if inflation were to average 4%/Yr.

APPENDIX A

APPENDIX A
REFERENCES

1. American Water Works Association (AWWA), 1986, Manual of Water Supply Practices No. 26, Water Rates and Related Charges, manual presenting alternatives and recommendations for establishing rates and charges; 43 pages.

2. California Department of Water Resources (CDWR), 1997, Bulletin 132-96, Management of the California State Water Project, annual management report on the operation of the State Water Project; 348 pages.

3. Kennedy/Jenks Consultants (K/J), 1995, Antelope Valley Water Resources Study, water resources study prepared for the Antelope Valley Water Group; 146 pages plus tables, figures, and appendices.

4. Los Angeles County Waterworks Districts (LACWD), 1995, District 40, Antelope Valley Urban Water Management Plan, water management and conservation plan; 69 pages plus appendices.

5. U.S. Geological Survey (USGS), 1995, Land Use and Water Use in the Antelope Valley, California, land and water use report prepared in conjunction with the Antelope Valley Water Group; 97 pages.

6. Los Angeles County Department of Regional Planning (LACDRP), 1994, Population Projections for the Antelope Valley Waterworks District No. 4 and Related Purveyors, 1990-2020.

APPENDIX B

TABLE B-1

LACO DISTRICT 40 MASTER PLAN
DOMESTIC DEMAND PROJECTIONS
REGION 38

1997 DEMAND ADJUSTMENT BASED ON ACTUAL CONSUMPTION			
	LACO MOD MDD (GPM)	ACTUAL* MDD (GPM)	DEMAND FACTOR**
REGION 38	2448.0	3075.0	
2850.0	1834.0	2042.0	1.113
2992.0	614.0	1033.0	1.682

* BASED ON BILLING UNITS AND DEMAND FACTOR
SEE DRAFT DESIGN MANUAL

** FACTORS BASED ON ALL JCT NODES EXCEPT J1080
(JCT 1080 SERVES REGION 35)

2010, 2020 DEMAND ADJUSTMENT BASED ON LACDRP POPULATION PROJECTIONS			
	1997	**2010**	**2020**
REGION 38 POP	11948	12659	15000
DEMAND FACTOR*			
2850		1.060	1.255
2992		1.060	1.255

* BASED ON % POP INCREASE

REGION 38

CYBERNET JCT #	LACO MODEL MDD (GPM)			ADJUSTED 1997 MDD		2010 MDD		2020 MDD	
	TOTAL	2992 ZONE	2850 ZONE	2992.0 ZONE	2850.0 ZONE	2992.0 ZONE	2850.0 ZONE	2992.0 ZONE	2850 ZONE
				1.682	1.113	1.060	1.060	1.255	1.255
20	23		23		26		27		32
30	23		23		26		27		32
40	23		23		26		27		32
50	23		23		26		27		32
60	34		34		38		40		48
80	6	6		10		11		13	
100	6	6		10		11		13	
110	6	6		10		11		13	
120	6	6		10		11		13	
130	23		23		26		27		32
140	23		23		26		27		32
150	23		23		26		27		32
160	23		23		26		27		32
190	7	7		12		12		15	
200	6	6		10		11		13	
210	6	6		10		11		13	
220	6	6		10		11		13	
240	8	8		13		14		17	
250	23		23		26		27		32
260	23		23		26		27		32
270	23		23		26		27		32
280	23		23		26		27		32
330	23		23		26		27		32
340	23		23		26		27		32
370	22		22		24		26		31
380	25		25		28		29		35
390	25		25		28		29		35
460	9		9		10		11		13
470	9		9		10		11		13
480	9		9		10		11		13
490	25		25		28		29		35
510	25		25		28		29		35
540	9		9		10		11		13
550	9		9		10		11		13
560	9		9		10		11		13
570	25		25		28		29		35
580	25		25		28		29		35
620	9		9		10		11		13
630	9		9		10		11		13
640	9		9		10		11		13
650	25		25		28		29		35
660	25		25		28		29		35
670					0				
680					0				
690	9		9		10		11		13
700	9		9		10		11		13

LACO DISTRICT 40 MASTER PLAN
DOMESTIC DEMAND PROJECTIONS
REGION 38

710	9		9		10		11		13
720	9		9		10		11		13
730	25		25		28		29		35
800	7	7		12		12		15	
810	7	7		12		12		15	
820	7	7		12		12		15	
830	7	7		12		12		15	
840	7	7		12		12		15	
850	7	7		12		12		15	
860	7	7		12		12		15	
870	7	7		12		12		15	
880	7	7		12		12		15	
890	7	7		12		12		15	
920	7	7		12		12		15	
930	7	7		12		12		15	
940	7	7		12		12		15	
950	7	7		12		12		15	
960	7	7		12		12		15	
970	7	7		12		12		15	
980	7	7		12		12		15	
990	7	7		12		12		15	
1000	7	7		12		12		15	
1010	9		9		10		11		13
1020	9		9		10		11		13
1030	9		9		10		11		13
1040	9		9		10		11		13
1050	25		25		28		29		35
1060	25		25		28		29		35
1080	283	283		283		300		355	
1090	7	7		12		12		15	
1100	7	7		12		12		15	
1110	7	7		12		12		15	
1120	7	7		12		12		15	
1130	7	7		12		12		15	
1140	7	7		12		12		15	
1150	7	7		12		12		15	
1160	7	7		12		12		15	
1170	9		9		10		11		13
1180	10		10		11		12		14
1190	10		10		11		12		14
1200	25		25		28		29		35
1210	25		25		28		29		35
1220	25		25		28		29		35
1230	25		25		28		29		35
1270	7	7		12		12		15	
1280	7	7		12		12		15	
1290	7	7		12		12		15	
1300	7	7		12		12		15	
1310	7	7		12		12		15	
1320	7	7		12		12		15	
1330	7	7		12		12		15	
1340	7	7		12		12		15	
1350	7	7		12		12		15	
1360	7	7		12		12		15	
1370	6	6		10		11		13	
1380	6	6		10		11		13	
1390	6	6		10		11		13	
1400	6	6		10		11		13	
1410	6	6		10		11		13	
1420	10		10		11		12		14
1430	10		10		11		12		14
1440	10		10		11		12		14
1450	25		25		28		29		35
1460	25		25		28		29		35
1510	10		10		11		12		14
1520	10		10		11		12		14

LACO DISTRICT 40 MASTER PLAN
DOMESTIC DEMAND PROJECTIONS
REGION 38

1530	10		10		11		12	14
1540	10		10		11		12	14
1550	10		10		11		12	14
1560								
1570	6	6		10		11	13	
1571	6	6		10		11	13	
1580	6	6		10		11	13	
1590	6	6		10		11	13	
1600	6	6		10		11	13	
1610	6	6		10		11	13	
1620	6	6		10		11	13	
1630	24		24		27		28	34
1640	24		24		27		28	34
1660	24		24		27		28	34
1670	10		10		11		12	14
1680	10		10		11		12	14
1690	10		10		11		12	14
1700	10		10		11		12	14
1730	10		10		11		12	14
1740	24		24		27		28	34
1750	24		24		27		28	34
1760	24		24		27		28	34
1770	24		24		27		28	34
1780	10		10		11		12	14
1790	10		10		11		12	14
1800	10		10		11		12	14
1810	10		10		11		12	14
1820	10		10		11		12	14
1830	10		10		11		12	14
1840	10		10		11		12	14
1850	10		10		11		12	14
1860	10		10		11		12	14
1870	10		10		11		12	14
1880	10		10		11		12	14
1890	10		10		11		12	14
1900	10		10		11		12	14
1910	10		10		11		12	14
1920	10		10		11		12	14
1930	11		11		12		13	15
1940	11		11		12		13	15
1950	11		11		12		13	15
1970	7	7		12		12	15	
1980	7	7		12		12	15	
1990	7	7		12		12	15	
2000	7	7		12		12	15	
2010	7	7		12		12	15	
2020	7	7		12		12	15	
2030	7	7		12		12	15	
2040	7	7		12		12	15	
2050	7	7		12		12	15	
2060	7	7		12		12	15	
2070	7	7		12		12	15	
2080	7	7		12		12	15	
2090	6	6		10		11	13	
2100	6	6		10		11	13	
2110	6	6		10		11	13	
2120	6	6		10		11	13	
2130	6	6		10		11	13	
2140	26	26		44		46	55	
2150	5	5		8		9	11	
2160	5	5		8		9	11	
2170	5	5		8		9	11	
2180	5	5		8		9	11	
2190	5	5		8		9	11	
2200	5	5		8		9	11	
2210	5	5		8		9	11	

LACO DISTRICT 40 MASTER PLAN
DOMESTIC DEMAND PROJECTIONS
REGION 38

2220	5	5		8		9		11	
2230	5	5		8		9		11	
2240	5	5		8		9		11	
2250	5	5		8		9		11	
2260	5	5		8		9		11	
2270	5	5		8		9		11	
2280	5	5		8		9		11	
2290	5	5		8		9		11	
2300	5	5		8		9		11	
2310	6	6		10		11		13	
2320	5		5		6		6		7
2330	5		5		6		6		7
2340	5		5		6		6		7
2350	5		5		6		6		7
2360	24		24		27		28		34
2380	25		25		28		29		35
2390	11		11		12		13		15
2400	11		11		12		13		15
2430	5		5		6		6		7
2440	5		5		6		6		7
2450	5		5		6		6		7
2460	5		5		6		6		7
2470	5		5		6		6		7
2480	25		25		28		29		35
2490	25		25		28		29		35
2500	25		25		28		29		35
2510	25		25		28		29		35
2520	11		11		12		13		15
2530	11		11		12		13		15
2540	11		11		12		13		15
2550	11		11		12		13		15
2560	5		5		6		6		7
2570	5		5		6		6		7
2580	5		5		6		6		7
2590	11		11		12		13		15
2600	5		5		6		6		7
2610	5		5		6		6		7
2630	4		4		4		5		6
2640	4		4		4		5		6
2650	4		4		4		5		6
2660	4		4		4		5		6
2670	5		5		6		6		7
2680	5		5		6		6		7
2690	5		5		6		6		7
2700	6		6		7		7		8
2710	4		4		4		5		6
2720	4		4		4		5		6
2730	4		4		4		5		6
2740	4		4		4		5		6
2750	4		4		4		5		6
3048	11		11		12		13		15
341519	**2727**	**897**	**1830**	**1316**	**2038**	**1394**	**2159**	**1652**	**2558**
TOTAL			**2727**		**3354**		**3553**		**4210**

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TABLE B-2

LACO DISTRICT 40 MASTER PLAN
DOMESTIC DEMAND PROJECTIONS
REGION 35

1997 DEMAND ADJUSTMENT BASED ON ACTUAL CONSUMPTION			
	LACO MOD MDD (GPM)	ACTUAL* MDD (GPM)	DEMAND FACTOR
REGION 35	134	208	**

2010, 2020 DEMAND ADJUSTMENT BASED ON LACDRP POPULATION PROJECTIONS			
	1997	**2010**	**2020**
REGION 35 POP	781	1910	2910
DEMAND FACTOR*		2.446	3.726

* BASED ON BILLING UNITS AND DEMAND FACTOR
SEE DRAFT DESIGN MANUAL

** ADJUSTMENT VARIES PER NODE

* BASED ON % POP INCREASE

REGION 35

CYBERNET JCT NUMBER	LACO MOD MDD (GPM)	ADJUSTED 1997 MDD	2010 MDD	2020 MDD
		*	2.446	3.726
122	1	1	2	4
132	8	8	20	30
150	0	8	20	30
229	22	25	61	93
420	3	3	7	11
490	1	5	12	19
550	11	22	54	82
560	*1*	1	2	4
620	1	1	2	4
640	10	20	49	75
660	3	6	15	22
708	*1*	1	2	4
742	1	1	2	4
743	1	1	2	4
800	1	1	2	4
824	*21*	21	51	78
940	8	16	39	60
1010	14	14	34	52
1040	8	8	20	30
1060	0	5	12	19
1150	5	10	24	37
1210	12	24	59	89
1320	1	3	7	11
1330	0	3	7	11
	134	**208**	**509**	**775**

* ADJUSTMENT VARIES PER NODE

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TABLE B-3

LACO DISTRICT 40 MASTER PLAN
DOMESTIC DEMAND PROJECTIONS
REGION 39

1997 DEMAND ADJUSTMENT BASED ON ACTUAL CONSUMPTION			
	LACO MOD MDD (GPM)	ACTUAL* MDD (GPM)	DEMAND FACTOR
REGION 39	222	222	1.000

* BASED ON BILLING UNITS AND DEMAND FACTOR
SEE DRAFT DESIGN MANUAL

2010, 2020 DEMAND ADJUSTMENT BASED ON LACDRP POPULATION PROJECTIONS			
	1997	**2010**	**2020**
REGION 39 POP	1011	2260	3000
DEMAND FACTOR*		2.235	2.967

* BASED ON % POP INCREASE

REGION 39

CYBERNET JCT NUMBER	LACO MOD MDD (GPM)	ADJUSTED 1997 MDD	2010 MDD	2020 MDD
		1.000	2.235	2.967
225	50	50	112	148
320	69	69	154	205
325	38	38	85	113
395	6	6	13	18
475	12	12	27	36
545	47	47	105	139
	222	**222**	**496**	**659**

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TABLE B-4

LACO DISTRICT 40 MASTER PLAN
DOMESTIC DEMAND PROJECTIONS
REGIONS 24, 27, 33

1997 DEMAND ADJUSTMENT BASED ON ACTUAL CONSUMPTION			
	LACO MOD MDD (GPM)	ACTUAL* MDD (GPM)	DEMAND FACTOR
REGION 24	211	313	1.483
REGION 27	980	1083	1.105
REGION 33	1144	1208	1.056

* BASED ON BILLING UNITS AND DEMAND FACTOR
SEE DRAFT DESIGN MANUAL

2010, 2020 DEMAND ADJUSTMENT BASED ON LACDRP POPULATION PROJECTIONS			
	1997	**2010**	**2020**
REGION 24 POP	971	7074	9000
DEMAND FACTOR*		N/A	N/A
REGION 27 POP	3337	3201	4000
DEMAND FACTOR**		0.96 (USE 1.0)	1.199
REGION 33 POP	3820	4025	5000
DEMAND FACTOR**		1.054	1.309

* BECAUSE LARGE INCREASE IN POP %, DETERMINE DEMAND DISTRIBUTION LOCATION BASED ON LAND USE MAP AND BUILDOUT PROJECTIONS
** SINCE SMALL INCREASE IN POPULATION %, ADJUST CURRENT DEMANDS UPWARD BASED ON % POP INCREASE

CYBERNET JCT NUMBER	LACO MOD MDD (GPM)	ADJUSTED 1997 MDD	2010 MDD	2020 MDD
REGION 24				
		1.483	*	*
1007	7	10	20	30
1008	20	30	200	300
1022	5	7	150	225
1030	43	64	344	435
1031	6	9	18	27
1032	43	64	344	435
1034	43	64	344	435
1036	44	65	344	435
1038	0	0	344	435
1040	0	0	344	435
	211	**313**	**2452**	**3192**
REGION 27				
		1.105	1.000	1.199
446	75	83	83	99
447	123	136	136	163
448	89	98	98	118
750	210	232	232	278
758	83	92	92	110
782	129	143	143	171
858	138	153	153	183
866	133	147	147	176
	980	**1083**	**1083**	**1298**
REGION 33				
		1.056	1.054	1.309
106	49	52	55	68
118	63	67	70	87
218	144	152	160	199
226	302	319	336	417
240	303	320	337	419
248	20	21	22	28
424	105	111	117	145
428	89	94	99	123
430	28	30	31	39
435	41	43	46	57
	1144	**1208**	**1273**	**1581**
TOTAL	**2335**	**2604**	**4808**	**6071**

* BASED ON LAND USE MAP AND BUILDOUT

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APPENDIX C

TABLE 1A

LACO DISTRICT 40 MASTER PLAN

BUILDOUT POPULATION PROJECTIONS BY REGION

AREA (ACRES)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential	SEE	5,046	1,856	6,543	0	59,025	1,715	3,644
Single Family Residential	TABLES	408	0	0	12,659	0	2,570	140
Multi-Family Residential	3 & 4	0	0	0	75	0	0	0
TOTAL		**5,454**	**1,856**	**6,543**	**12,734**	**59,025**	**4,285**	**3,784**

DWELLING UNITS

LAND USE	4	24	27	33	34*	35	38	39
Rural Residential	SEE	2,775	1,021	3,599	0	32,464	943	2,004
Single Family Residential	TABLES	3,468	0	0	15,730	0	21,842	1,192
Multi-Family Residential	3 & 4	0	0	0	978	0	0	0
TOTAL		**6,243**	**1,021**	**3,599**	**16,708**	**32,464**	**22,785**	**3,196**

POPULATION (3.17 CAP/DU)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential	SEE	8,798	3,235	11,408	0	102,910	2,990	6,354
Single Family Residential	TABLES	10,992	0	0	49,864	0	69,238	3,779
Multi-Family Residential	3 & 4	0	0	0	3,100	0	0	0
TOTAL		**19,790**	**3,235**	**11,408**	**52,964**	**102,910**	**72,228**	**10,133**

2010 Pop Per LACDRP	185,016	7,074	3,201	4,025	37,023	13,722	12,659	2,260
% of Buildout	N/A	35.7%	98.9%	35.3%	69.9%	13.3%	17.5%	22.3%

2020 Pop Per LACDRP	215,700	9,000	4,000	5,000	51,000	18,500	15,000	3,000
% of Buildout		45.5%	123.6%	43.8%	96.3%	18.0%	20.8%	29.6%

LACO Densities : RR = 0.55 DU/AC
SFR = 8.50 DU/AC (Except Regions 4 & 34)
MFR = 13.05 DU/AC (Except Region 4)

* SFR is Combination of 0.68 DU/AC to 8.05 DU/AC (See Table 3)

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TABLE 1B

LACO DISTRICT 40 MASTER PLAN

BUILDOUT POPULATION PROJECTIONS BY REGION SOI

AREA (ACRES)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential	SEE	833	N/A	N/A	0	N/A	74,838	13,521
Single family Residential	TABLES	0	N/A	N/A	3,574	N/A	23	4
Multi-family Residential	3 & 4	0	N/A	N/A	0	N/A	0	0
TOTAL		**833**	**N/A**	**N/A**	**3,574**	**N/A**	**74,861**	**13,525**

DWELLING UNITS

LAND USE	4	24	27	33	34*	35	38	39
Rural Residential	SEE	458	N/A	N/A	0	N/A	41,161	7,437
Single family Residential	TABLES	0	N/A	N/A	8,770	N/A	194	33
Multi-family Residential	3 & 4	0	N/A	N/A	0	N/A	0	0
TOTAL		**458**	**N/A**	**N/A**	**8,770**	**N/A**	**41,355**	**7,469**

POPULATION (3.17 CAP/DU)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential	SEE	1,452	N/A	N/A	0	N/A	130,480	23,574
Single family Residential	TABLES	0	N/A	N/A	27,801	N/A	616	103
Multi-family Residential	3 & 4	0	N/A	N/A	0	N/A	0	0
TOTAL		**1,452**	**N/A**	**N/A**	**27,801**	**N/A**	**131,096**	**23,677**

2010 Pop Per LACDRP	85,000	875	0	0	7,990	0	12,010	2,200
% of Buildout		60.3%			28.7%		9.2%	9.3%

2020 Pop Per LACDRP	105,000	2,000	0	0	12,750	0	16,000	3,000
% of Buildout		137.8%			45.9%		12.2%	12.7%

LACO Densities : RR = 0.55 DU/AC
SFR = 8.50 DU/AC (Except Regions 4 & 34)
MFR = 13.05 DU/AC

* SFR is Combination of 1.00 DU/AC to 8.05 DU/AC (SEE TABLE 3)

PWS-0204-0207

TABLE 2A

LACO DISTRICT 40 MASTER PLAN

DOMESTIC DEMAND PROJECTIONS BY REGION

AREA (ACRES)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential	SEE	5,046	1,856	6,543	0	59,025	1,715	3,644
Single family Residential		408	0	0	12,659	0	2,570	140
Multi-family Residential		0	0	0	75	0	0	0
Commercial	TABLES	99	10	151	1,196	0	162	22
Office		0	0	0	114	0	0	0
Industrial		237	0	457	708	0	0	0
Public Facilities	3 & 4	92	20	0	505	0	0	20
Parks		0	0	0	0	0	0	0
Open Space		104	10	8	166	3,811	9	290
Special Development		0	0	0	335	0	0	0
TOTAL		**5,986**	**1,896**	**7,159**	**15,758**	**62,836**	**4,456**	**4,116**

MAXIMUM DAY DEMAND - BUILDOUT (MGAL/DAY)

LAND USE	4	24	27	33	34	35	38	39
SF DESIGN FACTOR	1,500	1,250	1,250	1,250	1,600	944	1,200	834
MF DESIGN FACTOR	750	625	625	625	800	472	600	417
Rural Residential	SEE	3.47	1.28	4.50	0.00	30.65	1.13	1.67
Single Family Residential		4.33	0.00	0.00	25.17	0.00	26.21	0.99
Multi-Family Residential		0.00	0.00	0.00	0.78	0.00	0.00	0.00
Commercial*	TABLES	0.40	0.04	0.60	4.78	0.00	0.65	0.09
Office*		0.00	0.00	0.00	0.46	0.00	0.00	0.00
Industrial*		1.42	0.00	2.74	4.25	0.00	0.00	0.00
Public Facilities*	3 & 4	0.37	0.08	0.00	2.53	0.00	0.00	0.08
Parks*		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space		0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL		**10.0**	**1.4**	**7.8**	**38.0**	**30.6**	**28.0**	**2.8**

MAXIMUM DAY DEMAND - 2010 (MGAL/DAY)

(Based on % of buildout pop - see Table 1A)

LAND USE	4	24	27	33	34	35	38	39
Pop % to buildout		35.8%	99.0%	35.3%	69.9%	13.3%	17.5%	22.3%
Rural Residential	SEE	1.24	1.26	1.59	0.00	4.08	0.20	0.37
Single Family Residential		1.55	0.00	0.00	17.59	0.00	4.59	0.22
Multi-Family Residential		0.00	0.00	0.00	0.55	0.00	0.00	0.00
Commercial	TABLES	0.14	0.04	0.21	3.34	0.00	0.11	0.02
Office		0.00	0.00	0.00	0.32	0.00	0.00	0.00
Industrial		0.51	0.00	0.97	2.97	0.00	0.00	0.00
Public Facilities	5A & 6A	0.13	0.08	0.00	1.76	0.00	0.00	0.02
Parks		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space		0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	**106.5**	**3.6**	**1.4**	**2.8**	**26.5**	**4.1**	**4.9**	**0.6**

PWS-0204-0208

TABLE 2A

LACO DISTRICT 40 MASTER PLAN

DOMESTIC DEMAND PROJECTIONS BY REGION

MAXIMUM DAY DEMAND - 2010 (GAL/MIN)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential		862	877	1,103	0	2,830	138	259
Single Family Residential		1,078	0	0	12,217	0	3,185	154
Multi-Family Residential		0	0	0	380	0	0	0
Commercial		99	29	148	2,322	0	79	14
Office		0	0	0	221	0	0	0
Industrial		354	0	673	2,062	0	0	0
Public Facilities		91	54	0	1,226	0	0	12
Parks		0	0	0	0	0	0	0
Open Space		0	0	0	0	0	0	0
TOTAL	**73,948**	**2,484**	**960**	**1,923**	**18,428**	**2,830**	**3,401**	**439**

MAXIMUM DAY DEMAND - 2020 (MGAL/DAY)

(Based on % of buildout pop - see Table 1A)

LAND USE	4	24	27	33	34	35	38	39
Pop % to buildout		45.5%	123.6%	43.8%	96.3%	17.9%	20.8%	29.6%
Rural Residential	SEE	1.58	1.58	1.97	0.00	5.49	0.24	0.49
Single Family Residential		1.97	0.00	0.00	24.24	0.00	5.45	0.29
Multi-Family Residential		0.00	0.00	0.00	0.75	0.00	0.00	0.00
Commercial	TABLES	0.18	0.05	0.26	4.61	0.00	0.13	0.03
Office		0.00	0.00	0.00	0.44	0.00	0.00	0.00
Industrial		0.65	0.00	1.20	4.09	0.00	0.00	0.00
Public Facilities	5B & 6B	0.17	0.10	0.00	2.43	0.00	0.00	0.02
Parks		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space		0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	**120.8**	**4.5**	**1.7**	**3.4**	**36.6**	**5.5**	**5.8**	**0.8**

MAXIMUM DAY DEMAND - 2020 (GAL/MIN)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential		1,096	1,095	1,368	0	3,809	164	344
Single Family Residential		1,370	0	0	16,831	0	3,786	204
Multi-Family Residential		0	0	0	523	0	0	0
Commercial		126	36	184	3,199	0	94	18
Office		0	0	0	305	0	0	0
Industrial		450	0	834	2,841	0	0	0
Public Facilities		116	68	0	1,689	0	0	16
Parks		0	0	0	0	0	0	0
Open Space		0	0	0	0	0	0	0
TOTAL	**83,860**	**3,157**	**1,198**	**2,386**	**25,388**	**3,809**	**4,043**	**582**

*Commercial MDD = 4000 gpd/ac
Office MDD = 4000 gpd/ac
Industrial MDD = 6000 gpd/ac
Public Facilities (Schools, Cemetaries, Hosp) MDD = 5000 gpd/ac
Parks MDD = 3000 gpd/ac

PWS-0204-0209

TABLE 2B

LACO DISTRICT 40 MASTER PLAN

DOMESTIC DEMAND PROJECTIONS BY REGION SOI

AREA (ACRES)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential	SEE	833	N/A	N/A	0	N/A	66,761	13,146
Single family Residential		0	N/A	N/A	3,518	N/A	23	4
Multi-family Residential		0	N/A	N/A	0	N/A	0	0
Commercial	TABLES	0	N/A	N/A	761	N/A	0	0
Office		0	N/A	N/A	0	N/A	0	0
Industrial		0	N/A	N/A	0	N/A	6,185	0
Public Facilities	3 & 4	0	N/A	N/A	0	N/A	18	1
Parks		0	N/A	N/A	0	N/A	166	0
Open Space		0	N/A	N/A	99	N/A	1,746	373
TOTAL		**833**	**N/A**	**N/A**	**4,378**	**N/A**	**74,899**	**13,525**

MAXIMUM DAY DEMAND - BUILDOUT (MGAL/DAY)

LAND USE	4	24	27	33	34	35	38	39
SF DESIGN FACTOR	1,500	1,250	1,250	1,250	1,600	944	1,200	834
MF DESIGN FACTOR	750	625	625	625	800	472	600	417
Rural Residential	SEE	0.57	N/A	N/A	0.00	N/A	44.06	6.03
Single family Residential		0.00	N/A	N/A	14.03	N/A	0.23	0.03
Multi-family Residential		0.00	N/A	N/A	0.00	N/A	0.00	0.00
Commercial	TABLES	0.00	N/A	N/A	3.04	N/A	0.00	0.00
Office		0.00	N/A	N/A	0.00	N/A	0.00	0.00
Industrial		0.00	N/A	N/A	0.00	N/A	37.11	0.00
Public Facilities	3 & 4	0.00	N/A	N/A	0.00	N/A	0.07	0.01
Parks		0.00	N/A	N/A	0.00	N/A	0.50	0.00
Open Space		0.00	N/A	N/A	0.00	N/A	0.00	0.00
TOTAL		**0.6**	**N/A**	**N/A**	**17.1**	**N/A**	**82.0**	**6.1**

MAXIMUM DAY DEMAND - 2010 (MGAL/DAY)

(Based on % of buildout pop - see Table 1B)

LAND USE	4	24	27	33	34	35	38	39
Pop % to buildout		60.0%	N/A	N/A	28.7%	N/A	9.2%	9.3%
Rural Residential	SEE	0.34	N/A	N/A	0.00	N/A	4.05	0.56
Single Family Residential		0.00	N/A	N/A	4.03	N/A	0.02	0.00
Multi-Family Residential		0.00	N/A	N/A	0.00	N/A	0.00	0.00
Commercial	TABLES	0.00	N/A	N/A	0.87	N/A	0.00	0.00
Office		0.00	N/A	N/A	0.00	N/A	0.00	0.00
Industrial		0.00	N/A	N/A	0.00	N/A	3.41	0.00
Public Facilities	5C & 6C	0.00	N/A	N/A	0.00	N/A	0.01	0.00
Parks		0.00	N/A	N/A	0.00	N/A	0.05	0.00
Open Space		0.00	N/A	N/A	0.00	N/A	0.00	0.00
TOTAL	**49.2**	**0.3**	**N/A**	**N/A**	**4.9**	**N/A**	**7.5**	**0.6**

PWS-0204-0210

TABLE 2B

LACO DISTRICT 40 MASTER PLAN

DOMESTIC DEMAND PROJECTIONS BY REGION SOI

MAXIMUM DAY DEMAND - 2010 (GAL/MIN)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential		239	N/A	N/A	0	N/A	2,815	389
Single family Residential		0	N/A	N/A	2,800	N/A	15	2
Multi-family Residential		0	N/A	N/A	0	N/A	0	0
Commercial		0	N/A	N/A	608	N/A	0	0
Office		0	N/A	N/A	0	N/A	0	0
Industrial		0	N/A	N/A	0	N/A	2,371	0
Public Facilities		0	N/A	N/A	0	N/A	5	0
Parks		0	N/A	N/A	0	N/A	32	0
Open Space		0	N/A	N/A	0	N/A	0	0
TOTAL	**34,190**	**239**	**N/A**	**N/A**	**3,408**	**N/A**	**5,237**	**392**

MAXIMUM DAY DEMAND - 2020 (MGAL/DAY)

(Based on % of buildout pop - see Table 1B)

LAND USE	4	24	27	33	34	35	38	39
Pop % to buildout		137.7%	N/A	N/A	45.9%	N/A	12.2%	12.7%
Rural Residential	SEE	0.79	N/A	N/A	0.00	N/A	5.38	0.77
Single Family Residential		0.00	N/A	N/A	6.43	N/A	0.03	0.00
Multi-Family Residential		0.00	N/A	N/A	0.00	N/A	0.00	0.00
Commercial	TABLES	0.00	N/A	N/A	1.40	N/A	0.00	0.00
Office		0.00	N/A	N/A	0.00	N/A	0.00	0.00
Industrial		0.00	N/A	N/A	0.00	N/A	4.53	0.00
Public Facilities	5D & 6D	0.00	N/A	N/A	0.00	N/A	0.01	0.00
Parks		0.00	N/A	N/A	0.00	N/A	0.06	0.00
Open Space		0.00	N/A	N/A	0.00	N/A	0.00	0.00
TOTAL	**59.2**	**0.8**	**N/A**	**N/A**	**7.8**	**N/A**	**10.0**	**0.8**

MAXIMUM DAY DEMAND - 2020 (GAL/MIN)

LAND USE	4	24	27	33	34	35	38	39
Rural Residential		547	N/A	N/A	0	N/A	3,733	532
Single family Residential		0	N/A	N/A	4,468	N/A	20	2
Multi-family Residential		0	N/A	N/A	0	N/A	0	0
Commercial		0	N/A	N/A	969	N/A	0	0
Office		0	N/A	N/A	0	N/A	0	0
Industrial		0	N/A	N/A	0	N/A	3,144	0
Public Facilities		0	N/A	N/A	0	N/A	6	0
Parks		0	N/A	N/A	0	N/A	42	0
Open Space		0	N/A	N/A	0	N/A	0	0
TOTAL	**41,130**	**547**	**N/A**	**N/A**	**5,438**	**N/A**	**6,945**	**535**

PWS-0204-0211

TABLE 3

LACO DISTRICT 40 MASTER PLAN

BUILDOUT DOMESTIC DEMAND PROJECTIONS WITHIN PALMDALE SOI

NUMBER	AREA (ACRES)				LAND USE	LAND USE	DU/AC	# DU			ADD	MDD	MDD (GPM)				PHD
	34	34 SOI	4	4 SOI	PALMDALE	COLA		34	34 SOI	4	GAL/AC	GAL/DU	34	34 SOI	4	4 SOI	GPM
1			614.2		LDR		1.00			614		1500			640		1280
2			1490.6		SFR-2		1.50			2236		1500			2329		4658
3			17.5		NC	CO					2000				49		97
5			35.2		PF-W	PF					2500				122		245
6			187.0		SP-7		1.90			355		1500			370		740
7			22.0		CC	CO					2000				61		122
8			21.6		SFR-2		1.50			32		1500			34		68
9			16.9		ER		0.40			7		1500			7		14
11			48.9		CM	CO					2000				136		272
12			125.2		SP-9	IN					3000				521		1043
13			4.7		OC	OF					2000				13		26
14			16.1		CC	CO					2000				45		89
15			29.9		CM	CO					2000				83		166
16			8.5		PF-W	PF					2500				30		59
17			614.9		SP-10	CO					2000				1708		3416
18			3.4		IND	IN					3000				14		29
19	7.2				OC	OF					2000		20				40
20	223.9				RC	CO					2000		622				1244
21	161.8				OS	OS											
22	20.8				MR		8.05	167				800	93				186
23	171.9				SFR-3		4.55	782				1600	869				1738
24	62.6				MR		8.05	504				800	280				560
25	34.7				OC	OF					2000		96				193
26	675.7				SP-13	IN					3000		2815				5631
27	59.9				SP-16	CO					2000		167				333
28	42.5				CC	CO					2000		118				236
29	13.2				RC	CO					2000		37				73
30	3.6				OS	OS											
31	1443.1				SFR-3		4.55	6566				1600	7296				14592
32	12.6				OC	OF					2000		35				70
33	213.1				BP	CO					2000		592				1184
34	110.0				PF-LANDFILL	PF					2500		382				764
35	63.0				PF-LANDFILL	PF					2500		219				438
36	163.8				LDR		1.00	164				1600	182				364
37	38.1				SFR-1		1.00	38				1600	42				85
38	218.5				SFR-2		1.50	328				1600	364				728
39	45.8				MFR		13.05	598				800	332				664
40	58.4				RC	CO					2000		162				324
41	12.0				CC	CO					2000		33				67
42	9.5				CC	CO					2000		26				53
43	14.3				NC	CO					2000		40				80
44	8.0				MFR		13.05	105				800	58				117
45	8.1				OC	OF					2000		23				45

LACO DISTRICT 40 MASTER PLAN
BUILDOUT DOMESTIC DEMAND PROJECTIONS WITHIN PALMDALE SOI

46	7.2				OC	OF					2000		20				40
47	21.1				MFR		13.05	275				800	153				306
48	23.9				CC	CO					2000		66				133
49	3.1				PF	PF					2500		11				21
50	36.3				OC	OF					2000		101				202
51	8.3				OC	OF					2000		23				46
52	45.2				SFR-1		1.00	45				1600	50				100
53			3.5		OS	OS											
54			1264.4		SP-5		4.64			5867		1500			6111		12223
55			160.2		SP-6		2.80			449		1500			467		934
56			69.2		SFR-3		4.55			315		1500			328		656
57		31.6			SFR-3		4.55		144			1600		160			319
58		29.9			SFR-3		4.55		136			1600		151			303
59			29.6		SFR-3		4.55			135		1500			140		281
60			27.4		MR		8.05			220		1500			230		459
61			88.4		SFR-3		4.55			402		1500			419		838
62			298.5		LDR		1.00			299		1500			311		622
63		98.6			OS	OS											
64		34.8			LDR		1.00		35			1600		39			77
65		780.8			SFR-1		1.00		781			1600		868			1735
66		144.8			LDR		1.00		145			1600		161			322
67		180.9			LDR		1.00		181			1600		201			402
68	8202.8				SP-3		0.68	5578				1600	6198				12395
69			199.2		LDR		1.00			199		1500			208		415
70	1.0				PF	PF					2500		3				7
71	124.1				PF	PF					2500		431				862
72	133.4				PF	PF					2500		463				926
73		1799.5			SP-2		2.62		4715			1600		5239			10477
74	0.8				PF	PF					2500		3				5
75	17.9				PF	PF					2500		62				124
76	1.0				PF	PF					2500		3				7
77	2290.8				SP-3		0.68	1558				1600	1731				3462
78	48.0				PF-S	PF					2500		167				334
79				150.1	PFTP	PF					2500					521	1042
80	13.6				SP-11	IN					3000		56				113
81	18.0				IND	IN					3000		75				150
82	334.7				SD			0					0				0
83	5.9				PFS	PF					2500		20				41
100			1119.0		BP	CO					2000				3108		6216
101		761.4			BP	CO					2000			2115			4230
102	484.9				BP	CO					2000		1347				2694
103	40.0				BP	CO					2000		111				222
104		249.7			SFR-3		4.55		1136			1600		1262			2525
105			170.1		SFR-3		4.55			774		1500			806		1612
106		111.4			SFR-3		4.55		507			1600		563			1127

TABLE 3

LACO DISTRICT 40 MASTER PLAN

BUILDOUT DOMESTIC DEMAND PROJECTIONS WITHIN PALMDALE SOI

107		170.0			SP-5		4.64		789			1600		876			1753
108		35.9			SP-5		4.64		167			1600		185			370
109		4.3			MR		8.05		35			1600		39			78
		15758	**4434**	**6686**	**150**				**16708**	**8770**	**11904**		25998	11859	18290	521	113337

EQUESTRIAN RESIDENTIAL
LOW DENSITY RESIDENTIAL
1 SINGLE FAMILY
2 SINGLE FAMILY
3 SINGLE FAMILY
MEDIUM RESIDENTIAL
MULTI-FAMILY
COMMUNITY COMMERCIAL
REGIONAL COMMERCIAL
OFFICE COMMERCIAL
BUSINESS PARK
COMMERCIAL MANUFACTURING
DOWNTOWN COMMERCIAL
INDUSTRIAL
PUBLIC FACILITIES
SPECIFIC PLAN
OPEN SPACE
MINERAL RESOURCE EXTRACTION
SPECIAL DEVELOPMENT
SPECIAL POLICY AREA

SPECIFIC PLANS (O=PROPOSED PLAN)

1	HARRIS HOMES
2	CITY RANCH
3	RITTER RANCH
4	JOSHUA HILLS
5	RANCHO VISTA
6	HARRIS VALLEY
7	HILL SIDE RESIDENTIAL
8	DELETED
9	ANTELOPE VALLEY BUSINESS PARK
10	PALMDALE BUSINESS PARK CENTER
11	LOCKHEED
12	PALMDALE TRADE AND COMMERCIAL CENTER
13	EASTSIDE QUARRY
14	PALMDALE PARK SOUTH
15	AUTO CENTER

RURAL RESIDENTIAL
SINGLE FAMILY RESIDENTIAL
MULTI-FAMILY RESIDENTIIAL
COMMERCIAL
OFFICE
INDUSTRIAL
PUBLIC FACILITIES
PARKS
OPEN SPACE

PWS-0204-0214

TABLE 4

LACO DISTRICT 40 MASTER PLAN

BUILDOUT DOMESTIC DEMAND PROJECTIONS WITHIN LANCASTER SOI

NUMBER	AREA (ACRES)		LAND USE	LAND USE	DU/AC	# DU		ADD	MDD	MDD (GPM)		PHD
	4	4 SOI	LANCASTER	COLA		4	4 SOI	GAL/AC	GAL/DU	4	4 SOI	GPM
1		70	UR		4.30	0	303	0	1500	0	315	630
2		21	C	CO	0.00	0	0	2000			58	116
3		775	UR		4.30	0	3333	0	1500		3472	6944
4		9	S	PF	0.00	0	0	2500			32	65
5		21	PK	PF	0.00	0	0	1500			43	87
6		13	S	PF	0.00	0	0	2500			44	87
7		33	S	PF	0.00	0	0	2500			116	232
8		72	UR		4.30	0	310	0	1500		323	646
9		173	UR		4.30	0	744	0	1500		775	1549
10	40		UR		4.30	174	0	0	1500	181		362
11	42		UR		4.30	181	0	0	1500	188		376
12		13	C	CO	0.00	0	0	2000			37	75
13		309	SP		0.00	0	0	0	1500		0	0
14		5900	SP/LI	IN	0.00	0	0	3000			24583	49167
15	66		SP/PK	PF	0.00	0	0	1500		138		275
16		47	MR1		10.80	0	507	0	750		264	528
17		16	MR2		22.55	0	369	0	750		192	384
18		224	MR1		10.80	0	2417	0	750		1259	2517
19		9	MR2		22.55	0	209	0	750		109	217
20		654	UR		4.30	0	2812	0	1500		2929	5858
21	141		LI	IN	0.00	0	0	3000		588		1175
22	42		C	CO	0.00	0	0	2000		116		233
23	859		HI	IN	0.00	0	0	3000		3579		7158
24		1	C	CO	0.00	0	0	2000			3	5
25	1		C	CO	0.00	0	0	2000		1		3
26		4	C	CO	0.00	0	0	2000			10	20
27	7		C	CO	0.00	0	0	2000		20		39
28	66		UR		4.30	284	0	0	1500	296		593
29	12		C	CO	0.00	0	0	2000		32		64
30	11		C	CO	0.00	0	0	2000		29		59
31	10		S	PF	0.00	0	0	2500		34		69
32	520		UR		4.30	2238	0	0	1500	2331		4662
33	3		C	CO	0.00	0	0	2000		7		14
34	9		MR2		22.55	193	0	0	750	100		201
35	22		MR1		10.80	241	0	0	750	126		251
36	2		MR2		22.55	53	0	0	750	28		55
37	13		C	CO	0.00	0	0	2000		35		70
38	197		UR		4.30	846	0	0	1500	882		1763
39	8		PK	PF	0.00	0	0	1500		16		33
40	9		S	PF	0.00	0	0	2500		33		65
41	36		C	CO	0.00	0	0	2000		100		200
42	8		MR1		10.80	91	0	0	750	47		94
43	16		MR1		10.80	178	0	0	750	93		185
44	12		UR		4.30	53	0	0	1500	55		111
45	7		MR1		10.80	76	0	0	750	40		79
46	10		C	CO	0.00	0	0	2000		28		57

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47	1		LI	IN	0.00	0	0	3000		4		7
48	1		LI	IN	0.00	0	0	3000		3		6
50	24		LI	IN	0.00	0	0	3000		102		204
51	77		LI	IN	0.00	0	0	3000		322		644
52	4		C	CO	0.00	0	0	2000		12		24
53	19		S	PF	0.00	0	0	2500		65		130
54	27		MR1		10.80	294	0	0	750	153		307
55	8		MR1		10.80	86	0	0	750	45		89
56	12		MR1		10.80	131	0	0	750	68		137
57	7		MR1		10.80	71	0	0	750	37		74
58	5		MR1		10.80	51	0	0	750	27		53
59	14		C	CO	0.00	0	0	2000		40		80
60	6		C	CO	0.00	0	0	2000		16		32
61	11		LI	IN	0.00	0	0	3000		44		89
62	2		C	CO	0.00	0	0	2000		5		9
63	121		MR1		10.80	1303	0	0	750	679		1358
64	8		S	PF	0.00	0	0	2500		27		54
70	7		C	CO	0.00	0	0	2000		20		41
71	3		MR1		10.80	35	0	0	750	18		36
72	8		MR1		10.80	81	0	0	750	42		85
73	1		LI	IN	0.00	0	0	3000		5		10
74		3	LI	IN	0.00	0	0	3000			14	28
75		29	MR1		10.80	0	309	0	750		161	322
76	6		MR1		10.80	69	0	0	750	36		72
77	6		LI	IN	0.00	0	0	3000		25		49
78	4		C	CO	0.00	0	0	2000		10		20
79	19		MR1		10.80	207	0	0	750	108		216
80	3		LI	IN	0.00	0	0	3000		13		27
81		10	UR		4.30	0	43	0	1500		44	89
82		5	MR1		10.80	0	59	0	750		31	62
83		6	MR1		10.80	0	67	0	750		35	70
84		4	LI	IN	0.00	0	0	3000			17	35
85		4	C	CO	0.00	0	0	2000			11	22
86		3	C	CO	0.00	0	0	2000			10	19
87	9		MR1		10.80	97	0	0	750	50		101
88	27		PK	PF	0.00	0	0	1500		57		114
89	10		S	PF	0.00	0	0	2500		34		67
90		23	S	PF	0.00	0	0	2500		79		158
91		7	MR1		10.80	0	74	0	750		38	77
92		5	C	CO	0.00	0	0	2000			13	26
93		2	LI	IN	0.00	0	0	3000			8	17
94		19	C	CO	0.00	0	0	2000			54	108
95		12	MR1		10.80	0	128	0	750		67	133
96		8	LI	IN	0.00	0	0	3000			32	64
97		75	UR		4.30	0	324	0	1500		338	676
98		27	MR1		10.80	0	291	0	750		152	303
99		486	NU		1.20	0	583	0	1500		608	1216
100	11		C	CO	0.00	0	0	2000		31		62

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101	30		C	CO	0.00	0	0	2000		85		169	
102	49		MR1		10.80	533	0	0	750	278		555	
103	15		MR1		10.80	162	0	0	750	84		168	
104	7		C	CO	0.00	0	0	2000		19		37	
105		9	S	PF	0.00	0	0	2500			32	63	
106	7		C	CO	0.00	0	0	2000		20		39	
107		4	C	CO	0.00	0	0	2000			11	22	
108		25	UR		4.30	0	108	0	1500		112	224	
109		11	S	PF	0.00	0	0	2500		37		73	
110	8		C	CO	0.00	0	0	2000			22	44	
111	189		NU		1.20	227	0	0	1500	236		473	
112		49	S	PF	0.00	0	0	2500			169	337	
113	35		UR		4.30	150	0	0	1500	157		313	
114		15	O	OS	0.00	0	0	0		0		0	
115	28		UR		4.30	120	0	0	1500	125		250	
116	20		NU		1.20	24	0	0	1500	25		51	
117		120	PK	PF	0.00	0	0	1500			250	500	
118		4	C	CO	0.00	0	0	2000			10	20	
119	225		NU		1.20	270	0	0	1500	281		563	
120	81		UR		4.30	348	0	0	1500	362		724	
121		7	C	CO	0.00	0	0	2000			21	42	
122	170		UR		4.30	731	0	0	1500	761		1523	
123	116		MR1		10.80	1253	0	0	750	653		1306	
124	9		MR2		22.55	193	0	0	750	100		201	
125	10		C	CO	0.00	0	0	2000		27		55	
126	7		MR1		10.80	73	0	0	750	38		76	
127	9		C	CO	0.00	0	0	2000		25		50	
128	7		C	CO	0.00	0	0	2000		20		39	
129	15		MR2		22.55	340	0	0	750	177		354	
130	11		MR1		10.80	117	0	0	750	61		122	
131	4		MR1		10.80	47	0	0	750	24		49	
132	14		S	PF	0.00	0	0	2500		49		97	
133	15		MR1		10.80	164	0	0	750	85		170	
134	532		UR		4.30	2289	0	0	1500	2384		4768	
135	4		C	CO	0.00	0	0	2000		11		23	
136	5		C	CO	0.00	0	0	2000		13		26	
137	252		UR		4.30	1085	0	0	1500	1130		2260	
138	303		NU		1.20	363	0	0	1500	378		757	
139	49		LI	IN	0.00	0	0	3000		206		412	
140	75		LI	IN	0.00	0	0	3000		314		628	
141	191		UR		4.30	821	0	0	1500	855		1711	
142	10		C	CO	0.00	0	0	2000		27		55	
143	1		C	CO	0.00	0	0	2000		3		7	
144	10		S	PF	0.00	0	0	2500		36		72	
145	292		SP/LI	IN	0.00	0	0	3000		1219		2437	
146	7		SP/MR2		22.55	164	0	0	750	85		171	
147	11		SP/C	CO	0.00	0	0	2000		30		60	
148	5		C	CO	0.00	0	0	2000		13		26	

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149	16		MR1		10.80	168	0	0	750	87		175	
150	7		MR2		22.55	151	0	0	750	79		158	
151	28		C	CO	0.00	0	0	2000		77		155	
152	18		S	PF	0.00	0	0	2500		62		124	
153	480		UR		4.30	2065	0	0	1500	2151		4302	
154	6		C	CO	0.00	0	0	2000		16		31	
155	22		MR1		10.80	238	0	0	750	124		248	
156	6		MR2		22.55	142	0	0	750	74		148	
157	16		C	CO	0.00	0	0	2000		46		91	
158	15		C	CO	0.00	0	0	2000		42		83	
159	39		MR1		10.80	425	0	0	750	221		443	
160	9		NU		1.20	11	0	0	1500	11		22	
161	10		MR2		22.55	219	0	0	750	114		228	
162	20		MR1		10.80	218	0	0	750	113		227	
163	64		S	PF	0.00	0	0	2500		221		442	
164	10		C	CO	0.00	0	0	2000		29		58	
165	11		PK	PF	0.00	0	0	1500		23		45	
166	10		OP	OF	0.00	0	0	2000		27		55	
167	3		S	PF	0.00	0	0	2500		10		21	
168	7		C	CO	0.00	0	0	2000		20		40	
169	3		C	CO	0.00	0	0	2000		8		17	
170	11		PK	PF	0.00	0	0	1500		22		44	
171	10		S	PF	0.00	0	0	2500		34		67	
172	35		CE	PF	0.00	0	0	2500		122		245	
173	2		C	CO	0.00	0	0	2000		6		12	
174	341		UR		4.30	1468	0	0	1500	1529		3059	
175	14		S	PF	0.00	0	0	2500		49		98	
176	8		C	CO	0.00	0	0	2000		22		44	
177	1		LI	IN	0.00	0	0	3000		4		8	
178	2		C	CO	0.00	0	0	2000		5		11	
179	4		C	CO	0.00	0	0	2000		10		21	
180	67		MR1		10.80	725	0	0	750	378		756	
181	5		C	CO	0.00	0	0	2000		14		27	
182	136		LI	IN	0.00	0	0	3000		567		1134	
183	11		C	CO	0.00	0	0	2000		32		63	
184	60		MR2		22.55	1344	0	0	750	700		1400	
185	5		PK	PF	0.00	0	0	1500		10		20	
186	200		C	CO	0.00	0	0	2000		554		1109	
187	56		MR2		22.55	1252	0	0	750	652		1304	
188	39		UR		4.30	167	0	0	1500	174		349	
189	9		PK	PF	0.00	0	0	1500		18		36	
190	24		MR1		10.80	260	0	0	750	135		271	
191	28		C	CO	0.00	0	0	2000		77		155	
192	12		S	PF	0.00	0	0	2500		42		85	
193	21		MR1		10.80	225	0	0	750	117		234	
194	2		MR2		22.55	34	0	0	750	18		35	
195	10		MR2		22.55	226	0	0	750	118		236	
196	81		C	CO	0.00	0	0	2000		225		450	

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197	93		LI	IN	0.00	0	0	3000		387		775	
198	3		MR1		10.80	29	0	0	750	15		30	
199	2		MR1		10.80	16	0	0	750	9		17	
200	11		MR1		10.80	117	0	0	750	61		121	
201	284		UR		4.30	1220	0	0	1500	1271		2542	
202	4		OP	OF	0.00	0	0	2000		11		22	
203	13		S	PF	0.00	0	0	2500		45		90	
204	7		H	PF	0.00	0	0	2500		24		49	
205	14		C	CO	0.00	0	0	2000		38		77	
206	79		C	CO	0.00	0	0	2000		219		438	
207	102		MR2		22.55	2304	0	0	750	1200		2400	
208	139		C	CO	0.00	0	0	2000		386		772	
209	18		LI	IN	0.00	0	0	3000		76		152	
210	244		LI	IN	0.00	0	0	3000		1017		2033	
211	8		MR2		22.55	183	0	0	750	95		191	
212		546	HI	IN	0.00	0	0	3000			2274	4547	
213	81		SP/LI	IN	0.00	0	0	3000		336		672	
214	544		LI	IN	0.00	0	0	3000		2267		4535	
216	9		C	CO	0.00	0	0	2000		26		53	
217	73		PK	PF	0.00	0	0	1500		152		304	
218	121		C	CO	0.00	0	0	2000		336		671	
219	110		C	CO	0.00	0	0	2000		306		612	
220	19		MR1		10.80	205	0	0	750	107		213	
221	5		OP	OF	0.00	0	0	2000		13		25	
222	132		UR		4.30	569	0	0	1500	593		1185	
223	2		MR1		10.80	21	0	0	750	11		22	
224	9		C	CO	0.00	0	0	2000		24		49	
225	15		PK	PF	0.00	0	0	1500		30		61	
226	6		MR2		22.55	144	0	0	750	75		150	
227	36		C	CO	0.00	0	0	2000		99		198	
228	9		MR2		22.55	211	0	0	750	110		220	
229	15		OP	PF	0.00	0	0	0		0		0	
230	16		S	CO	0.00	0	0	2000		45		90	
231	24		MR2		22.55	530	0	0	750	276		552	
232	73		H		0.00	0	0	0	750	0		0	
233	29		C	CO	0.00	0	0	2000		80		160	
234	8		OP	PF	0.00	0	0	0		0		0	
235	1		MR1		10.80	11	0	0	750	6		12	
236	56		C		0.00	0	0	0	1500	0		0	
237	12		S	PF	0.00	0	0	2500		43		86	
238	8		MR1		10.80	86	0	0	750	45		89	
239	456		UR		4.30	1959	0	0	750	1021		2041	
240	6		PK		0.00	0	0	1500	750	0		0	
241	6		MR1	CO	10.80	63	0	2000		16		32	
242	5		MR2		22.55	114	0	0	1500	118		237	
243	2		MR1		10.80	21	0	0	750	11		22	
244	7		C	CO	0.00	0	0	2000		19		38	
245	34		UR		4.30	148	0	0	1500	154		309	

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246	8		MR1		10.80	86	0	0	750	45		90
247	31		C	CO	0.00	0	0	2000		87		174
248	39		H	PF	0.00	0	0	2500		136		271
249	227		C	CO	0.00	0	0	2000		630		1260
250	149		SP/UR		0.00	0	0	0	1500	0		0
251	14		UR		4.30	60	0	0	1500	62		124
252	12		S	PF	0.00	0	0	2500		41		83
253	15		MR1		10.80	165	0	0	750	86		172
254	33		MR1		10.80	353	0	0	750	184		368
255	478		UR		4.30	2055	0	0	1500	2140		4280
256	29		C	CO	0.00	0	0	2000		81		161
257	5		MR2		22.55	108	0	0	750	56		112
258	30		C	CO	0.00	0	0	2000		83		166
259	12		MR1		10.80	134	0	0	750	70		140
260	1		C	CO	0.00	0		2000		4		8
261	22		MR1		10.80	238		0	750	124		248
262	10		MR2		22.55	230	0	0	750	120		240
263	34		MR1		10.80	371	0	0	750	193		387
264	7		MR2		22.55	150	0	0	750	78		157
265	58		C	CO	0.00	0	0	2000		160		320
266	16		H	PF	0.00	0	0	0		0		0
267	15		OP	OF	0.00	0	0	2000		41		81
268	5		MR2		22.55	124	0	0	750	64		129
270	70		UR		4.30	301	0	0	1500	313		626
271	2		C	CO	0.00	0	0	2000		6		12
272	12		MR1		10.80	124	0	0	750	65		129
273	12		C	CO	0.00	0	0	2000		32		64
274	8		S	PF	0.00	0	0	2500		29		59
275	493		UR		4.30	2119	0	0	1500	2207		4415
276	3		OP	OF	0.00	0	0	2000		8		17
277	28		C	CO	0.00	0	0	2000		77		155
278	21		MR2		22.55	476	0	0	750	248		496
279	24		MR1		10.80	255	0	0	750	133		266
283	28		UR		4.30	122	0	0	1500	127		254
284	4		SP/MR1		10.80	45	0	0	750	23		47
286	72		MR1		10.80	777	0	0	750	405		809
287	21		PK	PF	0.00	0	0	1500		44		88
288	15		O	OS	0.00	0	0	0		0		0
289	21		S	PF	0.00	0	0	2500		73		146
290	21		O	OS	0.00	0	0	0		0		0
291	105		UR		4.30	451	0	0	1500	470		939
292	107		S	PF	0.00	0	0	2500		372		743
293	84		MR1		10.80	907	0	0	750	472		944
294	10		S	PF	0.00	0	0	2500		35		70
295	408		UR		4.30	1756	0	0	1500	1829		3659
296		66	S	PF	0.00	0	0	2500		229		458
297		7	C	CO	0.00	0	0	2000		19		39
298		521	UR		4.30	0	2242	0	1500		2336	4672

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299	247		UR		4.30	1063	0	0	1500	1107		2215
300	105		MR1		10.80	1130	0	0	750	589		1177
301	478		UR		4.30	2055	0	0	1500	2141		4282
317	162		UR		4.30	697	0	0	1500	726		1452
318	26		C	CO	0.00	0	0	2000		71		143
319	12		OP	OF	0.00	0	0	2000		34		67
320	9		C	CO	0.00	0	0	2000		26		52
321	24		S	PF	0.00	0	0	2500		82		164
323	34		MR1		10.80	362	0	0	750	189		377
324	2		C	CO	0.00	0	0	2000		4		9
330	447		UR		4.30	1921	0	0	1500	2001		4002
331	604		UR		4.30	2599	0	0	1500	2707		5414
332	591		P	PF	0.00	0	0	2500		2052		4104
333	140		MR1		10.80	1507	0	0	750	785		1570
334	14		S	PF	0.00	0	0	2500		48		95
335	271		UR		4.30	1165	0	0	1500	1213		2427
336	599		UR		4.30	2575	0	0	1500	2682		5365
337	77		S	PF	0.00	0	0	2500		267		535
338	468		UR		4.30	2013	0	0	1500	2097		4193
339	91		MR1		10.80	984	0	0	750	512		1024
341	612		UR		4.30	2630	0	0	1500	2740		5480
342	64		CE	PF	0.00	0	0	2500		223		446
343	616		UR		4.30	2647	0	0	1500	2757		5514
500	120		S	PF	0.00			2500		415		831
501	735		NU		1.20	882		0	1500	919		1838
502		6400	NU		1.20	0	7680	0	1500		8000	16000
503		45	NU		1.20		54		1500	56		113
504		315	UR		4.30	0	1354	0	1500		1410	2820
506		251	UR		4.30	0	1079	0	1500		1124	2247
507		166	NU		1.20	0	199	0	1500		208	415
509		225	NU		1.20	0	270	0	1500		281	562
510		54	UR		4.30	0	232	0	1500		241	483
511		91	NU		1.20	0	109	0	1500		114	228
512		1343	SP/LI	IN	0.00			3000			5596	11192
513		1703	SP/LI	IN	0.00			3000			7096	14192
514		32	SP/PK	PF	0.00	0	0	1500			67	133
515		220	LI	IN	0.00	0	0	3000			917	1833
516		642	HI	IN	0.00	0	0	3000			2675	5350
517		247	UR		4.30	0	1063	0	1500		1107	2215
518		32	NU		1.20	0	39	0	1500	40		80
519		100	UR		4.30	0	431	0	1500		449	899
520	680		NU		1.20	816	0	0	1500	850		1700
521	460		NU		1.20	552	0	0	1500	575		1150
522	1577		NU		1.20	1892	0	0	1500	1971		3943
523	728		UR		4.30	3130	0	0	1500	1517		3033
524		934	UR		4.30	0	4016	0	1500		1946	3892
525		880	UR		4.30	0	3784	0	1500		1833	3667
526	756		UR		4.30	3251	0	0	1500	1575		3150

TABLE 4

LACO DISTRICT 40 MASTER PLAN

BUILDOUT DOMESTIC DEMAND PROJECTIONS WITHIN LANCASTER SOI

527		8	C	CO	0.00	0	0	2000			21	42
528		85	MR1		10.80	0	918	0	750		478	956
529		29	MR1		10.80	0	311	0	750		162	324
530		10	UR		4.30	0	43	0	1500		44	89
	23965	**24288**	**0**			**79074**	**36811**			**86774**	**75201**	**323950**

LEGEND

LANCASTER GENERAL PLAN OCTOBER 28, 1997		
NU	NON URBAN RESIDENTIAL	1.2
UR	URBAN RESIDENTIAL	4.3
MR1	MULTI-RESIDENTIAL	10.8
MR2	MULTI-RESIDENTIAL	22.5
C	COMMERCIAL	
OP	OFFICE/PROFFESIONAL	
LI	LIGHT INDUSTRIAL	
HI	HEAVY INDUSTRIAL	
SP	SPECIFIC PLAN	
O	OPEN SPACE	
CE	CEMETARY	
H	HEALTH CARE	
PK	PARKS	
S	PUBLIC SCHOOLS	
P	PUBLIC USE	

COUNTY OF LOS ANGELES
RR
SF
MF
CO
OF
IN
PF
PA
OS

PWS-0204-0222

TABLE 5A

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 RESIDENTIAL DEMAND PROJECTIONS
REGION 4

LANCASTER

NUMBER	AREA (ACRES)	LAND USE LANCASTER	DU/AC	NO. DWELLING UNITS*				MDD	
				BUILDOUT	90% AREA 1	50% AREA 2	15% AREA 3	GAL/DU	(GPM)
10	40	UR	4.30	174			26	1500	27
11	42	UR	4.30	181			27	1500	28
28	66	UR	4.30	284	256			1500	267
32	520	UR	4.30	2238	2014			1500	2098
34	9	MR2	22.55	193	173			750	90
35	22	MR1	10.80	241	217			750	113
36	2	MR2	22.55	53	48			750	25
38	197	UR	4.30	846	762			1500	793
42	8	MR1	10.80	91	82			750	43
43	16	MR1	10.80	178	160			750	83
44	12	UR	4.30	53	48			1500	50
45	7	MR1	10.80	76	68			750	36
54	27	MR1	10.80	294		147		750	77
55	8	MR1	10.80	86		43		750	22
56	12	MR1	10.80	131	118			750	62
57	7	MR1	10.80	71	64			750	33
58	5	MR1	10.80	51	46			750	24
63	121	MR1	10.80	1303	1173			750	611
71	3	MR1	10.80	35	31			750	16
72	8	MR1	10.80	81	73			750	38
76	6	MR1	10.80	69		35		750	18
79	19	MR1	10.80	207	187			750	97
87	9	MR1	10.80	97	87			750	45
102	49	MR1	10.80	533	480			750	250
103	15	MR1	10.80	162	146			750	76
111	189	NU	1.20	227		113		1500	118
113	35	UR	4.30	150		75		1500	78
115	28	UR	4.30	120		60		1500	62
116	20	NU	1.20	24		12		1500	13
119	225	NU	1.20	270		135		1500	141
120	81	UR	4.30	348		174		1500	181
122	170	UR	4.30	731		366		1500	381
123	116	MR1	10.80	1253	1128			750	587
124	9	MR2	22.55	193	174			750	90
126	7	MR1	10.80	73	66			750	34
129	15	MR2	22.55	340	306			750	159
130	11	MR1	10.80	117	105			750	55
131	4	MR1	10.80	47	42			750	22
133	15	MR1	10.80	164	147			750	77
134	532	UR	4.30	2289	2060			1500	2145
137	252	UR	4.30	1085	977			1500	1017
138	303	NU	1.20	363		182		1500	189
141	191	UR	4.30	821	739			1500	770
146	7	SP/MR2	22.55	164	148			750	77
149	16	MR1	10.80	168	151			750	79
150	7	MR2	22.55	151	136			750	71
153	480	UR	4.30	2065	1858			1500	1936
155	22	MR1	10.80	238	214			750	112
156	6	MR2	22.55	142	128			750	67
159	39	MR1	10.80	425	382			750	199
160	9	NU	1.20	11	10			1500	10

TABLE 5A

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 RESIDENTIAL DEMAND PROJECTIONS
REGION 4

161	10	MR2	22.55	219	197			750	103
162	20	MR1	10.80	218	196			750	102
174	341	UR	4.30	1468	1321			1500	1376
180	67	MR1	10.80	725	653			750	340
184	60	MR2	22.55	1344	1210			750	630
187	56	MR2	22.55	1252	1126			750	587
188	39	UR	4.30	167	151			1500	157
190	24	MR1	10.80	260	234			750	122
193	21	MR1	10.80	225	202			750	105
194	2	MR2	22.55	34	31			750	16
195	10	MR2	22.55	226	204			750	106
198	3	MR1	10.80	29	26			750	14
199	2	MR1	10.80	16	15			750	8
200	11	MR1	10.80	117	105			750	55
201	284	UR	4.30	1220	1098			1500	1144
207	102	MR2	22.55	2304	2074			750	1080
211	8	MR2	22.55	183	165			750	86
220	19	MR1	10.80	205	184			750	96
222	132	UR	4.30	569	512			1500	533
223	2	MR1	10.80	21	19			750	10
226	6	MR2	22.55	144	129			750	67
228	9	MR2	22.55	211	190			750	99
231	24	MR2	22.55	530	477			750	248
235	1	MR1	10.80	11	10			750	5
238	8	MR1	10.80	86	77			750	40
239	456	UR	4.30	1959	1763			1500	1837
241	6	MR1	10.80	63	56			750	29
242	5	MR2	22.55	114	102			750	53
243	2	MR1	10.80	21	19			750	10
245	34	UR	4.30	148	133			1500	139
246	8	MR1	10.80	86	78			750	41
250	149	SP/UR	4.30	639	575			1500	599
251	14	UR	4.30	60	54			1500	56
253	15	MR1	10.80	165	149			750	78
254	33	MR1	10.80	353	318			750	165
255	478	UR	4.30	2055	1849			1500	1926
257	5	MR2	22.55	108	97			750	51
259	12	MR1	10.80	134	121			750	63
261	22	MR1	10.80	238	214			750	111
262	10	MR2	22.55	230	207			750	108
263	34	MR1	10.80	371	334			750	174
264	7	MR2	22.55	150	135			750	70
268	5	MR2	22.55	124	111			750	58
270	70	UR	4.30	301	270			1500	282
272	12	MR1	10.80	124	112			750	58
275	493	UR	4.30	2119	1907			1500	1987
278	21	MR2	22.55	476	429			750	223
279	24	MR1	10.80	255	230			750	120
283	28	UR	4.30	122		61		1500	63
284	4	SP/MR1	10.80	43		22		750	11
286	72	MR1	10.80	777		388		750	202
291	105	UR	4.30	451		225		1500	235
293	84	MR1	10.80	907		453		750	236
295	408	UR	4.30	1756		878		1500	915
299	247	UR	4.30	1063			159	1500	166

TABLE 5A

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 RESIDENTIAL DEMAND PROJECTIONS
REGION 4

300	105	MR1	10.80	1130			170	750	88
301	478	UR	4.30	2055		1028		1500	1071
317	162	UR	4.30	697			105	1500	109
323	34	MR1	10.80	362			54	750	28
330	447	UR	4.30	1921			288	1500	300
331	604	UR	4.30	2599			390	1500	406
333	140	MR1	10.80	1507			226	750	118
335	271	UR	4.30	1165			175	1500	182
336	599	UR	4.30	2575			386	1500	402
338	468	UR	4.30	2013			302	1500	314
339	91	MR1	10.80	984			148	750	77
341	612	UR	4.30	2630			395	1500	411
343	616	UR	4.30	2647			397	1500	414
501	735	NU	1.20	882		441		1500	459
518	32	NU	1.20	39		19		1500	20
520	680	NU	1.20	816			122	1500	128
521	460	NU	1.20	552			83	1500	86
522	1577	NU	1.20	1892			284	1500	296
523	728	UR	4.30	3130		1565		1500	1630
526	756	UR	4.30	3251	2926			1500	3048
	17737			**79751**	**37800**	**6422**	**3736**		**40476**

PALMDALE

NUMBER	AREA (ACRES)	LAND USE PALMDALE	DU/AC	NO. DWELLING UNITS*				MDD	
				BUILDOUT	90%	50%	15%	GAL/DU	(GPM)
1	614	LDR	1.00	614	553			1500	576
2	1491	SFR-2	1.50	2236	2012			1500	2096
6	187	SP-7	1.90	355	320			1500	333
8	22	SFR-2	1.50	32	29			1500	30
9	17	ER	0.40	7	6			1500	6
54	1264	SP-5	4.64	5867	5280			1500	5500
55	160	SP-6	2.80	449	404			1500	420
56	69	SFR-3	4.55	315	283			1500	295
59	30	SFR-3	4.55	135	121			1500	126
60	27	MR	8.05	220	198			1500	207
61	88	SFR-3	4.55	402	362			1500	377
62	299	LDR	1.00	299	269			1500	280
69	199	LDR	1.00	199	179			1500	187
105	170	SFR-3	4.55	774	696			1500	726
		4637			**10713**				**11160**

LANCASTER REGION 4 POPULATION (3.17 CAPITA/DU) = 152026

PALMDALE REGION 4 POPULATION (3.17 CAPITA/DU) = 33961

TOTAL = 185987

*% OF BUILDOUT FOR AREAS SHOWN (SEE AREA MAP)

PWS-0204-0225

TABLE 5B

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 RESIDENTIAL DEMAND PROJECTIONS
REGION 4

LANCASTER

NUMBER	AREA (ACRES)	LAND USE LANCASTER	DU/AC	NO. DWELLING UNITS*				MDD	
				BUILDOUT	95% AREA 1	75% AREA 2	30% AREA 3	GAL/DU	(GPM)
10	40	UR	4.30	174			52	1500	54
11	42	UR	4.30	181			54	1500	56
28	66	UR	4.30	284	270			1500	281
32	520	UR	4.30	2238	2126			1500	2214
34	9	MR2	22.55	193	183			750	95
35	22	MR1	10.80	241	229			750	119
36	2	MR2	22.55	53	51			750	26
38	197	UR	4.30	846	804			1500	837
42	8	MR1	10.80	91	86			750	45
43	16	MR1	10.80	178	169			750	88
44	12	UR	4.30	53	50			1500	53
45	7	MR1	10.80	76	72			750	38
54	27	MR1	10.80	294		221		750	115
55	8	MR1	10.80	86		64		750	33
56	12	MR1	10.80	131	125			750	65
57	7	MR1	10.80	71	68			750	35
58	5	MR1	10.80	51	49			750	25
63	121	MR1	10.80	1303	1238			750	645
71	3	MR1	10.80	35	33			750	17
72	8	MR1	10.80	81	77			750	40
76	6	MR1	10.80	69		52		750	27
79	19	MR1	10.80	207	197			750	103
87	9	MR1	10.80	97	92			750	48
102	49	MR1	10.80	533	506			750	264
103	15	MR1	10.80	162	154			750	80
111	189	NU	1.20	227		170		1500	177
113	35	UR	4.30	150		113		1500	118
115	28	UR	4.30	120		90		1500	94
116	20	NU	1.20	24		18		1500	19
119	225	NU	1.20	270		203		1500	211
120	81	UR	4.30	348		261		1500	272
122	170	UR	4.30	731		548		1500	571
123	116	MR1	10.80	1253	1191			750	620
124	9	MR2	22.55	193	183			750	95
126	7	MR1	10.80	73	69			750	36
129	15	MR2	22.55	340	323			750	168
130	11	MR1	10.80	117	111			750	58
131	4	MR1	10.80	47	45			750	23
133	15	MR1	10.80	164	155			750	81
134	532	UR	4.30	2289	2174			1500	2265
137	252	UR	4.30	1085	1031			1500	1074
138	303	NU	1.20	363	345	272		1500	359
141	191	UR	4.30	821	780			1500	813
146	7	SP/MR2	22.55	164	156			750	81
149	16	MR1	10.80	168	160			750	83
150	7	MR2	22.55	151	144			750	75
153	480	UR	4.30	2065	1962			1500	2043
155	22	MR1	10.80	238	226			750	118
156	6	MR2	22.55	142	135			750	70
159	39	MR1	10.80	425	404			750	210
160	9	NU	1.20	11	10			1500	11

TABLE 5B

LACO DISTRICT 40 MASTER PLAN

YEAR 2020 RESIDENTIAL DEMAND PROJECTIONS

REGION 4

161	10	MR2	22.55	219	208			750	108
162	20	MR1	10.80	218	207			750	108
174	341	UR	4.30	1468	1395			1500	1453
180	67	MR1	10.80	725	689			750	359
184	60	MR2	22.55	1344	1277			750	665
187	56	MR2	22.55	1252	1189			750	619
188	39	UR	4.30	167	159			1500	166
190	24	MR1	10.80	260	247			750	129
193	21	MR1	10.80	225	214			750	111
194	2	MR2	22.55	34	32			750	17
195	10	MR2	22.55	226	215			750	112
198	3	MR1	10.80	29	27			750	14
199	2	MR1	10.80	16	16			750	8
200	11	MR1	10.80	117	111			750	58
201	284	UR	4.30	1220	1159			1500	1207
207	102	MR2	22.55	2304	2189			750	1140
211	8	MR2	22.55	183	174			750	91
220	19	MR1	10.80	205	194			750	101
222	132	UR	4.30	569	541			1500	563
223	2	MR1	10.80	21	20			750	11
226	6	MR2	22.55	144	136			750	71
228	9	MR2	22.55	211	200			750	104
231	24	MR2	22.55	530	504			750	262
235	1	MR1	10.80	11	11			750	6
238	8	MR1	10.80	86	81			750	42
239	456	UR	4.30	1959	1861			750	969
241	6	MR1	10.80	63	60			750	31
242	5	MR2	22.55	114	108			1500	112
243	2	MR1	10.80	21	20			750	10
245	34	UR	4.30	148	141			1500	147
246	8	MR1	10.80	86	82			750	43
250	149	SP/UR	4.30	639	607			1500	632
251	14	UR	4.30	60	57			1500	59
253	15	MR1	10.80	165	157			750	82
254	33	MR1	10.80	353	335			750	175
255	478	UR	4.30	2055	1952			1500	2033
257	5	MR2	22.55	108	102			750	53
259	12	MR1	10.80	134	127			750	66
261	22	MR1	10.80	238	226			750	118
262	10	MR2	22.55	230	219			750	114
263	34	MR1	10.80	371	352			750	184
264	7	MR2	22.55	150	143			750	74
268	5	MR2	22.55	124	118			750	61
270	70	UR	4.30	301	285			1500	297
272	12	MR1	10.80	124	118			750	61
275	493	UR	4.30	2119	2013			1500	2097
278	21	MR2	22.55	476	453			750	236
279	24	MR1	10.80	255	243			750	126
283	28	UR	4.30	122		91		1500	95
284	4	SP/MR1	10.80	43		32		750	17
286	72	MR1	10.80	777		583		750	303
291	105	UR	4.30	451		338		1500	352
293	84	MR1	10.80	907		680		750	354
295	408	UR	4.30	1756		1317		1500	1372
299	247	UR	4.30	1063			319	1500	332

TABLE 5B

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 RESIDENTIAL DEMAND PROJECTIONS
REGION 4

300	105	MR1	10.80	1130			339	750	177
301	478	UR	4.30	2055		1542		1500	1606
317	162	UR	4.30	697			209	1500	218
323	34	MR1	10.80	362			109	750	57
330	447	UR	4.30	1921			576	1500	600
331	604	UR	4.30	2599			780	1500	812
333	140	MR1	10.80	1507			452	750	235
335	271	UR	4.30	1165			349	1500	364
336	599	UR	4.30	2575			773	1500	805
338	468	UR	4.30	2013			604	1500	629
339	91	MR1	10.80	984			295	750	154
341	612	UR	4.30	2630			789	1500	822
343	616	UR	4.30	2647			794	1500	827
501	735	NU	1.20	882		662		1500	689
518	32	NU	1.20	39		29		930	19
520	680	NU	1.20	816			245	1500	255
521	460	NU	1.20	552			166	1500	173
522	1577	NU	1.20	1892			568	1500	591
523	728	UR	4.30	3130		2348		1500	2446
526	756	UR	4.30	3251	3088			1500	3217
	17737			**79751**	**40245**	**9633**	**7472**		**47979**

PALMDALE

NUMBER	AREA	LAND USE	DU/AC	NO. DWELLING UNITS*				MDD	
	(ACRES)	PALMDALE		BUILDOUT	95%	75%	30%	GAL/DU	(GPM)
1	614	LDR	1.00	614	584			1500	608
2	1491	SFR-2	1.50	2236	2124			1500	2213
6	187	SP-7	1.90	355	338			1500	352
8	22	SFR-2	1.50	32	31			1500	32
9	17	ER	0.40	7	6			1500	7
54	1264	SP-5	4.64	5867	5573			1500	5806
55	160	SP-6	2.80	449	426			1500	444
56	69	SFR-3	4.55	315	299			1500	312
59	30	SFR-3	4.55	135	128			1500	133
60	27	MR	8.05	220	209			1500	218
61	88	SFR-3	4.55	402	382			1500	398
62	299	LDR	1.00	299	284			1500	295
69	199	LDR	1.00	199	189			1500	197
105	170	SFR-3	4.55	774	735			1500	766
		4637			**11308**	**0**	**0**		**11780**

LANCASTER REGION 4 POPULATION (3.17 CAPITA/DU) = 181799

PALMDALE REGION 4 POPULATION (3.17 CAPITA/DU) = 35848

TOTAL = 217647

*% OF BUILDOUT FOR AREAS SHOWN (SEE AREA MAP)

PWS-0204-0228

TABLE 5C

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 RESIDENTIAL DEMAND PROJECTIONS
REGION 4 SOI

LANCASTER

NUMBER	AREA (ACRES)	LAND USE LANCASTER	DU/AC	NO. DWELLING UNITS*			MDD	
				BUILDOUT	85% AREA 1	30% AREA 2	GAL/DU	(GPM)
1	70	UR	4.30	303	257		1500	268
3	775	UR	4.30	3333	2833		1500	2951
8	72	UR	4.30	310	264		1500	275
9	173	UR	4.30	744	632		1500	658
13	309	SP	0.00	0	0		1500	0
16	47	MR1	10.80	507	431		750	224
17	16	MR2	22.55	369	313		750	163
18	224	MR1	10.80	2417	2054		750	1070
19	9	MR2	22.55	209	177		750	92
20	654	UR	4.30	2812	2390		1500	2489
75	29	MR1	10.80	309	262		750	137
81	10	UR	4.30	43	36		1500	38
82	5	MR1	10.80	59	50		750	26
83	6	MR1	10.80	67	57		750	30
91	7	MR1	10.80	74	63		750	33
95	12	MR1	10.80	128	109		750	57
97	75	UR	4.30	324	276		1500	287
98	27	MR1	10.80	291	248		750	129
99	486	NU	1.20	583	496		1500	517
108	25	UR	4.30	108	91		1500	95
298	521	UR	4.30	2242	1906		1500	1985
502	6400	NU	1.20	7680		2304	1500	2400
503	45	NU	1.20	54	46		1500	48
504	315	UR	4.30	1354	1151		1500	1199
506	251	UR	4.30	1079	917		1500	955
507	166	NU	1.20	199	169		1500	176
509	225	NU	1.20	270	229		1500	239
510	54	UR	4.30	232	197		1500	205
511	91	NU	1.20	109	93		1500	97
517	247	UR	4.30	1063	904		1500	941
518	32	NU	1.20	39	33		1500	34
519	100	UR	4.30	431	367		1500	382
524	934	UR	4.30	4016	3414		1500	3556
525	880	UR	4.30	3784	3216		1500	3350
528	85	MR1	10.80	918	780		750	406
529	29	MR1	10.80	311	264		750	138
530	10	UR	4.30	43	36		1500	38
	13417	**0**		**36811**	**24762**	**2304**		**25689**

REGION 4 SOI POPULATION (3.17 CAPITA/DU) = 85798

*% OF BUILDOUT FOR AREAS SHOWN (SEE AREA MAP)

PWS-0204-0229

TABLE 5D

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 RESIDENTIAL DEMAND PROJECTIONS
REGION 4 SOI

LANCASTER

NUMBER	AREA (ACRES)	LAND USE LANCASTER	DU/AC	NO. DWELLING UNITS*			MDD	
				BUILDOUT	95% AREA 1	70% AREA 2	GAL/DU	(GPM)
1	70	UR	4.30	303	287		1500	299
3	775	UR	4.30	3333	3167		1500	3298
8	72	UR	4.30	310	295		1500	307
9	173	UR	4.30	744	707		1500	736
13	309	SP	0.00	0	0		1500	0
16	47	MR1	10.80	507	482		750	251
17	16	MR2	22.55	369	350		750	182
18	224	MR1	10.80	2417	2296		750	1196
19	9	MR2	22.55	209	198		750	103
20	654	UR	4.30	2812	2671		1500	2782
75	29	MR1	10.80	309	293		750	153
81	10	UR	4.30	43	41		1500	42
82	5	MR1	10.80	59	56		750	29
83	6	MR1	10.80	67	63		750	33
91	7	MR1	10.80	74	70		750	36
95	12	MR1	10.80	128	121		750	63
97	75	UR	4.30	324	308		1500	321
98	27	MR1	10.80	291	277		750	144
99	486	NU	1.20	583	554		1500	577
108	25	UR	4.30	108	102		1500	106
298	521	UR	4.30	2242	2130		1500	2219
502	6400	NU	1.20	7680		5376	1500	5600
503	45	NU	1.20	54	51		1500	53
504	315	UR	4.30	1354	1286		1500	1340
506	251	UR	4.30	1079	1025		1500	1067
507	166	NU	1.20	199	189		1500	197
509	225	NU	1.20	270	256		1500	267
510	54	UR	4.30	232	220		1500	229
511	91	NU	1.20	109	104		1500	108
517	247	UR	4.30	1063	1010		1500	1052
518	32	NU	1.20	39	37		1500	38
519	100	UR	4.30	431	410		1500	427
524	934	UR	4.30	4016	3815		1500	3974
525	880	UR	4.30	3784	3595		1500	3745
528	85	MR1	10.80	918	872		750	454
529	29	MR1	10.80	311	296		750	154
530	10	UR	4.30	43	41		1500	42
	13417	**0**		**36811**	**27675**	**5376**		**31629**

REGION 4 SOI POPULATION (3.17 CAPITA/DU) = 104771

*% OF BUILDOUT FOR AREAS SHOWN (SEE AREA MAP)

PWS-0204-0230

TABLE 6A

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 COMMERCIAL DEMAND PROJECTIONS
REGION 4

LANCASTER

NUMBER	AREA (ACRES)	LAND USE LANCASTER	LAND USE COLA	BUILDOUT ADD		MDD (GPM)*		
				GAL/AC/DAY	GAL/DAY	90% AREA 1	50% AREA 2	15% AREA 3
15	66	SP/PK	PF	1500	99000	124		
21	141	LI	IN	3000	423000	529		
22	42	C	CO	2000	83718	105		
23	859	HI	IN	3000	2577000	3221		
25	1	C	CO	2000	1028	1		
27	7	C	CO	2000	14061	18		
29	12	C	CO	2000	23061	29		
30	11	C	CO	2000	21216	27		
31	10	S	PF	2500	24790	31		
33	3	C	CO	2000	5018	6		
37	13	C	CO	2000	25096	31		
39	8	PK	PF	1500	11760	15		
40	9	S	PF	2500	23554	29		
41	36	C	CO	2000	72038	90		
46	10	C	CO	2000	20428	26		
47	1	LI	IN	3000	2618	3		
48	1	LI	IN	3000	2012	3		
50	24	LI	IN	3000	73411	92		
51	77	LI	IN	3000	231722	290		
52	4	C	CO	2000	8783	11		
53	19	S	PF	2500	46705	58		
59	14	C	CO	2000	28920	36		
60	6	C	CO	2000	11343	14		
61	11	LI	IN	3000	31973	40		
62	2	C	CO	2000	3278	4		
64	8	S	PF	2500	19477	24		
70	7	C	CO	2000	14600	18		
73	1	LI	IN	3000	3483	4		
77	6	LI	IN	3000	17807		12	
78	4	C	CO	2000	7255		5	
80	3	LI	IN	3000	9709		7	
88	27	PK	PF	1500	40888		28	
89	10	S	PF	2500	24227		17	
100	11	C	CO	2000	22300	28		
101	30	C	CO	2000	60964	76		
104	7	C	CO	2000	13434	17		
106	7	C	CO	2000	14175	18		
110	8	C	CO	2000	15998		11	
125	10	C	CO	2000	19645	25		
127	9	C	CO	2000	18072	23		
128	7	C	CO	2000	14210	18		
132	14	S	PF	2500	34947	44		
135	4	C	CO	2000	8125	10		
136	5	C	CO	2000	9481	12		
139	49	LI	IN	3000	148161	185		
140	75	LI	IN	3000	225955	282		
142	10	C	CO	2000	19725	25		
143	1	C	CO	2000	2423	3		
144	10	S	PF	2500	25766	32		
145	292	SP/LI	IN	3000	877417	1097		
147	11	SP/C	CO	2000	21430	27		

TABLE 6A

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 COMMERCIAL DEMAND PROJECTIONS
REGION 4

148	5	C	CO	2000	9459	12		
151	28	C	CO	2000	55683	70		
152	18	S	PF	2500	44714	56		
154	6	C	CO	2000	11293	14		
157	16	C	CO	2000	32881	41		
158	15	C	CO	2000	30043	38		
163	64	S	PF	2500	159233	199		
164	10	C	CO	2000	20923	26		
165	11	PK	PF	1500	16379	20		
166	10	OP	OF	2000	19731	25		
167	3	S	PF	2500	7410	9		
168	7	C	CO	2000	14243	18		
169	3	C	CO	2000	6014	8		
170	11	PK	PF	1500	15833	20		
171	10	S	PF	2500	24275	30		
172	35	CE	PF	2500	88087	110		
173	2	C	CO	2000	4209	5		
175	14	S	PF	2500	35399	44		
176	8	C	CO	2000	15783	20		
177	1	LI	IN	3000	3008	4		
178	2	C	CO	2000	3818	5		
179	4	C	CO	2000	7490	9		
181	5	C	CO	2000	9817	12		
182	136	LI	IN	3000	408393	510		
183	11	C	CO	2000	22694	28		
185	5	PK	PF	1500	7217	9		
186	200	C	CO	2000	399173	499		
189	9	PK	PF	1500	12927	16		
191	28	C	CO	2000	55794	70		
192	12	S	PF	2500	30511	38		
196	81	C	CO	2000	161872	202		
197	93	LI	IN	3000	278934	349		
202	4	OP	OF	2000	7824	10		
203	13	S	PF	2500	32222	40		
204	7	H	PF	2500	17612	22		
205	14	C	CO	2000	27566	34		
206	79	C	CO	2000	157717	197		
208	139	C	CO	2000	277928	347		
209	18	LI	IN	3000	54791	68		
210	244	LI	IN	3000	731937	915		
213	81	SP/LI	IN	3000	241775	302		
214	544	LI	IN	3000	1632576	2041		
216	9	C	CO	2000	18907	24		
217	73	PK	PF	1500	109521	137		
218	121	C	CO	2000	241662	302		
219	110	C	CO	2000	220296	275		
221	5	OP	OF	2000	9025	11		
224	9	C	CO	2000	17512	22		
225	15	PK	PF	1500	21800	27		
227	36	C	CO	2000	71436	89		
229	15	OP	PF	2500	37204	47		
230	16	S	CO	2000	32332	40		
232	73	H	PF	2500	182795	228		
233	29	C	CO	2000	57576	72		
234	8	OP	PF	2500	20983	26		

TABLE 6A

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 COMMERCIAL DEMAND PROJECTIONS
REGION 4

236	56	C		2000	112282	140		
237	12	S	PF	2500	30910	39		
240	6	PK		1500	9018	11		
244	7	C	CO	2000	13605	17		
247	31	C	CO	2000	62729	78		
248	39	H	PF	2500	97573	122		
249	227	C	CO	2000	453762	567		
252	12	S	PF	2500	29787	37		
256	29	C	CO	2000	58070	73		
258	30	C	CO	2000	59920	75		
260	2	C	CO	2000	3500	4		
265	58	C	CO	2000	115330	144		
266	16	H	PF	2500	40583	51		
267	15	OP	OF	2000	29212	37		
271	2	C	CO	2000	4448	6		
273	12	C	CO	2000	23110	29		
274	8	S	PF	2500	21207	27		
276	3	OP	OF	2000	5980	7		
277	28	C	CO	2000	55678	70		
287	21	PK	PF	1500	31517		22	
288	15	O	OS	0	0		0	
289	21	S	PF	2500	52528		36	
290	21	O	OS	0	0		0	
292	107	S	PF	2500	267515	334		
294	10	S	PF	2500	25133		17	
318	26	C	CO	2000	51341			11
319	12	OP	OF	2000	24200			5
320	9	C	CO	2000	18725			4
321	24	S	PF	2500	59195			12
324	2	C	CO	2000	3104			1
332	591	P	PF	2500	1477559			308
334	14	S	PF	2500	34227			7
337	77	S	PF	2500	192522	241		
342	64	CE	PF	2500	160583			33
500	45	S	PF	**		240		
	6186					**16943**	**156**	**381**

PALMDALE

NUMBER	AREA (ACRES)	LAND USE PALMDALE	LAND USE COLA	BUILDOUT ADD GAL/AC/DAY	BUILDOUT ADD GAL/DAY	MDD (GPM)* 90%	50%	15%
3	17.5	NC	CO	2000	34966	44		
5	35.2	PF-W	PF	2500	88078	110		
7	22.0	CC	CO	2000	43918	55		
11	48.9	CM	CO	2000	97818	122		
13	4.7	OC	OF	2000	9361	12		
14	16.1	CC	CO	2000	32170	40		
15	29.9	CM	CO	2000	59730	75		
16	8.5	PF-W	PF	2500	21313	27		
17	614.9	SP-10	CO	2000	1229763	1537		
18	3.4	IND	IN	3000	10338	13		
100	1119.0	BP	CO	2000	2237905	2797		
	1920				**3865362**	**4832**	**0**	**0**

*% OF BUILDOUT FOR AREAS SHOWN (SEE AREA MAP)
** FIXED BASED ON SPECIFIC PLAN

PWS-0204-0233

TABLE 6B

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 COMMERCIAL DEMAND PROJECTIONS
REGION 4

LANCASTER

NUMBER	AREA (ACRES)	LAND USE LANCASTER	LAND USE COLA	BUILDOUT ADD		MDD (GPM)	MDD (GPM)*		
				GAL/AC/DAY	GAL/DAY	GPM	95% AREA 1	75% AREA 2	30% AREA 3
15	66	SP/PK	PF	1500	99000	138	131		
21	141	LI	IN	3000	423000	588	558		
22	42	C	CO	2000	83718	116	110		
23	859	HI	IN	3000	2577000	3579	3400		
25	1	C	CO	2000	1028	1	1		
27	7	C	CO	2000	14061	20	19		
29	12	C	CO	2000	23061	32	30		
30	11	C	CO	2000	21216	29	28		
31	10	S	PF	2500	24790	34	33		
33	3	C	CO	2000	5018	7	7		
37	13	C	CO	2000	25096	35	33		
39	8	PK	PF	1500	11760	16	16		
40	9	S	PF	2500	23554	33	31		
41	36	C	CO	2000	72038	100	95		
46	10	C	CO	2000	20428	28	27		
47	1	LI	IN	3000	2618	4	3		
48	1	LI	IN	3000	2012	3	3		
50	24	LI	IN	3000	73411	102	97		
51	77	LI	IN	3000	231722	322	306		
52	4	C	CO	2000	8783	12	12		
53	19	S	PF	2500	46705	65	62		
59	14	C	CO	2000	28920	40	38		
60	6	C	CO	2000	11343	16	15		
61	11	LI	IN	3000	31973	44	42		
62	2	C	CO	2000	3278	5	4		
64	8	S	PF	2500	19477	27	26		
70	7	C	CO	2000	14600	20	19		
73	1	LI	IN	3000	3483	5	5		
77	6	LI	IN	3000	17807	25		19	
78	4	C	CO	2000	7255	10		8	
80	3	LI	IN	3000	9709	13		10	
88	27	PK	PF	1500	40888	57		43	
89	10	S	PF	2500	24227	34		25	
100	11	C	CO	2000	22300	31	29	23	
101	30	C	CO	2000	60964	85	80	64	
104	7	C	CO	2000	13434	19	18	14	
106	7	C	CO	2000	14175	20	19	15	
110	8	C	CO	2000	15998	22		17	
125	10	C	CO	2000	19645	27	26		
127	9	C	CO	2000	18072	25	24		
128	7	C	CO	2000	14210	20	19		
132	14	S	PF	2500	34947	49	46		
135	4	C	CO	2000	8125	11	11		
136	5	C	CO	2000	9481	13	13		
139	49	LI	IN	3000	148161	206	195		
140	75	LI	IN	3000	225955	314	298		
142	10	C	CO	2000	19725	27	26		
143	1	C	CO	2000	2423	3	3		
144	10	S	PF	2500	25766	36	34		
145	292	SP/LI	IN	3000	877417	1219	1158		
147	11	SP/C	CO	2000	21430	30	28		
148	5	C	CO	2000	9459	13	12		
151	28	C	CO	2000	55683	77	73		
152	18	S	PF	2500	44714	62	59		

TABLE 6B

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 COMMERCIAL DEMAND PROJECTIONS
REGION 4

154	6	C	CO	2000	11293	16	15		
157	16	C	CO	2000	32881	46	43		
158	15	C	CO	2000	30043	42	40		
163	64	S	PF	2500	159233	221	210		
164	10	C	CO	2000	20923	29	28		
165	11	PK	PF	1500	16379	23	22		
166	10	OP	OF	2000	19731	27	26		
167	3	S	PF	2500	7410	10	10		
168	7	C	CO	2000	14243	20	19		
169	3	C	CO	2000	6014	8	8		
170	11	PK	PF	1500	15833	22	21		
171	10	S	PF	2500	24275	34	32		
172	35	CE	PF	2500	88087	122	116		
173	2	C	CO	2000	4209	6	6		
175	14	S	PF	2500	35399	49	47		
176	8	C	CO	2000	15783	22	21		
177	1	LI	IN	3000	3008	4	4		
178	2	C	CO	2000	3818	5	5		
179	4	C	CO	2000	7490	10	10		
181	5	C	CO	2000	9817	14	13		
182	136	LI	IN	3000	408393	567	539		
183	11	C	CO	2000	22694	32	30		
185	5	PK	PF	1500	7217	10	10		
186	200	C	CO	2000	399173	554	527		
189	9	PK	PF	1500	12927	18	17		
191	28	C	CO	2000	55794	77	74		
192	12	S	PF	2500	30511	42	40		
196	81	C	CO	2000	161872	225	214		
197	93	LI	IN	3000	278934	387	368		
202	4	OP	OF	2000	7824	11	10		
203	13	S	PF	2500	32222	45	43		
204	7	H	PF	2500	17612	24	23		
205	14	C	CO	2000	27566	38	36		
206	79	C	CO	2000	157717	219	208		
208	139	C	CO	2000	277928	386	367		
209	18	LI	IN	3000	54791	76	72		
210	244	LI	IN	3000	731937	1017	966		
213	81	SP/LI	IN	3000	241775	336	319		
214	544	LI	IN	3000	1632576	2267	2154		
216	9	C	CO	2000	18907	26	25		
217	73	PK	PF	1500	109521	152	145		
218	121	C	CO	2000	241662	336	319		
219	110	C	CO	2000	220296	306	291		
221	5	OP	OF	2000	9025	13	12		
224	9	C	CO	2000	17512	24	23		
225	15	PK	PF	1500	21800	30	29		
227	36	C	CO	2000	71436	99	94		
229	15	OP	PF	0	0	0	0		
230	16	S	CO	2000	32332	45	43		
232	73	H		0	0	0	0		
233	29	C	CO	2000	57576	80	76		
234	8	OP	PF	0	0	0	0		
236	56	C		0	0	0	0		
237	12	S	PF	2500	30910	43	41		
240	6	PK		1500	9018	13	12		
244	7	C	CO	2000	13605	19	18		
247	31	C	CO	2000	62729	87	83		
248	39	H	PF	2500	97573	136	129		

TABLE 6B

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 COMMERCIAL DEMAND PROJECTIONS
REGION 4

249	227	C	CO	2000	453762	630	599		
252	12	S	PF	2500	29787	41	39		
256	29	C	CO	2000	58070	81	77		
258	30	C	CO	2000	59920	83	79		
260	2	C	CO	2000	3500	5	5		
265	58	C	CO	2000	115330	160	152		
266	16	H	PF	2000	32466	45	43		
267	15	OP	OF	2000	29212	41	39		
271	2	C	CO	2000	4448	6	6		
273	12	C	CO	2000	23110	32	30		
274	8	S	PF	2500	21207	29	28		
276	3	OP	OF	2000	5980	8	8		
277	28	C	CO	2000	55678	77	73		
287	21	PK	PF	1500	31517	44		33	
288	15	O	OS	0	0	0		0	
289	21	S	PF	2500	52528	73		55	
290	21	O	OS	0	0	0		0	
292	107	S	PF	2500	267515	372	353		
294	10	S	PF	2500	25133	35		26	
318	26	C	CO	2000	51341	71			21
319	12	OP	OF	2000	24200	34			10
320	9	C	CO	2000	18725	26			8
321	24	S	PF	2500	59195	82			25
324	2	C	CO	2000	3104	4			1
332	591	P	PF	2500	1477559	2052			616
334	14	S	PF	2500	34227	48			14
337	77	S	PF	2500	192522	267	254		
342	64	CE	PF	2500	160583	223			67
500	45	S	PF	**	0	0	240		
	6186				**15054912**	**20910**	**17394**	**350**	**762**

PALMDALE

NUMBER	AREA	LAND USE	LAND USE	BUILDOUT ADD		MDD (GPM)	MDD (GPM)*		
	(ACRES)	PALMDALE	COLA	GAL/AC/DAY	GAL/DAY	GPM	95%	75%	30%
3	17	NC	CO	2000	34966	49	46		
5	35	PF-W	PF	2500	88078	122	116		
7	22	CC	CO	2000	43918	61	58		
11	49	CM	CO	2000	97818	136	129		
12	125	IND	IN	3000	375600	522	496		
13	5	OC	OF	2000	9361	13	12		
14	16	CC	CO	2000	32170	45	42		
15	30	CM	CO	2000	59730	83	79		
16	9	PF-W	PF	2500	21313	30	28		
17	615	SP-10	CO	2000	1229763	1708	1623		
18	3	IND	IN	3000	10338	14	14		
100	1119	BP	CO	2000	2237905	3108	2953		
	2045				**4240962**	**5890**	**5596**	**0**	**0**

*% OF BUILDOUT FOR AREAS SHOWN (SEE REGION MAP)
** FIXED BASED ON SPECIFIC PLAN

PWS-0204-0236

TABLE 6C

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 COMMERCIAL DEMAND PROJECTIONS
REGION 4 SOI

LANCASTER

NUMBER	AREA (ACRES)	LAND USE LANCASTER	LAND USE COLA	BUILDOUT ADD		MDD (GPM)*	
				GAL/AC/DAY	GAL/DAY	BUILDOUT	85%
2	21	C	CO	2000	41702	29	25
4	9	S	PF	2500	23258	16	14
5	21	PK	PF	1500	31241	22	18
6	13	S	PF	2500	31389	22	19
7	33	S	PF	2500	83572	58	49
12	13	C	CO	2000	26879	19	16
24	1	C	CO	2000	1887	1	1
26	4	C	CO	2000	7246	5	4
74	3	LI	IN	3000	10200	7	6
84	4	LI	IN	3000	12555	9	7
85	4	C	CO	2000	7868	5	5
86	3	C	CO	2000	6987	5	4
90	23	S	PF	2500	56790	39	34
92	5	C	CO	2000	9385	7	6
93	2	LI	IN	3000	6074	4	4
94	19	C	CO	2000	38715	27	23
96	8	LI	IN	3000	23182	16	14
105	9	S	PF	2500	22775	16	13
107	4	C	CO	2000	7845	5	5
109	11	S	PF	2500	26295	18	16
112	49	S	PF	2500	121353	84	72
114	15	O	OS	0	0	0	0
117	120	PK	PF	1500	179926	125	106
118	4	C	CO	2000	7200	5	4
121	7	C	CO	2000	14965	10	9
212	546	HI	IN	3000	1636959	1137	966
296	66	S	PF	2500	164785	114	97
297	7	C	CO	2000	13911	10	8
512	1343	SP/LI	IN	3000	4029000	2798	2378
513	1703	SP/LI	IN	3000	5109000	3548	3016
514	32	SP/PK	PF	1500	48000	33	28
515	220	LI	IN	3000	660000	458	390
516	642	HI	IN	3000	1926000	1338	1137
527	8	C	CO	2000	15200	11	9
	4971	**0**			**14402143**	**10001**	**8501**

*% OF BUILDOUT FOR AREAS SHOWN (SEE AREA MAP)

PWS-0204-0237

TABLE 6D

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 COMMERCIAL DEMAND PROJECTIONS
REGION 4 SOI

LANCASTER

NUMBER	AREA (ACRES)	LAND USE LANCASTER	LAND USE COLA	BUILDOUT ADD		MDD (GPM)*	
				GAL/AC/DAY	GAL/DAY	BUILDOUT	95%
2	21	C	CO	2000	41702	29	28
4	9	S	PF	2500	23258	16	15
5	21	PK	PF	1500	31241	22	21
6	13	S	PF	2500	31389	22	21
7	33	S	PF	2500	83572	58	55
12	13	C	CO	2000	26879	19	18
24	1	C	CO	2000	1887	1	1
26	4	C	CO	2000	7246	5	5
74	3	LI	IN	3000	10200	7	7
84	4	LI	IN	3000	12555	9	8
85	4	C	CO	2000	7868	5	5
86	3	C	CO	2000	6987	5	5
90	23	S	PF	2500	56790	39	37
92	5	C	CO	2000	9385	7	6
93	2	LI	IN	3000	6074	4	4
94	19	C	CO	2000	38715	27	26
96	8	LI	IN	3000	23182	16	15
105	9	S	PF	2500	22775	16	15
107	4	C	CO	2000	7845	5	5
109	11	S	PF	2500	26295	18	17
112	49	S	PF	2500	121353	84	80
114	15	O	OS	0	0	0	0
117	120	PK	PF	1500	179926	125	119
118	4	C	CO	2000	7200	5	5
121	7	C	CO	2000	14965	10	10
212	546	HI	IN	3000	1636959	1137	1080
296	66	S	PF	2500	164785	114	109
297	7	C	CO	2000	13911	10	9
512	1343	SP/LI	IN	3000	4029000	2798	2658
513	1703	SP/LI	IN	3000	5109000	3548	3371
514	32	SP/PK	PF	1500	48000	33	32
515	220	LI	IN	3000	660000	458	435
516	642	HI	IN	3000	1926000	1338	1271
527	8	C	CO	2000	15200	11	10
	4971	**0**			**14402143**	**10001**	**9501**

*% OF BUILDOUT FOR AREAS SHOWN (SEE AREA MAP)

PWS-0204-0238

TABLE 7A

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 RESIDENTIAL DEMAND PROJECTIONS
REGION 34

NUMBER	AREA (ACRES)	LAND USE PALMDALE	DU/AC	# DU		MDD GAL/DU	MDD (GPM)
				BUILDOUT	69.9%		
22	21	MR	8.05	167	117	1600	130
23	172	SFR-3	4.55	782	547	1600	608
24	63	MR	8.05	504	352	1600	391
31	1443	SFR-3	4.55	6566	4590	1600	5100
36	164	LDR	1.00	164	114	1600	127
37	38	SFR-1	1.00	38	27	1600	30
38	219	SFR-2	1.50	328	229	1600	255
39	46	MFR	13.05	598	418	800	232
44	8	MFR	13.05	105	73	800	41
47	21	MFR	13.05	275	193	800	107
52	45	SFR-1	1.00	45	32	1600	35
68	8203	SP-3	0.68	5578	3899	1600	4332
77	2291	SP-3	0.68	1558	1089	1600	1210
82	335	SD	0.00	0	0	1600	0
	13067		**70**	**16708**	**11679**		**12597**

REGION 34 POPULATION (3.17 CAPITA/DU)= 37023

TABLE 7B

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 RESIDENTIAL DEMAND PROJECTIONS
REGION 34

NUMBER	AREA (ACRES)	LAND USE PALMDALE	DU/AC	# DU		MDD GAL/DU	MDD (GPM)
				BUILDOUT	96.3%		
22	21	MR	8.05	167	161	1600	179
23	172	SFR-3	4.55	782	753	1600	837
24	63	MR	8.05	504	485	1600	539
31	1443	SFR-3	4.55	6566	6323	1600	7026
36	164	LDR	1.00	164	158	1600	175
37	38	SFR-1	1.00	38	37	1600	41
38	219	SFR-2	1.50	328	316	1600	351
39	46	MFR	13.05	598	576	800	320
44	8	MFR	13.05	105	101	800	56
47	21	MFR	13.05	275	265	800	147
52	45	SFR-1	1.00	45	44	1600	48
68	8203	SP-3	0.68	5578	5372	1600	5968
77	2291	SP-3	0.68	1558	1500	1600	1667
82	335	SD	0.00	0	0	1600	0
	13067		**70**	**16708**	**16090**		**17354**

REGION 34 POPULATION (3.17 CAPITA/DU)= 51005

PWS-0204-0239

TABLE 7C

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 RESIDENTIAL DEMAND PROJECTIONS
REGION 34 SOI

NUMBER	AREA (ACRES)	LAND USE PALMDALE	DU/AC	# DU		MDD GAL/DU	MDD (GPM)
				BUILDOUT	28.7%		
57	32	SFR-3	4.55	144	41	1600	46
58	30	SFR-3	4.55	136	39	1600	43
64	35	LDR	1.00	35	10	1600	11
65	781	SFR-1	1.00	781	224	1600	249
66	145	LDR	1.00	145	42	1600	46
67	181	LDR	1.00	181	52	1600	58
73	1800	SP-2	2.62	4715	1355	1600	1506
104	250	SFR-3	4.55	1136	327	1600	363
106	111	SFR-3	4.55	507	146	1600	162
107	170	SP-5	4.64	789	227	1600	252
108	36	SP-5	4.64	167	48	1600	53
109	4	MR	8.05	35	10	1600	11
	3574		**42**	**8770**	**2520**		**2800**

REGION 34 POPULATION (3.17 CAPITA/DU)= 7990

TABLE 7D

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 RESIDENTIAL DEMAND PROJECTIONS
REGION 34 SOI

NUMBER	AREA (ACRES)	LAND USE PALMDALE	DU/AC	# DU		MDD GAL/DU	MDD (GPM)
				BUILDOUT	45.9%		
57	32	SFR-3	4.55	144	66	1600	73
58	30	SFR-3	4.55	136	62	1600	69
64	35	LDR	1.00	35	16	1600	18
65	781	SFR-1	1.00	781	358	1600	398
66	145	LDR	1.00	145	66	1600	74
67	181	LDR	1.00	181	83	1600	92
73	1800	SP-2	2.62	4715	2162	1600	2402
104	250	SFR-3	4.55	1136	521	1600	579
106	111	SFR-3	4.55	507	233	1600	258
107	170	SP-5	4.64	789	362	1600	402
108	36	SP-5	4.64	167	76	1600	85
109	4	MR	8.05	35	16	1600	18
	3574		**42**	**8770**	**4022**		**4469**

REGION 34 POPULATION (3.17 CAPITA/DU)= 12749

PWS-0204-0240

TABLE 8A

LACO DISTRICT 40 MASTER PLAN
YEAR 2010 COMMERCIAL DEMAND PROJECTIONS
REGION 34 AND 34 SOI

REGION 34

NUMBER	AREA (ACRES)	LAND USE PALMDALE	LAND USE COLA	BUILDOUT ADD GAL/AC	BUILDOUT ADD GAL/DAY	BUILDOUT ADD GPM	MDD (GPM) 69.9%
19	7	OC	OF	2000	14423	10	14
20	224	RC	CO	2000	447719	311	435
21	162	OS	OS	0	0	0	0
25	35	OC	OF	2000	69305	48	67
26	676	SP-13	IN	3000	2027122	1408	1968
27	60	SP-16	CO	2000	119892	83	116
28	43	CC	CO	2000	85038	59	83
29	13	RC	CO	2000	26386	18	26
30	4	OS	OS	0	0	0	0
32	13	OC	OF	2000	25122	17	24
33	213	BP	CO	2000	426227	296	414
34	110	PF-LANDFILL	PF	2500	275000	191	267
35	63	PF-LANDFILL	PF	2500	157546	109	153
40	58	RC	CO	2000	116792	81	113
41	12	CC	CO	2000	24051	17	23
42	9	CC	CO	2000	18963	13	18
43	14	NC	CO	2000	28629	20	28
45	8	OC	OF	2000	16263	11	16
46	7	OC	OF	2000	14318	10	14
48	24	CC	CO	2000	47864	33	46
49	3	PF	PF	2500	7687	5	7
50	36	OC	OF	2000	72599	50	70
51	8	OC	OF	2000	16698	12	16
70	1	PF	PF	2500	2437	2	2
71	124	PF	PF	2500	310146	215	301
72	133	PF	PF	2500	333445	232	324
74	1	PF	PF	2500	1898	1	2
75	18	PF	PF	2500	44730	31	43
76	1	PF	PF	2500	2493	2	2
78	48	PF-S	PF	2500	120100	83	117
80	14	SP-11	IN	3000	40654	28	39
81	18	IND	IN	3000	53889	37	52
83	6	PFS	PF	2500	14643	10	14
102	485	BP	CO	2000	969841	674	942
103	40	BP	CO	2000	80000	56	78
	2691						**5837**

REGION 34 SOI

NUMBER	AREA (ACRES)	LAND USE PALMDALE	LAND USE COLA	BUILDOUT ADD GAL/AC	BUILDOUT ADD GAL/DAY	BUILDOUT ADD GPM	MDD (GPM) 28.7%
63	99	OS	OS	0	0	0	0
101	761	BP	CO	2000	1522898	1058	608
	860						**608**

PWS-0204-0241

TABLE 8B

LACO DISTRICT 40 MASTER PLAN
YEAR 2020 COMMERCIAL DEMAND PROJECTIONS
REGION 34 AND 34 SOI

REGION 34

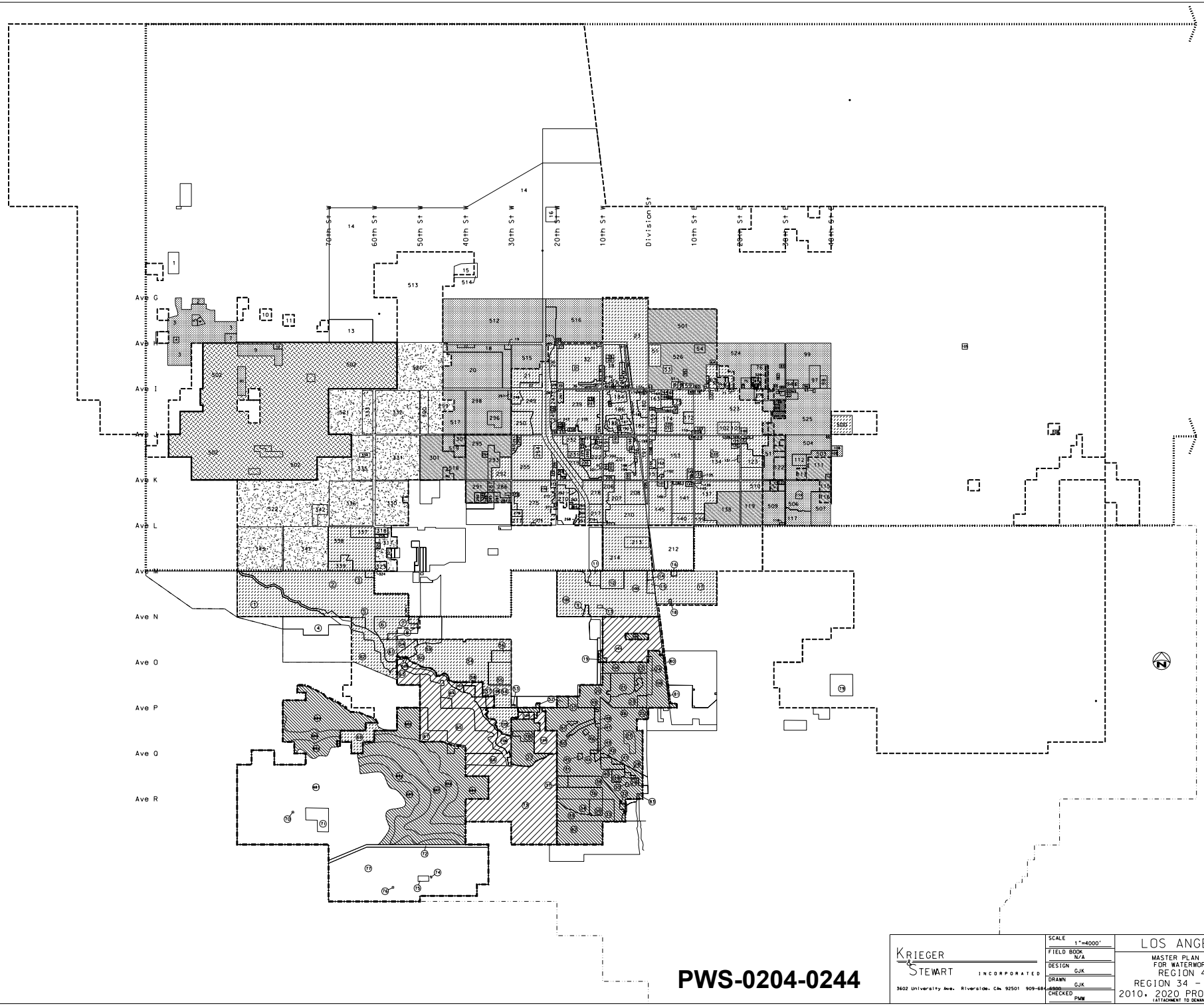
NUMBER	AREA	LAND USE	LAND USE	BUILDOUT ADD			MDD (GPM)
	(ACRES)	PALMDALE	COLA	GAL/AC	GAL/DAY	GPM	96.3%
19	7	OC	OF	2000	14423	10	19
20	224	RC	CO	2000	447719	311	599
21	162	OS	OS		0	0	0
25	35	OC	OF	2000	69305	48	93
26	676	SP-13	IN	3000	2027122	1408	2711
27	60	SP-16	CO	2000	119892	83	160
28	43	CC	CO	2000	85038	59	114
29	13	RC	CO	2000	26386	18	35
30	4	OS	OS		0	0	0
32	13	OC	OF	2000	25122	17	34
33	213	BP	CO	2000	426227	296	570
34	110	PF-LANDFILL	PF	2500	275000	191	368
35	63	PF-LANDFILL	PF	2500	157546	109	211
40	58	RC	CO	2000	116792	81	156
41	12	CC	CO	2000	24051	17	32
42	9	CC	CO	2000	18963	13	25
43	14	NC	CO	2000	28629	20	38
45	8	OC	OF	2000	16263	11	22
46	7	OC	OF	2000	14318	10	19
48	24	CC	CO	2000	47864	33	64
49	3	PF	PF	2500	7687	5	10
50	36	OC	OF	2000	72599	50	97
51	8	OC	OF	2000	16698	12	22
70	1	PF	PF	2500	2437	2	3
71	124	PF	PF	2500	310146	215	415
72	133	PF	PF	2500	333445	232	446
74	1	PF	PF	2500	1898	1	3
75	18	PF	PF	2500	44730	31	60
76	1	PF	PF	2500	2493	2	3
78	48	PF-S	PF	2500	120100	83	161
80	14	SP-11	IN	3000	40654	28	54
81	18	IND	IN	3000	53889	37	72
83	6	PFS	PF	2500	14643	10	20
102	485	BP	CO	2000	969841	674	1297
103	40	BP	CO	2000	80000	56	107
	2691						**8041**

REGION 34 SOI

NUMBER	AREA	LAND USE	LAND USE	BUILDOUT ADD			MDD (GPM)
	(ACRES)	PALMDALE	COLA	GAL/AC	GAL/DAY	GPM	45.9%
63	99	OS	OS	0	0	0	0
101	761	BP	CO	2000	1522898	1058	970
	860						**970**

PWS-0204-0242

MAPS



LEGEND OF SYMBOLS

CITY OF PALMDALE LAND USE

BP	BUSINESS PARK
CC	COMMUNITY COMMERCIAL
CM	COMMERCIAL MANUFACTURING
DC	DOWNTOWN COMMERICAL
ER	EQUESTRIAN RESIDENTIAL
IND	INDUSTRIAL
LDR	LOW DENSITY RESIDENTIAL
MFR	MULTI-FAMILY
MR	MEDIUM RESIDENTIAL
MRE	MINERAL RESOURCE EXTRACTION
OC	OFFICE COMMERCIAL
OS	OPEN SPACE
PF	PUBLIC FACILITIES
RC	REGIONAL COMMERCIAL
SD	SPECIAL DEVELOPMENT
SFR-1	SINGLE FAMILY
SFR-2	SINGLE FAMILY
SFR-3	SINGLE FAMILY
SP	SPECIFIC PLAN
78	TYPICAL LAND USE DESIGNATION (SEE ACCOMPANYING TABLES)

CITY OF LANCASTER LAND USE

C	COMMERCIAL
CE	CEMETARY
H	HEALTH CARE
HI	HEAVY INDUSTRIAL
LI	LIGHT INDUSTRIAL
MR1	MULTI-RESIDENTIAL (10.8 CAP/DU)
MR2	MULTI-RESIDENTIAL (22.5 CAP/DU)
NU	NON-URBAN RESIDENTIAL (1.2 CAP/DU)
O	OPEN SPACE
OP	OFFICE/PROFESSIONAL
P	PUBLIC USE
PK	PARKS
S	PUBLIC SCHOOLS
SP	SPECIFIC PLAN
UR	URBAN RESIDENTIAL (4.3 CAP/DU)
100	TYPICAL LAND USE DESIGNATION (SEE ACCOMPANYING TABLES)

REGION 4 & 34

- REGION 4 & 4 SOI BOUNDARY
- REGION 34 & 34 SOI BOUNDARY
- CITY OF LANCASTER SOI
- CITY OF PALMDALE SOI
- LAND USE BOUNDARY
- REGION 4 - AREA 1
- REGION 4 - AREA 2
- REGION 4 - AREA 3
- REGION 4 SOI - AREA 1
- REGION 4 SOI - AREA 2
- REGION 34 - AREA 1
- REGION 34 SOI - AREA 1

PWS-0204-0244

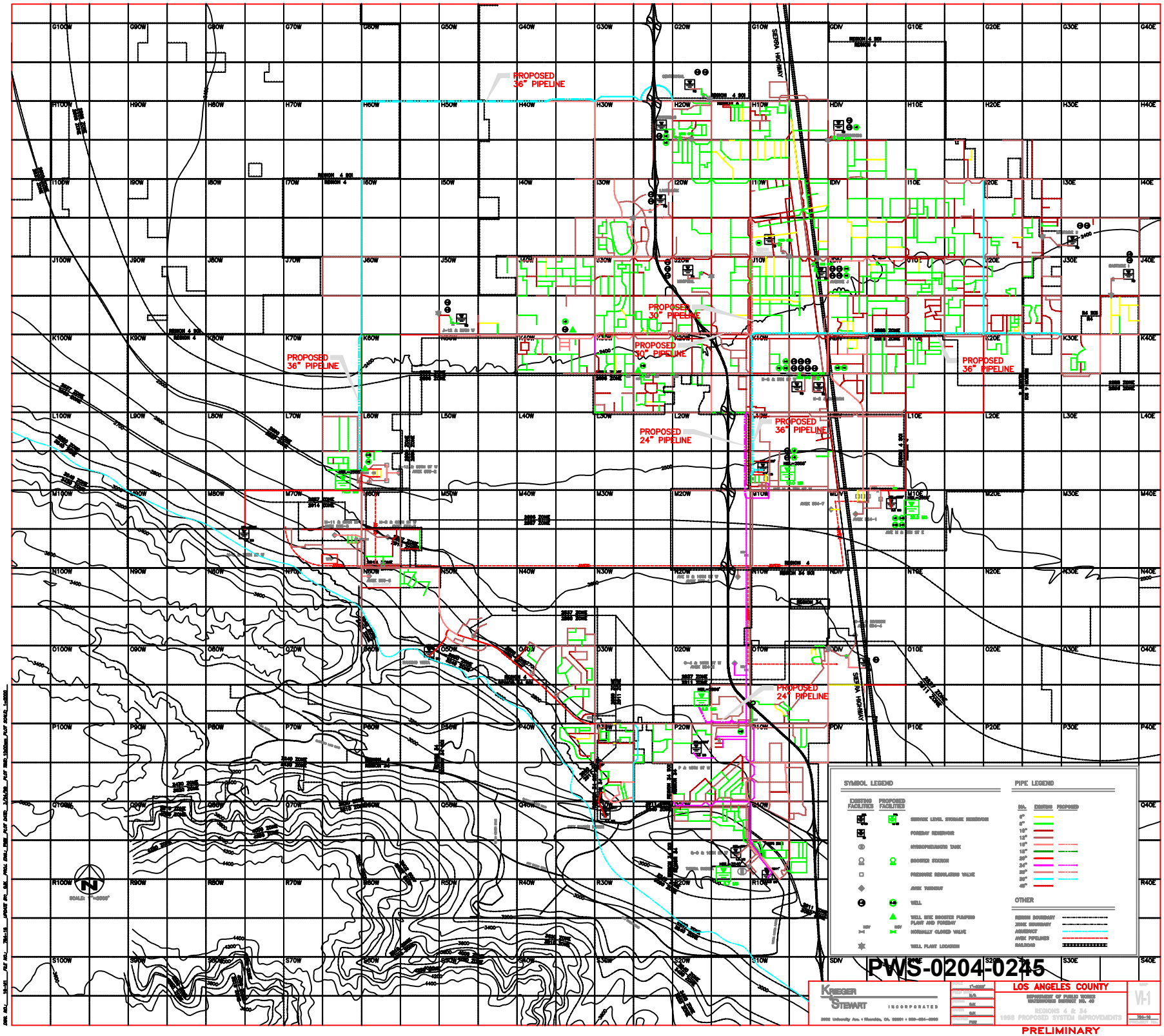
KRIEGER & STEWART INCORPORATED
3602 University Ave. Riverside, CA 92501 909-684-6900

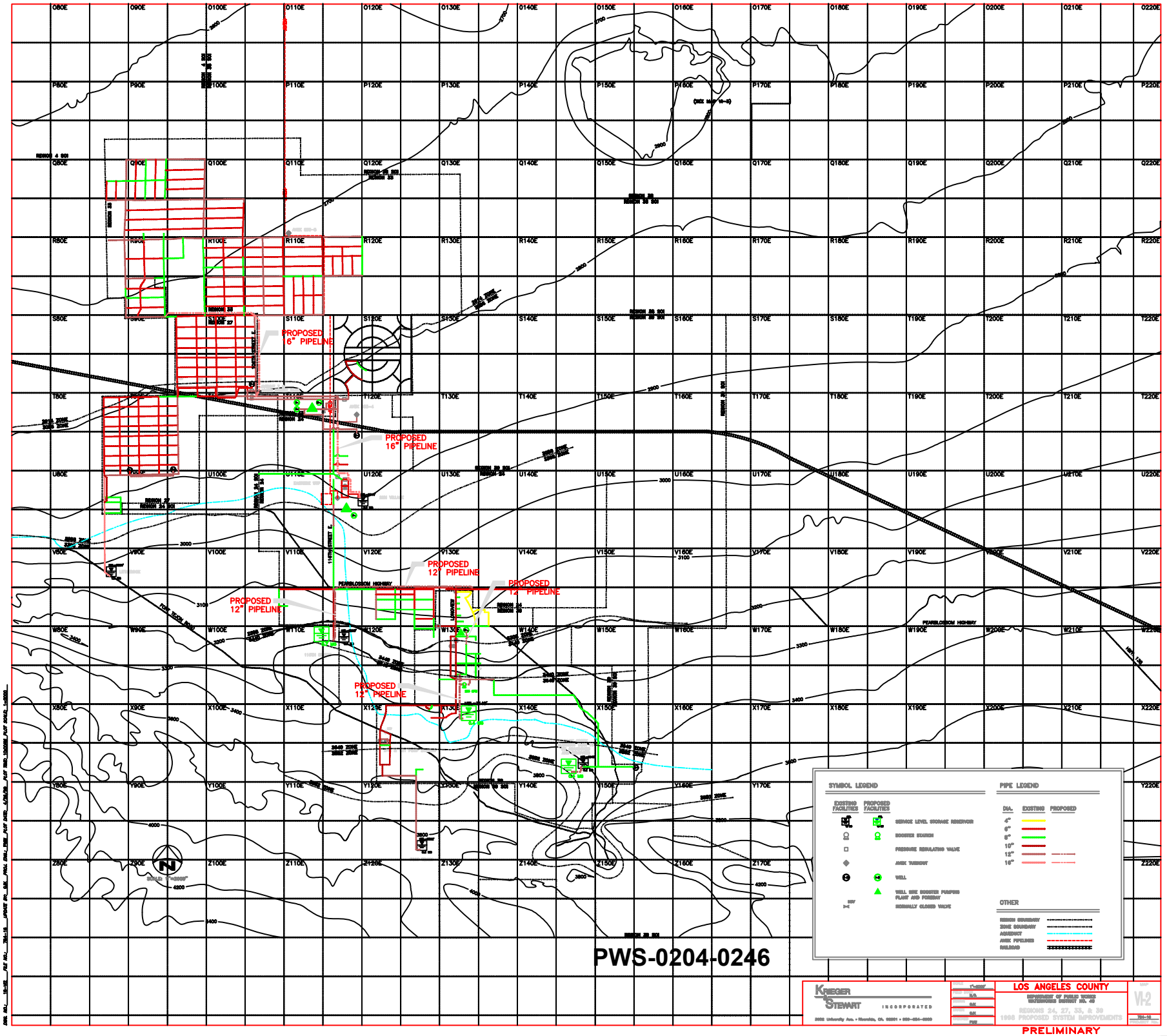
SCALE 1"=4000'
FIELD BOOK N/A
DESIGN GJK
DRAWN GJK
CHECKED PWM

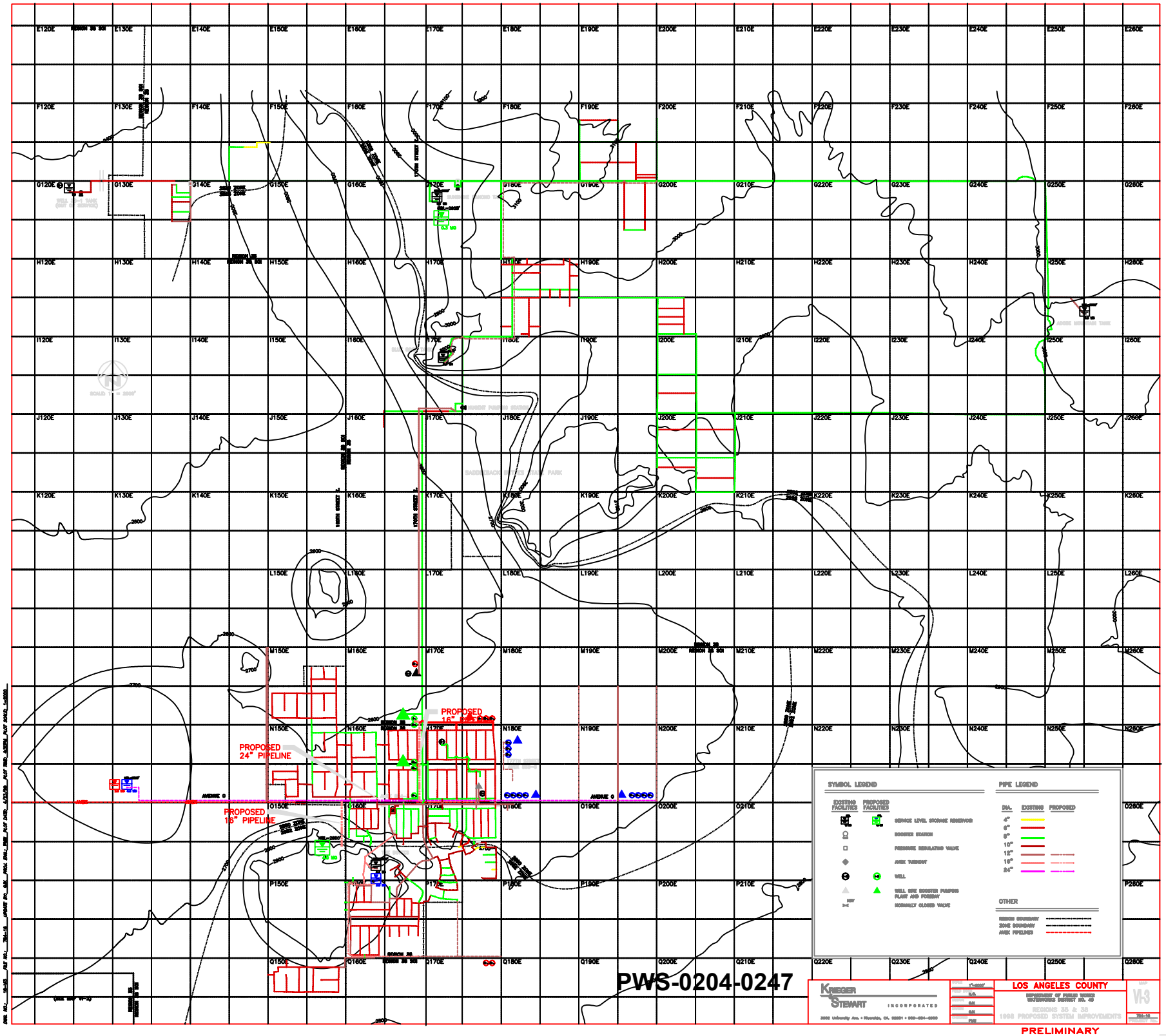
LOS ANGELES COUNTY

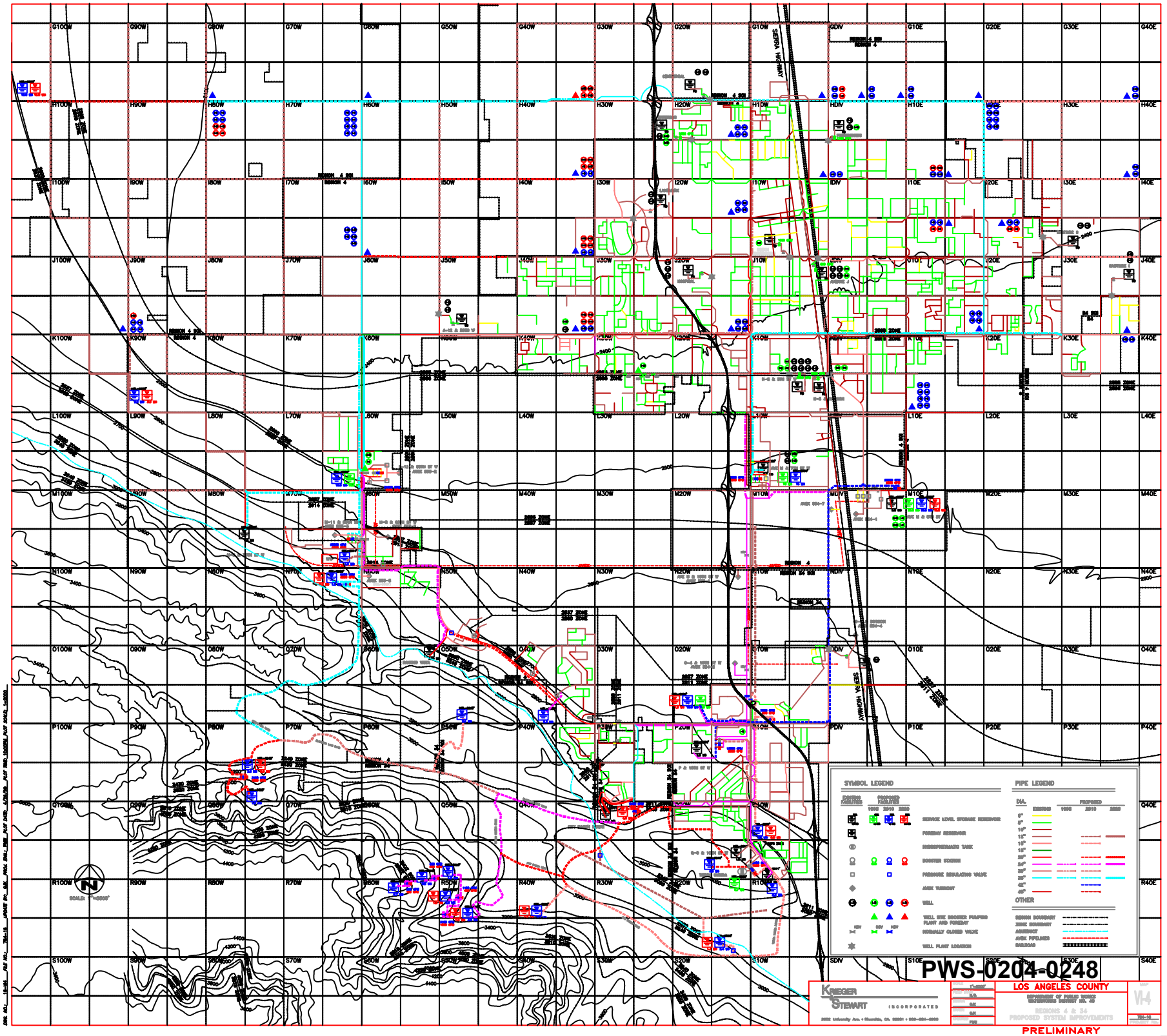
MASTER PLAN OF WATER FACILITIES
FOR WATERWORKS DISTRICT NO. 40
REGION 4 - LANCASTER
REGION 34 - DESERT HIGHLANDS
2010, 2020 PROJECTED DEMAND AREAS
(ATTACHMENT TO DEMAND PROJECTION TABLES APPENDIX B)

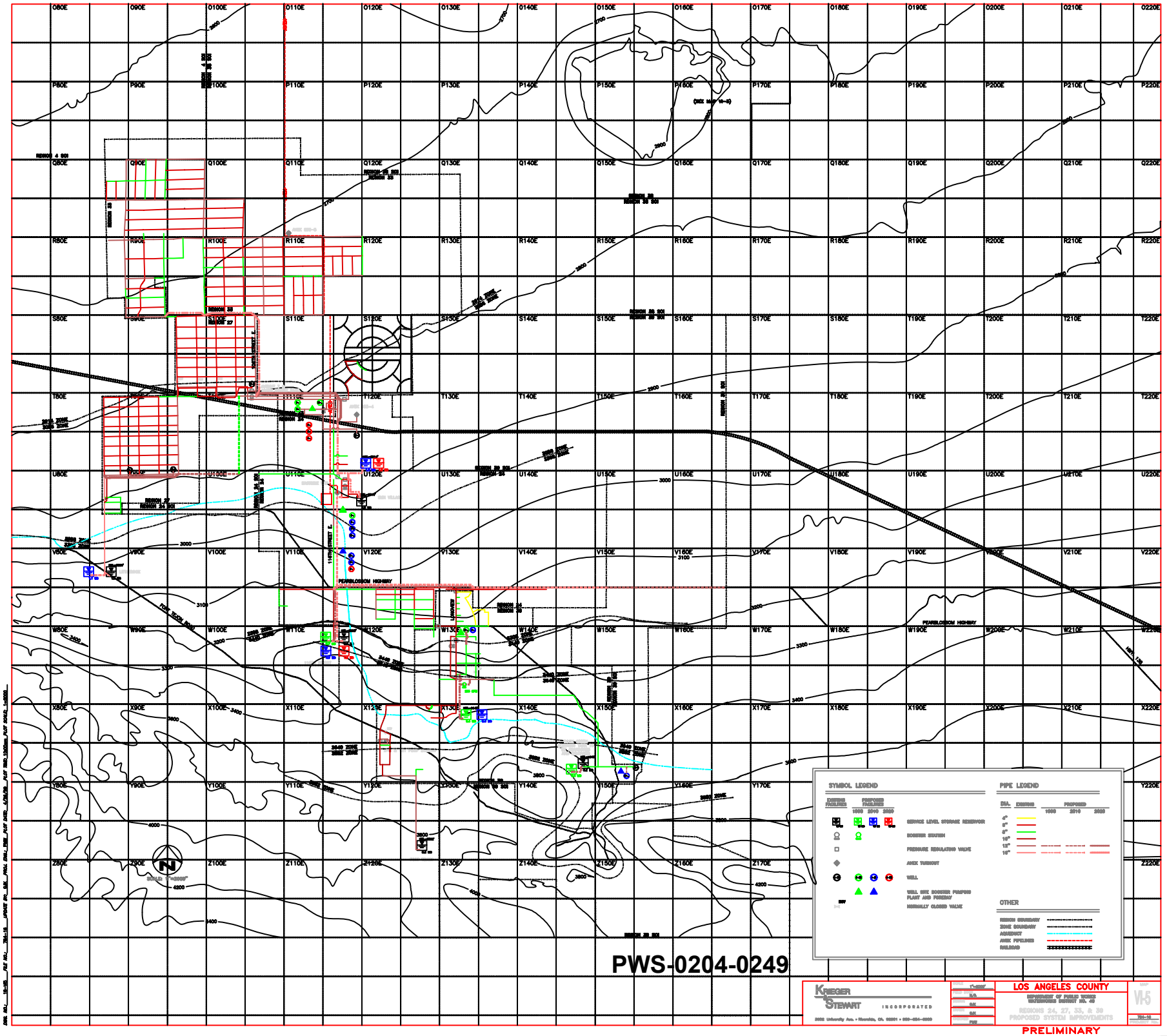
SHEET 1 OF 1 SHEETS
784-16 PROJECT NO.

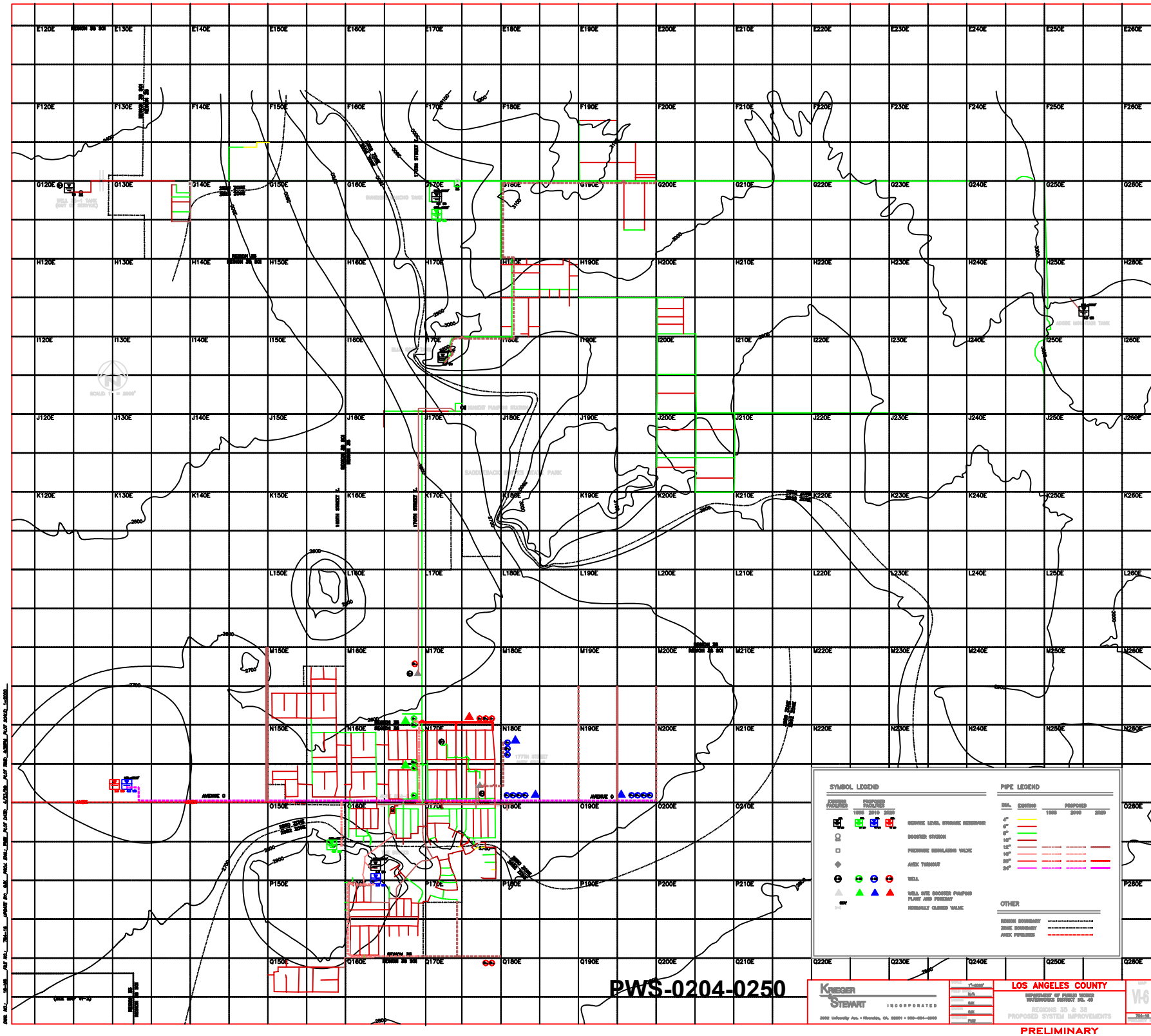

PROPOSED 36" PIPELINE
PROPOSED 30" PIPELINE
PROPOSED 30" PIPELINE
PROPOSED 36" PIPELINE
PROPOSED 24" PIPELINE
PROPOSED 36" PIPELINE
PROPOSED 36" PIPELINE
PROPOSED 24" PIPELINE
SIERRA HIGHWAY
SIERRA HIGHWAY
SYMBOL LEGEND
EXISTING FACILITIES
PROPOSED FACILITIES
SERVICE LEVEL STORAGE RESERVOIR
FOREBAY RESERVOIR
HYDROPNEUMATIC TANK
BOOSTER STATION
PRESSURE REGULATING VALVE
AVAK TURNOUT
WELL
WELL SITE BOOSTER PUMPING PLANT AND FOREBAY
NORMALLY CLOSED VALVE
WELL PLANT LOCATION
PIPE LEGEND
DIA.
EXISTING
PROPOSED
OTHER
REGION BOUNDARY
ZONE BOUNDARY
AQUEDUCT
AVEK PIPELINES
RAILROAD
PWS-0204-0245
KRIEGER STEWART
INCORPORATED
LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS
WATERWORKS DISTRICT NO. 40
REGIONS 4 & 34
1998 PROPOSED SYSTEM IMPROVEMENTS
VI-1
PRELIMINARY


PROPOSED 16" PIPELINE
PROPOSED 16" PIPELINE
PROPOSED 12" PIPELINE
PROPOSED 12" PIPELINE
PROPOSED 12" PIPELINE
PROPOSED 12" PIPELINE
PEARBLOSSOM HIGHWAY
PEARBLOSSOM HIGHWAY
115TH STREET E.
SYMBOL LEGEND
EXISTING FACILITIES
PROPOSED FACILITIES
SERVICE LEVEL STORAGE RESERVOIR
BOOSTER STATION
PRESSURE REGULATING VALVE
ANGLE TURNOUT
WELL
WELL SITE BOOSTER PUMPING PLANT AND FOREBAY
NORMALLY CLOSED VALVE
PIPE LEGEND
DIA.
EXISTING
PROPOSED
4"
6"
8"
10"
12"
16"
OTHER
REGION BOUNDARY
ZONE BOUNDARY
AQUEDUCT
ANGLE PIPELINE
RAILROAD
PWS-0204-0246
KRIEGER & STEWART INCORPORATED
LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS
WATERWORKS DISTRICT NO. 40
REGIONS 24, 27, 33, & 36
1998 PROPOSED SYSTEM IMPROVEMENTS
VI-2
PRELIMINARY


PROPOSED 16" PIPELINE
PROPOSED 24" PIPELINE
PROPOSED 16" PIPELINE
SYMBOL LEGEND
EXISTING FACILITIES
PROPOSED FACILITIES
STORAGE LEVEL STORAGE RESERVOIR
BOOSTER STATION
PRESSURE REGULATING VALVE
ANNEX TURNOUT
WELL
WELL SITE BOOSTER PUMPING PLANT AND FOREBAY
NORMALLY CLOSED VALVE
PIPE LEGEND
DIA.
EXISTING
PROPOSED
4"
6"
8"
10"
12"
16"
24"
OTHER
REGION BOUNDARY
ZONE BOUNDARY
ANNEX PIPELINES
PWS-0204-0247
KRIEGER STEWART INCORPORATED
LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS
WATERWORKS DISTRICT NO. 40
REGIONS 3B & 3B
1968 PROPOSED SYSTEM IMPROVEMENTS
VI-3
PRELIMINARY


SYMBOL LEGEND
PIPE LEGEND
GROUND ELEVATION
PROPOSED
1990
2010
2020
GROUND LEVEL STORAGE RESERVOIR
STANDBY RESERVOIR
HYDROPNEUMATIC TANK
BOOSTER STATION
PRESSURE REGULATION VALVE
AIR VALVE
WELL
WELL SITE BOOSTER PUMPING PLANT AND FOREBAY
NORMALLY CLOSED VALVE
WELL PLANT LOCATION
DIA.
EXISTING
PROPOSED
OTHER
REGION BOUNDARY
ZONE BOUNDARY
AQUEDUCT
AVEK PIPELINES
RAILROAD
SIERRA HIGHWAY
SCALE: 1"=2000'
PWS-0204-0248
KRIEGER STEWART
INCORPORATED
LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS
WATERWORKS DIST. 40
REGIONS 4 & 34
PROPOSED SYSTEM IMPROVEMENTS
PRELIMINARY


SYMBOL LEGEND
PIPE LEGEND
OTHER
SERVICE LEVEL STORAGE RESERVOIR
BOOSTER STATION
PRESSURE REGULATING VALVE
ANEX TURNOUT
WELL
WELL SITE BOOSTER PUMPING PLANT AND FOREBAY
NORMALLY CLOSED VALVE
PEARBLOSSOM HIGHWAY
115TH STREET E.
PWS-0204-0249
LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS
WATERWORKS DISTRICT NO. 40
REGIONS 24, 27, 35, & 36
PROPOSED SYSTEM IMPROVEMENTS
PRELIMINARY


SYMBOL LEGEND
EXISTING FACILITIES
PROPOSED FACILITIES
1995 2010 2020
SERVICE LEVEL STORAGE RESERVOIR
BOOSTER STATION
PRESSURE REGULATING VALVE
AVEK TURNOUT
WELL
WELL SITE BOOSTER PUMPING PLANT AND FOREBAY
NORMALLY CLOSED VALVE
PIPE LEGEND
DIA.
EXISTING
PROPOSED
1995
2010
2020
4"
6"
8"
12"
16"
20"
24"
OTHER
REGION BOUNDARY
ZONE BOUNDARY
AVEK PIPELINES
PWS-0204-0250
KRIEGER STEWART INCORPORATED
LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS
WATERWORKS DISTRICT NO. 40
REGIONS 3B & 3B
PROPOSED SYSTEM IMPROVEMENTS
PRELIMINARY