Annual Report
Upper Los Angeles River Area Watermaster

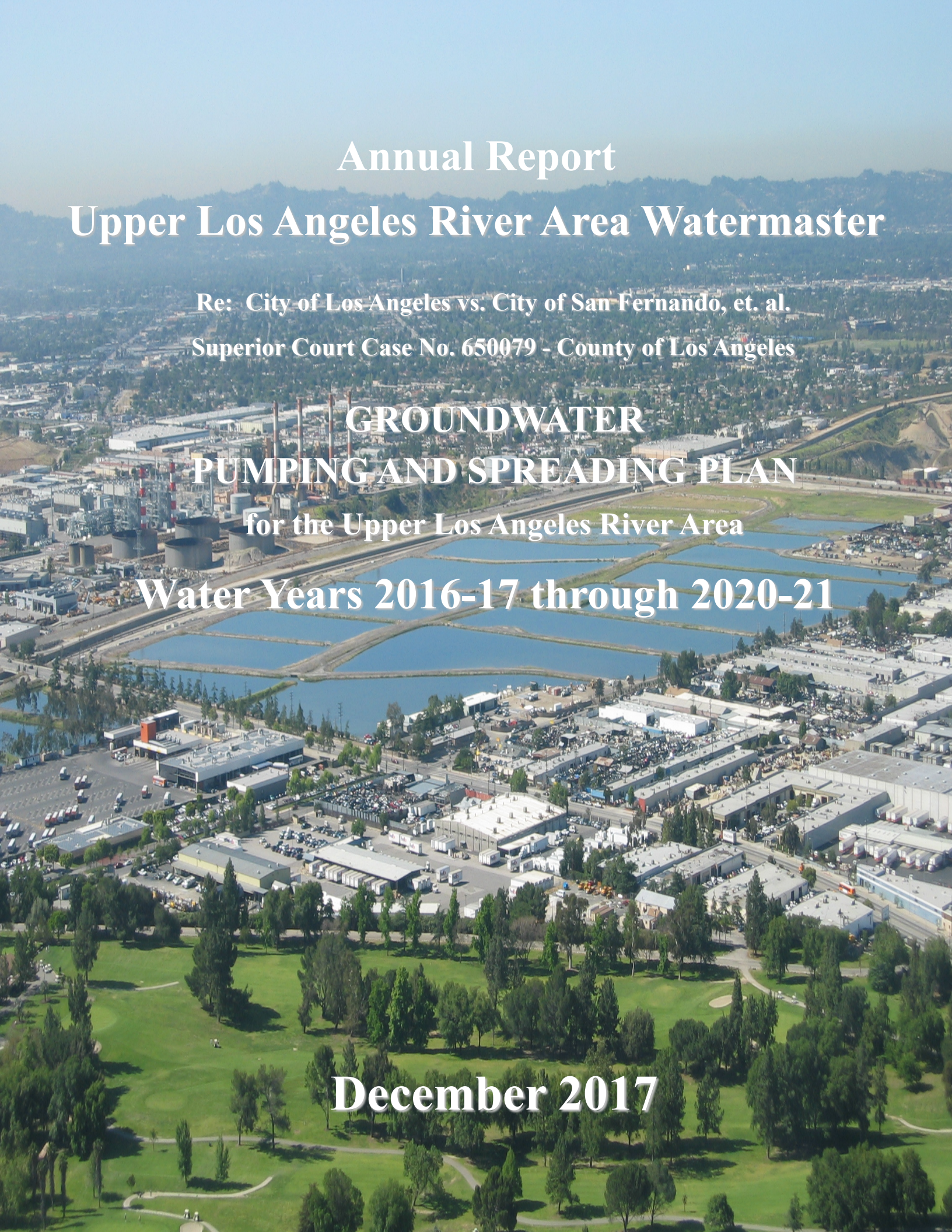
Re: City of Los Angeles vs. City of San Fernando, et. al.

Superior Court Case No. 650079 - County of Los Angeles

GROUNDWATER PUMPING AND SPREADING PLAN

for the Upper Los Angeles River Area

Water Years 2016-17 through 2020-21



December 2017

ANNUAL REPORT
UPPER LOS ANGELES RIVER AREA WATERMASTER

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GROUNDWATER PUMPING AND SPREADING PLAN FOR THE UPPER LOS ANGELES RIVER AREA (ULARA) LOS ANGELES COUNTY, CALIFORNIA

Water Years 2016-17 through 2020-21
October 2016 – September 2021

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ULARA Watermaster Website (http://ULARAwatermaster.com).

December 2017

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I. EXECUTIVE SUMMARY

As the Court-appointed Watermaster for the adjudicated Upper Los Angeles River Area (ULARA), I am pleased to submit this Annual Report for the Groundwater Pumping and Spreading Plan for Water Years 2016-17 through 2020-21 (i.e., for the period from October 2016 through September 2021). Note that this Groundwater Pumping and Spreading Plan is being submitted to the Court later than its anticipated July 2017 filing date. Due to the delayed receipt of data necessary for analysis, reporting and timely finalization of the report, this current report is being provided to the Court in April 2020. To avoid confusion with the submittal to the Court of the subsequent Annual Pumping and Spreading Plan for Water Years 2017-18 through 2021-22, this current report has been purposely dated December 2017.

Preparation of this Annual Report is in compliance with Section 5.4 of the Policies and Procedures document (as developed by the original ULARA Watermaster), which established the Watermaster's responsibility for management of the four groundwater basins in ULARA (the San Fernando, Verdugo, Sylmar and Eagle Rock basins). Also provided in this Groundwater Pumping and Spreading Plan, as appendices, are the individual pumping and spreading plans submitted by each of the five major pumping Parties in ULARA (the cities of Burbank, Glendale, Los Angeles and San Fernando, and the Crescenta Valley Water District) for their proposed operations during Water Years 2016-17 through 2020-21. Further, this report discusses the possible changes in recharge, spreading, pumping rates and pumping patterns, especially in relation to the available plans for cleanup of the contaminated groundwater in the eastern portion of the San Fernando Groundwater Basin (SFB).

In the current water year, above-average rainfall in the region created an increase local stormwater supplies available for spreading in the ULARA spreading basins, and native water spreading totals thus far in Water Year 2016-17 are higher than the sum of all spreading operations that took place from Water Year 2012-13 through Water Year 2015-16. In addition, the above-average statewide rainfall has allowed for a significant increase in deliveries of Los Angeles Aqueduct (LAA) water to ULARA, which resulted in an overall decrease in groundwater extractions to date in Water Year 2016-17. However, the cities of Los Angeles and San Fernando continued to experience pumping difficulties in the Sylmar Basin as a result of local groundwater contamination. Both of these Parties also expect to pump less than their annual entitlements from the SFB. Overall pumping in the SFB is expected to be less than its long-term average during the upcoming water year, primarily due to the recent availability of significant volumes of imported LAA water. Consistent with past practices, the cities of Burbank and Glendale are on track to produce more

than their adjudicated water rights from SFB, pumped as part of groundwater cleanup operations within their respective USEPA Operable Units. The City of Los Angeles continues to experience considerable challenges with groundwater contamination in its water-supply wells in the SFB and continues to implement changes to their system (such as wellhead treatment facilities), where possible. In addition, work by the City of Los Angeles to construct new and/or replacement water wells in the Sylmar Basin has been ongoing to further increase its supply of local groundwater. For the Verdugo Basin, the Crescenta Valley Water District (CVWD), due primarily to declining water levels, and Glendale, due to its limited local pumping capacity, expect to produce less than their adjudicated water rights from this basin during Water Year 2016-17. There are no municipal-supply wells in the Eagle Rock Basin, the smallest of the four separate groundwater basins in ULARA.

There are currently five major groundwater cleanup facilities in operation in ULARA; each facility has its own extraction wells and treatment plant. These include: the North Hollywood Operable Unit (NHOU) and the Pollock Wells Treatment Plant, both of which are located in the City of Los Angeles; the Burbank Operable Unit (BOU) in Burbank; the Glendale Operable Unit (GOU), which includes the Glendale North Extraction Wells in Glendale and the Glendale South Extraction Wells in the City of Los Angeles; and the CVWD Glenwood Nitrate Water Treatment Plant in La Crescenta. In addition, the City of Los Angeles continues to operate wellhead treatment facilities at a few of the twelve wells in its Tujunga Wellfield in the SFB. Both the City of San Fernando and CVWD are working to bring new nitrate treatment plants online in the Sylmar Basin and the Verdugo Basin, respectively.

The groundwater model for the SFB is updated annually by the Watermaster Support Services group at the Los Angeles Department of Water and Power (LADWP), and it has been used to simulate the combined effects of the projected pumping and spreading operations on groundwater elevations in this basin for the five-year period ending September 30, 2021. Water levels simulated by the model are projected to increase in some areas of the SFB as a result of: the projected future spreading of stormwater and imported Metropolitan Water District of Southern California (MWD) water; increased deliveries of LAA Water; and the reduction of pumping by the City of Los Angeles. Some "pumping troughs" or areas of declining water levels are identified as a result of ongoing pumping operations in those areas. The City of Los Angeles has had to reduce pumping in some of its wellfields in the SFB in response to ongoing water quality concerns regarding the existence of certain contaminants at concentrations that exceed their respective regulatory limits in the groundwater. As a result, LADWP has begun evaluating potential response actions to restore the beneficial use of groundwater in the vicinity of its various wellfields. These efforts include the study of appropriate response actions as well as other analyses and activities to evaluate

appropriate response actions. While additional work is required to evaluate the appropriate interim and final response actions for each area, one potential set of alternatives would consist of the siting, design and construction of a series of local and centralized water treatment facilities that would treat and produce water for potable use. In addition, wellhead treatment in the Tujunga wellfield has allowed for some increased groundwater extraction from the SFB by LADWP.

Also noteworthy are the simulated groundwater elevation contours in the areas near the BOU wells, which appear to show some possible effects of plume containment by those wells. The estimated cumulative amounts of extraction have been projected to exceed the cumulative amounts of recharge by approximately 54,768 acre-feet (AF) over the next five years, as simulated by the LADWP model using projections of future pumping and spreading operations provided by the ULARA Parties for this modeling work.

In closing, I appreciate the effort that each Party has expended to provide its individual Spreading and Pumping Plan for the next five water years, and express my gratitude to each of those Parties for providing information and data that were essential to the preparation of this Annual Pumping and Spreading Plan document for Water Years 2016-17 through 2020-21. Also much appreciated has been the continued assistance of the Watermaster Support Services group at LADWP (including Mr. Hadi Jonny, Ms. Fatema Akhter, Mr. Rafael Villegas, Mr. Manuel Aguilar, Mr. Chris Repp, Mr. Scott Hungerford) in helping with data analyses, modeling, and preparation of the figures for this report.

RICHARD C. SLADE
ULARA Watermaster

II. INTRODUCTION

As a result of the groundwater contamination that was detected in certain municipal-supply water wells in the eastern portion of the San Fernando Basin in the late-1970s, the original ULARA Watermaster and Administrative Committee, together with the Los Angeles Regional Water Quality Control Board (RWQCB-LA), revised the ULARA Watermaster's Policies and Procedures document in late-1993 to help prevent further degradation of groundwater quality and to help limit the spread of contamination in all four ULARA groundwater basins. The Policies and Procedures document was revised again by that Watermaster in February 1998 to organize the material into a more comprehensive document.

Section 5.4 of the Policies and Procedures requires each of the five municipal-supply purveyors (Parties) in ULARA to prepare its own annual Groundwater Pumping and Spreading Plan for each successive five-year period. These five Parties include the cities of Burbank, Glendale, Los Angeles and San Fernando as well as CVWD. Each of these municipal-supply pumpers is required to annually submit (on or before May 1 of each water year) its own Groundwater Pumping and Spreading Plan to the ULARA Watermaster in fulfillment of this requirement. Each plan is to include the projected groundwater pumping and spreading volumes, recent water quality data for each active water well, and possible modifications planned for key facilities owned and/or operated by that Party (e.g., constructing or destroying wells, building or modifying treatment plants, etc.) for the next five-year period.

The ULARA Watermaster is required to: evaluate the five individual plans with regard to the potential impacts of the combined pumping and spreading activities by all Parties related to the implementation of the San Fernando Judgment of January 26, 1979; and provide, if needed, recommendations for improving groundwater management and/or for helping to protect groundwater quality in the ULARA groundwater basins. The Watermaster's evaluation and recommendations are to be included in each annual Groundwater Pumping and Spreading Plan, and the Administrative Committee is to review and approve the plan so that it may be provided to the Court in July of each water year.

This Annual Report represents the Groundwater Pumping and Spreading Plan for the five water year period of 2016-17 through 2020-21 for ULARA, and it has been prepared pursuant to Section 5.4 of the Policies and Procedures document. This Groundwater Pumping and Spreading Plan provides basic information to the Administrative Committee for use in possibly improving basin management, providing protection of the water rights of each Party, and protecting water quality within ULARA.

III. PLANS FOR THE 2016-17 THROUGH 2020-21 WATER YEARS

A. Projected Groundwater Pumping for 2016-17 Water Year

The estimated pumping capacities of the municipal-supply water wells owned by each of the five Parties within the San Fernando, Sylmar and Verdugo basins are listed on Table 3-1. There are no municipal-supply wells in the Eagle Rock Basin, so this small basin is not listed on Table 3-1 and is not discussed further herein. Also shown on Table 3-1 are the number of active wells owned by each Party in each basin, the total number of municipal-supply wells owned by each Party in each basin, and the estimated pumping capacity of each well (as reported by each Party). The SFB has the most Parties (3) and the total largest number of currently active municipal-supply water wells (76); the Sylmar Basin has the fewest active wells (5). The number of active wells in each basin is subject to change each year as a result of various problems, such as water level declines, mechanical problems, and/or impacts from groundwater contamination.

Table 3-1A shows the actual and projected volumes of groundwater pumped by the five Parties for Water Year 2016-17 in the San Fernando, Sylmar and Verdugo groundwater basins. Values listed on Table 3-1A represent the volume of groundwater pumped by each Party for the period of October 2016 through March or April 2017 (depending on the Party), as reported to the Watermaster by each Party. Projected values shown on Table 3-1A are the groundwater extractions estimated (or projected) by each Party for the remainder of Water Year 2016-17 (i.e., from April or May 2017 through September 2017) for each of the three ULARA groundwater basins in which municipal-supply water wells are located. As seen on Table 3-1A, the five Parties expect to pump a combined total of 65,767 acre feet (AF) of groundwater during Water Year 2016-17 from these three ULARA groundwater basins. Of those total groundwater extractions by the five Parties for Water Year 2016-17, 59,441 AF are from SFB, 3,620 AF are from Sylmar Basin and 2,706 AF are from Verdugo Basin.

The total volume of groundwater expected to be pumped by all Parties during the current water year (65,767 AF) is 40,465 AF less than the 106,232 acre-feet per year (AFY) long-term historical average extractions from these three basins for the period of Water Year 1979-80 to 2015-16, and 25,413 AF less than the five-year average of 91,180 AFY. The estimated total combined volume of pumping by all Parties from these three basins for the next water year (2017-18) is shown on Table 3-1B to be 71,899 AF, which is also less than the historic long-term (1979-2016) average for these basins (106,232 AFY).

As shown on Tables 3-1A and 3-1B, the City of Burbank plans to pump 10,262 AF of groundwater from the SFB in the 2016-17 Water Year; this volume exceeds its annual pumping entitlement

from this basin. Groundwater extractions by Burbank for Water Year 2016-17 are projected to be 244 AF less than its five-year average of 10,506 AFY, and 3,905 AF higher than its long-term average of 6,357 AFY for the period of Water Year 1979-80 to 2015-16 (these historic averages include extractions by Valhalla Mortuary). Valhalla Mortuary no longer extracts groundwater from its onsite water wells because it converted to recycled water use for onsite irrigation-supply in January 2016. Burbank's annual entitlement for the 2016-17 Water Year is 3,485 AF, based on its 20 percent import return credit (as identified in the 2015-16 Annual Watermaster Report).

Existing and planned extractions by Burbank are required by its United States Environmental Protection Agency (USEPA)-mandated groundwater clean-up operations by its BOU facilities; the BOU has a total pumping capacity of 9,000 gallons per minute (gpm), which represents about 14,000 AFY. Burbank can account for its pumping in excess of its annual import return credit by electing to purchase as much as 4,200 AFY of Physical Solution water from the City of Los Angeles. Burbank can also purchase and import water from MWD and store it in the SFB, or it may choose to deliver that imported water to the City of Los Angeles in exchange for water credits from the City of Los Angeles. Since the completion of the Foothill Feeder connection, Burbank can spread MWD water in the Pacoima spreading grounds and accumulate credit for the spread water. As of May 2017, Burbank had spread 6,967 AF of MWD water in the Pacoima spreading grounds during the months of October through December in Water Year 2016-17. Burbank can also use a portion of its *available* groundwater storage credits, which were 1,291 AF as of October 1, 2016 (Burbank also has an additional 12,957 AF of stored water credits *on reserve*). For the remaining four water years discussed in this plan, Burbank plans to purchase about 7,200 AFY of Physical Solution credits, untreated imported water, or a combination of the two.

CVWD plans to pump 1,390 AF in Water Year 2016-17 from Verdugo Basin; this volume is less than its current full right of 3,294 AFY from this basin. This planned pumping by CVWD from Verdugo Basin is 1,394 AF less than its long-term average of 2,784 AFY for the period of 1979-2016 and 1,005 AF less than its five-year average of 2,399 AFY (for Water Years 2011-2016).

In the 2016-17 Water Year, Glendale plans to pump 7,832 AF of groundwater from the SFB. This volume is 127 AF more than Glendale's five-year average of 7,705 AFY (2011-2016), and 3,452 AF higher than its long-term historic (1979-2016) average pumping of 4,380 AFY from the SFB. Glendale's annual water right is 4,117 AFY from SFB, based on its 20 percent import return credit for water delivered to its service area within this basin during the 2015-16 Water Year. Glendale has the right to purchase up to 5,500 AFY of Physical Solution water from the City of Los Angeles to cover the excess pumping. Glendale can also use a portion of its *available* stored water credits,

which totaled 3,019 AF as of October 1, 2016 (Glendale also has an additional 30,315 AF of stored water credits *on reserve*).

In the Verdugo Basin, Glendale plans to pump 1,316 AF in Water Year 2016-17; this volume is 846 AF less than its long-term (1979-80 to 2015-16) historic average extraction of 2,162 AFY from this basin, and represents a decrease of 156 AF relative to its average pumping of 1,472 AFY during the recent five-year period of 2011-2016 (see Table 3-1B). Glendale has been taking steps to increase its pumping capacity within the Verdugo Basin by rehabilitating its Glorietta Well 6 in 2016 and its Glorietta Wells 3 and 4 in 2013. Glendale also began rehabilitation of Glorietta Well 3 in late-2016. In Water Year 2010-11, Glendale rehabilitated an old, unused well on Foothill Boulevard and connected it to the City's water supply system in mid-2011. Additionally, a new well was constructed at the Rockhaven Sanitarium in mid-2011, but the well could not be used immediately because its pumped groundwater contained elevated concentrations of nitrate. In 2014, the City of Glendale and CVWD applied for and were awarded a grant through the Greater Los Angeles County Integrated Regional Water Management (IRWM) Group for a joint project to make use of groundwater from the Rockhaven Well. Groundwater extracted from the Rockhaven Well is now conveyed to CVWD's Glenwood Nitrate Water Treatment Plant for nitrate removal and disinfection, and will then be served to the La Crescenta-Montrose area. The volume of groundwater extracted from the Rockhaven Well is counted against the adjudicated water right of Glendale in the Verdugo Basin; those extractions will be reported to the ULARA Watermaster on a monthly basis; Glendale Water and Power (GWP) entered into an agreement with CVWD for this arrangement. Design and construction of the Rockhaven Well project was completed in March 2016, at which time the well became operational.

In the current water year, the City of Los Angeles expects to pump 41,347 AF from the SFB. This volume is 43,600 AF less than this city's long-term (1979-80 to 2015-16) annual average of 84,947 AFY from this basin, and 23,863 AF less than its average pumping of 65,210 AFY over the last five water years (2011 to 2016). The City of Los Angeles expects to pump 820 AF of groundwater from the Sylmar Basin this current water year. This volume is 1,685 AF less than its 1979-80 to 2015-16 average of 2,505 AFY from this basin, but only 3 AF lower than its average pumping of 823 AFY by its wells within this basin. As of October 1, 2016, the City of Los Angeles' *available* stored water credits were 47,419 AF in the SFB (the City also has an additional 476,110 AF of stored water credits *on reserve* in the SFB). In the Sylmar Basin, the City of Los Angeles currently has 9,014 AF of "frozen" water credits, or 13,733 AF of credits using the 5-year calculation method.

Near-record levels of rain and snowpack were observed in the Eastern Sierras during the Winter of 2017. This condition has created extremely large quantities of surface water runoff which would

then tend to allow Los Angeles to increase LAA deliveries. As a result, the City of Los Angeles has decreased its pumping in ULARA beginning in February 2017, and this curtailment is anticipated to continue through the end of the current water year.

For Water Year 2016-17, the City of San Fernando plans to pump 2,800 AF from the Sylmar Basin. This volume is 268 AF less than its average pumping from the Sylmar Basin for the past five years of 3,068 AFY, and 296 AF less than its long-term average for 1979 to 2016 of 3,096 AFY. San Fernando currently has 404 AF of "frozen" water credits, or 2,001 AF of credits using the 5-year calculation method.

Estimated pumping capacities of the ULARA wellfields are provided in Table 3-1A. Actual and projected amounts of pumping and spreading by the major parties during Water Year 2016-17 are shown in Tables 3-1A, 3-1B, and 5-1A.

B. Constraints on Pumping as of 2016-17

CONSTRAINTS ON PUMPING IN THE SAN FERNANDO BASIN

City of Burbank - The USEPA Consent Decree Project for the BOU became fully operational on January 3, 1996. The sources of groundwater for treatment at the BOU are the groundwater extractions by Burbank Wells VO-1 through VO-8; the treatment plant has a capacity of 9,000 gpm.

The BOU, funded by Lockheed-Martin under a USEPA Consent Decree, is owned and operated by the City of Burbank at the expense of Lockheed Martin. The BOU uses air stripping (vapor-phase) and liquid-phase granular activated carbon (VPGAC and LPGAC, respectively) to remove VOCs from groundwater (local groundwater also contains elevated concentrations of nitrate and chromium). Over the past few years, several process enhancements and repairs were made to the LPGAC vessels and to the VPGAC vessels. Following these treatments, the treated water is blended with imported water from the MWD for delivery within the City of Burbank. There may be 500 AFY of such deliveries beginning in Water Year 2017-18. The increased groundwater extractions and MWD purchased water for blending associated with the deliveries to the City of Los Angeles are not included in Burbank's MWD purchases, because they will be reported as City of Los Angeles demands.

The City of Burbank is also concerned about hexavalent chromium [Cr(VI)] in the groundwater produced by wells within the BOU.

More information about the BOU can be found via USEPA's website, https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902251.

As part of the requirement to close the first consent decree, USEPA required Burbank to demonstrate that the BOU would operate at its design capacity. In the fall of 2010, Burbank successfully completed a 60-day performance test at the BOU operating at 9,000 gpm. To ensure the effectiveness of the remedy, USEPA monitored water level drawdown and the extent of the cone of depression by conducting a multi-well pumping test for 30 days during the demonstration time frame. USEPA used water levels and pumping ratio data monitored during this pumping test to update hydraulic conductivity, transmissivity and storativity values for the BOU in the Basin-wide groundwater model. The BOU treated 9,377 AF of groundwater in Water Year 2015-16.

Groundwater extracted by the City of Burbank also contains chromium, which cannot be removed by the existing BOU or by Burbank's other groundwater treatment facility (the

Lake Street GAC Treatment Plant). Operations at BOU are currently limited by fluctuations in city-wide water demands and blending requirements for managing chromium concentrations. Burbank has been blending the pumped groundwater with imported water to keep the concentration of total chromium at or below 7 micrograms per liter (µg/L). The GAC Treatment Plant is configured to treat groundwater produced from Burbank Well Nos. 7 and 15, but the plant will remain on an active status and will not be operated except for water quality testing of its wells, and for emergencies. No capital improvement projects are planned for the GAC Treatment Plant, which has a treatment capacity of 2,000 gpm. In Water Year 2015-16, the wells and the GAC Treatment Plant were operated to replace recycled water in the cooling towers for the City's power plant when the recycled water supply was reduced due to a major sewer force main being shut down. The amount of water produced and delivered to the Magnolia Power Project cooling towers for industrial cooling was 65 AF.

The City of Burbank currently contracts with the consulting firm of TerranearPMC, for day-to-day operation of the BOU.

City of Glendale - Construction of the Glendale Operable Unit (GOU) allowed for treated water to be available for delivery in December 2000. The system includes four Glendale North OU extraction wells (with a total pumping capacity of 3,300 gpm) and four Glendale South OU extraction wells (with a total capacity of 1,700 gpm). The treatment process uses aeration and LPGAC to treat VOC-contaminated groundwater and then blends the treated water with imported MWD water at the Grandview Pump Station. As a result of elevated Cr(VI) concentrations in the pumped groundwater, only a small quantity of water was initially pumped and delivered. Full operation started on January 6, 2002. The wells were being pumped and blended with MWD water in a manner to limit Cr(VI) concentrations to achieve the City's target of 5 µg/L for this constituent.

The City managed a major research effort on identifying viable treatment technologies for the removal of Cr(VI) from its pumped groundwater. In 2010, Glendale constructed the Weak Base Anion (WBA) Chromium Removal facility to remove Cr(VI) from groundwater pumped from GOU Well GS-3 using WBA exchange technology. The City also constructed a 100-gpm demonstration-scale facility adjacent to the Glendale Water Treatment Plant (GWTP), which uses reduction, coagulation and filtration (RCF) technology with microfiltration to remove Cr(VI). These facilities have been effective in removing Cr(VI) in the extracted groundwater to concentrations below 5 µg/L. The Hexavalent Chromium Removal Research Project Report was initiated in

February 2013, and was completed in 2015, followed by a Supplemental Project Report in December 2015.

To maintain the reliability of the GWTP water supply, the City also worked with the DDW and the Glendale Respondents Group (GRG) to construct the ninth GOU Well (GS-5) in the City of Los Angeles and a full-scale Weak-Base Anion Exchange (WBA) facility at the GWTP to treat the Cr(VI) at the GN-3 Well. The new WBA facility and the GS-5 Well began full operation in December and November 2016, respectively. With the operation of the new WBA facility and the ability of blending with Metropolitan imported water, Glendale continues to meet the goal of less than 5 μg/L Cr(VI) entering the distribution system.

City of Los Angeles - All wellfields operated by the City of Los Angeles within the SFB have been impacted to varying degrees by groundwater contamination. Most significantly this groundwater contamination has been caused by the volatile organic compounds (VOCs) trichloroethylene (TCE), perchloroethylene (PCE) and 1,4-dioxane. Furthermore, increasing concentrations of Cr(VI) and perchlorate, as well as other emerging chemicals have been detected in the City's wells in the SFB. VOC concentrations have exceeded their respective State Primary Maximum Contaminant Levels (MCLs) in a large percentage of the active wells operated by the City of Los Angeles. Whereas the City of Los Angeles' five-year pumping plans reflect continued reductions in its groundwater pumping, the City is responding to the challenges of groundwater contamination by pursuing plans to build new treatment facilities for contaminant removal. When completed, these facilities will help restore the City of Los Angeles' ability to pump and serve potable groundwater to its customers.

CONSTRAINTS ON PUMPING IN THE SYLMAR BASIN

City of San Fernando - All groundwater pumped by the City of San Fernando is extracted from the Sylmar Basin. VOC contamination has not been detected in any of its municipal-supply wells in this basin. However, two of its wells have pumped groundwater with nitrate concentrations that have exceeded the State's Primary MCL for nitrate (as NO_3) of 45 milligrams per liter (mg/L). One of these wells (Well 7A) was placed on inactive status whereas the other well (Well 3) has been on stand-by status while awaiting implementation of a nitrate mitigation plan. Old septic systems and past agricultural practices in the region are the likely causes of these elevated nitrate concentrations in the local groundwater.

Current projections include activation of Well 7A by the end of 2017 and start-up of a new Envirogen ion exchange nitrate removal unit.

City of Los Angeles - The City of Los Angeles has not been able to pump its full adjudicated water right from the Sylmar Basin as a result of elevated TCE concentrations in at least two wells in its Mission Wellfield and also due to the physical deterioration of the infrastructure at this facility. To help address these limitations, the City of Los Angeles has implemented the Mission Wells Improvement Project. This project's goal is the rehabilitation and replacement of the City's deteriorating groundwater facilities in Sylmar Basin, including construction of three replacement production wells, a few monitoring wells, new piping, pump station upgrades, electrical upgrades, and controls. An application has been submitted to California Division of Drinking Water (DDW) to permit the operation of Well No. 10, one of the three new production wells in Sylmar Basin. The other three wells, Nos. 7, 8 and 9, will not be operated due to very low production capacity (Well No. 8) and/or concentrations of TCE, which exceed the State's Primary MCL for the constituent. The recently constructed on-site Chlorination Generation System has been permitted and is in operation, and Well No. 10 is expected to have a new submersible pump and flowmeter installed in June 2019.

CONSTRAINTS ON PUMPING IN THE VERDUGO BASIN

Crescenta Valley Water District - The groundwater rights of CVWD occur entirely within the Verdugo Basin. Groundwater contamination from VOCs has been negligible to date, but nitrate contamination is widespread and methyl tertiary butyl ether (MTBE), a component of gasoline, has also been detected in a few CVWD-owned wells. Elevated nitrate concentrations are mitigated in the water supply by treating a portion of the pumped groundwater using anion exchange at the existing Glenwood Nitrate Water Treatment Plant, and by blending untreated groundwater with treated groundwater and/or with imported MWD supplies in order to meet drinking water standards.

Following the initial detection of MTBE in 2005 in this basin, certain wells in its 12-well system have had MTBE concentrations as high as approximately 50 µg/L. In August 2006, concentrations of MTBE increased to values above its State Primary MCL of 13 µg/L in Well 7, whereupon this well was immediately taken out of service. In November 2006, the prior ULARA Watermaster responded by establishing the Verdugo Basin MTBE Task Force. Task force members included the California Department of Public Health (CDPH, now known as DDW), the RWQCB-LA, the Watermaster, GWP, CVWD, and various oil

companies and independent gas station owners in the Verdugo Basin. The Task Force had historically been meeting at the CVWD office on a bi-monthly basis to coordinate site-remediation activities among the various responsible parties.

In Water Year 2009-10, CVWD received a grant from the then CDPH under the Drinking Water Treatment and Research Fund for funding the installation of a GAC water treatment system for removal of MTBE at its Well 5. In February 2011, CVWD performed a pumping test at Well 5 to determine if the MTBE levels would increase or decrease during operational pumping activity. The results of the pumping test were that the MTBE concentrations in the groundwater remained steady at a concentration of 0.20 µg/L. CVWD was given permission by CDPH to place Well 5 back into service in March 2011 and, in addition, CDPH suspended CVWD's grant for funding the installation of the GAC at Well 5. Since the MTBE concentrations in Well 5 were below that constituent's State Secondary and State Primary MCLs, grant funding was put on hold until such time that MTBE concentrations might increase once again. In Water Year 2011-12, the grant funding was eliminated by the State, so if MTBE levels do rise again in its wells, CVWD will have to find a new funding source for the treatment. In Water Year 2015-16, the Task Force did not meet; it will reconvene at any time MTBE concentrations are higher than 1.0 µg/L in any CVWD well.

Declining water levels in the Verdugo Basin have also affected CVWDs ability to extract groundwater. In Water Year 2012-13, CVWD received a Local Groundwater Assistance (LGA) grant from DWR to perform a feasibility study for stormwater recharge within the Verdugo Basin. The study is a cooperative effort with the City of Glendale, the County of Los Angeles and other local stakeholders to determine if stormwater can be captured, stored and then recharged at Crescenta Valley County Park. The feasibility study started in August 2013 and work is still ongoing.

CVWD started well rehabilitation at its Well 8 at the end of Water Year 2015-16 and is planning to complete the work in Water Year 2016-17. In addition, CVWD is planning to perform well rehabilitation on its Well 7 in Water Year 2016-17 in an effort to obtain better well efficiency and to potentially increase groundwater production. CVWD also plans to construct a new groundwater production well within the next 3-5 years to help modernize and replace its aging well system.

City of Glendale - The City of Glendale has made only limited use of its current maximum adjudicated right of 3,856 AFY from the Verdugo Basin, due to water quality problems, groundwater level declines and limited extraction capacity in this basin. To increase the

utilization of its water rights, the City completed construction of the Verdugo Park Water Treatment Plant (VPWTP) in 1996. This facility treats water from the City's two low-capacity wells, and from a subsurface horizontal collection system within Verdugo Canyon.

In Water Year 2010-11, Glendale completed the rehabilitation of its Foothill Well and constructed its new Rockhaven Well in the Montrose area to further increase its extraction capacity from the Verdugo Basin. The Foothill Well was connected to the City's water supply system in mid-2011. In 2013, the City completed the rehabilitation of Glorietta Wells 3 & 4. The Rockhaven Well was completed and placed in operation in March 2016, in accordance with the treatment agreement between the City and CVWD. GWP also is planning to construct a new well in the next fiscal year to replace Glorietta Well 6, and has scheduled an evaluation of the Verdugo Basin groundwater supply and of the potential rehabilitation of Verdugo Wells A & B in its fiscal year 2018-19.

TABLE 3-1: ESTIMATED CAPACITY OF EXISTING WELLFIELDS

Party/Well Field	Number of Active Wells	Number of Standby Wells	Estimated Capacity (All Wells) (cfs)	(gpm)
SAN FERNANDO BASIN				
City of Los Angeles				
Aeration (NHOU)	7	---	2.5	1,122
Erwin	2	---	6.1	2,738
North Hollywood	14	3	55.5	24,910
Pollock	2	---	5.9	2,648
Rinaldi-Toluca	15	---	113.0	50,718
Tujunga	12	---	98.2	44,075
Verdugo	2	---	7.4	3,321
Whitnall	4	---	14.8	6,643
City of Burbank	8	2	24.5	11,000
City of Glendale	10	---	17.0	7,650
TOTAL	76	5	345.0	154,825
SYLMAR BASIN				
City of Los Angeles	2	---	5.0	2,244
City of San Fernando	3	1	8.0	3,610
TOTAL	5	1	13.0	5,854
VERDUGO BASIN				
CVWD	12	---	5.3	2,400
City of Glendale	6	---	5.0	2,240
TOTAL	18	---	10.3	4,640

Note:

A. There are no municipal-supply water wells in the Eagle Rock Basin.

TABLE 3-1A: HISTORIC AND PROJECTED GROUNDWATER EXTRACTIONS 2016-17

(Acre-feet)

Party/Well Field	2016			2017									Total
	Oct.	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
						SAN FERNANDO BASIN							
City of Los Angeles													
Aeration (NHOU)	0	54	54	77	36	74	100	104	100	104	104	100	907
Erwin	0	0	0	0	0	0	0	0	0	0	0	0	-
North Hollywood	1,710	1,531	1,182	5	4	172	0	0	0	0	0	0	4,604
Pollock	29	312	332	197	164	182	143	387	375	387	387	375	3,270
Rinaldi-Toluca	2,327	2,250	1,755	2,341	7	9	0	0	0	0	0	0	8,689
Tujunga	3,754	3,435	2,391	2,930	1,455	1,452	1,387	1,433	1,387	1,433	1,433	1,387	23,877
Verdugo	0	0	0	0	0	0	0	0	0	0	0	0	-
Whitnall	0	0	0	0	0	0	0	0	0	0	0	0	-
SUBTOTAL City of Los Angeles:	7,820	7,582	5,714	5,550	1,666	1,889	1,630	1,924	1,862	1,924	1,924	1,862	41,347
City of Burbank[A]	929	865	779	600	534	646	587	1,064	1,064	1,064	1,064	1,064	10,262
City of Glendale[B]	619	724	676	626	471	705	646	673	673	673	673	673	7,832
TOTAL San Fernando Basin:	**9,368**	**9,171**	**7,169**	**6,776**	**2,671**	**3,240**	**2,863**	**3,661**	**3,599**	**3,661**	**3,661**	**3,599**	**59,441**
						SYLMAR BASIN							
City of Los Angeles	0	0	0	0	0	0	0	166	161	166	166	161	820
City of San Fernando	247	220	198	176	155	203	223	276	276	276	276	276	2,800
TOTAL Sylmar Basin:	**247**	**220**	**198**	**176**	**155**	**203**	**223**	**442**	**437**	**442**	**442**	**437**	**3,620**
						VERDUGO BASIN							
Crescenta Valley Water Dist.	127	120	99	110	95	109	107	125	125	125	125	125	1,390
City of Glendale[D]	92	101	116	114	99	110	99	117	117	117	117	117	1,316
TOTAL Verdugo Basin:	**219**	**221**	**215**	**224**	**194**	**219**	**206**	**242**	**242**	**242**	**242**	**242**	**2,706**
ULARA TOTAL:	**9,834**	**9,612**	**7,582**	**7,176**	**3,020**	**3,662**	**3,292**	**4,345**	**4,278**	**4,345**	**4,345**	**4,278**	**65,767**

Notes:

A. Includes BOU.

B. Includes GOU, Forest Lawn and Grayson Power Plant.

C. Shaded cells denote projected values.

D. Includes production for CVWD's Rockhaven Well.

- There are no municipal-supply water wells in the Eagle Rock Basin.

- All values published in this table supersede values published in previous Groundwater Pumping and Spreading Plans for ULARA. Any errors discovered in previously published tables have been resolved upon discovery.

TABLE 3-1B: HISTORIC AVERAGE AND PROJECTED GROUNDWATER EXTRACTIONS

(Acre-feet)

Party/Wellfield	Historic Average Pumping (AFY)		Projected Groundwater Pumping (AF)				
			SAN FERNANDO BASIN				
City of Los Angeles	1979-2016[A]	2011-2016[B]	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
Aeration (NHOU)	1,173	786	907	1,262	1,086	1,089	1,086
Erwin	3,203	228	0	0	0	0	0
North Hollywood	24,266	13,168	4,604	6,633	13,587	14,533	16,686
Pollock	1,392	1,906	3,270	2,006	2,241	2,246	2,877
Rinaldi-Toluca	24,730	15,736	8,689	10,343	18,307	22,151	22,707
Tujunga	21,414	30,837	23,877	24,929	35,398	42,116	42,001
Verdugo	3,873	1,423	0	0	0	0	0
Whitnall	4,896	1,126	0	0	0	0	0
SUBTOTAL City of Los Angeles[C]	84,947	65,210	41,347	45,173	70,619	82,135	85,357
City of Burbank[D]	6,357	10,506	10,262	10,558	11,135	11,135	11,135
City of Glendale[E]	4,380	7,705	7,832	8,000	8,000	8,000	8,000
TOTAL San Fernando Basin:	**95,685**	**83,421**	**59,441**	**63,731**	**89,754**	**101,270**	**104,492**
			SYLMAR BASIN				
City of Los Angeles	2,505	823	820	2,172	4,170	4,170	4,170
City of San Fernando	3,096	3,068	2,800	2,900	2,900	2,900	2,900
TOTAL Sylmar Basin:	**5,601**	**3,892**	**3,620**	**5,072**	**7,070**	**7,070**	**7,070**
			VERDUGO BASIN				
Crescenta Valley Water District	2,784	2,395	1,390	1,660	1,845	1,980	2,130
City of Glendale[F]	2,162	1,472	1,316	1,436	1,436	1,436	1,436
TOTAL Verdugo Basin:	**4,946**	**3,868**	**2,706**	**3,096**	**3,281**	**3,416**	**3,566**
TOTAL ULARA:	106,232	91,180	65,767	71,899	100,105	111,756	115,128

Notes:

A. In prior reports, the long term-average included only muncipal well field pumping. Herein, the averages include physical solution pumping for Burbank, Glendale and CVWD (but not Los Angeles). Historic pumping averages include wells that are no longer in service.

B. 5-year average. Please note that in the historic report dated July 2011, this 5-year average did not include physical solution pumping.

C. Projections are not provided for the City of Los Angeles' Van Norman wells.
Production from this city's Van Norman wells are therefore not included in the long-term averages, the short-term averages, or the totals presented on this table. As a result, values may differ between this table and corresponding values in the Annual ULARA Watermaster Report.

D. Includes BOU, City pumping, and Valhalla. Valhalla pumping not included in projections after 2013-14. Valhalla converted to recycled water use in January 2016 and is now included only in the Historic Average Pumping values.

E. Includes Forest Lawn, GOU, and Grayson Power Plant pumping.

F. Includes production for CVWD's Rockhaven Well.

- There are no municipal-supply water wells in the Eagle Rock Basin.

IV. GROUNDWATER PUMPING AND TREATMENT FACILITIES

A. Wellfields

As shown on Table 3-1, there are ten municipal-supply wellfields located in the SFB, two in the Sylmar Basin, and two in the Verdugo Basin. There are no municipal-supply wells in the Eagle Rock Basin. Table 3-1, as mentioned previously, also lists the current number of active wells in each basin and the estimated pumping capacity of each wellfield (as reported by each Party). The general locations of wellfields within the SFB are shown on Plate 3.

Table 4-1 has been prepared to summarize the volumes (in AF) of groundwater that have reportedly been pumped and treated in the San Fernando, Sylmar and Verdugo basins by each of the various treatment facilities owned and/or historically operated by the five Parties in ULARA. The volumes of treated groundwater are listed for the Water Years 1985-86 through 2015-16. As seen on Table 4-1, 574,709 AF of groundwater have been treated during that time period by the eight listed treatment facilities. Table 4-2 lists the volumes (in AF) of groundwater that are projected to be treated at the eight listed (active) treatment facilities for the Water Years 2016-17 through 2020-21. Note that Table 4-2 includes the Glenwood Nitrate Water Treatment Plant. As shown on Table 4-2, the Parties report that approximately 279,808 AF of water are projected to be treated at their existing treatment facilities between Water Years 2016-17 through 2020-21.

TABLE 4-1 HISTORIC AND CURRENT GROUNDWATER TREATMENT

(Acre-feet)

Water Year	Burbank GAC	Lockheed Aqua Detox	Burbank OU	Glendale North/South OUs	CVWD Glenwood Nitrate Water Treatment Plant	Los Angeles North Hollywood OU	Los Angeles Pollock Wells Treatment Plant	Los Angeles Tujunga Wells Treatment Plant	Annual Total
1985-86		1							1
1986-87		1							1
1987-88		1							1
1988-89		924							924
1989-90		1,108				1,148			2,256
1990-91		747				1,438			2,185
1991-92		917			847	786			2,550
1992-93	1,205	692			337	1,279			3,513
1993-94	2,395	425	378		1,550	726			5,474
1994-95	2,590		462		1,626	1,626			6,304
1995-96	2,295		5,772		1,419	1,182			10,668
1996-97	1,620		9,280		1,562	1,448			13,910
1997-98	1,384		2,580		1,391	2,166			7,521
1998-99	1,555		9,184		1,281	1,515	1,513		15,048
1999-00	1,096		11,451	979	1,137	1,213	1,851		17,727
2000-01	995		9,133	6,345	989	1,092	1,256		19,810
2001-02	0		10,540	6,567	515	998	1,643		20,263
2002-03	0		9,170	7,508	216	1,838	1,720		20,452
2003-04	0		9,660	6,941	164	1,150	1,137		19,052
2004-05	0		6,399	7,541	782	1,042	1,752		17,517
2005-06	0		10,108	6,777	997	1,766	2,442		22,090
2006-07	0		9,780	7,562	644	1,307	2,231		21,524
2007-08	0		6,817	7,347	660	1,038	2,573		18,435
2008-09	148		9,818	7,148	459	662	1,698		19,932
2009-10	5		10,043	7,300	410	935	2,377	36,623	57,693
2010-11	4		10,394	7,473	592	1,150	3,127	12,200	34,940
2011-12	4		9,993	7,830	447	1,248	2,957	20,648	43,128
2012-13	0		11,387	6,518	488	343	1,629	5,718	26,084
2013-14	1		10,148	7,231	150	968	2,580	38,304	59,382
2014-15	2		10,006	7,025	186	1,132	3,037	10,442	31,830
2015-16	65		9,377	7,250	533	835	1,731	34,703	54,494
Total AF	**15,364**	**4,815**	**191,881**	**115,343**	**19,382**	**32,032**	**37,255**	**158,638**	**574,709**

- All values published in this table supersede values published in previous Groundwater Pumping and Spreading Plans for ULARA. Any errors discovered in previously published tables have been resolved upon discovery.

TABLE 4-2 PROJECTED GROUNDWATER TREATMENT

(Acre-feet)

	Burbank GAC	Burbank OU	Glendale North/South OUs [1]	CVWD Glenwood Nitrate Removal Plant	Los Angeles North Hollywood OU	Los Angeles Pollock Wells Treatment Plant	Los Angeles Tujunga Wells Treatment Plant [2]	Annual Total
2016-17	0	10,262	7,417	255	907	3,269	23,878	45,988
2017-18	0	10,558	7,580	300	1,262	2,006	24,929	46,635
2018-19	0	11,135	7,580	300	1,086	2,241	35,398	57,740
2019-20	0	11,135	7,580	300	1,089	2,246	42,116	64,466
2020-21	0	11,135	7,580	300	1,086	2,877	42,001	64,979
TOTAL	**0**	**54,225**	**37,737**	**1,455**	**5,430**	**12,639**	**168,322**	**279,808**

1. Groundwater treatment includes chromium removal via the WBA Chromium Removal facility and the RCF demonstration project.
2. Treatment plant utilizing GAC wellhead treatment only on Wells #6 and #7 of the twelve extraction wells at Tujunga Wellfield.

B. Active Groundwater Pumping and Treatment Facilities

Glendale OU (GOU) - City of Glendale

Construction of the GOU allowed for treated water to be available for delivery in Glendale in August 2000. The original system includes four Glendale North OU (GNOU) extraction wells (with a total pumping capacity of 3,300 gpm) and four Glendale South OU (GSOU) extraction wells (with a total capacity of 1,700 gpm). The treatment process uses aeration and LPGAC to treat VOC-contaminated groundwater and then blends the treated water with imported MWD water at the Grandview Pump Station. The ninth well, GS-5, was constructed and began operation in November 2016.

More information about the GOU can be found at USEPA's website: https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0902252.

Burbank OU (BOU) - City of Burbank

The BOU is funded by Lockheed-Martin under a USEPA Consent Decree and is owned and operated by the City of Burbank at the expense of Lockheed Martin. Air stripping and LPGAC are used at the BOU to remove VOCs from groundwater (local groundwater also contains elevated concentrations of nitrate and chromium). Following these treatments, the treated water is the blended with imported water from MWD for delivery within the City of Burbank.

The City of Burbank is also concerned about Cr(VI) in the groundwater produced by BOU wells and has been blending the pumped groundwater with imported water to keep the concentration of total chromium at or below a concentration of 7 µg/L; the BOU treatment facility was not designed to treat chromium.

More information about the BOU can be found via USEPA's website at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902251.

GAC Treatment Plant - City of Burbank

The City of Burbank GAC system (Lake St wells) was shut down in March 2001 as a result of the elevated concentrations of Cr(VI) in the groundwater, and remained out of service through the 2007-08 Water Year. The plant saw limited use for non-potable purposes in Water Year 2008-09, and since then it has been used only when necessary to obtain water quality data from the wells. If the plant is returned to service, production may be considered as part of the average pumping goal of 9,000 gpm for the BOU.

North Hollywood OU (NHOU) - City of Los Angeles

The North Hollywood Operable Unit (NHOU) began operating in December 1989 in response to elevated concentrations of chlorinated VOCs (including TCE and PCE). USEPA provides 90 percent of the funding for the operations and maintenance of this facility. The NHOU was designed to remove TCE and PCE, and has a groundwater treatment capacity of 2,000 gpm. The treatment facility operates by pumping water into an aeration tower where VOCs are removed from the water by an air stripper, with VPGAC vessels used on the aeration tower's air emissions to prevent introduction of VOCs to the atmosphere. Treated water is chlorinated and blended with other sources of clean water before distribution to the public water supply. Water quality measurements from the treated effluent show that VOCs were effectively removed by the treatment process. Current NHOU operations include the use of four of the seven extraction wells.

More recently, USEPA detected emerging contaminants including Cr(VI) and 1,4-dioxane in some of the wells within NHOU. In addition, two of these wells have experienced concentrations of 1,4-dioxane in excess of its State Primary MCL and Notification Level. The existing NHOU treatment system is incapable of removing Cr(VI) and 1,4-dioxane, and a sharp increase in the chromium concentrations has caused two of the eight NHOU extraction wells to be shut down and removed from the system. The untreated effluent from these two wells has been redirected for discharge into the municipal sewer. Because these wells provide an important plume containment function for the high levels of contamination, these shutdowns demonstrated the need for a change in the remedy.

In response to these shutdowns and continued migration of VOC-contaminated groundwater, USEPA conducted a Focused Feasibility Study (FFS) to evaluate alternatives for changing the groundwater remedy. USEPA summarized the results in its July 2009 Proposed Plan and selected the preferred remedy in its September 2009 Second Interim Record of Decision. The Second Interim Remedy is intended to upgrade and expand the existing NHOU groundwater supply production from the local wellfields, and address treatment of emerging contaminants. The selected remedy included: installation of wellhead treatment for Cr(VI) and 1,4-dioxane; expansion of the combined treatment system; construction of additional monitoring wells; construction and operation of three additional groundwater extraction wells; and continuing to provide the treated water to LADWP for a drinking water end use. USEPA amended the 2009 Second Interim Record of Decision in 2014 to allow for consideration of the treated effluent to be reinjected back into the aquifer (reinjection end use). In 2015, Lockheed Martin Corporation and Honeywell International Inc. prepared and submitted a groundwater Modeling Memorandum to USEPA for the design of the Second Interim Remedy for groundwater remediation at the NHOU.

For more information about the NHOU, please visit the following USEPA website: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902251.

Pollock Wells Treatment Plant (PWTP) - City of Los Angeles

San Fernando Valley (Area 4) USEPA superfund site, which is an area of contaminated groundwater covering approximately 5,860 acres near the Pollock Wellfield in the City of Los Angeles. This area is part of the SFB, where groundwater is contaminated with various chlorinated VOCs including TCE and PCE.

USEPA completed an interim investigation of the Pollock Wellfield in April 1994 and concluded that selecting and implementing a Superfund remedy for the Pollock Area was not immediately necessary because LADWP planned to conduct a wellhead treatment project in the Pollock Wellfield. In March 1999, LADWP reactivated wells in the Pollock Wellfield to extract and treat the groundwater using LPGAC at the PWTP. This treatment plant was designed to remove VOCs from extracted groundwater at rates up to 3,000 gpm. The treated water is delivered to LADWP's distribution system for a drinking water end use. Water quality measurements from the treated effluent show that VOCs were effectively removed by the treatment process. Emerging contaminants in the Pollock Wellfield include 1,4-dioxane. LADWP plans to upgrade the existing PWTP to include treatment for 1,4-dioxane.

USEPA and the California Regional Water Quality Control Board entered into a Cooperative Agreement to perform an investigation of potential sources of contamination in the SFB. Currently, USEPA is conducting a search for Potentially Responsible Parties within the Pollock Site 4 Area, as well as a data gap analysis to identify where additional sampling and site characterization is needed. Following these activities, USEPA will conduct a Remedial Investigation and Feasibility Study to identify the extent of contamination and evaluate clean up alternatives.

For more information about Superfund Area 4 and the Pollock Wells Treatment Plant, please visit the following USEPA website:
https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902253.

Temporary Tujunga Wells Treatment Study Project (TTW) - City of Los Angeles

Tujunga Wellfield was established in the SFB in 1992 and has utilized 12 production wells to produce groundwater for municipal-supply use. Certain VOCs, including TCE and PCE, were detected in each of the wells. Over time, VOC concentrations increased sharply above their respective Federal and/or State MCLs, requiring the shutdown of multiple wells and, at times, the entire wellfield. In 2010, LADWP and MWD completed the Temporary Tujunga Wells Treatment

Study Project, a wellhead treatment project, with the installation of LPGAC adsorption vessels on two of the most severely impacted wells. Water quality data from the treated effluent show that VOCs were effectively removed by the treatment process. The plant has a treatment capacity of 8,000 gpm and it has restored more than 20,000 AFY of groundwater pumping capacity that was unavailable due to water quality constraints. Other constituents of concern include 1,4 dioxane, carbon tetrachloride, and 1,1-dichloroethene (DCE). In this wellfield, Well No. 8 has been connected to the treatment system and serves as a backup when Well Nos. 6 or 7 are shut down for either mechanical or maintenance needs. LADWP has requested a permit amendment from DDW to operate this connection.

Glenwood Nitrate Water Treatment Plant - Crescenta Valley Water District

Groundwater pumped from wells operated by CVWD in the Verdugo Basin often contains elevated to excessive concentrations of nitrate. A portion of the pumped groundwater is treated by ion exchange at the City's Glenwood Nitrate Water Treatment Plant and is then blended with untreated water from MWD and/or imported water to reduce nitrate concentrations to values that are below the State's Primary MCL for nitrate (as NO_3) of 45 mg/L. In the past few years, the ion-exchange plant has been in operation for the majority of each year to help maximize the use of local groundwater. The plant began to receive water from the Rockhaven Well in March 2016. The ion-exchange plant was in operation for nine of the twelve months of Water Year 2015-16 and produced 533 AF of treated water, which allowed CVWD to maximize its use of local groundwater. CVWD expects this trend to continue in Water Year 2016-17, unless there are maintenance issues requiring the plant to discontinue operation.

C. Other Projects

1. Future Groundwater Pumping and/or Treatment Facilities

Groundwater System Improvement Study - City of Los Angeles

In early-2015, LADWP completed groundwater characterization in the SFB, including the siting, design and construction of twenty-five new monitoring wells. In mid-2015, LADWP began the necessary planning for new groundwater basin remediation facilities, which may consist of centralized and/or localized treatment, to effectively clean up and remove contaminants from its wells in the SFB and restore the beneficial use of groundwater from this basin. Contaminants of concern and proposed treatment will be determined through site-specific remedial investigations and feasibility studies. The four highest-priority basin remediation facilities are anticipated to be operational by 2021.

LADWP has begun evaluating potential response actions to restore the beneficial use of groundwater in the vicinity of its various wellfields. These efforts include studies, activities, and other analysis required by USEPA's National Contingency Plan to evaluate appropriate response actions. While additional work is required to evaluate the appropriate interim and final response actions for each area, one potential set of alternatives would consist of a series of local and centralized treatment facilities that would produce water for potable use. Some facts suggest this approach could be ideal. These include: the size and location of the existing groundwater contamination plumes; the beneficial uses of the groundwater; reliability concerns of long-term availability of alternative water sources; and its high cost if such groundwater treatment did not occur.

The information LADWP will evaluate includes an analysis of pumping rates and treatment capacity that would be appropriate to capture contaminant mass and help to restore the beneficial use of the aquifer for that wellfield, based on fate and transport modeling as well as other analysis. LADWP also plans to evaluate ways to minimize the volume of groundwater that would require treatment by prioritizing pumping from wells with higher levels of contamination to minimize the potential for contamination to spread to wells that currently do not contain levels of contamination that would require treatment. This analysis will also evaluate other alternatives.

LADWP will leverage its actions with current and planned response actions in the basin by LADWP and other parties, such as remedial actions undertaken by or overseen by state or federal regulatory agencies, as well as other feasible alternatives, such as source control, in-situ treatment or pumping from other areas.

As reported by LADWP, generally, other agencies in Southern California are focusing on source control and other "hot spot" areas, whereas LADWP generally focuses more on restoring the beneficial uses of groundwater in the vicinity of production wells that have been impacted by groundwater that has already migrated from the source areas.

To provide information about these potential response action alternatives, LADWP has completed a preliminary analysis of the work scope and anticipated project costs. Preliminary analysis indicates that production of major SFB wellfields, either alone or in conjunction with other response actions, could reach a maximum production capacity on the order of 135,000 gpm (or roughly 300 cubic feet per second, cfs). LADWP anticipates that the treatment systems would have modularity for addressing additional treatment capacity that may be needed as a result of regulatory changes or plume migration. Design and construction costs for this set of alternatives are estimated to be on the order of $600 million, with remediation treatment costs as high as $50 million per year. These estimates assume that these facilities would be designed to utilize multiple best-available technologies to clean up contaminants including TCE, PCE and 1,4-dioxane in order to restore LADWP's highest producing wellfields in the northern SFB.

North Hollywood West Advanced Oxidation Processes (AOP) Pilot Project

The North Hollywood West Advanced Oxidation Process Pilot Project (UV/AOP) is a pilot test for treatment of VOCs and 1,4-dioxane using the Ultraviolet Advanced Oxidation Process (UV AOP). The testing as part of this Pilot Project has two phases. Phase 1 will incorporate bench scale testing with lab results, utilizing the oxidation from peroxide, chloride, and other background chemicals at flow rates ranging from 10 to 50 gpm. Phase 2 testing will evaluate low flow on-site pilot testing, increasing the flow rate up to 100 gpm and increasing the UV dose with the goal of better understanding reactor efficiency. In both phases, the contaminant removal efficiency and possible byproducts from the various treatment methods will be evaluated.

Mission Wellfield Facility Improvement Project

The purpose of the Mission Wells Facility Improvement Project is to rehabilitate and replace deteriorating City of Los Angeles groundwater facilities in Sylmar Basin. This would include construction of three replacement production wells and several groundwater monitoring wells, along with new piping, pump station upgrades, electrical upgrades, and controls. An application has been submitted to DDW to permit the operation of Well No. 10, one of the three new LADWP production wells in the

Sylmar basin. The other two wells, Nos. 9 and 10, will not be operated because of very low production capacity and TCE concentrations that exceed that constituent's State MCL, respectively. The recently constructed on-site Chlorination Generation System has been permitted and is in operation; Well No. 10 is expected to be operational by December 2017.

Van Norman Complex Investigation

Two exploratory wells were drilled in 2015 to depths of approximately 1,500 feet below ground surface on the LADWP Van Norman Complex property to investigate the existence and extent of groundwater within the underlying Saugus Formation. Initial pumping tests from the two exploratory wells produced groundwater with concentrations of total dissolved solids (TDS) that were in excess of 1,000 mg/L. Additional pumping tests will be performed starting in mid-2017 and ending mid-2018 to further evaluate potential aquifer yields and responses to various pumping conditions. The water generated from the pumping tests is expected to be discharged to the high-speed channel that feeds directly to the Los Angeles Aqueduct Filtration Plant.

Other Groundwater Remediation Projects

Many privately-owned, industrial-type properties in the ULARA groundwater basins have been found to have contaminated the soils and/or the groundwater beneath their facilities. Many of these facilities are under Cleanup and Abatement Orders from the RWQCB-LA; some sites are under the regulatory authority of the State Department of Toxic Substance Control (DTSC). Each known contaminated site typically has soil vapor borings and/or groundwater monitoring wells, whereas some have extraction wells, treatment facilities, and/or injection wells to help mitigate the spread of contamination. USEPA has been including Cr(VI) in the quarterly sampling from its monitoring wells in SFB as a step in the eventual containment and cleanup of this contaminant. The RWQCB-LA has also been evaluating properties and/or facilities in the eastern portion of the SFB for their possible onsite use, storage and/or release of Cr(VI) to the environment over time.

The reader can obtain current information and more details for various contamination and/or cleanup sites within ULARA, which are regulated by the RWQCB-LA, via that agency's GeoTracker website: http://geotracker.waterboards.ca.gov/. The DTSC website, http://www.envirostor.dtsc.ca.gov/public/, also contains information regarding groundwater quality investigations and/or cleanup sites within ULARA.

2. Dewatering Operations

Temporary Construction Dewatering

Temporary construction excavations, such as for deep subterranean parking structures or pipelines, sometimes require dewatering in areas that have a high (shallow) water table. Groundwater that is discharged from such temporary dewatering operations may, depending on volume, be required to be accounted for by the Watermaster. The annual groundwater withdrawals by these dewatering activities would be deducted from the local water right holder.

Permanent Dewatering Operations

A few facilities along the southern and western portions of the SFB have deep foundations and subterranean parking structures that have been excavated and constructed into areas of shallow (high) groundwater; these facilities require permanent dewatering. The amount of groundwater pumped at each of these facilities is to be reported to the Watermaster. These activities are subject to approval by the affected municipal-supply Party, and the dewaterer may be required to pay that Party for the replacement cost of the extracted groundwater. The pumped groundwater may be subtracted from the affected Party's water right by the Watermaster.

3. Unauthorized Pumping in the County

There are numerous individuals, primarily within the unincorporated hill and mountain area of ULARA, who are or may be pumping groundwater for domestic and/or local irrigation use without reporting the annual volume of production to the Watermaster. This groundwater was adjudicated and, in the opinion of prior Watermasters, is owned by the City of Los Angeles. The volume produced by each pumper is very likely small. Working in cooperation with the Los Angeles County Department of Public Health and Los Angeles County Planning, the former Watermaster and LADWP initiated a process to help begin identification and monitoring of the water usage of these private pumpers through a water license agreement. LADWP and the Watermaster's office continue to work together to identify and track groundwater extractions associated with these private pumpers.

V. GROUNDWATER RECHARGE FACILITIES AND PROGRAMS

A. Agency-Owned Spreading Facilities

There are five active spreading facilities located in the SFB (see Plate 1). The Los Angeles County Department of Public Works (LACDPW) operates the Branford, Hansen, Lopez, and Pacoima spreading grounds, whereas the LACDPW operates the Tujunga spreading grounds in cooperation with the City of Los Angeles through the LADWP. These spreading facilities are used for spreading native and imported water, when available. Projects are underway to deepen and improve the capacity of these spreading basins and the LACDPW and the LADWP are also working to identify ways to maximize spreading, including possible changes to the operations at each spreading basin.

The City of Burbank completed construction of MWD's new Foothill Feeder connection in 2010, which is capable of delivering 50 cfs to the Pacoima spreading grounds, in order to enable Burbank to spread imported water when it is available. These facilities also allow Burbank to direct water to the Lopez spreading grounds. Burbank spread 306 AF of water in the Pacoima spreading grounds in November 2015 and April 2016 so that water in the Foothill Feeder would be "turned over" to maintain water quality. Through December 2016 in this 2016-17 Water Year, Burbank spread 6,967 AF in the Pacoima spreading grounds.

B. Proposed Spreading Facilities

Rory M. Shaw Wetlands Park

The Rory M. Shaw Wetlands Park, Strathern Wetlands Park Project, consists of stormwater capture and treatment facilities within a 46-acre site that was previously used as a gravel borrow pit. The project includes the construction of detention ponds and wetlands to store and treat stormwater runoff that will be pumped to Sun Valley Park for infiltration. This project has the potential to recharge an average of approximately 590 AF of runoff per year and is currently being designed; construction is estimated to start in 2017 and be completed by 2020.

C. Actual and Projected Spreading Operations

Table 5-1A shows the recent and projected volumes of native and imported water spread in SFB for the current 2016-17 Water Year. An estimated 23,376 AF of native runoff and imported water are projected to be spread in Water Year 2016-17. This represents a decrease of 5,501 AF when compared to the long-term (1968-2016) average of 28,877 AFY, and an increase of 15,111 AF in

comparison with the past five-year (2011-2016) average of 8,265 AFY. The recent increase was related to increased Los Angeles Aqueduct deliveries to ULARA.

TABLE 5-1A RECENT AND PROJECTED SPREADING OPERATIONS, Water Year 2016-17

(Acre-feet)

Month	Basin Operator					Total
	LACDPW				LACDPW and LADWP	
	Branford	Hansen	Lopez	Pacoima[A,B]	Tujunga[A]	
Actual						
Oct-16	20	0	450	1,510	0	1,980
Nov-16	87	0	471	2,530	0	3,088
Dec-16	166	0	806	1,760	0	2,732
Jan-17	74	3,730	300	2,010	0	6,114
Feb-17	57	5,790	219	2,150	0	8,216
Projected						
Mar-17	86	408	0	257	0	751
Apr-17	25	95	0	160	0	280
May-17	27	47	0	0	0	74
Jun-17	14	0	19	65	0	98
Jul-17	15	0	0	0	0	15
Aug-17	15	0	0	0	0	15
Sep-17	13	0	0	0	0	13
TOTAL	599	10,070	2,265	10,442	0	23,376
2011-2016 Average (AFY)	530	2,968	262	4,098	407	8,265
1968-2016 Average (AFY)	550	12,872	565	6,631	8,260	28,877

A) Includes native and imported water.

B) Includes water spread via the new Foothill Feeder connection.

- Headworks Spreading Grounds out of service since 1981-82. The average spreading from 1968-69 to 1981-82 was 5,283 AF at this site.
- All values published in this table supersede values published in previous Groundwater Pumping and Spreading Plans for ULARA. Any errors discovered in previously published tables have been resolved upon discovery.
- AFY = Acre-feet per year

Precipitation on the valley fill area in the SFB is projected to be about 8.53 inches for Water Year 2016-17, lower than the long-term average (1968-2016) of 17.13 inches per water year, and close to the five-year average for 2011-16 (8.83 inches per water year).

TABLE 5-1B HISTORICAL PRECIPITATION ON THE VALLEY FILL

(inches per water year)

1968-16	2011-16	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17**
17.13	8.83	10.81	7.71	6.30	10.79	8.53	8.53

** Projected

The estimated capacities (in AFY) of the five spreading grounds in the northeastern portion of the SFB are shown on Table 5-2. Also listed for each spreading grounds are: the site operator; the type of basin; the approximate total wetted area; and the water storage capacity. As shown, the total capacity of these five spreading grounds is approximately 108,000 AFY.

TABLE 5-2 ESTIMATED CAPACITIES OF EXISTING SPREADING GROUNDS

Name of Spreading Grounds	Basin Type	Total Wetted Area (ac)	Capacity (AFY)
Operated by LACDPW			
Branford	Deep basin	7	2,100
Hansen	Shallow basin	117	35,100
Lopez	Shallow basin	12	3,900
Pacoima	Med. Depth basin	107	24,100
Operated by LACDPW and LADWP			
Tujunga	Shallow basin	83	42,800
	TOTAL:	326	108,000

D. Stormwater Recharge Capacity Enhancements

Background Information

Historically, during the 1997-98 Water Year, area-weighted-average precipitation in the valley-fill and hill-and-mountain areas in ULARA was approximately 225% of normal. This amount of rainfall provided a well above-average volume of stormwater runoff that became available for capture in upstream reservoirs and diversion into existing spreading grounds. In April 1998, a former Watermaster received notice from the LACDPW that spreading at both the Hansen and Tujunga spreading grounds would be suspended temporarily. The reasons for curtailing spreading were that: the water table had risen to a level that threatened to inundate the base of the Bradley-East Landfill near the Hansen spreading grounds; and methane gas generated from the refuse was migrating from the Sheldon-Arleta Landfill and into the surrounding neighborhood due to the recharge operations at the nearby Tujunga spreading grounds. At that time, reservoirs in Los Angeles County were full, and thus thousands of acre-feet of surface water runoff had to otherwise be discharged and lost to the ocean. The spreading activities were suspended for at least one month at that time.

In response to this undesirable condition, in May 1998, the former Watermaster formed the Tujunga and Hansen Spreading Grounds Task Force which later became the San Fernando Basin Recharge Task Force. The task force included representatives from the LACDPW, LADWP, Los

Angeles Bureau of Sanitation and the Watermaster. After a series of meetings, the task force developed preliminary mitigation measures to help improve the utilization of both spreading grounds, particularly during years of above-normal runoff and recharge.

The task force met as the Stormwater Recharge Committee for a period of time and has since become a collaborative effort between LACDPW and LADWP to focus on projects to enhance the recharge capacity of spreading basins in the eastern portion of the SFB. As a result, watershed management groups have been formed within both the LACDPW and LADWP to address the entire cycle of pumping and recharge as an interrelated discipline, and these groups are work in partnership to study and develop solutions to enhance the groundwater supply in the SFB.

LADWP and the Los Angeles County Flood Control District (LACFCD), in cooperation with the City of Los Angeles Bureau of Engineering, Bureau of Sanitation and Bureau of Street Services, continue to partner on, jointly fund, and collaborate on several projects that will enhance the capacity for recharge of native water into the SFB via existing spreading grounds in the eastern portion of the SFB.

Below, a list of plans for modifying existing spreading facilities and construction of new facilities to provide expanded opportunities for enhancing the recharge capacity of the SFB and even possibly the Verdugo Basin.

Projects

- Hansen Spreading Grounds

Hansen spreading grounds is a 156-acre parcel, located adjacent to the channel of Tujunga Wash and downstream of Hansen Dam. The total wetted area of the spreading grounds is 117 acres, and it has a maximum intake of 600 cfs. These spreading grounds are operated by LACDPW. Improvements to deepen and combine the basins as well as to retrofit and automate the intake structure were completed in January 2013. No additional modifications to the spreading basin are currently proposed. LADWP and LACFCD shared the $8.4 million cost for construction of this project, and it is expected that the project will increase average stormwater recharge by 2,100 AFY.

- Sheldon-Arleta Project - Cesar Chavez Recreational Complex Project (Phase I)

Located adjacent to the Tujunga spreading grounds is the Sheldon-Arleta Landfill, which has caused environmental concern because of the methane gas that is produced and released into the subsurface as a byproduct of landfill operations.

During the spreading of surface water at the adjoining Tujunga spreading grounds, recharge water moving downward through the underlying earth materials displaces the air from voids within the

unsaturated soil matrix. The resulting lateral migration of the air mass has the potential to displace methane gas out of the adjacent landfill. In recent years, the methane has occasionally migrated offsite, and elevated concentrations of this gas have been reported at a nearby school. To avoid such occurrences, temporary limitations have been placed on the amount of stormwater that can be spread at the Tujunga spreading grounds.

To mitigate the displacement of methane gas, LADWP, the Los Angeles Bureau of Sanitation, and the Los Angeles Bureau of Engineering completed replacement of the existing methane gas collection system at the Sheldon-Arleta Landfill with a new gas collection system. This new system enhances containment of the methane gas within the landfill, restores the historic spreading flow capacity of 250 cfs at the Tujunga spreading grounds, and restores operations at some of the Tujunga spreading basins closest to the landfill. Construction was completed in 2009 and the three agencies will eventually conduct an evaluation (hopefully during the next substantial storm season) to determine the maximum recharge capacity of the improved facility. It is expected that the project could increase average annual stormwater capture by 3,000 AF, to a total of 5,000 AF, at this spreading grounds.

- Tujunga Spreading Grounds

Tujunga spreading grounds occupy a 150-acre parcel located along the Tujunga Wash Channel at its confluence with the Pacoima Wash Channel. This spreading facility, which is owned by LADWP and operated by LACFCD, has a total wetted area of 83 acres, a maximum intake capacity of 250 cfs, and a storage capacity of 100 AF at this time.

The Tujunga Spreading Grounds Upgrade project entered the construction phase in August 2016 and is expected to be completed in 2019. The scope includes consolidating and deepening existing spreading basins, installing two high-flow rubber dam intakes and modifying the existing intake to remove sediments. This project is expected to increase regional average stormwater capture and recharge by 8,000 AFY. As a result of this construction, these spreading grounds are projected to not be able to be used to spread water throughout the 2016-17 Water Year.

- Pacoima Spreading Grounds

The 169-acre Pacoima spreading grounds surround the old Pacoima Wash Channel, downstream of Pacoima Dam and Reservoir. This spreading facility is owned and operated by LACFCD, has a total wetted area of 107 acres, a maximum intake capacity of 600 cfs and a storage capacity of 530 AF.

LADWP and LACFCD are currently working cooperatively to improve stormwater capture at this facility by upgrading and automating the intake structure and revitalizing the recharge basins. This

upgrade project is currently in design, with construction expected to begin in 2018 and be completed by 2020. The LACFCD is finalizing the Mitigated Negative Declaration documents in the environmental review process. The scope includes consolidating existing spreading basins, excavating sediment to improve infiltration rates and installing a new automated intake structure. This project is expected to increase regional average stormwater capture and recharge by 5,300 AFY.

- Lopez Spreading Grounds

Lopez spreading grounds, owned and operated by the LACFCD, are located downstream of Pacoima Dam. The facility has a total wetted area of 12 acres, a maximum intake of 25 cfs and a storage capacity of 24 AF.

LADWP and LACFCD are currently working cooperatively to improve stormwater capture by upgrading and automating the intake facility and revitalizing the recharge basins. This upgrade project is currently in design, with construction expected to begin in 2018 and be completed by 2020. The scope includes expanding and deepening existing spreading basins, excavating sediment to improve infiltration rates and improving the intake structure. This project is expected to increase regional average stormwater capture and recharge by 480 AFY.

- Branford Spreading Grounds

Branford spreading grounds, owned and operated by LACFCD, are located immediately adjacent to Tujunga spreading grounds, along the Pacoima diversion channel. Most of the water that arrives at the Branford spreading grounds is urban runoff from Branford Street Channel. The total wetted area of the facility is 7 acres, and it has with a maximum intake of 1,540 cfs and a storage capacity of 137 AF. Average annual recharge for the facility is approximately 550 AF, based on LACFCD historical records.

The Branford Spreading Basin Upgrade Project is currently in design, with construction expected to begin in 2018 and be completed by 2020. The work scope includes installing a new pipe to divert water from the Branford Basin into the Tujunga spreading grounds. This project is expected to increase regional average stormwater recharge by 597 AFY.

- Big Tujunga Dam Seismic Retrofit

Big Tujunga Dam was constructed by LACDPW in the 1930s primarily as a flood control facility. In the 1970s, a seismic analysis indicated the dam was susceptible to damage from a large earthquake. As a result, the dam had to be operated at a reduced capacity for safety reasons.

Fortunately, LACDPW completed a major seismic retrofit of this dam in January 2012 and this effort has also restored its storage capacity for flood control and water conservation. Specifically,

the structural improvements to Big Tujunga Dam increased its storage capacity from 1,500 AF to 6,000 AF. This project, which was partially funded by the City of Los Angeles, greatly enhances LACDPW's ability to retain and manage stormwater for flood protection, water conservation, and environmental restoration.

- CVWD Stormwater Recharge Feasibility Study

CVWD's Verdugo Basin Groundwater Recharge, Storage, and Conjunctive Use Feasibility Study was completed in 2005 and recommended methods for stormwater recharge and storage within this basin. In Water Year 2012-13, CVWD received a Local Groundwater Assistance (LGA) grant from DWR to perform a feasibility study for potential stormwater recharge within the Verdugo Basin.

The study is a cooperative effort with the City of Glendale, the County of Los Angeles, and other local stakeholders to determine if stormwater can be stored at Crescenta Valley County Park. The feasibility study started in August 2013 and is expected to possibly be completed in late-2016.

VI. GROUNDWATER INVESTIGATION PROGRAMS

There are numerous ongoing groundwater quality investigations underway by others in ULARA, particularly in the SFB. The reader can obtain current information and more details for the sites mentioned below, which are regulated by the RWCQCB-LA, via that agency's GeoTracker website: http://geotracker.waterboards.ca.gov/.

The DTSC website, http://www.envirostor.dtsc.ca.gov/public/, also contains information regarding groundwater quality investigations and/or cleanup sites within ULARA.

Below are brief descriptions of some of the groundwater quality investigations for contaminated and/or potentially contaminated sites within ULARA. The discussion below does not provide a complete list of these sites. Possible omission of a site from the list below does not imply that the omitted site is not important or not of concern to the Watermaster or to the Parties to the ULARA adjudication.

Pacoima Area Groundwater Investigation

A major VOC contaminant plume exists in the groundwater near the intersection of San Fernando Road and the Simi Valley Freeway (118 Freeway), in the Pacoima area of the SFB. This area lies approximately 2.5 miles north of and upgradient from the LADWP Tujunga wellfield. Groundwater pumped from certain wells in this wellfield has experienced increasing concentrations of VOCs over time.

To help characterize the extent and potential migration of contamination in the Pacoima area, LADWP constructed two groundwater monitoring wells in 1997, including: PA-01, approximately 0.5 miles downgradient; and PA-02, approximately 1.25 miles downgradient from the suspected source areas.

The suspected contaminant sources in this area reportedly include the Chase chemical (formerly Holchem) and the Black & Decker (formerly Price-Pfister) sites, which are under the jurisdiction of DTSC and RWQCB-LA, respectively.

Chromium Investigations

The RWQCB-LA, funded in part with a grant from USEPA, reviewed a large number of sites for potential Cr(VI) contamination in the SFB and published its original findings in December 2002. Based on this RWQCB-LA review, 255 suspected Cr(VI) sites were identified and inspected. As a result of those inspections, the RWQCB-LA recommended closure (i.e., no further action) for

150 of those sites and further assessment of the remaining 105 sites. In addition, the RWQCB-LA issued Cleanup and Abatement Orders to several sites including, among others, B.F. Goodrich (formerly Menasco Aerospace Division), PRC-Desoto (formerly Courtauld), Drilube, Honeywell (formerly Allied Signal), Lockheed (2), ITT, and Excello Plating. The RWQCB-LA may eventually issue additional orders to several other sites as well. These Cleanup and Abatement Orders require a responsible party to assess, clean up, and remediate the effects of contamination encountered in the soil and groundwater. Increasing concentrations of Cr(VI) in the groundwater have caused the shutdown or reduced pumping of several municipal-supply water wells associated with groundwater treatment plants because those plants were not designed to remove this contaminant (or any other newly-emerging contaminants). Shutdowns of those municipal-supply wells may allow the continued vertical and lateral migration of the VOCs and chromium to other production wells, and may also continue to complicate the extraction, management and delivery of potable water by the Parties within the SFB.

The Glendale Chromium Operable Unit (GCOU) was established in 2007 to help characterize the extent of chromium contamination in groundwater in the Glendale area, and to determine appropriate remedial action. USEPA is working with the DTSC and the RWQCB-LA to identify and clean up sources of chromium contamination. Remedial investigation of chromium contamination in groundwater in the GCOU began in 2011. To date, at least 29 groundwater monitoring wells have been constructed to help evaluate the location and extent of the chromium contamination in soils and groundwater beneath the area.

Information for the GCOU is available from USEPA's website at:
https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0902252

Tujunga Discovery Project

In 2008, the LADWP formed a task force in conjunction with the USEPA and DTSC to conduct an inter-agency investigation into groundwater contamination at/near the Tujunga wellfield. The investigation began with LADWP's comprehensive sampling of eight existing groundwater monitoring wells in the vicinity of this wellfield. Two additional monitoring wells were sampled in December 2009. The lack of VOCs detected in groundwater samples collected from LADWP monitoring well TJ-MW-01 reportedly suggests that the Sheldon-Arleta Landfill, adjacent to the Tujunga wellfield, may not be the source of this contamination.

USEPA's contractor performed soil vapor sampling and limited soil sampling along several miles of transects upgradient of LADWP's Tujunga wellfield. The site-specific soil vapor results indicated low levels of PCE at most of the investigated sites. In early-2010, sediment sampling

was conducted in the adjacent Branford spreading grounds to determine whether or not sediments in this basin might be a source of VOC contamination. Numerous borings were drilled, and a large number of soil samples were analyzed for various analytes, including VOCs. TCE was not detected in any of these soils samples, but acetone and 2-butanone in were detected in certain samples, although these may be related to laboratory contamination.

The next stage of the investigation involved the construction of several new groundwater monitoring wells in the capture zone of the Tujunga wellfield. The locations of these new monitoring wells were prioritized by LADWP and others based on data gaps in the existing wellfield. LADWP completed the construction of four new monitoring wells near the Tujunga wellfield between April 2012 and June 2013, and two additional monitoring wells were constructed in 2013. USEPA also constructed a monitoring well (TJ-MW-09) in 2013.

VII. ULARA WATERMASTER MODELING ACTIVITIES

A. Introduction

LADWP continues to support the ULARA Watermaster by performing groundwater modeling of the SFB. The basic purpose of this groundwater modeling is to evaluate the combined effects of the proposed groundwater pumping and estimated groundwater recharge in the SFB projected over a five-year period. The projected pumping volumes used in the model were obtained from the "Water Year 2016-17 through 2020-21 Pumping and Spreading Plans" submitted by each Party pursuant to the provisions established in the revised February 1998 Policies and Procedures report. A copy of the Pumping and Spreading Plan for each Party is included in the appendix of this report. The groundwater flow model used by LADWP is a comprehensive three-dimensional computer model that was developed originally for USEPA during the Remedial Investigation Study of the San Fernando Valley (December 1992). The model is a tool and it has been used herein to estimate the future response to pumping and spreading in the SFB for the current five-year period ending September 30, 2021.

The model code, "Modular Three-Dimensional Finite-Difference Groundwater Flow Model," commonly called MODFLOW, was originally developed by the U.S. Geological Survey (McDonald-Harbaugh); this model is currently used to develop the San Fernando Basin Groundwater Flow Model. This model consists of 64 rows, 86 columns, and up to four layers to reflect the varying geologic and hydrogeologic characteristics of the SFB in three dimensions. In the deepest portion of the SFB, the model is subdivided into four layers, each layer characterizing a specific depth zone beneath ground surface. The model has a variable horizontal grid that ranges from 1,000 by 1,000 feet in size in the southeastern portion of the SFB, to 3,000 by 3,000 feet in size in the northwestern portion of this basin (Figure 7-1) or where less data are available; LADWP regularly updates this model.

B. Model Inputs

The input data for the LADWP model are illustrated in Tables 7-1A and 7-1B. Specifically, Table 7-1A provides the various elements of recharge into the SFB: recharge from precipitation; delivered water; hill and mountain runoff; spreading; and subsurface inflow. Table 7-1B provides the volumes of groundwater extracted from the SFB by each major producer, including the cities of Los Angeles, Burbank and Glendale, as well as other individual pumpers. Both tables show projected values for the five-year period, from Fall 2016 to Fall 2021, as well as any actual values that have been reported for the first half of the 2016-17 Water Year.

In Table 7-1A, the projected values for percolation and spreading activities were estimated using the long-term average rainfall and recharge amounts, and the resulting estimates were then used as inputs to the model. The projections for 2016-21 include the actual amounts reported for the first half of this current water year. The spreading estimates reflect temporary shutdowns during construction of the Tujunga spreading grounds. Construction to enhance the spreading capacity at the Tujunga spreading grounds is planned to occur from 2016 through 2018. The anticipated spreading of imported water at the Pacoima spreading grounds by the City of Burbank is also included in these projections. Subsurface inflows to the SFB occur from the Sylmar Basin (through the Sylmar Notch and Pacoima Notch) were estimated by the current ULARA Watermaster to be approximately 250 AFY. The amounts of subsurface inflows from the Verdugo Basin were derived from the 1962 Report of Referee. These values were used as constants in the model throughout the five-year study period.

The volumes for all groundwater extractions shown on Table 7-1B and used as model inputs were obtained from the "Groundwater Pumping and Spreading Plans" submitted by the five municipal–supply producers; a copy of each of these plans is included in the appendices of this report. The total extraction by each wellfield was initially allocated among the individual wells comprising each wellfield, and then a percentage of the pumping allocated to each well was assigned to each model layer based on the percentage of casing perforations considered to be contained within each layer.

The initial head values (groundwater elevations) were derived from the actual data from Water Year 2015-16, and these values set the initial conditions for model analysis for the next five-year period. These initial conditions reflect the decrease in simulated groundwater elevations observed in most areas of the SFB resulting from increased pumping in the wellfields operated by the City of Los Angeles.

At the close of every water year, the Watermaster staff at LADWP updates the model input files with the actual basin recharge and extraction data; this activity is performed each year by LADWP and incorporates actual data from as early as 1981.

Table 7-1
MODEL INPUT
San Fernando Basin Recharge & Extractions
2016-2021

Table 7-1A
Projected San Fernando Basin Recharge 2016-21

WATER YEAR	RAINFALL (IN/Y)		SAN FERNANDO BASIN RECHARGE (AF/Y)																
			PERCOLATION			H&M (A)	SPREADING GROUNDS							SUBSURFACE INFLOW				
										PACOIMA								
	VALLEY	HILL & MTN	VALLEY FILL	RETURN WATER	SUB TOTAL	HILL & MTN	BRANFORD	HANSEN (B) (NATIVE)	LOPEZ	PACOIMA (NATIVE)	PACOIMA (C) (MWD)	PACOIMA (TOTAL)	TUJUNGA (D)	SUB - TOTAL	PACOIMA NOTCH (E)	SYLMAR NOTCH (E)	VERDUGO BASIN	SUB - TOTAL	TOTAL RECHARGE
2016-17	8.53	10.99	5,925.82	50,610	56,535.82	1,877.02	599	10,070	2,265	10,442	7,200	17,642	0	30,576	117	133	70	320	89,309
2017-18	17.12	21.15	11,893.32	49,918	61,811.32	3,612.29	540	13,900	540	6,564	7,000	13,564	0	28,544	117	133	70	320	94,288
2018-19	17.12	21.15	11,893.32	49,918	61,811.32	3,612.29	540	13,900	540	6,564	7,000	13,564	0	28,544	117	133	70	320	94,288
2019-20	17.12	21.15	11,893.32	49,918	61,811.32	3,612.29	540	13,900	540	6,564	7,200	13,764	5,100	33,844	117	133	70	320	99,588
2020-21	17.12	21.15	11,893.32	49,918	61,811.32	3,612.29	540	13,900	540	6,564	7,200	13,764	5,100	33,844	117	133	70	320	99,588

Table 7-1B
Projected San Fernando Basin Extraction 2016-21

WATER YEAR	SAN FERNANDO BASIN RECHARGE (AF/Y)																		
	LADWP											BURBANK			GLENDALE			OTHERS		TOTAL EXTRACTION
	AE	FR	HW	NH (WEST)	NH (EAST)	PL	RT	TJ	VD	WH	TOTAL LADWP (F)	BURBANK PSD	LOCKHEED	NON-BURBANK (VMP)	CITY OF GLENDALE	OU-NORTH	OU-SOUTH	TOTAL NON-LADWP	TOTAL NON-GLENDALE (F LAWN)	
2016-17	-907	0	0	-4,604	0	-3,269	-8,689	-23,878	0	0	-41,347	0	-10,262	0	-15	-4,821	-2,596	-721	-400	-60,162
2017-18	-1,262	0	0	-6,633	0	-2,006	-10,343	-24,929	0	0	-45,173	0	-10,558	0	-20	-4,927	-2,653	-721	-400	-64,452
2018-19	-1,086	0	0	-13,587	0	-2,241	-18,307	-35,398	0	0	-70,619	0	-11,135	0	-20	-4,927	-2,653	-721	-400	-90,475
2019-20	-1,089	0	0	-14,533	0	-2,246	-22,151	-42,116	0	0	-82,135	0	-11,135	0	-20	-4,927	-2,653	-721	-400	-101,991
2020-21	-1,086	0	0	-16,686	0	-2,877	-22,707	-42,001	0	0	-85,357	0	-11,135	0	-20	-4,927	-2,653	-721	-400	-105,213

NOTES:

(A) Hill & Mountain runoff

(B) Hansen Spreading Grounds activated in the water year of 2009-10 after completing the modification work

(C) Burbank projected to spread a total of 7,000 AF to 7,200 AF of imported water (MWD) at Pacoima Spreading Grounds on a yearly basis.

(D) Tujunga Spreading Grounds will be taken out of service during the water years of 2016-18 for modifications to increase storage capacity

(E) The values were estimated on the updated Safe Yield for the Sylmar Basin by Mr. Richard Slade, the Watermaster of Upper Los Angeles River Area.

(F) The values shown for Los Angeles on this extraction plan are estimates only. The estimated groundwtaer pumping amounts for the above-mentioned wellfields may be increased as treatment faculities are installed or as the blending with external source of water will continue to be allowable.

C. Simulated Groundwater Elevations and Flow Directions

After running the model for five separate but successive stress periods (Water Years 2016-2021), each lasting 365 days, MODFLOW generated various numerical data, including the heads (groundwater elevations), the drawdown (change in groundwater elevations), and the cell-by-cell flow (vector or flow direction data). These numerical data were used by LADWP modelers to create the following figures and plates:

- The simulated groundwater (water table) contour results for Model Layer 1 for Fall 2021 are shown on Plate 1; the simulated contours for Model Layer 2 are shown on Plate 2 for the same period.
- The changes in the simulated groundwater elevation contours were generated from the drawdown data from the Fall 2016 to Fall 2021 stress period and the results are shown on Plate 3 for Layer 1 and on Plate 4 for Layer 2.
- The simulated horizontal groundwater flow directions for Fall 2021 are shown on Plate 5 for Model Layer 1 and on Plate 6 for Layer 2 for the same period.
- Plates 7 through 10 depict the most recently generated contaminant plumes for TCE, PCE, NO_3, and total dissolved chromium (as adapted from 2014-dated work published by USEPA), superimposed onto the Layer 1 simulated horizontal groundwater flow direction for the year 2021.

D. Evaluation of Model Results

Plate 1: Simulated Groundwater Contour Model Layer 1 – Fall 2021

The most noticeable feature of the simulated groundwater contours shown on Plate 1 is the cone of depression (pumping cone) that has developed around the BOU. The extractions by this facility occur primarily from Layer 1, although Layer 2 does provide some recharge to Layer 1. Burbank has projected pumping of about 11,135 AFY from its BOU for the period from Fall 2016 to Fall 2021. The radius of pumping influence is shown to extend as far as 4,000 feet in the downgradient (southeasterly) direction from the BOU wells. The upgradient radius of influence is usually larger than the down-gradient radius of influence. Plate 1 illustrates the smaller pumping influence of the GOU wells, and the Pollock Treatment Plant Wells.

Plate 2: Simulated Groundwater Contour Model Layer 2 – Fall 2021

The most significant features of the simulated groundwater contours shown on Plate 2 are the simulated cones of depression near the Tujunga wellfield, Rinaldi-Toluca wellfield, North Hollywood wellfield and the BOU. Approximately 75 percent of the groundwater pumped from the Tujunga, Rinaldi-Toluca and North Hollywood wellfields is from model Layers 2, 3 and 4.

Plate 3: Change in Groundwater Elevation Model Layer 1 – Fall 2016 to Fall 2021

In general, the model simulation showed an increase in groundwater elevations in most areas of the basin, particularly in areas near the wellfields. This increase in simulated water levels would result mostly from the difference between the amount of pumping and the amount of recharge that were simulated during the five-year model run.

The estimated total groundwater recharge during the five years of simulation exceeded the total extraction volume by about 54,768 AF, cumulatively. The items below provide a more detailed review of Plate 3:

- The area in the vicinity of the Tujunga spreading grounds shows an increase in simulated groundwater elevations of about 15 feet.
- The area in the vicinity of Hansen spreading grounds shows an increase in simulated groundwater elevations of about 30 feet.
- The increase in simulated groundwater elevations from 2016 to 2021 in the vicinity of the Pacoima spreading grounds results from proposed spreading of imported water by Burbank (7,200 AFY) in addition to the normal recharge of native surface water by the LACDPW.
- The simulated groundwater elevations for the Rinaldi-Toluca wellfield were shown by the model to increase by about 10 feet.
- Groundwater elevations near the Erwin, Whitnall and Verdugo wellfields were simulated to decrease by 5 feet.
- The simulated groundwater elevation near the BOU showed an expected decrease by about 5 feet.

Plate 4: Change in Groundwater Elevation Model Layer 2 – Fall 2016 to Fall 2021

- Similar to Model Layer 1, Plate 4 illustrates much of the same increase in simulated groundwater elevations in Model Layer 2 which would also result from the increased recharge during the five years of the model scenario.

- The model simulated a 10-foot increase in groundwater elevations in the area near the Rinaldi-Toluca wellfield. Simulated groundwater elevations in the area near the Erwin, Whitnall and Verdugo wellfields were projected by the model to decrease by 3 feet.

Plate 5: Simulated Groundwater Flow Direction Model Layer 1 – Fall 2021

- Plate 5 consists of groundwater flow direction arrows superimposed on the simulated groundwater elevation contours to illustrate the general (or regional) direction of groundwater flow within Layer 1 of the model.
- Groundwater pumped at the Rinaldi-Toluca, Tujunga, North Hollywood, GOU, and BOU wellfields and water spread at the Hansen, Pacoima and Tujunga spreading grounds caused the most pronounced effect on the direction of groundwater flow in the SFB. In particular, the BOU may create such a significant cone of pumping depression that groundwater appears to flow inward toward the wellfield from all directions (radial flow*).*
- A groundwater divide apparently develops south of the BOU wells. This appears to be primarily due to the "pumping trough" formed by the pumping at the BOU.

Plate 6: Simulated Groundwater Flow Direction Model Layer 2 – Fall 2021

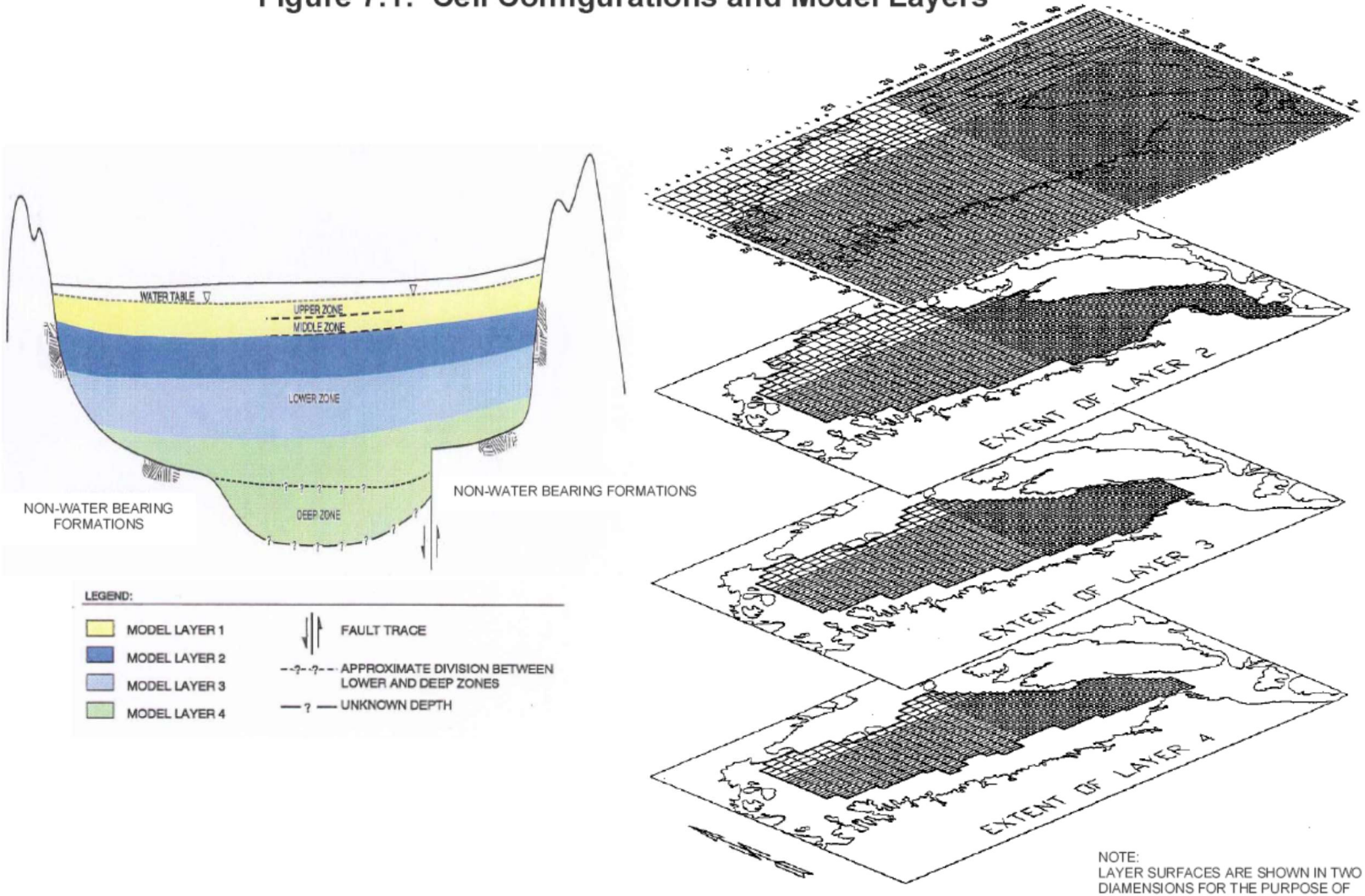
- Plate 6 consists of groundwater flow direction arrows superimposed on the simulated groundwater elevation contours to illustrate the general or regional direction of groundwater flow within Layer 2 of the model.

Plates 7 – 10: Simulated Groundwater Flow Direction and TCE, PCE, NO_3, and Chromium (Cr) Contamination in Model Layer 1 – Fall 2021

- Plates 7 through 10 depict the most recent TCE, PCE, NO_3, and Cr contaminant plumes available from the work of USEPA (as of 2014), and these plumes are superimposed onto the horizontal direction of groundwater movement in Layer 1 for Fall 2021. The BOU appears to contain most of the 1,000 to 5,000 µg/L regions of the TCE and PCE plumes, and a large portion of the 0-5, 5-50, 100-500, and 500-1,000 µg/L regions of the TCE and PCE plumes. The uncaptured portions of these plumes are likely to continue migrating in a southeasterly direction toward the Los Angeles River Narrows area and toward the GOU.
- Pumping by the BOU (11,135 AFY) tends to flatten the horizontal gradient in a southeasterly direction and slows the natural movement of groundwater southeasterly of the plume in the area of the BOU.

- Wells in the Glendale NOU and SOU capture a portion of the plumes that are not captured by the BOU wells. GOU wells also capture the plume up gradient and within the radius of influence of these wells.
- Pumping by the Pollock wells (2,246 AFY) appears to have little effect on Layer 1 because approximately 75 percent of the pumping by this facility extracts groundwater from the zones within Layer 2.
- Plate 9 (NO_3 Contamination) indicates that Layer 1 extractions by the NHOU, BOU and GOU wells may be impacted by NO_3.
- Plate 10 (Total Dissolved Chromium) indicates that Layer 1 extractions by wells in the NHOU, BOU, the north and south GOUs, and the Pollock Wells may be impacted by the Cr plumes.

Figure 7.1: Cell Configurations and Model Layers



Source: Remedial Investigation Report of Groundwater Contamination in the San Fernando Valley, December 1992

VIII. WATERMASTER EVALUATION AND RECOMMENDATIONS

The Parties to the Judgment continue to explore ways to increase groundwater recharge in the ULARA groundwater basins. In an effort to increase stormwater recharge in SFB, the City and County of Los Angeles initiated and continue to fund an ambitious and very important program to increase the recharge capacity in several of the local spreading grounds; the City of Los Angeles also continues to investigate additional alternatives to increase water conservation. This Watermaster commends the City and County of Los Angeles for these vital efforts. The City of Burbank has continued spreading imported water in the basins when possible to increase basin recharge, and CVWD continues to work independently and with the City of Glendale to possibly try to implement stormwater capture programs to increase recharge in the Verdugo Basin. Further, Burbank, Glendale and the City of Los Angeles continue to expand their recycled water programs to offset groundwater and imported water use.

VOC contamination in conjunction with newly discovered contaminants (such as 1,4-dioxane) in some areas continue to be the most serious challenge to water quality and to the ability of the Parties to pump their water rights (without treatment) from the SFB. The various contaminant plumes are large and continue to migrate, despite years of groundwater remediation and treatment. For example, the VOC plumes in North Hollywood have not been completely controlled by the extraction wells in the NHOU, due in large part to declining groundwater levels which have resulted in the reduced pumping capacity of those extraction wells. It is encouraging to see USEPA's proposed Second Interim Remedy for the NHOU which entails facility improvements to increase its peak pumping capacity to as much as 4,000 gpm (3,050 gpm on average). Although the planned implementation of these improvements is several years away, this Remedy should eventually help remove additional contaminant mass and control contaminant migration in the nearby plumes. The BOU has undergone several capital improvements and the facility now operates with much greater reliability for pumping and treatment of VOC-contaminated groundwater at near its 9,000 gpm design capacity on a consistent basis.

The Watermaster continues to monitor and be concerned with detections of Cr(VI) in several production wells in the eastern portion of the SFB. As Watermaster, I continue to support an aggressive approach by regulatory agencies including USEPA, RWQCB-LA and DTSC in identifying the various sources of this contaminant and in requiring effective, efficient and timely cleanup by the responsible parties. The Watermaster appreciates Glendale's lead in the development of chromium treatment technology in the area and in the construction of its Chromium (VI) Removal Demonstration Facilities.

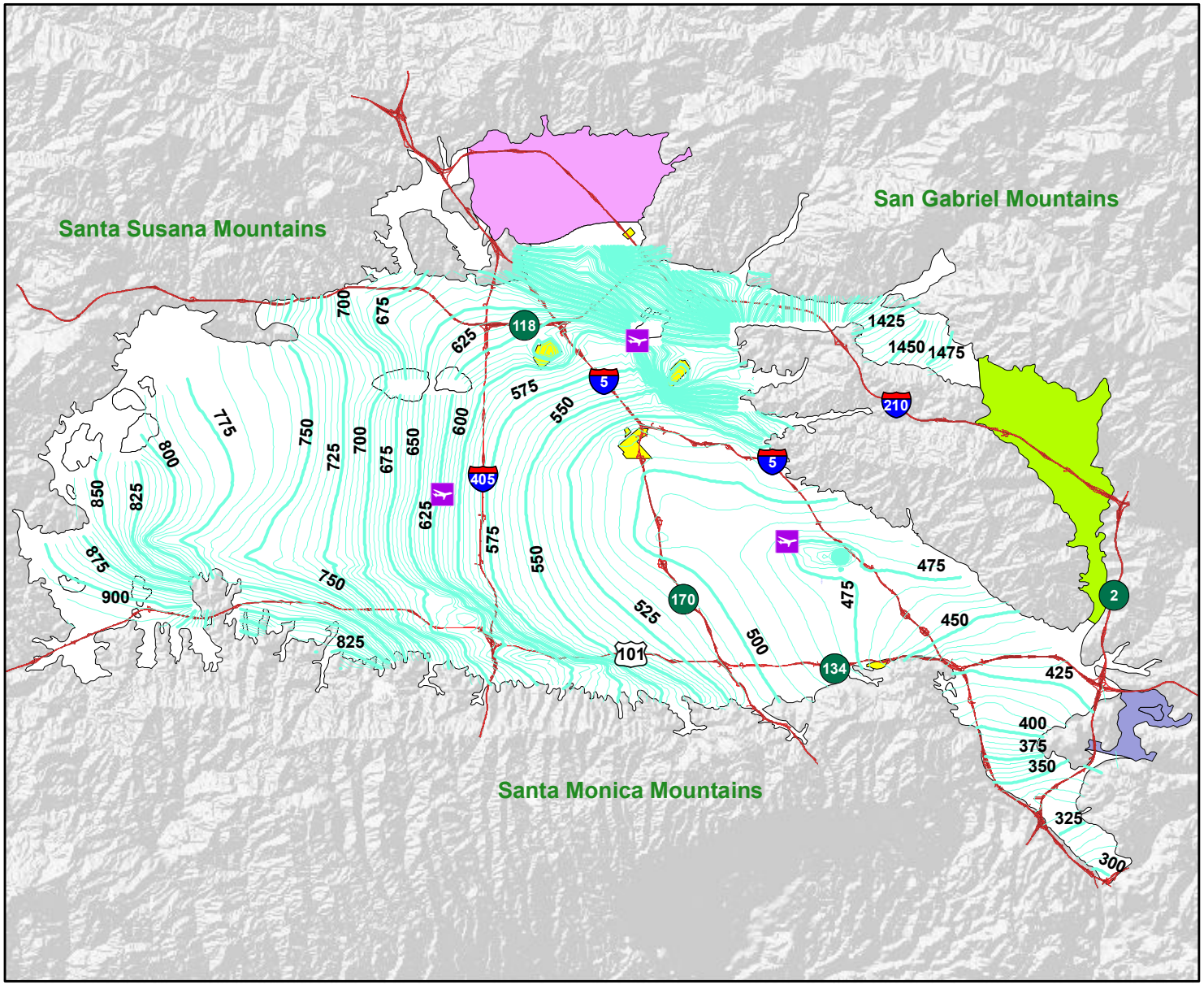
As a result of the geologic conditions in Verdugo Basin and the presence of local bedrock constrictions, groundwater tends to rise to ground surface near the Verdugo Wash Narrows and eventually leaves this basin as surface outflow. Glendale is currently unable to pump its full right from the Verdugo Basin, but by rehabilitating one of its previously-abandoned wells and constructing a new municipal-supply well, Glendale has taken steps to increase its use of groundwater from this basin and help reduce the continued groundwater outflow from this basin. The Watermaster commends the ongoing efforts of Glendale to increase its pumping capacity. The Watermaster also commends the efforts of CVWD on its ongoing evaluation of potential stormwater recharge projects in Verdugo Basin.

The Parties should continue to expect significant challenges to both the availability and quality of groundwater in the ULARA groundwater basins during the next five water years. It is the opinion of this Watermaster that, over the forthcoming years, it will be essential for the continuing safe yield operation of the ULARA groundwater basins to continue to: provide more recharge at existing spreading basins; define and implement new locations and/or other methods (such as the use of injection wells) for recharging these groundwater basins; and actively pursue the possible spreading of recycled water in existing spreading basins at the northeastern side of the SFB in order to augment groundwater recharge that occurs naturally during the rainy season in those existing spreading basins.

PLATES

PLATE 1

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years



LEGEND

- Groundwater Contour
- Spreading Grounds
- Airport

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

2 0 2 Miles

Simulated Groundwater Contour - Model Layer 1
Fall 2021

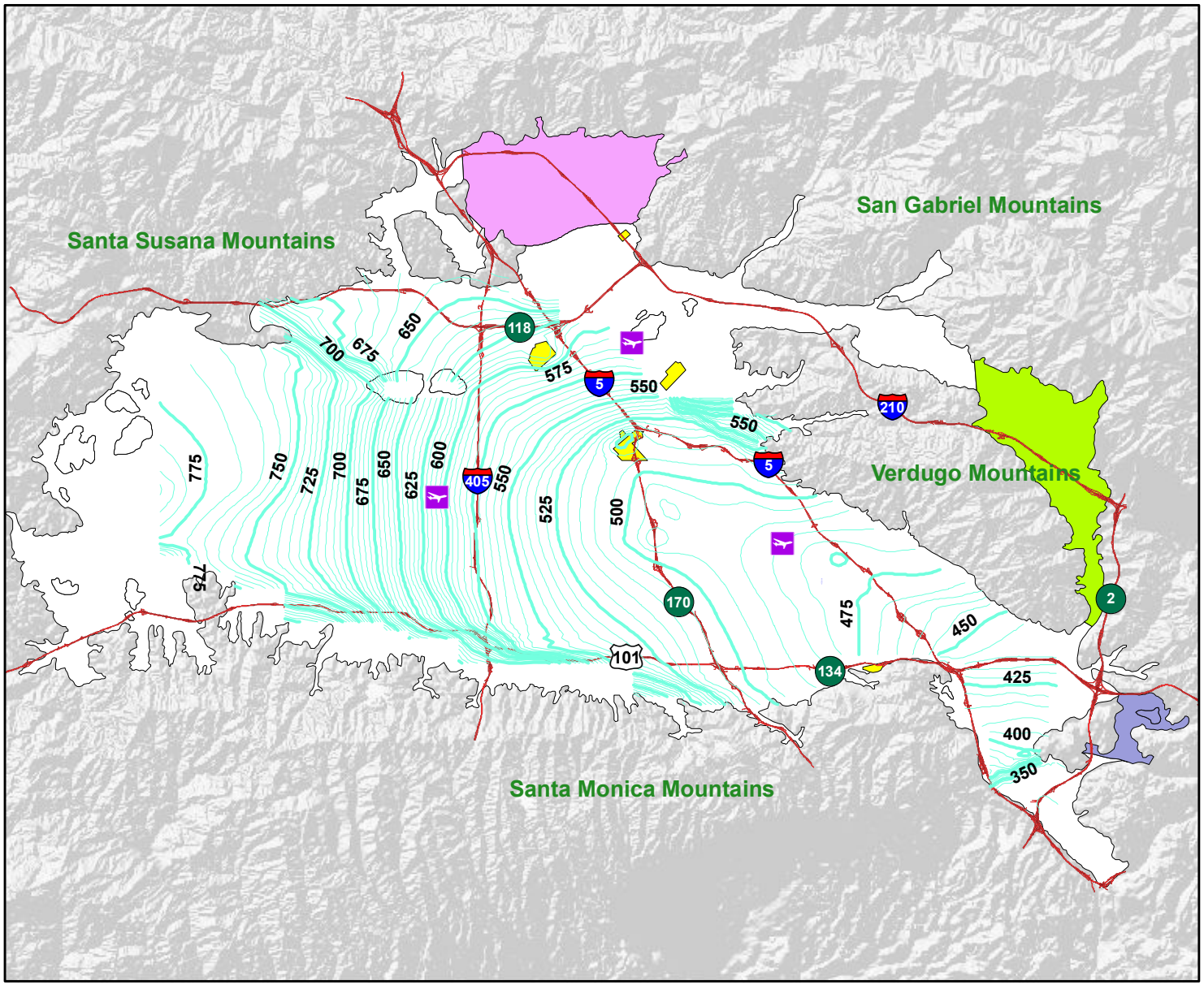


PLATE 2

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years

LEGEND

- Groundwater Contour
- Spreading Grounds
- Airport

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

2 0 2 Miles

Simulated Groundwater Contour - Model Layer 2
Fall 2021

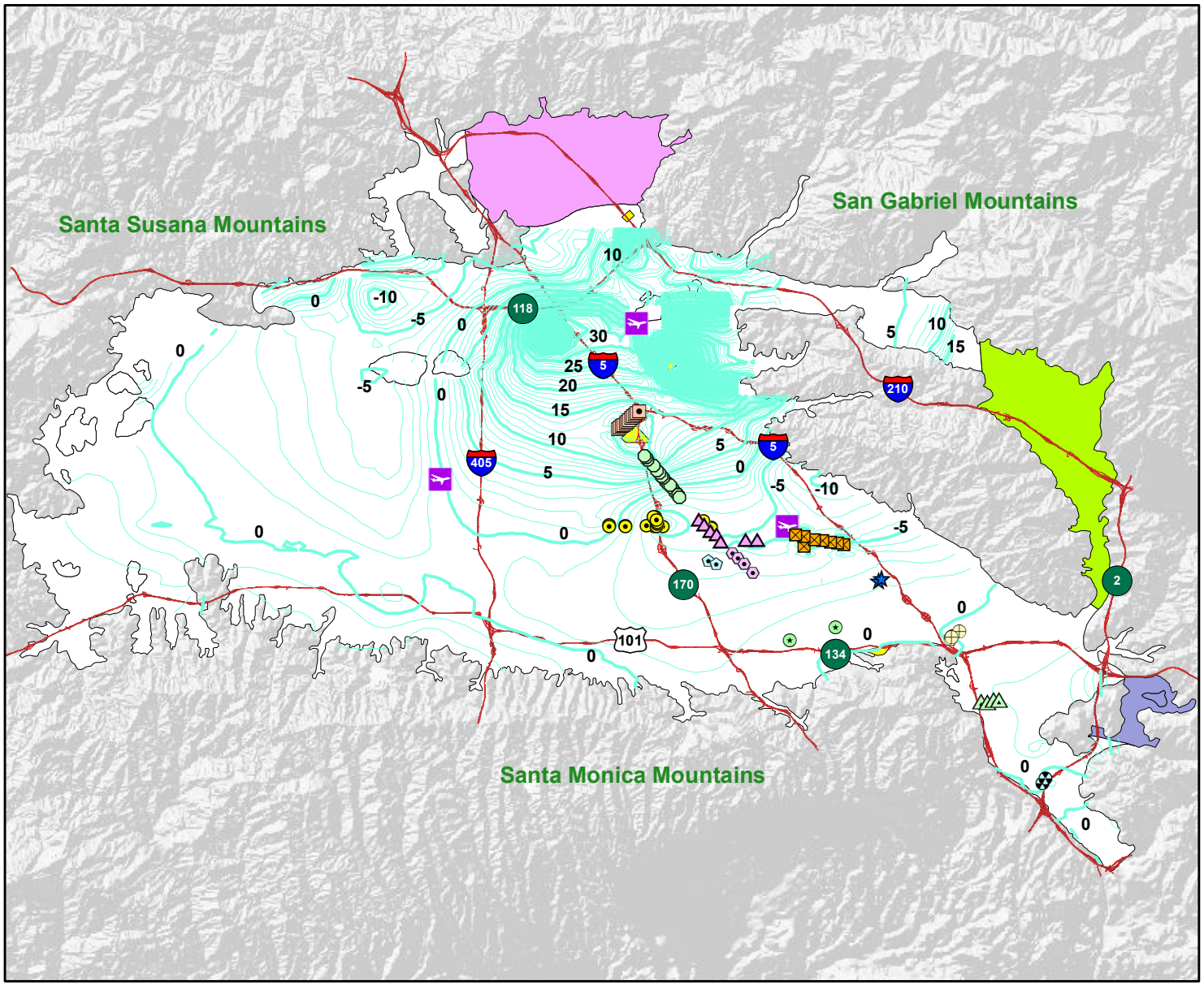


PLATE 3

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years

LEGEND

- Burbank OU
- Burbank GAC
- Glendale North OU
- Glendale South OU
- North Hollywood OU
- Pollock
- Tujunga
- Rinaldi-Toluca
- North Hollywood
- Erwin
- Whitnall
- Verdugo
- Change in GW Elev.
- Spreading Grounds
- Airport

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

2 0 2 Miles

Simulated Change in Groundwater Elevation Model Layer 1
Fall 2016 - Fall 2021

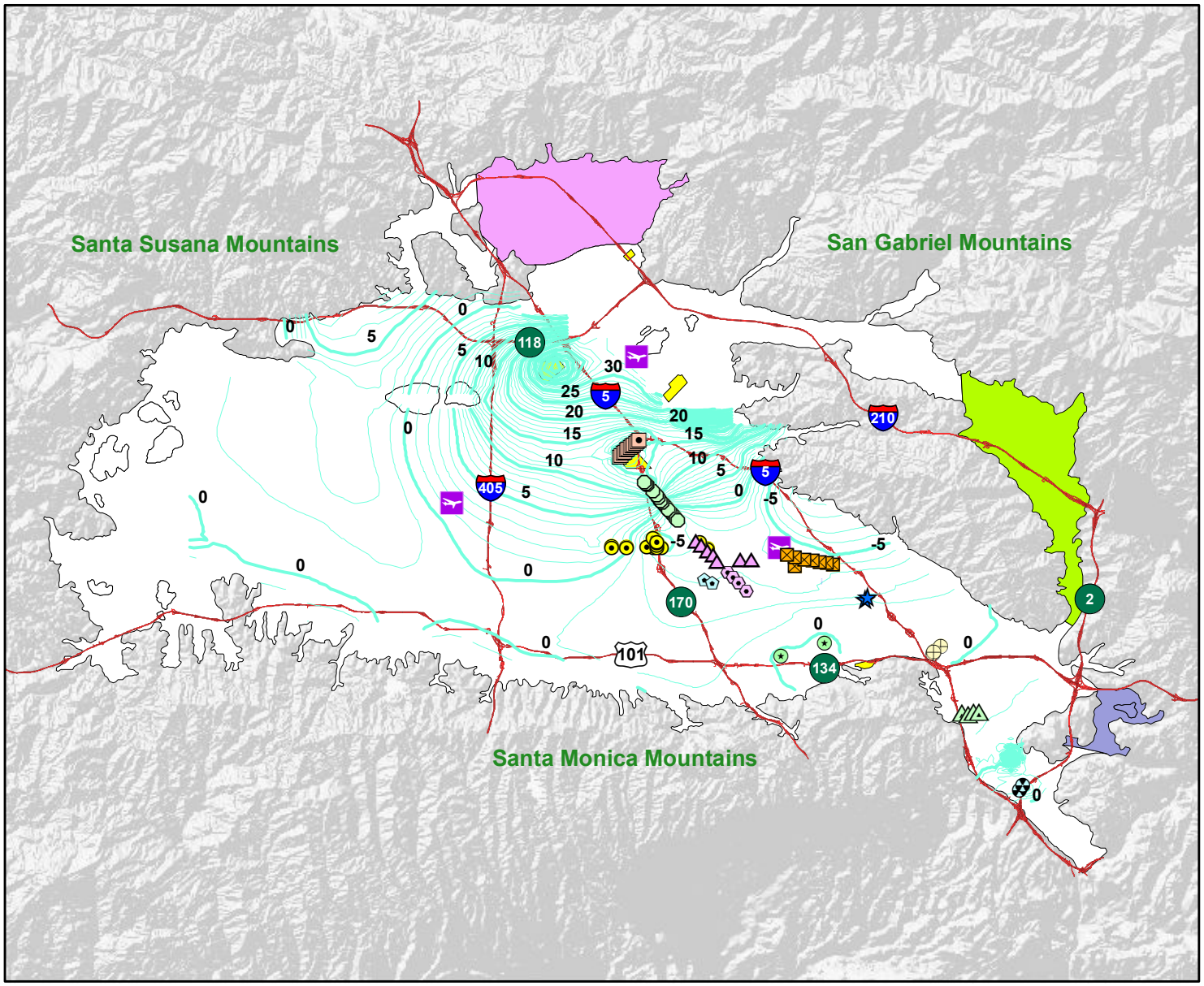


PLATE 4

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years

LEGEND

- Burbank OU
- Burbank GAC
- Glendale North OU
- Glendale South OU
- North Hollywood OU
- Pollock
- Tujunga
- Rinaldi-Toluca
- North Hollywood
- Erwin
- Whitnall
- Verdugo
- Change in GW Elev.
- Spreading Grounds
- Airport

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

2 0 2 Miles

Simulated Change in Groundwater Elevation Model Layer 2
Fall 2016 - Fall 2021

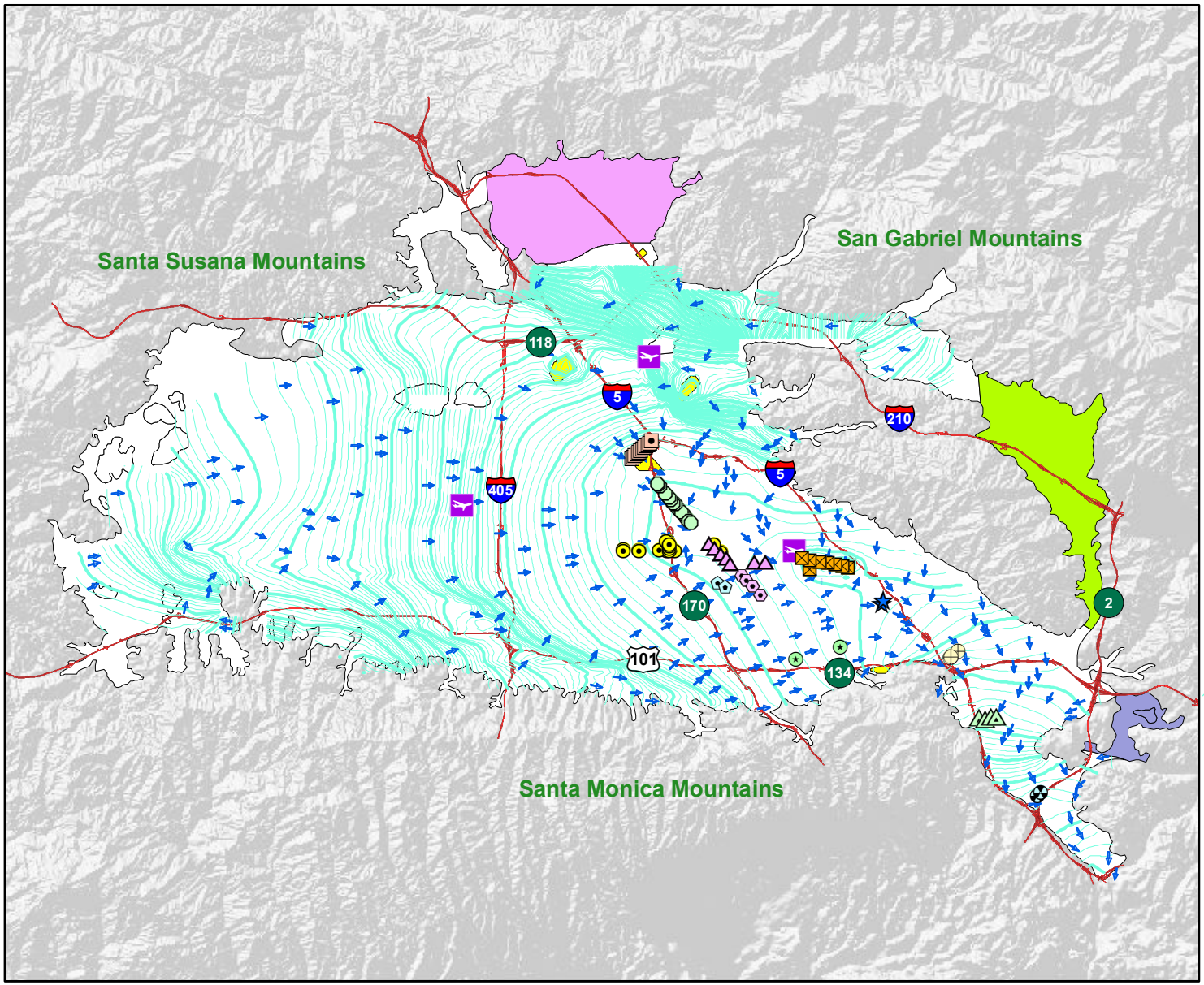


PLATE 5

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years

LEGEND

- Burbank OU
- Burbank GAC
- Glendale North OU
- Glendale South OU
- North Hollywood OU
- Pollock
- Tujunga
- Rinaldi-Toluca
- North Hollywood
- Erwin
- Whitnall
- Verdugo
- Groundwater Flow Direction
- Groundwater Contour
- Spreading Grounds
- Airport

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

2 0 2 Miles

Simulated Groundwater Flow Direction - Model Layer 1
Fall 2021

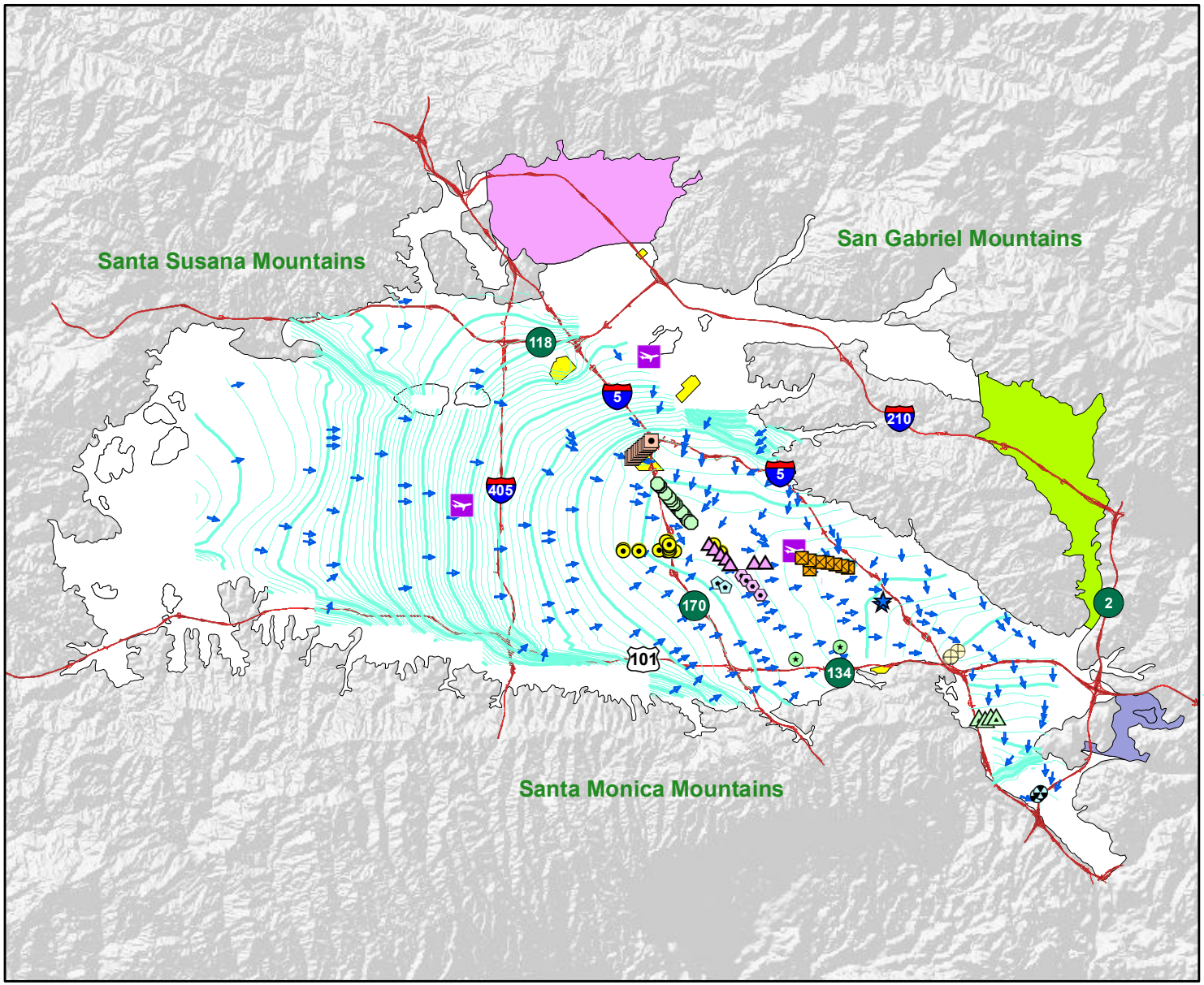


PLATE 6

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years

LEGEND

- Burbank OU
- Burbank GAC
- Glendale North OU
- Glendale South OU
- North Hollywood OU
- Pollock
- Tujunga
- Rinaldi-Toluca
- North Hollywood
- Erwin
- Whitnall
- Verdugo
- Groundwater Flow Direction
- Groundwater Contour
- Spreading Grounds
- Airport

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

2 0 2 Miles

Simulated Groundwater Flow Direction - Model Layer 2
Fall 2021

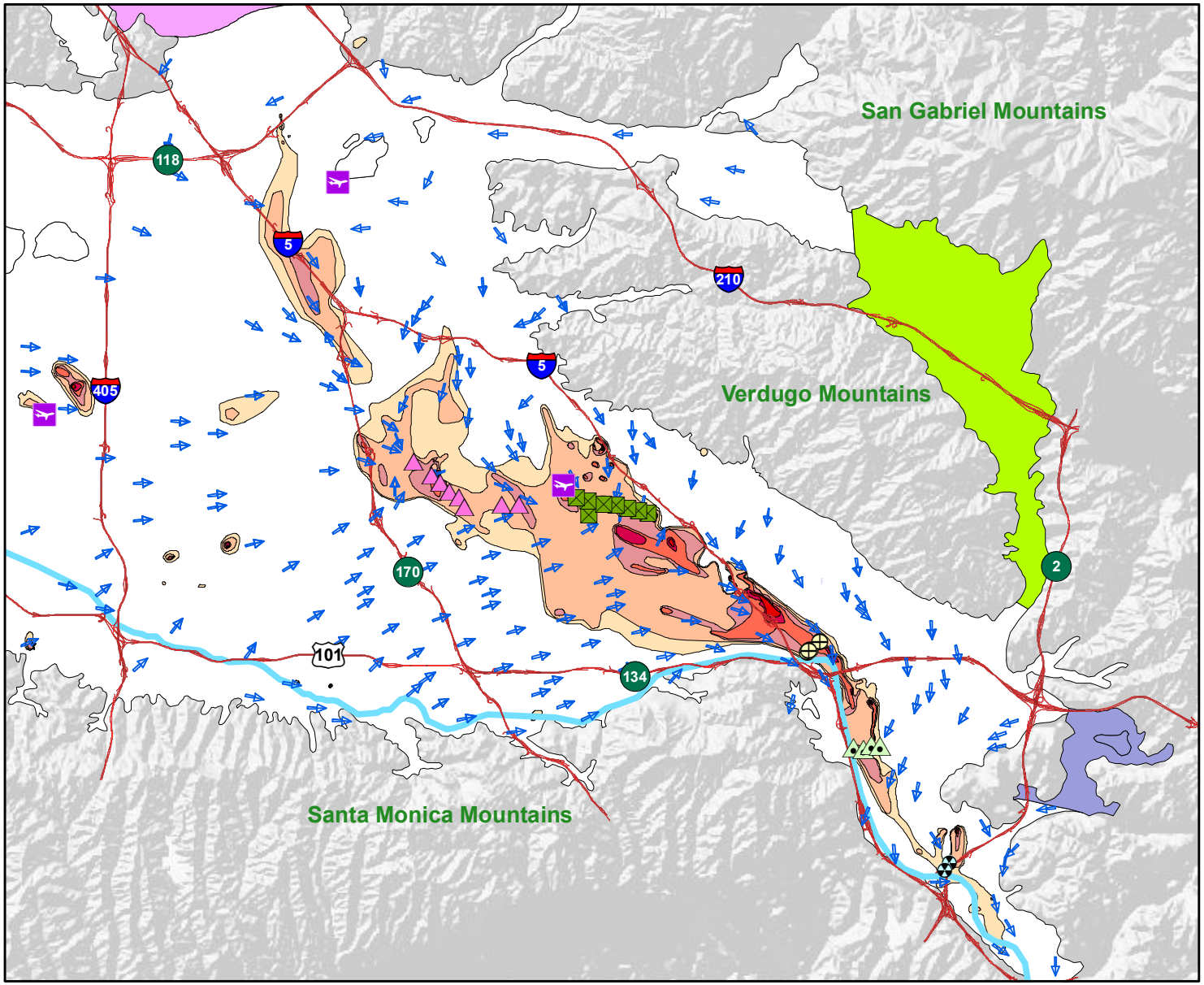


PLATE 7

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years

LEGEND

- Burbank OU
- Glendale North OU
- Glendale South OU
- North Hollywood OU
- Pollock Wells

TCE PLUME (Source: USEPA)

- > DL - 5 ug/L
- 5.01 - 50 ug/L
- 50.01 - 100 ug/L
- 100.01 - 500 ug/L
- 500.01 - 1,000 ug/L
- 1,000.01 - 10,000 ug/L
- > 10,000 ug/L

- Groundwater Flow Direction
- Airport
- Los Angeles River

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

1 0 1 2 Miles

2014 TCE Contamination and 2021 Simulated Groundwater Flow Direction Model Layer 1

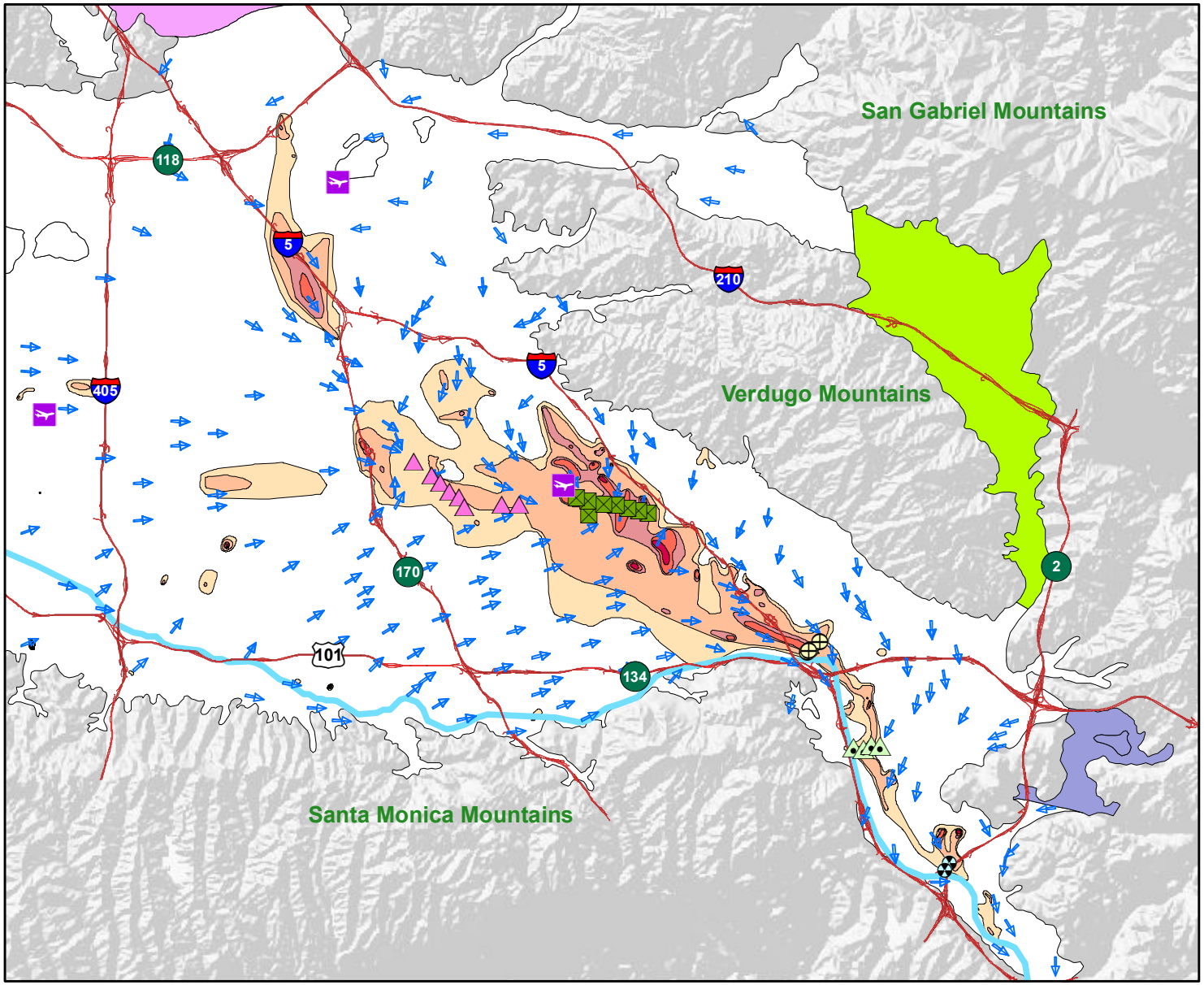


PLATE 8

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years

LEGEND

- Burbank OU
- Glendale North OU
- Glendale South OU
- North Hollywood OU
- Pollock Wells

PCE PLUME (Source: USEPA)

- > DL - 5 ug/L
- 5.01 - 50 ug/L
- 50.01 - 100 ug/L
- 100.01 - 500 ug/L
- 500.01 - 1,000 ug/L
- > 1,000 ug/L

- Groundwater Flow Direction
- Airport
- Los Angeles River

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

1 0 1 2 Miles

2014 PCE Contamination and 2021 Simulated Groundwater Flow Direction Model Layer 1

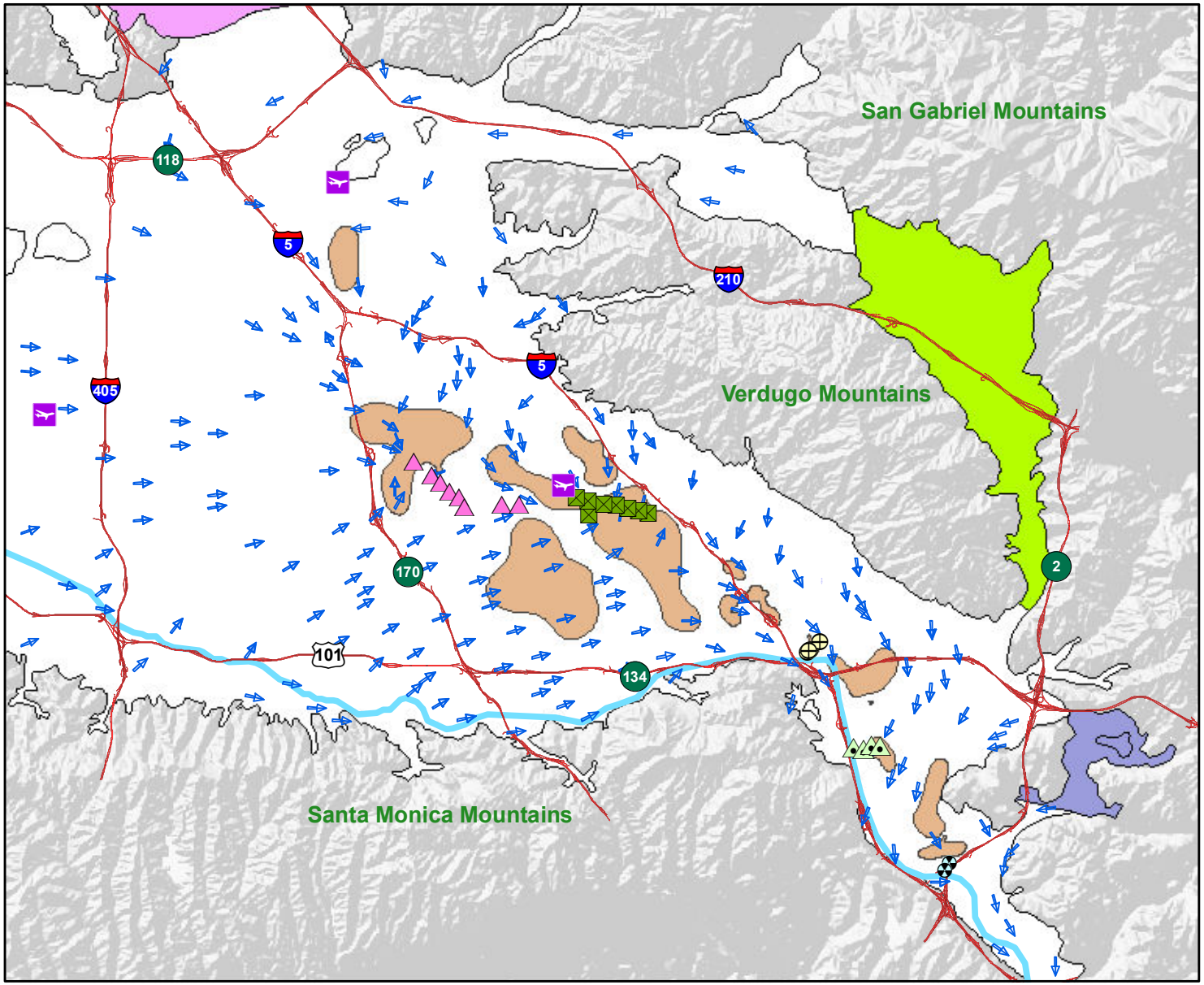


PLATE 9

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years

LEGEND

- Burbank OU
- Glendale North OU
- Glendale South OU
- North Hollywood OU
- Pollock Wells

NO3 PLUME (Source: USEPA)

- 2010 Nitrate (Shallow)
- Groundwater Flow Direction
- Airport
- Los Angeles River

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

1 0 1 2 Miles

2010 Nitrate (as NO3) Contamination and 2021 Simulated Groundwater Flow Direction Model Layer 1

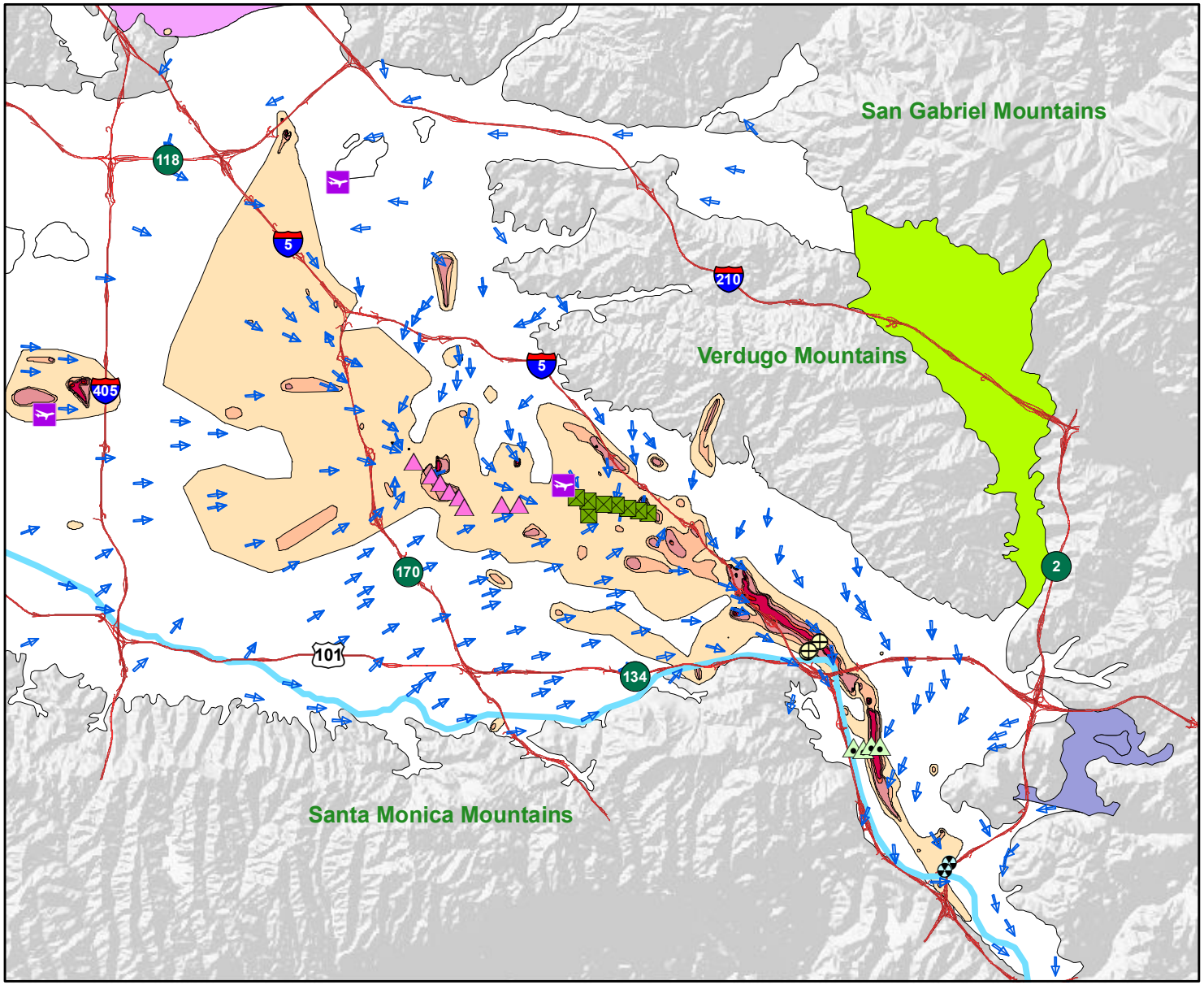


PLATE 10

Upper Los Angeles River Area
WATERMASTER
Pumping and Spreading Report
2016-2021 Water Years

LEGEND

- Burbank OU
- Glendale North OU
- Glendale South OU
- North Hollywood OU
- Pollock Wells

Total Chromium Plume (Source: USEPA)

- > DL - 5 ug/L
- 5.01 - 10 ug/L
- 10.01 - 50 ug/L
- 50.01 - 100 ug/L
- 100.01 - 1,000 ug/L
- > 1,000 ug/L

- Groundwater Flow Direction
- Airport
- Los Angeles River

Groundwater Basins

- San Fernando
- Sylmar
- Verdugo
- Eagle Rock

N

1 0 1 2 Miles

2014 Total Dissolved Chromium Contamination and 2021 Simulated Groundwater Flow Direction Model Layer 1

APPENDIX A

CITY OF LOS ANGELES

PUMPING AND SPREADING PLAN

2016-17 through 2020-21 Water Years

CITY OF LOS ANGELES
GROUNDWATER PUMPING AND SPREADING PLAN
IN THE UPPER LOS ANGELES RIVER AREA
FOR WATER YEARS 2016-2021

May 2017

Prepared by:
Water Rights & Groundwater Management Group
WATER RESOURCES DIVISION
Los Angeles Department of Water and Power

TABLE OF CONTENTS

Introduction

The water rights in the Upper Los Angeles River Area (ULARA) were set forth in a Final Judgment, entered on January 26, 1979, ending litigation that lasted over 20 years. The ULARA Watermaster's Policies and Procedures give a summary of the decreed extraction rights within ULARA, together with a detailed statement describing the ULARA Administrative Committee operations, reports to and by the Watermaster and necessary measuring tests and inspection programs. The ULARA Policies and Procedures have been revised several times since the original issuance, to reflect current groundwater management thinking.

In Section 5.4 of the ULARA Policies and Procedures as amended in February 1998, it is stated that:

> *"...all parties or non-parties who pump groundwater are required to submit annual reports by May 1 to the Watermaster that include the following:*
>
> - *A 5-year projection of annual groundwater pumping rates and volumes.*
> - *A 5-year projection of annual spreading rates and volumes.*
> - *The most recent water quality data for each well."*

This 2017 report presents the five-year Groundwater Pumping and Spreading Plan for the Water Years 2016–2021 for the City of Los Angeles.

Section 1: Facilities Description

Groundwater conditions in ULARA are influenced by facilities owned or operated by the Los Angeles Department of Water and Power (LADWP).

a. Spreading Grounds

There are five spreading ground facilities that can be used for groundwater recharge of native water in ULARA. The Los Angeles County Flood Control District (LACFCD) owns and operates the Branford, Hansen, Lopez, and Pacoima spreading grounds. LADWP owns Tujunga spreading grounds which are cooperatively operated and maintained by LACFCD and LADWP. Estimated capacities for the spreading grounds are shown in Table 1-1 and their locations are shown in Figure 1-1.

Headworks spreading grounds has not been used since 1993. Starting this year it will no longer be reported in Table 2-3.

TABLE 1-1
ESTIMATED CAPACITIES OF SPREADING GROUNDS

Spreading Ground	Basin Type	Wetted area (acre)	Max Experienced Recharge (acre-feet/year)
Operated by LACFCD			
Branford	Deep	7	2,100
Hansen	Shallow	117	35,100
Lopez	Shallow	12	3,900
Pacoima	Medium	107	24,100
Jointly Maintained by LADWP & LACFCD			
Tujunga	Shallow	83	42,800
		TOTAL:	108,000

b. Extraction Wells

LADWP has eight active wellfields in the San Fernando Basin, and one in the Sylmar Basin. The rated capacities of the nine wellfields are shown in Table 1-2. The rated capacities are approximate, as operating capacities vary depending on the water levels. Actual groundwater pumping will vary due to maintenance schedules and water quality for each well.

TABLE 1-2
RATED CAPACITIES OF LADWP WELLFIELDS IN ULARA

Wellfield	Number of Wells			Rated Capacity	
San Fernando Basin	Active	Standby	Total	cfs	gpm
Aeration	7	---	7	2.5	1,122
Erwin	2	---	2	6.1	2,738
Headworks [A]	---	---	---	---	---
North Hollywood	14	---	14	55.5	24,910
Pollock	2	---	2	5.9	2,648
Rinaldi-Toluca	15	---	15	113.0	50,718
Tujunga	12	---	12	98.2	44,075
Verdugo	2	---	2	7.4	3,321
Whitnall	4	---	4	14.8	6,643
Sylmar Basin					
Mission	2	---	2	5	2,244
TOTAL	60	---	60	308.4	138,419

[A] Headworks Wellfield is not in service

Crystal Springs Wellfield which has been listed in the past will no longer appear in Table 1-2 as of this year. It was abandoned pursuant to sale of property to DreamWorks, Inc.

c. Groundwater Remediation Facilities

LADWP operates three groundwater remediation facilities. Treated effluent produced by these facilities is conveyed to the water distribution system and delivered to LADWP customers for potable supply as a beneficial end use.

North Hollywood Groundwater Treatment Facility

The North Hollywood Operable Unit (NHOU) was placed into service December 1989 and is being operated and maintained by LADWP under the direction of the United States Environmental Protection Agency (USEPA) in accordance with the Cooperative Agreement between these two agencies. USEPA provides 90 percent of the funding for the operations and maintenance of the North Hollywood Groundwater Treatment Facility.

The NHOU was designed to achieve a groundwater treatment capacity of up to 2,000 gallons per minute (gpm) utilizing eight shallow extraction wells and an aeration tower to remove volatile organic compounds (VOC) from the extracted groundwater. Vapor-phase granular activated carbon (GAC) vessels are then utilized to remove VOCs from the aeration tower air emissions.

Pollock Wells Treatment Plant

The Pollock Wells Treatment Plant was placed into service March 1999 to remove VOCs from the groundwater at a rate of up to 3,000 gpm. This facility was designed to remove trichloroethylene (TCE) and perchloroethylene (PCE) from groundwater produced by two extraction wells. Liquid-phase GAC vessels restored the use of Pollock Wells, which also reduces the potential of rising groundwater discharge from the San Fernando Basin into the Los Angeles River.

Temporary Tujunga Wells Treatment Study Project

The Temporary Tujunga Wells Treatment Study Project was placed into service May 2010 to remove VOCs from the groundwater with a remediation capacity of approximately 8,000 gpm. Liquid-phase GAC vessels designed to remove VOCs from groundwater were installed at two wells at the Tujunga Wellfield, and have restored more than 20,000 acre feet per year (AFY) of pumping capacity that was unavailable due to water quality constraints.

Section 2: Annual Pumping and Spreading Projections

a. Pumping Projections for Water Years 2016-2021

The City of Los Angeles has the following six sources of water supply:

1) Los Angeles Aqueduct supply imported from the Owens Valley/Mono Basin areas,
2) Local groundwater supply from the San Fernando, Sylmar , Central, and West Coast Basins
3) Metropolitan Water District of Southern California (MWD) supply imported from the San Francisco Bay Delta via the State Water Project (SWP) and the Colorado River Aqueduct,
4) Recycled water,
5) Stormwater, and
6) Conservation.

LADWP's use of groundwater from the San Fernando Basin fluctuates from year to year depending on the availability of the imported water sources, which can vary as a result of hydrologic conditions and operational constraints. Use of the San Fernando Basin groundwater supply is largely constrained by the impacts of groundwater contamination, including most significantly PCE, TCE, 1,4-Dioxane, potentially hexavalent chromium (Cr-VI) and perchlorate, and other emerging chemicals. VOCs that have escaped the containment area of the NHOU have affected nearby groundwater supply wells. To a lesser degree, VOCs have impaired LADWPs use of groundwater in Sylmar Basin and Central Basin.

The San Fernando, Sylmar, Central, and West Coast Basins provide the City's local groundwater supply. The City of Los Angeles has the following average annual water rights, in acre feet (AF), which comprise approximately 21% of the City's supply:

San Fernando Basin:	87,000 AF
Sylmar Basin:	3,570 AF
Central Basin:	17,236 AF
West Coast Basin:	1,503 AF

Table 2-1 shows the amount of groundwater extractions that are expected, during the 2016-2017 Water Year, from the San Fernando and Sylmar Basins. Projected 2017 to 2021 groundwater extractions are provided in Table 2-2. These projections are based upon water demand forecasts and availability of Los Angeles Aqueduct flows, and are subject to yearly adjustments.

TABLE 2-1
ACTUAL AND PROJECTED PUMPING
BY THE CITY OF LOS ANGELES FOR WY 2016-2017
(acre-feet)

San Fernando Basin		Actual Extraction						Projected Extraction [A]					
	Total	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17
Aeration	**907**	0	54	54	77	36	74	100	104	100	104	104	100
Erwin	**0**	0	0	0	0	0	0	0	0	0	0	0	0
Headworks	**0**	0	0	0	0	0	0	0	0	0	0	0	0
North Hollywood	**4,604**	1,710	1,531	1,182	5	4	172	0	0	0	0	0	0
Pollock	**3,269**	29	312	332	197	164	182	143	387	375	387	387	375
Rinaldi-Toluca	**8,689**	2,327	2,250	1,755	2,341	7	9	0	0	0	0	0	0
Tujunga	**23,878**	3,754	3,435	2,391	2,930	1,455	1,452	1,387	1,433	1,387	1,433	1,433	1,387
Verdugo	**0**	0	0	0	0	0	0	0	0	0	0	0	0
Whitnall	**0**	0	0	0	0	0	0	0	0	0	0	0	0
San Fernando Basin Total	**41,348**	**7,821**	**7,583**	**5,714**	**5,550**	**1,667**	**1,888**	**1,630**	**1,924**	**1,862**	**1,924**	**1,924**	**1,862**
Sylmar Basin													
Mission	**820**	0	0	0	0	0	0	0	166	161	166	166	161
ULARA Total	**42,168**	**7,821**	**7,583**	**5,714**	**5,550**	**1,667**	**1,888**	**1,630**	**2,090**	**2,023**	**2,090**	**2,090**	**2,023**

[A] ULARA pumping has been significantly curtailed since February 2017, in anticipation of near record Los Angeles Aqueduct Deliveries to the City.

Near record levels of rain and snowpack was observed in the Eastern Sierras during the Winter of 2017. This has created extremely large quantities of runoff and expected Los Angeles Aqueduct deliveries. As a result, as seen in Table 2-1, our Operations Division has significantly decreased pumping in ULARA beginning in February 2017, and the curtailment is anticipated to continue through the end of the water year.

TABLE 2-2
PROJECTED PUMPING IN THE SAN FERNANDO AND SYLMAR BASINS
BY THE CITY OF LOS ANGELES FOR 2016-2021
(acre-feet)

WELL FIELD	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
AERATION	907	1,262	1,086	1,089	1,086
ERWIN	0	0	0	0	0
HEADWORKS	0	0	0	0	0
NORTH HOLLYWOOD	4,604	6,633	13,587	14,533	16,686
POLLOCK	3,269	2,006	2,241	2,246	2,877
RINALDI-TOLUCA	8,689	10,343	18,307	22,151	22,707
TUJUNGA	23,878	24,929	35,398	42,116	42,001
VERDUGO	0	0	0	0	0
WHITNAL	0	0	0	0	0
TOTAL ACRE-FEET (SFB)	**41,348**	**45,173**	**70,619**	**82,136**	**85,357**
MISSION WELLFIELD (Sylmar)	820	2,172	4,170	4,170	4,170

b. Spreading Projections for the 2016-2017 Water Year

Native groundwater recharge from captured storm runoff occurs primarily as a result of runoff diversion from adjacent storm channels into engineered spreading grounds. Spreading grounds are primarily operated by Los Angeles County Flood Control District (LACFCD). Table 2-3 represents the anticipated spreading volumes for Water Year 2016-2017.

TABLE 2-3
ACTUAL AND PROJECTED CENTRALIZED SPREADING
IN ULARA SPREADING GROUNDS FOR WY 2016-2017
(acre-feet)

	Operated by:					
Month	**LACDPW**				**LACDPW and LADWP**	**Monthly Total**
	Branford	**Hansen**	**Lopez**	**Pacoima**	**Tujunga**	
	Actual					
Oct-16	20	0	450	1,510	0	1,980
Nov-16	87	0	471	2,530	0	3,088
Dec-16	166	0	806	1,760	0	2,732
Jan-17	74	3,730	300	2,010	0	6,114
Feb-17	57	5,790	219	2,150	0	8,216
	Projected					
Mar-17	86	408	0	257	0	751
Apr-17	25	95	0	160	0	280
May-17	27	47	0	0	0	74
Jun-17	14	0	19	65	0	98
Jul-17	15	0	0	0	0	15
Aug-17	15	0	0	0	0	15
Sep-17	13	0	0	0	0	13
Total	**599**	**10,070**	**2,265**	**10,442**	**0**	**23,376**

LADWP and the LACFCD are cooperatively working to enhance the 150 acre Tujunga Spreading Grounds. Enhancements include expanding and combining the spreading basins and installing new intake structures, which will increase the facility's storage and intake capacity and allow more stormwater to be captured. The project will result in an increase in groundwater recharge of the San Fernando Groundwater Basin. Due to construction which started in August 2016, the intake structure is out of commission and spreading is not feasible until completion in 2019. As seen in Table 2-3, Tujunga has no spreading throughout the 2016-17 water year.

Section 3: Water Quality Monitoring Program Description

All of LADWP's 60 active wells in ULARA are monitored in conformance with the requirements set forth in Title 22, California Code of Regulations (CCR). For all active wells, monitoring is required whether the well is in production or not. State regulations require the following types of monitoring regimens:

1. Inorganic compounds
2. Organic compounds
3. General Minerals
4. Radiological compounds
5. Secondary Standards: VOC, SOC

Each well, whether on active or standby status, is monitored every three years for many types of inorganic and organic compounds. Monitoring is performed at various frequencies commensurate with regulatory standards. A complete list of the parameters that must be tested for is contained in Title 22 of the CCR.

Appendix A provides the concentrations of various compounds detected in LADWP's groundwater wells in the San Fernando and Sylmar Basins during the period of April 2016 through March 2017. This report includes concentrations detected for a number of contaminants including TCE, PCE, Perchlorate, Cr-VI, and 1-4 Dioxane.

Section 4: Groundwater Treatment Facilities Operations Summary

a. North Hollywood Operable Unit (NHOU)

Table 4-1 provides the volume of groundwater extracted by each North Hollywood extraction well and treated through the aeration tower for VOC removal. This table also provides the concentrations of TCE and PCE detected in the raw groundwater from each wellhead before treatment. Water quality measurements from the treated effluent show that VOCs were effectively removed by the treatment process. Current operations include the use of four of the seven extraction wells.

Emerging contaminants have also impacted operational reliability of the NHOU. North Hollywood Extraction Well Nos. 2 and 3 (NHE-2, NHE-3) have been disconnected from the distribution system since February 2007 and March 2013, respectively, due to elevated concentrations of Cr-VI, which the NHOU was not designed to remove. To contain the plumes, the responsible party, Honeywell International, Inc., began operating NHE-2 in 2008, and NHE-3 in 2015 and has been discharging the untreated effluent into the sanitary sewer.

TABLE 4-1
GROUNDWATER TREATMENT FROM THE NORTH HOLLYWOOD OPERABLE UNIT (AERATION) WELLS
(acre-feet)

	Groundwater Treatment from Aeration Wells								PCE (µg/L)		TCE (µg/L)	
Mon-Yr	**No.2[A]**	**No.3[A]**	**No. 4**	**No. 5**	**No. 6**	**No. 7**	**No. 8**	**Total**	**Influent**	**Effluent**	**Influent**	**Effluent**
Apr-16	--	--	8	0	31	26	35	**100**	8.33	ND	39.5	ND
May-16	--	--	8	0	33	27	36	**104**	8.97	ND	43.3	ND
Jun-16	--	--	5	0	21	18	23	**68**	ns	ns	ns	ns
Jul-16	--	--	1	0	3	3	4	**12**	ns	ns	ns	ns
Aug-16	--	--	0	0	0	0	0	**0**	ns	ns	ns	ns
Sep-16	--	--	0	0	0	0	0	**0**	ns	ns	ns	ns
Oct-16	--	--	0	0	0	0	0	**0**	ns	ns	ns	ns
Nov-16	--	--	5	0	23	0	26	**54**	10.50	ND	58.4	ND
Dec-16	--	--	5	0	13	12	25	**54**	ns	ns	ns	ns
Jan-17	--	--	7	0	17	17	36	**77**	9.27	ND	42.6	ND
Feb-17	--	--	3	0	9	8	17	**36**	9.21	ND	43.1	ND
Mar-17	--	--	5	0	18	16	35	**74**	9.11	ND	41.4	ND
Total								**580**				

Note:
[A] Effluent from Well Nos. 2 and 3 is currently being diverted to the sanitary sewer and does not enter the NHOU.
ND: Not Detected
ns: Not Sampled

b. Pollock Wells Treatment Plant (PWTP)

Table 4-2 provides the volume of groundwater extracted by each well and treated through the liquid-phase GAC vessels for VOC removal. This table also provides the concentrations of TCE and PCE detected in the raw groundwater from the influent line before treatment. Water quality measurements from the treated effluent show that VOCs were effectively removed by the treatment process.

TABLE 4-2
GROUNDWATER TREATMENT FROM POLLOCK WELLS

	Treatment (AF)			PCE (µg/L)		TCE (µg/L)	
Mon-Yr	**No. 4**	**No. 6**	**Total**	**Influent**	**Effluent**	**Influent**	**Effluent**
Apr-16	176.34	0.16	176.50	1.51	ND	2.04	ND
May-16	176.34	0.07	176.41	1.74	ND	2.14	ND
Jun-16	173.07	0.13	173.20	1.77	ND	2.36	ND
Jul-16	183.63	0.30	183.93	1.72	ND	2.40	ND
Aug-16	180.64	0.13	180.77	2.08	ND	2.66	0.62
Sep-16	47.42	0.00	47.42	2.73	ns	3.20	ns
Oct-16	29.44	0.00	29.44	ns	ns	ns	ns
Nov-16	141.23	170.99	312.22	ns	ns	ns	ns
Dec-16	99.24	232.27	331.51	4.22	ns	3.66	ns
Jan-17	135.00	61.71	196.71	5.76	ns	4.77	ns
Feb-17	163.55	0.18	163.73	1.82	ns	2.56	ns
Mar-17	181.75	0.10	181.85	2.29	ns	2.76	ns
Total			2153.69				

Note:
ND: Not Detected
ns: Not Sampled

c. Temporary Tujunga Wells Treatment Study Project (TTW)

Table 4-3 provides the volume of groundwater extracted by each well and treated through the liquid-phase GAC vessels for VOC removal. This table also provides the concentrations of TCE and PCE detected in the raw groundwater from each wellhead before treatment. Water quality measurements from the treated effluent show that VOCs were effectively removed by the treatment process.

Well No. 8 has been connected to the treatment system to run as a backup when Well Nos. 6 or 7 are shutdown either for mechanical or maintenance needs. LADWP has requested a permit amendment from the Division of Drinking Water to operate this connection.

TABLE 4-3
GROUNDWATER TREATMENT FROM TUJUNGA WELLS

Mon-Yr	Tujunga Well No. 6					Tujunga Well No. 7					Treatment Totals
	Treatment (AF)	PCE (µg/L)		TCE (µg/L)		Treatment (AF)	PCE (µg/L)		TCE (µg/L)		
		Influent	Effluent	Influent	Effluent		Influent	Effluent	Influent	Effluent	
Apr-16	449	17.1	ND	11.9	ND	435	28.5	ND	21.4	ND	**884**
May-16	459	15.6	ND	11.0	ND	445	32.1	ND	23.6	ND	**904**
Jun-16	453	11.7	ND	8.96	ND	439	29.9	ND	22.4	ND	**892**
Jul-16	460	10.1	ND	7.83	ND	447	31.3	ND	22.4	ND	**907**
Aug-16	434	ns	ND	ns	ND	421	29.3	ND	22.4	ND	**855**
Sep-16	452	12.2	ND	9.6	ND	439	35.1	ND	25.4	ND	**891**
Oct-16	463	16.1	ND	11.6	ND	449	33.1	ND	24.1	ND	**912**
Nov-16	453	23.7	ND	15.9	ND	440	37.3	ND	27.0	ND	**893**
Dec-16	416	24.1	ND	13.8	ND	404	37.8	ND	24.2	ND	**821**
Jan-17	510	16.0	ND	10.1	ND	495	38.5	ND	23.8	ND	**1,004**
Feb-17	418	13.5	ND	8.96	ND	405	37.5	ND	25.2	ND	**823**
Mar-17	461	10.1	ND	6.70	ND	447	38.5	ND	25.1	ND	**909**
Total											**10,695**

Note:
ND: Not Detected
ns: Not Sampled
* : sample was “non representative”

Section 5: Proposed Facility Modifications

LADWP and LACFCD, in cooperation with the City of Los Angeles Bureau of Engineering, Bureau of Sanitation, and Bureau of Street Services continue to partner on, jointly fund, and collaborate on several projects that will enhance the capacity for recharge of stormwater and recycled water into the groundwater basin via existing spreading grounds in the eastern portion of the San Fernando Basin. This section describes plans for modifying existing spreading facilities and construction of new facilities to provide expanded opportunities for enhancing the groundwater recharge potential.

a. Spreading Grounds

Tujunga Spreading Grounds Upgrade

The project is currently under construction and is expected to be completed in 2019. The scope includes consolidating and deepening existing spreading basins, installing two high-flow intakes with rubber dams, and modifying the existing intake. This project is expected to increase regional annual average stormwater capture and recharge by about 8,000 AFY.

Lopez Spreading Grounds Upgrade

This upgrade project is currently in design, with construction expected to begin in 2018 and be completed by 2020. The scope includes expanding and deepening existing spreading basins, excavating sediment to improve infiltration rates, and improving the intake structure. This project is expected to increase regional annual average stormwater capture and recharge by approximately 480 AFY.

Branford Spreading Basin Upgrade

This upgrade project is currently in design, with construction expected to begin in 2019 and be completed by 2020. The scope includes installing a new pipe to divert water from the Branford Basin into the Tujunga Spreading Grounds. This project is expected to increase regional annual average stormwater capture and recharge by 597 AFY.

Pacoima Spreading Grounds Upgrade

This upgrade project is currently in design, with construction expected to begin in 2018 and be completed by 2020. The scope includes consolidating existing spreading basins, excavating sediment to improve infiltration rates, and installing a new automated intake structure. This project is expected to increase regional annual average stormwater capture and recharge by approximately 5,300 AFY.

b. Groundwater Production Facilities

Mission Wellfield Improvement Project

The purpose of the Mission Wells Improvement Project is to rehabilitate and replace deteriorating groundwater facilities in Sylmar Basin, including installation of three replacement production wells, monitoring wells, new piping, pump station upgrades, electrical upgrades, and controls. An application has been submitted to California Division of Drinking Water to permit the operation of Well No. 10, one of the three new production wells. The other two wells, Nos. 9 and 10 will not be operated due to very low production capacity and TCE concentrations exceeding the State Maximum Contamination Level, respectively. The recently constructed on-site Chlorination Generation System has been permitted and is in operation and Well No. 10 is expected to be operational by December 2017.

Van Norman Complex Investigation

Two exploratory wells were drilled in 2015 to approximately 1,500 feet below ground surface on the LADWP Van Norman Complex property to investigate the existence and extent of groundwater within the Saugus Formation. Initial pump tests from the two exploratory wells produced groundwater with concentrations of Total Dissolved Solids in excess of 1,000 milligrams per liter. Additional pump tests and well development will be performed starting in mid-2017 and ending mid-2018 to further evaluate potential aquifer yield and response to various pumping conditions. The water generated from the pump tests is expected to be discharged to the high-speed channel that feeds directly to the Los Angeles Aqueduct Filtration Plant.

c. Groundwater Remediation Facilities

North Hollywood Operable Unit (NHOU)

The NHOU, which has been in operation since December 1989, was designed to remove TCE and PCE contaminants from groundwater via aeration. The treated effluent is disinfected and conveyed into the municipal water distribution system. More recently, EPA has detected emerging contaminants, including Cr-VI and 1,4-dioxane, in excess of the state MCL and notification level (NL) for 1,4-dioxane at two of the NHOU extraction wells. The existing NHOU treatment system is incapable of removing these contaminants, and a sharp increase in the chromium concentrations has caused two of the eight extraction wells to be shut down, removed from the system, and the untreated effluent from these two wells have been redirected for discharge into the municipal sewer. These wells serve an important plume containment function for the high levels of contamination, and these shut downs demonstrated the need for a change in the remedy.

In response to the above shut downs and continued migration of VOC-contaminated groundwater, USEPA conducted a Focused Feasibility Study (FFS) to evaluate alternatives for changing the groundwater remedy. USEPA summarized the results in its July 2009 Proposed Plan, and selected the preferred remedy in its September 2009 Second Interim Record of Decision. The selected remedy is to install well-head treatment for hexavalent chromium and 1,4 dioxane, expand the combined treatment system, install additional monitoring wells, install and operate three additional groundwater extraction wells, and to continue to provide the treated water to LADWP for a drinking water end use. USEPA amended the 2009 Second Interim Record of Decision in 2014 to allow for consideration of the treated effluent to be reinjected back into the aquifer (reinjection end use).

San Fernando Groundwater Basin Remediation Efforts

LADWP has begun evaluating potential response actions to restore the beneficial use of groundwater in the vicinity of various well fields. These efforts include studies, activities, and other analysis required by the EPA's National Contingency Plan to evaluate appropriate response actions. While additional work is required to evaluate the appropriate interim and final response actions for each area, one potential set of alternatives would consist of a series of local and centralized treatment facilities that produce water for potable use. Some facts suggest this approach could be ideal. These include the size and location of the plumes, the beneficial uses of the groundwater, and reliability concerns of long-term availability of alternative water sources and its high cost if such groundwater treatment did not occur.

The information LADWP will evaluate includes an analysis of pump rates and treatment capacity that would be appropriate to capture contaminant mass and help to restore the beneficial use of the aquifer for that wellfield, based on fate and transport modeling and other analysis. LADWP also plans to evaluate ways to minimize the volume of water that requires treatment by prioritizing pumping from wells with higher levels of contamination to minimize the potential for contamination to spread to wells that currently do not contain levels of contamination that would require treatment. This analysis will also evaluate other alternatives.

LADWP will leverage its actions with current and planned response actions in the basin by LADWP and other parties, such as remedial actions undertaken by or overseen by the state or federal regulatory agencies, as well as other feasible alternatives, such as source control, in-situ treatment or pumping from other areas.

Generally, other agencies are focusing on source control and other hot spot areas, while LADWP generally focuses more on restoring the beneficial uses of water in the vicinity of production wells that has already migrated from the source areas.

To provide information about these potential response action alternatives, LADWP has completed a rough preliminary analysis of the scope and anticipated project costs. Preliminary analysis indicates that production of major SFB wellfields, either alone or in conjunction with other response actions, could reach a maximum of over 300 cfs well production capacity. LADWP would anticipate that the treatment systems would have modularity for addressing additional treatment capacity that may be needed due to regulatory changes or plume migration. Design and construction costs for this set of alternatives are estimated to be approximately $600 million, with remediation treatment costs of up to $50 million per year. This estimate assumes that the facilities would be designed to utilize multiple best-available technologies to clean up the contaminants including TCE, PCE, and 1,4-dioxane, restoring LADWP's highest producing wellfields in the northern SFB.

North Hollywood West Advanced Oxidation Processes (AOP) Pilot Project

The UV/AOP testing has two phases. Phase 1 will incorporate bench scale testing with lab results. Phase 2 will evaluate low flow on-site pilot testing. In both phases, the contaminant removal efficiency and possible byproducts from the various treatment methods will be evaluated.

d. Recycled Water Projects

Groundwater Replenishment (GWR) Project

The GWR Project will provide up to 30,000 AFY of recycled water to replenish the SFB to increase the City's local water supplies and reduce the need for purchased imported water. The water utilized for GWR will consist of tertiary-treated recycled water from DCT that will go through additional treatment that meets or exceeds the State's Title 22 groundwater recharge regulations before being used for replenishment.

The GWR project is in the planning phase. The Final Environmental Impact Report was certified by the Board of Water and Power Commissioners on December 6, 2016. Outreach is being conducted for the Mayor's Office, Council Districts, Neighborhood Councils, and community groups throughout the City of Los Angeles. The project's Phase 2 Pilot Study began in February 2016 and is testing various combinations of purification technologies to optimize the production of recycled water and cost.

APPENDIX A:
Water Quality Sampling Results,
April 2016 through March 2017

APPENDIX B

CITY OF BURBANK

PUMPING AND SPREADING PLAN

2016-17 through 2020-21 Water Years

GROUNDWATER PUMPING
AND
SPREADING PLAN

FIVE WATER YEARS
OCTOBER 1, 2016 TO SEPTEMBER 30, 2021

WATER DIVISION
164 W. MAGNOLIA BOULEVARD
MAY 2017

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SECTION 1: INTRODUCTION

The groundwater rights of the City of Burbank are defined by the Judgment in Superior Court Case No. 650079, entitled "The City of Los Angeles, a Municipal Corporation, Plaintiff, vs. City of San Fernando, et. al., Defendants". The Final Judgment (Judgment) was signed on January 26, 1979.

In 1993, significant revisions were made to the Upper Los Angeles River Area (ULARA) Policies and Procedures with the addition of Section 2.9, Groundwater Quality Management. This addition was made by the Watermaster and the Administrative Committee to affirm its commitments to participate in the cleanup of the ground water and limit the spread of contamination in the San Fernando basin. The 1998 revision of the Policies and Procedures now includes Section 5.0, Watermaster Management of Groundwater Quality. This report is in response to Section 5.4, Groundwater Pumping and Spreading Plan for the Upper Los Angeles River Area.

The annual Groundwater Pumping and Spreading Plan is based on the water year, October 1 to September 30, and it includes projections for five years beginning with the current water year. This Plan for Burbank will be submitted to the Watermaster in May 2017. The Watermaster will evaluate the impact of pumping and spreading by all the parties, and the ULARA Pumping and Spreading Plan will be published by the Watermaster.

Burbank's Plan was prepared by the Water Engineering and Planning Section of City of Burbank Water and Power. Questions may be addressed to Bob Doxsee, Civil Engineering Associate, at (818) 238-3500 or by e-mail to bdoxsee@burbankca.gov.

SECTION 2: WATER DEMAND

The annual total water demand for the last ten years and the projected annual water demand for the next five years are shown in Table 2.

Urgent requests for voluntary conservation began in 2007. With increasing public awareness of water supply issues, and to comply with new State legislation, the plan was for 20 percent reduction in per-capita potable water usage by 2020. That target was actually reached in Fiscal Year 2009/10, with some help from the weather. In the more recent dry years, it is not surprising that water demands were higher. Then, with continuing drought, emergency regulation in 2015 called for an immediate 25 percent reduction compared to 2013 levels. Burbank did achieve reductions to meet its targets, and lower water demands have continued. For this plan, per-capita water use is predicted to remain lower than in 2013 because watering restrictions have been made permanent. Local supplies will be used as much as possible in order to reduce the demand on imported supplies from the Metropolitan Water District of Southern California (MWD). The projected water demand may vary significantly due to weather and/or economic conditions in the Burbank area; a variance of ±5% may be expected. A major expansion of the recycled system was completed in 2013, and demand on the potable water system will be offset by recycled water as additional site conversions are completed.

SECTION 3: WATER SUPPLY

The water supply for the City of Burbank is composed of purchased water from MWD, locally produced and treated groundwater, and recycled water from the Burbank Water Reclamation Plant. A discussion about each of the sources of supply is included below, and historic and projected use of each water source is shown in Table 3.

3.1 MWD

Burbank continues to directly rely on MWD for up to 70% of its water supply. Burbank purchases from MWD treated water for direct delivery to its distribution system and untreated water for basin replenishment. The City must purchase and spread water within the basin or purchase Physical Solution credits from the Los Angeles Department of Water and Power (LADWP) to operate its local groundwater wells. The economics determine which of these two options or what percentage of each Burbank will exercise in a given water year.

3.2 GAC Treatment Plant

Historically, the GAC Treatment Plant was normally operated during the summer season from May to October. The California Department of Public Health (CDPH) issued a draft Maximum Contaminant Level (MCL) for Chromium VI of 10 micrograms per liter in late 2013, and the MCL was adopted as final on July 1, 2014. Total chromium in the plant effluent is expected to exceed the new MCL and the GAC treatment process does not remove chromium, and facilities for blending are not available. Current plans are to keep the plant shut down, except for emergencies, water quality testing, or onsite non-potable use.

The GAC Treatment Plant treats the groundwater produced from Well No. 7 and Well No. 15 (Figure 3.1). The plant has a treatment capacity of 2,000 gallons per minute (gpm). In Water Year (WY) 2015/16, the wells and treatment plant were operated to replace recycled water in the cooling towers for the power plant when the recycled water supply was reduced due to a major sewer force main being shut down. The amount of water produced and delivered to the Magnolia Power Project cooling towers for industrial cooling was 65 acre-feet.

3.3 EPA Consent Decree Project

The EPA Consent Decree Project (also known as Burbank Operable Unit or BOU) became operational January 3, 1996. The source of groundwater for treatment at the BOU is Wells VO-1 through VO-8 (Figure 3.1) and the treatment plant has a capacity of 9,000 gpm. The Second Consent Decree was entered on June 22, 1998. An agreement has been negotiated with LADWP to treat and deliver groundwater from Burbank to Los Angeles during periods of low demand on the Burbank system, when the BOU would otherwise operate below capacity.

There may be 500 AFY of such deliveries beginning in WY 2017/18. The increased groundwater extractions and MWD purchased water for blending associated with the deliveries to Los Angeles are not included in this Plan, because they will be reported as Los Angeles demands.

3.4 Recycled Water

A master plan for expansion of the recycled water system was completed in 2007 and updated in 2010. The plan detailed an expansion of the distribution system which is expected to ultimately deliver an additional 1,000 acre-feet per year (AFY) of recycled water. 625 AFY of this total will directly offset potable water deliveries. The remaining 375 AFY will offset groundwater pumped from the well at Valhalla Memorial Park (Valhalla). The distribution main construction is complete, and site conversions are in progress.

3.5 Production Wells

Burbank has eight wells that are part of the BOU collector system, plus another four wells which are mechanically and electrically operable, and two others which have had equipment removed. The eight BOU wells are on “Active” status, while all the others are on "Inactive" status with the California Department of Public Health (DPH). (See Table 1.) Except for water quality testing at Wells 7 and 15, Burbank does not plan to operate the inactive wells in WY 2015/16 unless an emergency develops. Wells 7 and 15 may be operated for non-potable power plant use if there is an interruption or shortfall in the recycled water supply from the wastewater plant. This occurred in WY 2015/16 when a major sewer force main was under construction. Well No. 7 produces 1,050 gpm and Well No. 15 produces 850 gpm to supply the GAC treatment plant.

TABLE 1

BWP’S WELL STATUS

Active Wells	Inactive Wells	Inactive-Pulled
VO-1	No. 6A	No. 11A
VO-2	No. 7	No. 12
VO-3	No. 13A	
VO-4	No. 15	
VO-5		
VO-6		
VO-7		
VO-8		

SECTION 4: GROUNDWATER CREDITS

The Judgment includes a number of procedures related to groundwater pumping that Burbank and the other defendants must follow. In order to pump groundwater, rights to groundwater must be established, and in the San Fernando Basin those rights are accounted for as groundwater credits. Rights and procedures related to establishing, counting and maintaining groundwater credits are discussed in the following paragraphs. Historic and projected future groundwater credits are shown in Table 4.

4.1 Import Return Water

Under the Judgment, Burbank is entitled to extract 20 percent of the volume of water it delivered (potable and recycled) in the prior water year. This is known as import return water. The import return water credited for WY 2016/17 (based on water delivered in WY 2015/16) is 3,484 AF.

Estimated import return water credit for the next water year, based on 17,759 AF of delivered water, will be 3,552 AF.

4.2 Physical Solution

Burbank has a Physical Solution right to 4,200 AFY in addition to its import return water extraction rights. This is a right to purchase up to 4,200 AFY of groundwater credits from the City of Los Angeles. The price paid to the City of Los Angeles for this groundwater is set by formula in the Judgment.

Depending on the price of MWD untreated imported water and Physical Solution water from the City of Los Angeles, a decision will be made each year regarding which to purchase. MWD untreated water is currently less expensive than Physical Solution water. Therefore, Burbank will not purchase Physical Solution water from the City of Los Angeles in WY 2016/17. The current plan reflects the spreading of imported water instead of the purchase of Physical Solution credits.

In the Judgment, Valhalla and Lockheed Martin have the right under the Physical Solution to pump up to 300 AFY and 25 AFY, respectively. Burbank will charge the Physical Solution right holders for groundwater they extracted and claim the extractions against Burbank's rights.

4.3 Stored Water Credit

Burbank has a stored water credit of 14,249 AF as of October 1, 2016. Burbank's objective is to maintain a reserve of 10,000 AF of stored water credits. (See Appendix B.) Therefore, some

combination of Physical Solution and/or spreading of imported water is necessary to avoid depleting the stored water credits.

4.4 Spreading Operations and Transfers of Credits

In 2010 Burbank completed a new service connection to MWD at the end of the Foothill Feeder. (See Figure 4.1.) Connection B-06 is capable of delivering 50 cubic feet per second (cfs) of untreated imported water to the Pacoima Wash, where the water is conveyed down to the Pacoima Spreading Grounds operated by the L.A. County Public Works Department. Additionally, this service connection allows Burbank to direct water to the Lopez Spreading Grounds via the Lopez Ditch. These facilities allow Burbank to spread the 6,000 to 8,000 AFY of untreated water at the Pacoima Spreading Grounds that is needed to avoid depleting its stored groundwater credits.

Burbank received the first water delivery through the new connection on April 26, 2010. By agreement with MWD, Burbank will spread a minimum of 150 AF twice a year to maintain water quality at the end of the Foothill Feeder. After the MWD allocation ended, MWD water was available for a limited time at the lower replenishment rate, so Burbank spread as much water as possible in WY 2010/11. A total of 11,187 AF of imported water was delivered and spread at the Pacoima spreading grounds. The replenishment rate was not available after September 2011, but Burbank still spread 1,371 AF in WY 2011/12, 6,700 AF in WY 2012/13, and 7,000 AF in WY 2013/14.

Because of the severe drought, instead of spreading imported water in WY 2014/15 and WY 2015/16, Burbank and Los Angeles agreed, as they had done several times before, to exchange purchased imported water delivered to LADWP through MWD connection LA-35 at the LADWP treatment plant for groundwater credits to Burbank. In October 2015, 7,200 AF of credits were added to Burbank's account by this exchange. In November 2015 and April 2016, a total of 306 AF were spread at Pacoima as the water in the Foothill Feeder was turned over to maintain water quality.

In October, November, and December 2016, a total of 6,967 AF were spread at Pacoima. For the remaining four water years covered by this plan, Burbank plans to purchase about 7,200 AF per year of Physical Solution credits, untreated imported water, or a combination of the two. (See Table 4.)

SECTION 5: CAPITAL IMPROVEMENTS

5.1 Wells

Burbank plans to continue the use of Wells No. 7 and No. 15 for the GAC Treatment Plant when it is operated. Wells V-01 through V-08 will continue to be operated to supply water to the BOU. No capital improvements are planned for any wells.

5.2 Groundwater Treatment Facilities

EPA Project: The EPA Consent Decree Project became fully operational on January 3, 1996. Burbank assumed responsibility for operation and maintenance of the BOU on March 12, 2001. Initially, the facility had difficulty in sustaining operation at the designed treatment rate of 9,000 gpm. Burbank, Lockheed-Martin, and the USEPA cooperated in efforts to determine the cause(s) of the reduced production. Over the past few years, several process enhancements and repairs were made to the liquid-phase GAC vessels and to the vapor-phase GAC vessels.

As part of the requirement to close the First Consent Decree, USEPA required Burbank to demonstrate that the BOU would operate at its design capacity. In the fall of 2010, Burbank successfully completed the performance test of the BOU by operating the facility at 9,000 gpm for 60-days.

The City of Burbank currently contracts with TerranearPMC for the day-to-day operation and maintenance of the BOU.

GAC Treatment Plant: The plant will remain on an active status, but will not be operated except for well water quality tests and for emergencies. No capital improvement projects are planned for the GAC Treatment Plant.

TABLE 2

ACTUAL AND PROJECTED WATER DEMAND

Water Year	Acre-Feet
2006/07	25,745
2007/08	24,653
2008/09	22,532
2009/10	20,852
2010/11	19,735
2011/12	20,938
2012/13	20,937
2013/14	21,874
2014/15	18,234
2015/16	17,494
2016/17*	17,784
2017/18*	18,320
2018/19*	18,817
2019/20*	18,927
2020/21*	18,937

* Projected

NOTES:

1) Water demand equals the total of MWD, extractions (GAC, Valley/BOU, Valhalla, and cleanup pumpers), and recycled.
2) The five-year average water demand was 19,895 AFY for WY 2011/12 through 2015/16.

TABLE 3

GROUNDWATER EXTRACTIONS, MWD TREATED WATER, AND RECYCLED WATER

Water Year	MWD	GAC	BOU	Recycled	Valhalla	Total
2006/07	13,444	0	9,780	2,082	431	25,737
2007/08	15,299	0	6,817	2,192	337	24,645
2008/09	10,202	148	9,818	2,011	346	22,525
2009/10	8,401	5	10,043	2,080	317	20,846
2010/11	7,376	4	10,394	1,568	387	19,729
2011/12	8,602	4	9,993	2,000	338	20,937
2012/13	7,507	0	11,387	1,608	435	20,937
2013/14	8,901	1	10,148	2,407	417	21,874
2014/15	5,619	2	10,006	2,307	300	18,234
2015/16	5,092	65	9,377	2,903	57	17,494
2016/17*	4,714	0	10,262	2,808	0	17,784
2017/18*	4,740	0	10,558	3,022	0	18,320
2018/19*	4,740	0	11,135	2,942	0	18,817
2019/20*	4,740	0	11,135	3,052	0	18,927
2020/21*	4,740	0	11,135	3,062	0	18,937

*Projected

Notes:

1. Use of BOU will be maximized, with MWD used for required blending and to meet total demand.
2. MWD amounts are treated water. (Untreated MWD purchases are in Table 4.)
3. GAC was used only for non-potable use in the Magnolia Power Plant.
4. BOU includes small amounts of non-municipal use which is not included in the import return calculation.
5. Groundwater extractions need to be balanced over time by groundwater credits (Table 4.)
6. Valhalla converted to recycled water in January 2016.
7. Groundwater extractions by small cleanup pumpers are not included in this table. They were about 6 to 8 AFY from 2004/05 through 2010/11, but have dropped to zero since then.

TABLE 4

GROUNDWATER CREDITS

Water Year	Physical Solution	Import Return	Spreading Operations	Other	Total
2006/07	4,200	5,058	0	4,000 (1)	13,258
2007/08	4,200	4,855	0	0	9,055
2008/09	4,200	4,432	0	2,000 (2)	10,632
2009/10	0	4,103	34	0	4,137
2010/11	0	3,864	11,187	0	15,051
2011/12	0	4,117	1,371	0	5,488
2012/13	0	4,096	6,703	0	10,799
2013/14	0	4,288	7,000	0	11,288
2014/15	0	3,583	150	7,200 (3)	10,933
2015/16	0	3,484	306	7,200 (4)	10,990
2016/17*	0	3,552	7,200	0	10,752
2017/18*	0	3,659	7,000	0	10,659
2018/19*	0	3,758	7,000	65 (5)	10,823
2019/20*	0	3,780	7,200	125 (5)	11,105
2020/21*	0	3,782	7,200	190 (5)	11,172

*Projected

Notes:

1. A 4,000 AF exchange of untreated MWD water for groundwater credits was arranged with LADWP for WY 2006/07.
2. A 2,000 AF exchange of untreated MWD water for groundwater credits was arranged with LADWP for WY 2008/09.
3. A 7,200 AF exchange of untreated MWD water for groundwater credits was arranged with LADWP in December 2014 for WY 2014/15.
4. A 7,200 AF exchange of untreated MWD water for groundwater credits was arranged with LADWP in October 2015 for WY 2015/16.
5. Beginning WY 2018/19, groundwater credits are expected from LADWP in exchange for recycled water delivered from Burbank to LADWP.

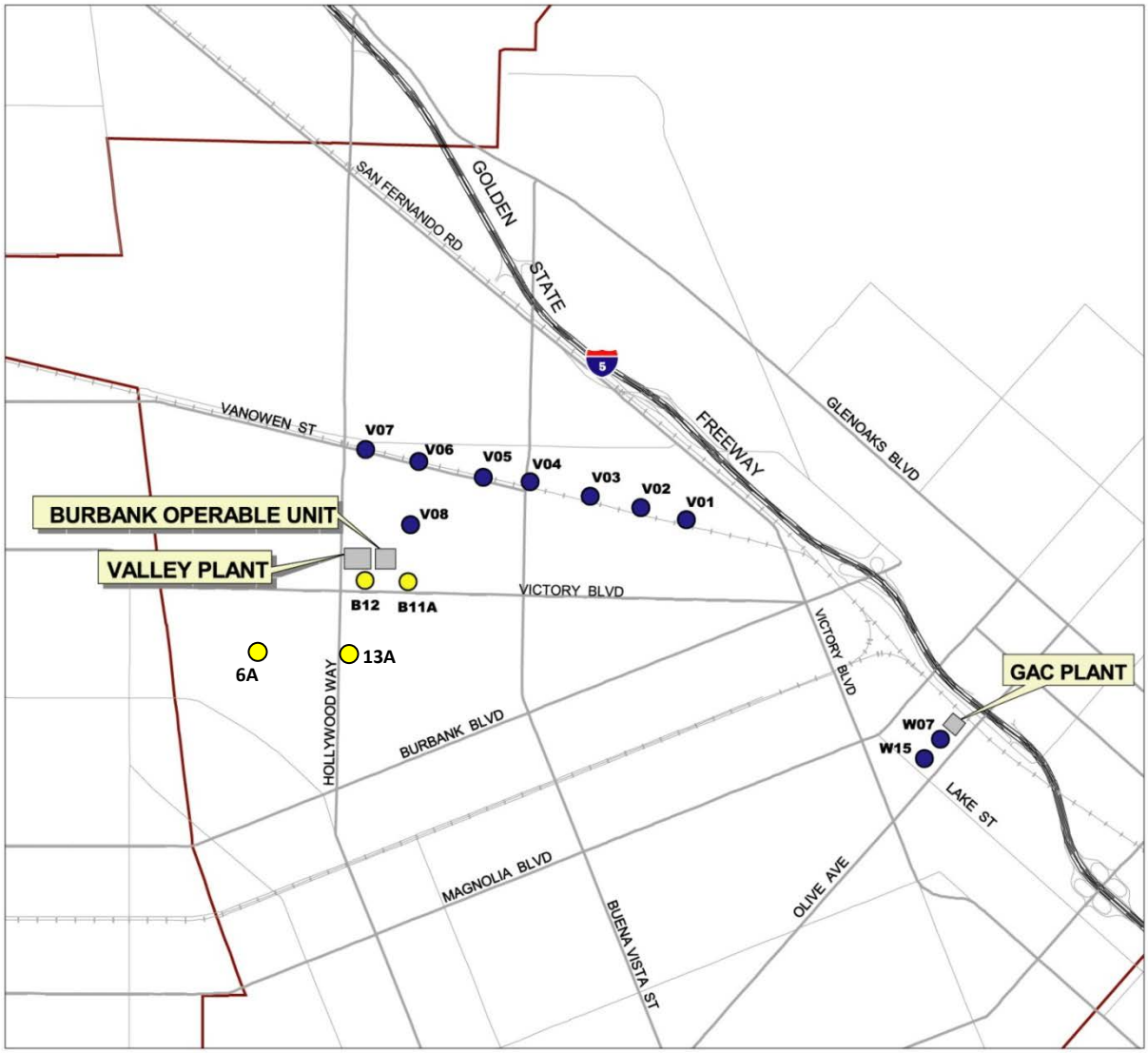


FIGURE 3.1

WELLS AND GROUNDWATER TREATMENT PLANTS

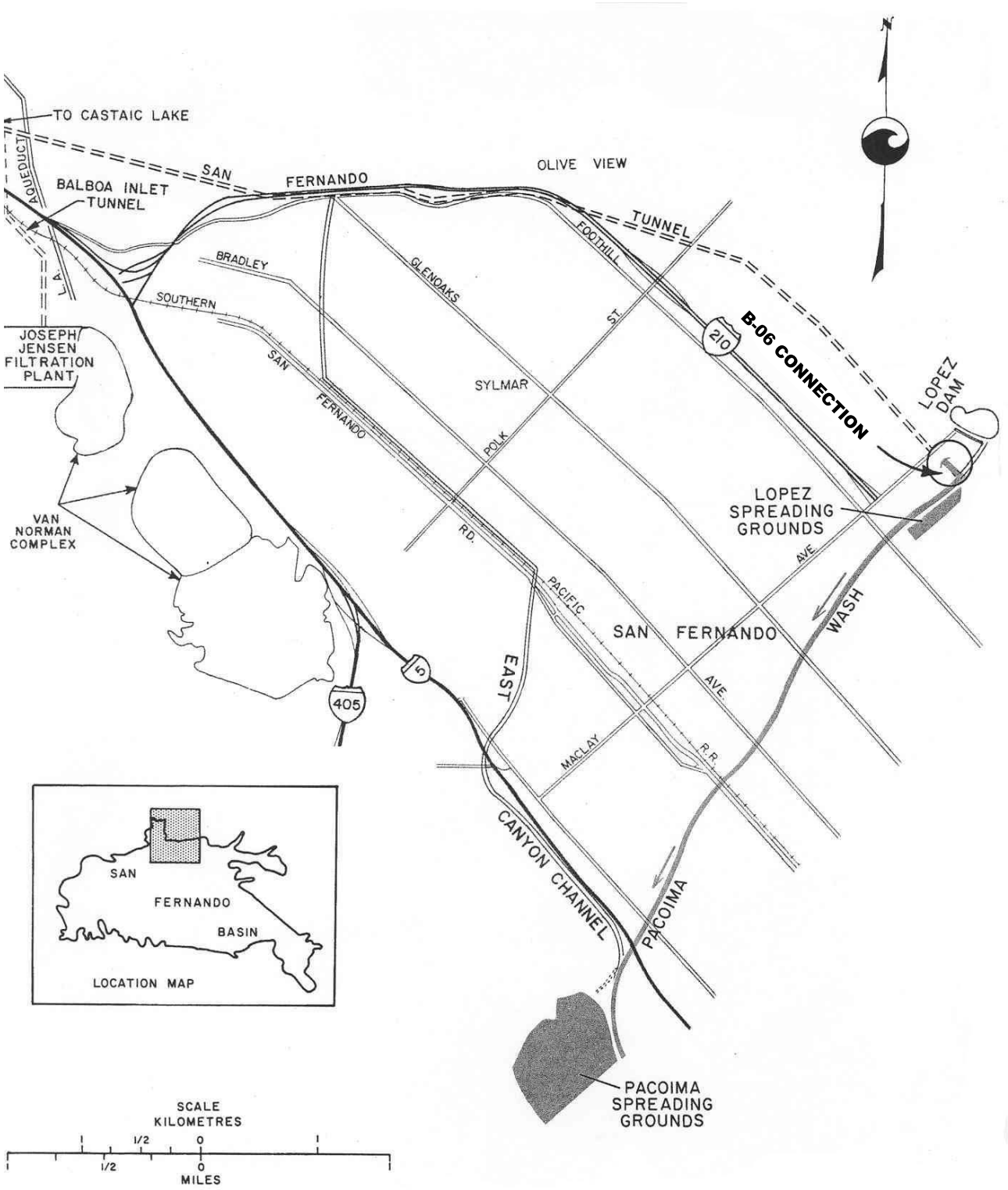


FIGURE 4.1

LOCATION OF MWD UNTREATED WATER CONNECTION

Appendix A

Water Treatment Facilities

LAKE STREET GAC TREATMENT PLANT

320 North Lake Street
Burbank CA 91502

OPERATOR:

City of Burbank
Burbank Water and Power, Water Division
Albert Lopez, Water Production/ Operations Superintendent

QUANTITY TREATED (10/1/15 through 9/30/16):

65 AF for non-potable power plant use

WATER QUALITY:

Contaminant VOC'S: TCE, PCE, 1,2-DCE, 1,2-DCA

DISPOSITION:

Magnolia Power Project
Non-potable Water

EPA CONSENT DECREE PROJECT – BURBANK OPERABLE UNIT

2030 North Hollywood Way
Burbank CA 91505

OPERATOR:

City of Burbank
Burbank Water and Power, Water Division
Albert Lopez, Water Production/ Operations Superintendent

QUANTITY TREATED (10/1/15 through 9/30/16):

9,377 AF

WATER QUALITY:

Contaminants: VOCs, Nitrate, Chromium, 1,2,3-TCP

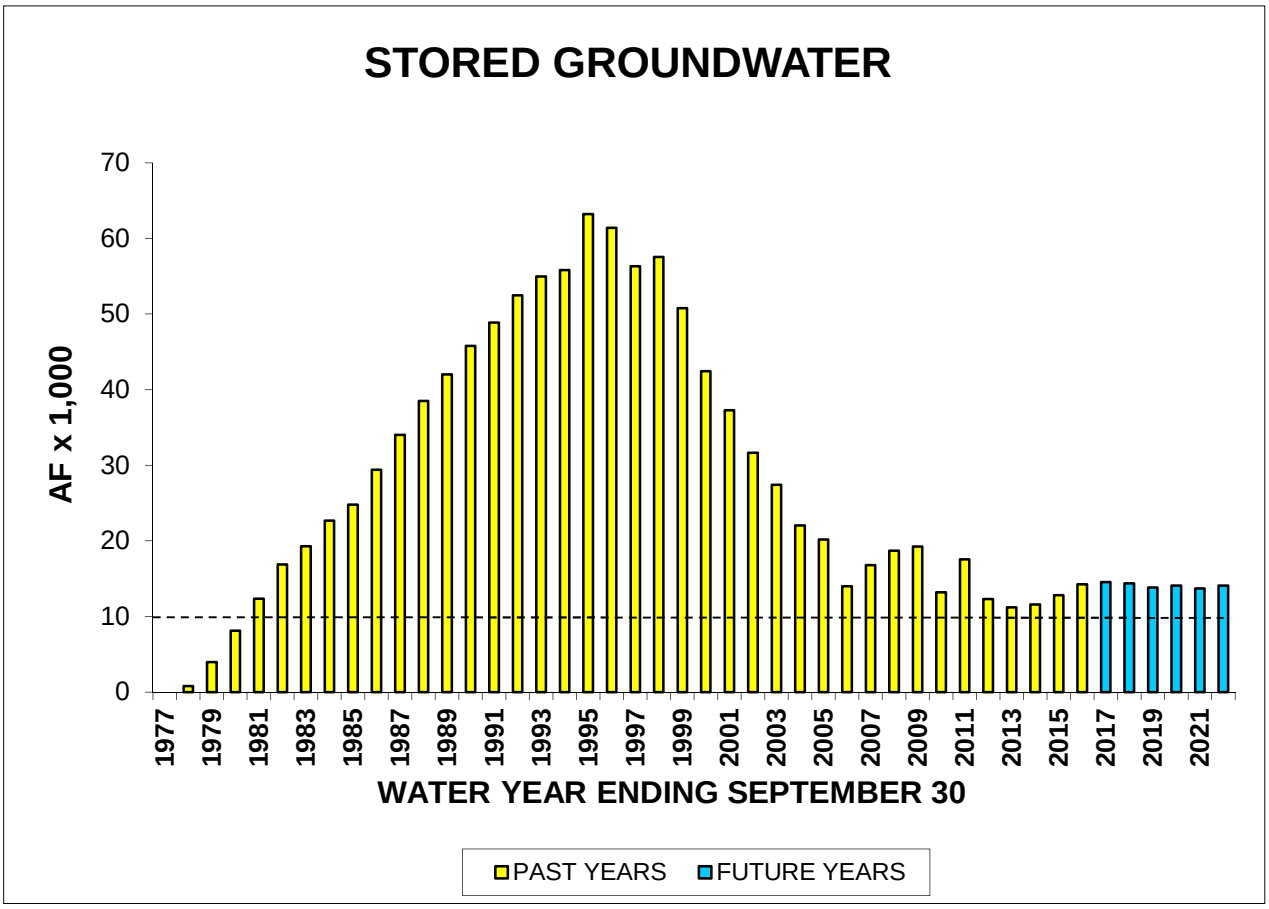
DISPOSITION:

1) Test Water- Waste
2) Operation Water (backwash, etc.) - Waste
3) Burbank Water System-(Potable water after blending)

Appendix B

Stored Groundwater

BURBANK WATER AND POWER
WATER DIVISION
WY 2015/16



NOTES:

- 10,000 AF RECOMMENDED AS BASIN BALANCE. THIS EQUATES TO ABOUT ONE YEAR OF DOMESTIC SYSTEM PRODUCTION IF REPLENISHMENT NOT AVAILABLE FROM MWD.
- STORED WATER IS REDUCED WHEN PRODUCTION EXCEEDS THE RETURN FLOW CREDIT (~4,200 AF) PLUS SPREAD WATER OR PHYSICAL SOLUTION CREDITS.
- SPREADING WATER OR GROUNDWATER CREDIT PURCHASES TO BE CONTINUED TO MAINTAIN BASIN BALANCE.

CITY OF BURBANK WATER AND POWER
WATER DIVISION

BURBANK'S STORED GROUNDWATER

WATER YEAR	DELIVERED WATER AF	RETURN FLOW CREDIT AF	SPREAD WATER AF	OTHER CREDITS AF	PUMPED GROUNDWATER AF	STORED WATER CREDIT AF
1976/77	22,743	4,549				
1977/78	22,513	4,503			3,767	(1) 782
1978/79	24,234	4,847			1,358	(2) 3,947
1979/80	24,184	4,837			677	8,117
1980/81	25,202	5,040			595	12,359
1981/82	22,120	4,424			523	16,876
1982/83	22,118	4,424			2,002	19,298
1983/84	24,927	4,985			1,063	22,659
1984/85	23,641	4,728			2,863	24,781
1985/86	23,180	4,636			123	29,386
1986/87	23,649	4,730			0	34,022
1987/88	23,712	4,742			253	38,498
1988/89	23,863	4,773			1,213	42,027
1989/90	23,053	4,611	378		1,401	45,777
1990/91	20,270	4,054	504		2,032	48,860
1991/92	20,930	4,186	503		938	52,479
1992/93	21,839	4,368	500		(3) 2,184	54,981
1993/94	24,566	4,913	0		(3) 3,539	55,810
1994/95	22,541	4,508	0	5,380	2,888	63,215
1995/96	23,124	4,625	0	2,000	8,308	61,415
1996/97	24,888	4,977	0	1,500	11,243	56,297
1997/98	22,447	4,489	0	0	3,731	57,543
1998/99	22,671	4,534	0	2,000	13,262	50,770
1999/2000	26,312	5,262	0	0	12,862	42,442
2000/01	25,619	5,124	0	0	10,440	37,264
2001/02	24,937	4,987	0	0	10,764	31,624
2002/03	23,108	4,622	0	300	9,483	27,428
2003/04	24,235	4,847	0	44	10,057	22,037
2004/05	21,749	4,350	0	0	6,694	20,190
2005/06	24,084	4,817	0	0	10,543	13,999
2006/07	25,288	5,058	0	8,200	10,220	16,796
2007/08	24,277	4,855	0	4,200	7,161	18,704
2008/09	22,160	4,432	0	6,200	10,319	19,246
2009/10	20,513	4,103	34	0	10,371	13,208
2010/11	19,322	3,864	11,187	0	10,791	17,530
2011/12	20,584	4,117	1,371	0	10,336	12,305
2012/13	20,480	4,096	6,703	0	11,822	11,190
2013/14	21,442	4,288	7,000	0	10,567	11,602
2014/15	17,917	3,583	150	7,200	10,308	12,803
2015/16	17,422	3,484	306	7,200	9,499	14,249
2016/17	17,759	3,552	7,200	0	10,262	14,525
2017/18	18,295	3,659	7,000	0	10,558	14,374
2018/19	18,792	3,758	7,000	65	11,135	13,823
2019/20	18,902	3,780	7,200	125	11,135	14,080
2020/21	18,912	3,782	7,200	190	11,135	13,698
2021/22	18,912	3,782	7,200	280	11,135	14,064

NOTES:
(1) STORED WATER AS OF OCTOBER 1, 1978
(2) STORED WATER AS OF OCTOBER 1, 1979
(3) EXCLUDES 150 AF OF PUMPING FOR TESTING.
OTHER CREDITS INCLUDE PHYSICAL SOLUTION PURCHASES, IN-LIEU STORAGE, AND OTHER TRANSFERS OF GROUNDWATER CREDITS
COLUMNS (1) THROUGH (6) - FROM ULARA WATERMASTER REPORTS
COLUMN (2) = 20% OF COL. (1)
PUMPED GROUNDWATER INCLUDES CITY, VALHALLA, LOCKHEED, DISNEY, MENASCO, HOME DEPOT
BEGINNING 2007-08, 1% IS DEDUCTED FROM THE STORED WATER AT THE END OF EACH YEAR.
SHADED AREAS OF TABLE ARE PROJECTED VALUES .

APPENDIX C

CITY OF GLENDALE

PUMPING AND SPREADING PLAN

2016-17 through 2020-21 Water Years

glendale california

Glendale Water & Power
Water Engineering

141 North Glendale Ave., Level 4
Glendale, CA 91206-4496
Tel: (818) 548-2062 Fax: (818) 240-4754

May 15, 2017

Mr. Richard Slade
ULARA Watermaster
14051 Burbank Blvd, Suite 300
Sherman Oaks, CA 91401

Subject: **Annual Pumping & Spreading Plan for Water Years 2016-2020 for City of Glendale**

Dear Mr. Slade:

Enclosed please find the annual Pumping and Spreading Plan for the City of Glendale for the Water Years 2016-2020. Glendale, as you know, does not have any spreading facilities.

If you have any question or need further information, please do not hesitate to contact my staff, Ms. Tracy Wassif at (818) 548-3972 or via email at twassif@glendaleca.gov.

Respectfully yours,

Raja Takidin
Senior Civil Engineer

RT/LC/TW

Enclosed

cc: Anthony Hicke, Assistant Watermaster
Michael De Ghetto, Chief Assistant General Manager – Water
Richard Ruyle, Water Services Administrator

File: Cover Letter WaterMaster WY 2016-202020

CITY OF GLENDALE

GROUNDWATER PUMPING AND SPREADING PLAN

WATER YEARS 2016-2020

Prepared By

GLENDALE *WATER & POWER*

May 2017

TABLE OF CONTENTS

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Introduction

This report discusses water supplies to the City of Glendale for Water Year 2016-17 and projections in local water resources available to meet future water demands and to reduce Glendale dependency on imported water. This information is used by the ULARA Watermaster and a wide group of individuals and organizations including Glendale's City Manager and Council Members, regulatory agencies and others interested in the future conditions of Glendale's water resources.

Executive Summary

Glendale receives its groundwater supply from San Fernando Groundwater Basin and Verdugo Groundwater Basin. Table 1 illustrates the actual (in bold letters) and projected pumping activities in the two basins between 2016-17 and 2020-21. Glendale currently does not have any spreading facility.

TABLE 1
ACTUAL & PROJECTED PUMPING ACTIVITIES IN WATER YEAR 2016-17 – 2020-21
(Acre Feet per Year)

Source	2016-17*	2017-18	2018-19	2019-20	2020-21
San Fernando (SF) Basin					
Glendale OU	***7,417***	*7,580*	*7,580*	*7,580*	*7,580*
Forest Lawn Memorial Park	***400***	*400*	*400*	*400*	*400*
Grayson Power Plant	***15***	*20*	*20*	*20*	*20*
SF Basin Total	**7,832**	8,000	8,000	8,000	8,000
Verdugo Basin	**1,316**	1,436	1,436	1,436	1,436

** The first seven months of the year were based on actual production data.*

Existing Water Sources and Supplies

The City of Glendale ("City") currently has four sources of water available to meet demands: groundwater from the San Fernando Basin and Verdugo Basin, imported water from the Metropolitan Water District of Southern California ("Metropolitan") and recycled water from the Los Angeles/Glendale Water Reclamation Plant ("LAGWRP"). Each of these sources is described below. The entry points into the City water system for the various supplies are shown in Figure 1.

1. San Fernando Basin

The City's water right to San Fernando Basin supplies is defined by the judgment entitled "The City of Los Angeles vs. the City of San Fernando, et al." (1979) hereinafter referred to as the "Judgment"). The Judgment consists of a return flow credit, which is a type of water right based on the assumption that a percentage of water used in the City is returned to the groundwater basin. The City has a right to accumulate its return flow credits annually if its water rights are not used. In the water year of 2014-15, the City has a storage credit of 40,254 acre feet ("AF") within the basin. In addition, the Judgment contains rights for physical solution water. This is a right to produce water in excess of return flow credit and the accumulated credits, subject to a payment obligation to the City of Los Angeles based primarily on the cost of Metropolitan alternative supplies. This option to produce physical solution water in excess of the return flow credit and the accumulated credits is a significant factor in relation to the water production at the Glendale Water Treatment Plant ("GWTP"). The GWTP is part of a U.S. Environmental Protection Agency ("EPA") Superfund clean-up project in Glendale. The project consists of a 5,250* gallon per minute ("gpm") facility and nine (9)† wells that supply the plant. Further discussion regarding the GWTP can be found in the Section: *Past Water Use and Trend* on page 8 in this report. The various San Fernando Basin supplies are:

Return Flow Credit – Glendale is entitled to a return flow credit of twenty (20.0) percent of all City-delivered water, including recycled water, in the San Fernando Basin and its tributary hill and mountain area. A location map is shown in Figure 2 *(Source: 2012-13 Water Year ULARA Watermaster Report)*. This credit ranges from about 4,500 acre feet per year (AFY) to 5,400 AFY depending on actual water use. This is the City's primary water right in the San Fernando Basin.

Physical Solution Water – The City has an agreement to extract water over and above the return flow credit and accumulated credits, and it is chargeable against the rights of the City of Los Angeles upon payment of specified charges generally tied to Metropolitan's water rates. The City's physical solution right is 5,500 AFY.

Pumping for Groundwater Cleanup – Section 2.5 of the Upper Los Angeles River Area's ("ULARA") Policies and Procedures, dated July, 1993, provides for the extraction of basin water for SUPERFUND activities, subject to payment of specified charges similar to physical solution water. This right became a significant factor with the completion of the GWTP in 2000.

Carry-over extractions – In addition to current extractions of return flow water and stored water, Glendale may, in any one year, extract from the San Fernando Basin an amount not to exceed 10 percent of its last annual credit for import return water, subject to an obligation to replace such over-extraction by reduced extraction during the next water year. This provides important year-to-year flexibility in meeting water demands.

** State Water Resources Control Board – Division of Drinking Water (DDW) approved to increase the overall treatment plant capacity from the original 5,000 gpm to 5,250 gpm in October 2008.*

† The ninth extraction well (GS-5) began operation in November 2016.

San Fernando Basin production has been limited in the past and was eventually eliminated for a time because of volatile organic compounds ("VOC") contamination of the groundwater. The entire San Fernando Valley is part of a U. S. Environmental Protection Agency ("EPA") Superfund cleanup program. Since the early 1990s, many water treatment plants had been constructed in the San Fernando Valley to remove VOC from the groundwater. EPA had focused on the construction of cleanup facilities in the City. The GWTP and eight extraction wells have been constructed to pump, treat and deliver water to the City via its Grandview Pumping Plant. Significant production from the basin and delivery to the City started in January 2002.

The cleanup facilities consist of eight shallow extraction wells and one deep well; the 5,250 gpm GWTP to remove the VOC; piping to convey the untreated groundwater from the wells to the water treatment plant; a system to convey treated water from the treatment plant to the City's potable distribution system; the Grandview facility to blend the treated groundwater with water from Metropolitan, and a disinfection facility. A general layout of these facilities is shown in Figure 3.

In 2000, major agreements were signed between City of Glendale and Glendale Respondents Group (GRG), which represents forty-plus industries identified by the EPA as potentially responsible for the groundwater contamination, and the EPA. GRG retained CDM Consulting Engineers, Inc. to design, construct and operate the water treatment facilities required by the agreements. The State Water Resources Control Board – Division of Drinking Water ("DDW") (formally known as the California Department of Public Health) issued a permit for the City to operate the facilities in July 2000. The City started taking small quantities of water from this facility on July 23, 2001. The delivery of the water was initially limited because of the City's concern with taking water with higher hexavalent chromium ("Cr(VI)") levels than in the current water supply, even though such water met all water quality standards. In January 2002, the Glendale City Council authorized the City to start delivering 5,000 gpm from the treatment facility into the City's potable water system with a target to minimize the concentration of Cr(VI) in the water. This source is expected to provide about 7,300 AFY to the City, which will meet about twenty-six percent (26%) of projected near-term water demands. There is additional groundwater production of 400 AFY by Forest Lawn Memorial Park for irrigation purposes, and about 20 AFY for use on the cooling tower and steam and gas combustion turbines at the Glendale Grayson Power Plant, for a total of approximately 7,720 AFY.

The City, as of October 1, 2014, has 40,254 AF in accumulated pumping credits in the San Fernando Basin. In order to achieve 7,720 AF of San Fernando Basin productions per year, Glendale must utilize its return flow credit of 5,500 AF per year and 2,220 AF of its accumulated pumping credits. Additional stored groundwater credit of 14,160 AF could be used to meet unexpected demands or in cases of emergency. Usage of the additional amounts of stored groundwater pumping credits was not considered in the supply-demand analysis of this Water Supply Evaluation, but rather would be in addition to the amounts of available water supplies detailed in that analysis. That these additional amounts of groundwater were not included in the supply-demand analysis further ensures that there are sufficient supplies to meet Plan demands.

2. Verdugo Basin

Historically, groundwater supplies from the Verdugo Basin contributed a small portion to the City's water supplies via five wells and an underground water infiltration system. The Judgment granted Glendale the right to extract 3,856 AFY from the Verdugo Basin. Crescenta Valley Water District (CVWD) also has water rights of 3,294 AFY and is the only other entity allowed to extract water from the Verdugo Basin.

Use of the Verdugo Basin supplies has been limited in the past due to water quality problems, groundwater levels, and limited extraction capacity. In order to increase the use of these supplies, the City completed construction of the Verdugo Park Water Treatment Plant ("VPWTP") in 1995. VPWTP treats water pumped from two low capacity wells, referred to as Verdugo Wells A & B, and from the water supplies in the Verdugo Pickup System, a subsurface horizontal infiltration system. The water is then pumped into the City's distribution system. The plant was originally designed to treat 1,150 gpm, however, at VPWTP startup in July of 1995 the flow was 550 gpm and over the years, the production of VPWTP has slowly declined. Due to the low production, the Verdugo Wells and the VPWTP were temporarily taken offline on September 17, 2013.

In 2011, the City completed the rehabilitation of the Foothill Well and the drilling of the Rockhaven Well in the Montrose area to increase its extraction capacity from the Verdugo Basin.

In 2014, the City and CVWD worked together as a joint project to construct and develop the Rockhaven Well. The new Rockhaven Well began operation in March 2016.

3. Metropolitan Water District of Southern California

The City relies on Metropolitan water supply to meet a majority of its current water supply requirements. For the past five water years ended September 30, 2015, water deliveries from Metropolitan averaged 15.9 million gallons per day (approximately 17,772 AFY), which constituted an average of 68% of the City's total potable water supply. The City expects to continue reliance on Metropolitan sales of water to meet a majority of its future water supply requirements.

The following information regarding Metropolitan has been obtained from Metropolitan and sources that the City believes to be reliable, but the City takes no responsibility for the accuracy or completeness hereof. Additional information about Metropolitan can be obtained on Metropolitan's website at *www.mwdh2o.com*.

3.1. History and Background

The Metropolitan Water District of Southern California is a public agency organized in 1928 by a vote of the electorates of eleven (11) southern California cities which included the City of Glendale, under authority of the Metropolitan Water District Act (California Statutes 1927, Chapter 429, as reenacted in 1969 as Chapter 209, as amended, herein referred to as the "Metropolitan Act"). The Metropolitan Act authorizes Metropolitan to levy property taxes within its service area; establish water rates; impose charges for water standby and service availability; incur general obligation bonded indebtedness and issue revenue bonds, notes and short-term

revenue certificates; execute contracts; and exercise the power of eminent domain for the purpose of acquiring property. In addition, Metropolitan's Board of Directors ("Metropolitan's Board") is authorized to establish terms and conditions under which additional areas may be annexed to Metropolitan's service area.

Metropolitan's primary purpose is to provide a supplemental supply of water for domestic and municipal uses at wholesale rates to its member public agencies. The City is one of the 26 Metropolitan member public agencies. If additional water is available, such water may be sold for other beneficial uses. Metropolitan serves its member agencies as a water wholesaler and has no retail customers.

Metropolitan's charges for water sales and availability are fixed by Metropolitan's Board and are not subject to regulation by the California Public Utilities Commission or any other state or federal agency. Metropolitan imports water from two principal sources: northern California via the Edmund G. Brown California Aqueduct (the "California Aqueduct") of the State Water Project owned by the State of California and the Colorado River via the Colorado River Aqueduct owned by Metropolitan. Water deliveries through the Colorado River Aqueduct began in the early 1940's. This imported water supplemented the local water supplies of the original 13 southern California member cities. In 1972, to meet growing water demands in its service area, Metropolitan started receiving additional water supplies from the California Aqueduct. Metropolitan owns and operates the Colorado River Aqueduct and has a long-term contract for water from the State Water Project.

The locations of the California Aqueduct and Colorado River Aqueduct are shown in Figure 4. Metropolitan's service area also includes the southern California coastal plain. It extends about 200 miles along the Pacific Ocean from the City of Oxnard on the north to the international boundary with Mexico border on the south, and it reaches seventy (70) miles inland from the coast. The total area served is nearly 5,200 square miles. The service area includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. Metropolitan is currently composed of twenty-six (26) member agencies, including fourteen (14) cities, eleven (11) municipal water districts, and one (1) county water authority. Glendale is one of the fourteen member agency cities served by Metropolitan.

3.2. State Water Project

One of Metropolitan's two major sources of water is the State Water Project, which is owned by the State and operated by the State Department of Water Resources ("DWR"). The State Water Project (SWP) transports water from San Francisco Bay/Sacramento-San Joaquin River Delta ("Bay-Delta") south via the California Aqueduct to Metropolitan. The total length of the California Aqueduct is approximately 444 miles. The State Water Contract, under a 100 percent allocation, provides Metropolitan 1,911,500 AF of water per year.

Drought conditions in fiscal year 2014/15 resulted in a substantially reduced amount of 634,679 AF of available water through the SWP System, about 250,000 AF less than the previous year. The final SWP allocation for calendar year 2014 was just five percent, or 96,000 AF (the lowest in history) and slightly improved in calendar year 2015 at a 20 percent allocation, or 382,000 AF (second lowest in history). *(Source: MWDSC Annual Report 2015)*

3.3. Colorado River Aqueduct

Metropolitan has a legal entitlement to receive water from the Colorado River under a permanent service contract with the Secretary of the Interior. Water from the Colorado River or its tributaries is also available to other users in California, as well as users in the states of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, resulting in both competition and the need for cooperation among these holders of Colorado River entitlements. The Colorado River Aqueduct, which is owned and operated by Metropolitan, transports water from the Colorado River approximately 242 miles to its terminus at Lake Mathews in Riverside County.

Historically, Metropolitan had been able to take full advantage of the availability of surplus water and apportioned but unused water. However, other users increased their use of water from the Colorado River beginning in 1998. Although use of water is expected to fluctuate annually, this trend is projected to continue in the future. In addition, severe droughts in the Colorado River Basin have reduced water supplies.

In response to the low SWP deliveries in 2014/2015, Metropolitan maximized the use of Colorado River supplies, relied on storage reserves, and increased conservation and outreach efforts. During Fiscal Year 2014-15, no surplus was available to Metropolitan from the Colorado River and was limited to its 550,000 AF Basic Apportionment plus water management programs. Metropolitan conveyed 1.19 MAF in its Colorado River Aqueduct in calendar year 2014. *(Source: MWDSC Annual Report 2015)*

3.4. Metropolitan's Services to Glendale

Glendale receives Metropolitan water through three (3) service connections as shown on Figure 1. The service connection number and capacity are summarized in Table 2 below. In total, Metropolitan has a total delivery capacity of seventy-eight (78) cubic feet-per-second (cfs). During hot summer days, Glendale has the capability to utilize the full capacity of the facilities. Any significant increase in demands on Metropolitan could require another service connection.

TABLE 2
METROPOLITAN CONNECTIONS AND CAPACITY

Service Connection Number	Capacity (cfs)
G-1	48
G-2	10
G-3	20

Over the years, Metropolitan has provided high level of reliability in meeting Glendale's supplemental water supply needs. It is believed that the reliability of water supply to the City will continue in the future as a result of the many water resource programs under way and the proposed future programs now being considered based on Metropolitan's Integrated Water Resources Plan (IRP) and the Water Shortage and Drought Management Plan (WSDM). This source will always be a major factor in meeting the water needs of the City. The City closely follows the planning activities at Metropolitan to assure that it has adequate supplies to meet the needs of its member agencies.

4. Recycled Water

The City has been delivering recycled water from the LAGWRP since the late 1970's. This is a twenty (20) million gallon-per-day (MGD) facility owned by the Cities of Los Angeles and Glendale. Based on a 1970 contract between the Cities of Los Angeles and Glendale, Glendale is entitled to fifty percent (50%) of any effluent produced at the plant, which is more than sufficient to for all recycled water use within City of Glendale. Treated wastewater that is not used in either the Glendale or Los Angeles system is discharged to the Los Angeles River and eventually reaches the ocean.

In the 1990's Glendale Water & Power Department (GWP) began to require all new high-rise buildings (4-story or higher) to install dual-plumbing system within the Glendale Downtown area. Recycled water customers are solely responsible for funding and installing the connectors from the recycled water pipeline in the public streets to the customer's property, and for all on-site facilities to distribute recycled water to the ultimate use. The main recycled water distribution pipelines and existing recycled water facilities are shown in more detail in Figure 5.

As of October 2016, Glendale has a total of fifty-three (53) recycled water users. These include a landfill, the Grayson Power Plant, two golf courses, two memorial parks, six schools, seven recreation parks, and other irrigation areas. Also, three (3) high-rise buildings, Glendale Police Headquarter, the Disney Complex on Flower Street, and the facilities at the Glendale Community College that are dual-plumbed to use recycled water for sanitary flushing purposes. (Figure 6).

5. Summary of Local Supplies

The current use of local groundwater resources available to the City is substantially less than its rights because of water quality and extraction problems. A general summary of the City's rights to local water resources compared to the amount currently being used is shown on Table 3.

TABLE 3
LOCAL WATER PROJECTS AND USE (AFY)

Potential Source	Right	Current Use	Future Use
San Fernando Basin	4,500 - 5,400	7,693	7,720
Verdugo Basin	3,856	1,170	1,516
Recycled Water	10,000	1,612	1,662

Past Water Use and Trends

Historically, the City used groundwater to meet a varying portion of its water demand. In the 1940s and 1950s essentially all of the City's water needs were obtained from the San Fernando and the Verdugo Basins with limited supplies from Metropolitan. In the 1960's, production from the San Fernando Basin reached a peak of about 17,000 AFY. The Grandview well water collection system in the San Fernando Basin and the Grandview Pumping Plant originally pumped a peak capacity of about 24,000 gpm (34.6 MGD) from San Fernando Basin directly into Glendale's potable water system.

In the mid-1970s, Glendale limited production from the San Fernando Basin to about 12,000 AFY as part of a court decree arising from a Water Rights lawsuit by the City of Los Angeles. In 1975, the California Supreme Court issued the Judgment in City of Los Angeles vs. City of San Fernando which further limited Glendale's production right. The current right is about 5,500 AFY based on a Return Flow Credit right from water use in Glendale, with certain additional rights as described above. Other limitations to groundwater use occurred in the late 1970s, when production from the Verdugo pick-up system in the Verdugo Basin was discontinued because of water quality problems.

In late 1979, Assembly Bill 1803 required that all water agencies using groundwater must conduct tests for the presence of certain industrial solvents. The tests indicated that VOC such as trichlorethylene and perchloroethylene were present in the San Fernando Basin groundwater supplies in concentrations exceeding State Department of Health Services' maximum contaminant levels. Both chemicals were used extensively in the past as degreasers in manufacturing industries.

At that time, the presence and hazards to the water supplies were identified. As a result, Glendale had to further limit its use of San Fernando Basin supplies. From 1980 to 1992, Glendale reduced production; and from 1992 to 2000, Glendale totally suspended production from the basin because of the presence of VOC. During the twenty year period of reduced production, Glendale was allowed to accumulate the groundwater storage credits that could be used in the future. Glendale's storage account balance was 40,254 AF as of October 1, 2014.

The water quality problems in the San Fernando Basin and groundwater levels in the Verdugo Basin have impacted the ability of Glendale to produce water from these Basins. Glendale was able to better utilize its rights to the San Fernando Basin water supplies accumulated for many years started in 2000. The EPA has designated several locations in the San Fernando Basin as Superfund sites and required construction of cleanup treatment facilities by the industry group responsible for the contamination. The Glendale cleanup project – Glendale Operable Unit (GOU) is the last in a series of EPA-required cleanup facilities for VOC and is now complete.

The GOU is comprised of a treatment plant (the GWTP), nine (9) groundwater extraction wells, a pumping plant, a disinfection facility, and associated piping. The facility was designed to treat groundwater contaminated by TCE and PCE at a combined rate of 5,000 gpm using aeration and granulated activated carbon (GAC). The treated water is then blended with imported supplies to control nitrate concentrations. In December 2000, the City started operating the GOU. But due to the Cr(VI) issue, only a small quantity was initially pumped and delivered. Full operation started on January 6, 2002.

The wells were being pumped and blended in a manner to limit Cr(VI) concentrations to achieve the City's target of 5 µg/L. In 2003, the City began a major research effort on identifying viable treatment technologies for the removal of Cr(VI) from its pumped groundwater. In 2010, the City constructed the Weak Base Anion (WBA) Chromium Removal facility to remove Cr(VI) from groundwater produced by GOU Well GS-3. The City also constructed a 100-gpm demonstration-scale facility using reduction, coagulation and filtration (RCF) technology to remove Cr(VI). These facilities effectively removed Cr(VI) in the groundwater to concentration below 5 µg/L. The Cr(VI) Removal Research Project was completed in 2015.

In the Verdugo Basin, Glendale currently has six (6) active production wells and a pick-up system (infiltration galleries), along with the VPWTP. The four active wells referred to as Glorietta Wells 3, 4 & 6 and Foothill Well produce about 1,145 AFY in Water Year 2014-15 and account for about five percent (5%) of Glendale's total potable water supply. The declined water levels have significantly reduced supplies for this source, and accordingly, the City has reduced its projections of supply from this source as well. Due to the low production from the Verdugo Wells A & B, the two wells and the VPWTP were temporarily shut down since September 17, 2013 pending well performance evaluation and rehabilitation. The location of the VPWTP and existing wells are shown on Figure 1.

The City is committed to aggressively advocate the use of recycled water for irrigation & toilet flushing, which will help increased the conservation of potable water and reduced the dependency on imported supplies. In 2014, GWP and Glendale Public Works completed the design of recycled water pipeline extension project to the Public Works service yard and constructed with LADWP a pipeline that provides recycled water for the Bette Davis Park. The two new facilities were estimated to increase the recycled water use by 10 AF per year.

Glendale's Ability To Meet Demands

Over the past three years, there has been a sizeable increase in the development of multi-family mix-use buildings in the City. Reliability of water supplies is a key goal in the operation of Glendale's water distribution system to serve the current and forthcoming water demand. In Water Year 2015-16 Glendale imported approximately 65 percent of its potable water supply from Metropolitan. Consequently, the reliability of Metropolitan water supplies to meet Glendale water needs becomes exceptionally crucial. Glendale continues to maximize local groundwater production and work closely with Metropolitan on imported water delivery to meet the needs of our citizens.

Future Goals

The City's Water Department (GWP) has been actively trying to increase groundwater production in the Verdugo Basin. In 2014, GWP and CVWD worked together as a joint project to construct and develop the Rockhaven Well. Groundwater extracted from the well is conveyed to CVWD's Nitrate Removal Treatment Facility at Glenwood for nitrate removal and disinfection and is served to the La Crescenta-Montrose area. The extracted volume is accounted as part of the adjudicated water right of Glendale and will be reported to the ULARA Watermaster on a monthly basis. The Rockhaven Well began operation in March 2016.

Due to the declining water level of the Verdugo Basin resulted from the current drought and the conditions of the existing wells, the groundwater productions were gradually reducing from these

wells. In June 2016, GWP began the rehabilitation of Glorietta Well 6 and in November 2016 began the rehabilitation of Glorietta Well 3. GWP also is planning on drilling a new Well in the next fiscal year to replace Glorietta Well 6 and schedule an evaluation of the Verdugo Basin groundwater supply and the potential rehabilitation of Verdugo Wells A & B in the fiscal year 2018-19.

GWP is currently working with City of Pasadena to supply a projected volume of 3,100 AFY of recycled water to Pasadena via the existing Glenoaks 1666 Tank. Also the City has a contract in place for the design and construction of a pipeline to extend the use of Recycled Water to three Glendale Unified School District facilities (55 AFY). For the next several years, GWP is planning for at least three major capital improvement projects to extend the recycled water supply to (1) Camino San Rafael & Chevy Oaks (120 AFY), (2) the Chevy Chase Golf Course (100 AFY), and (3) the Glendale T Project (50 AFY). The total estimated recycled water usage from these improvements is 329 AFY. The City continues to aggressively advocate the use of recycled water for irrigation & toilet flushing, which will help increased the conservation of potable water and reduce the dependency on imported supplies.

To maintain the reliability of the GWTP water supply, the City also worked with the DDW and the GRG to construct a full-scale Weak-Base Anion Exchange (WBA) facility at the GWTP in dealing with the Cr(VI) at the GN-3 Well and the ninth GOU well in the City of Los Angeles. The new WBA facility and the GS-5 Well began full operation in December and November 2016, respectively. With the operation of the new WBA facility and the ability of blending with Metropolitan imported water, Glendale continues to meet the goal of less than 5 µg/L Cr(VI) entering the distribution system

In water year 2015-2016, the City imported 65% of the total potable water used from the Metropolitan as a result of the implementation of the Stage 3 water conservation measure. Given the drought conditions and the well rehabilitation activities in both the San Fernando and Verdugo Basins, it is the goal of the City's Water Department to maintain the City's water purchase from Metropolitan to less than seventy percent (70%) of the total water use in water year 2016-17.

FIGURES

City of Glendale Water & Power

Your Trusted Community Utility

FIGURE 1

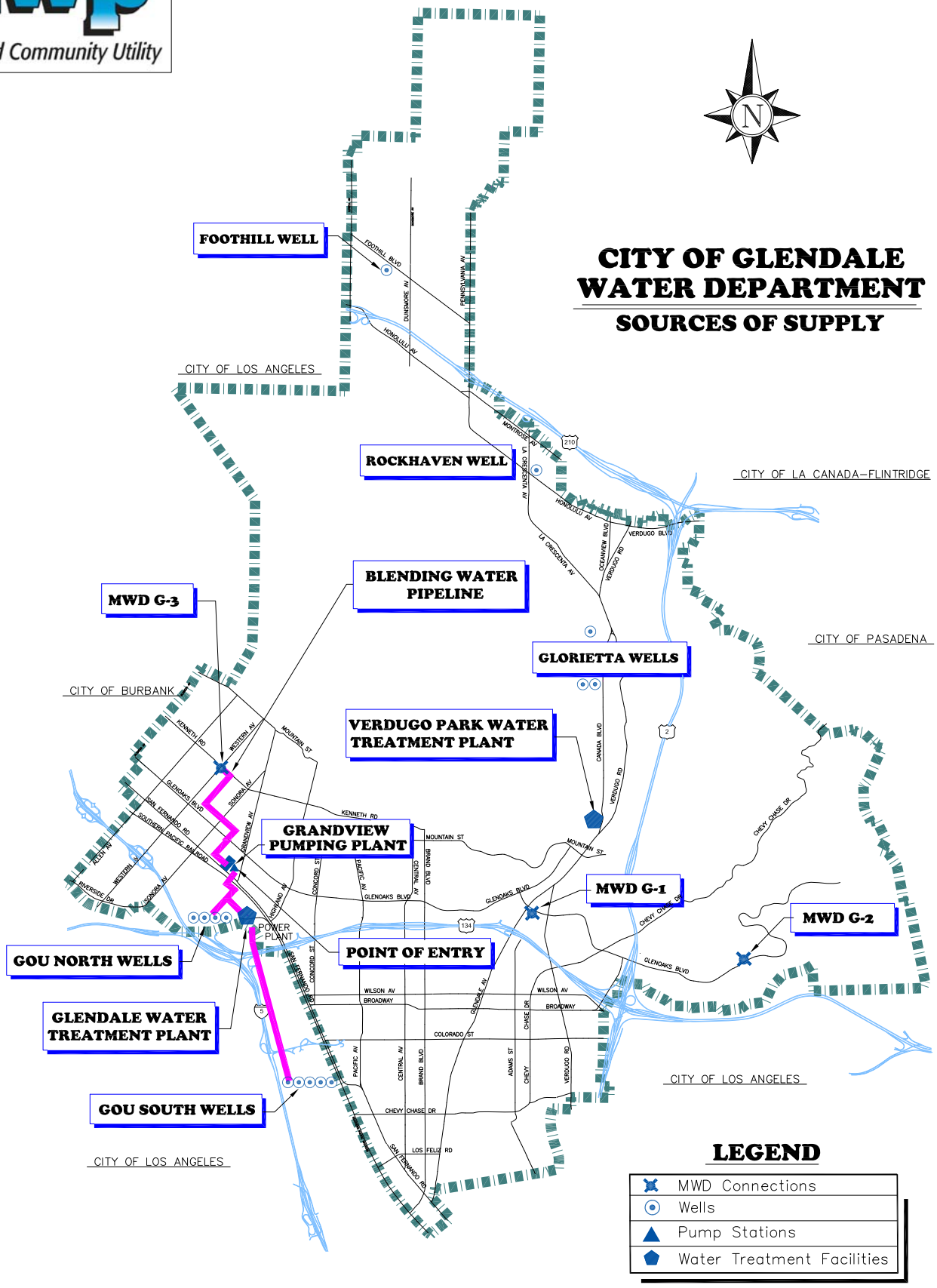
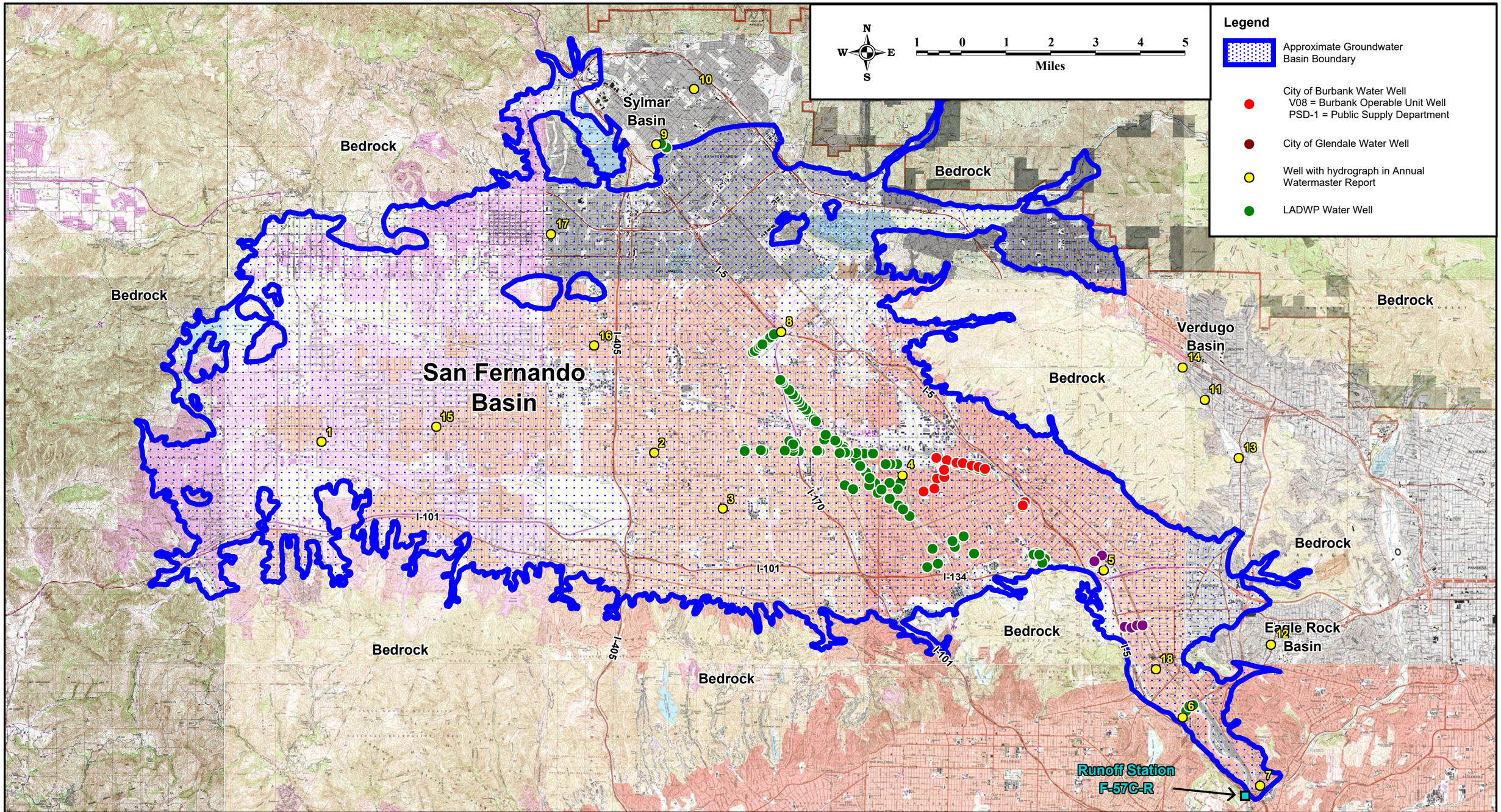


FIGURE 2



2013-2014 Water Year ULARA Wastermaster Report	Upper Los Angeles River Area: San Fernando Groundwater Basin Map	PLATE 1A

FIGURE 3

GLENDALE WATER TREATMENT PLANT SYSTEM LAYOUT

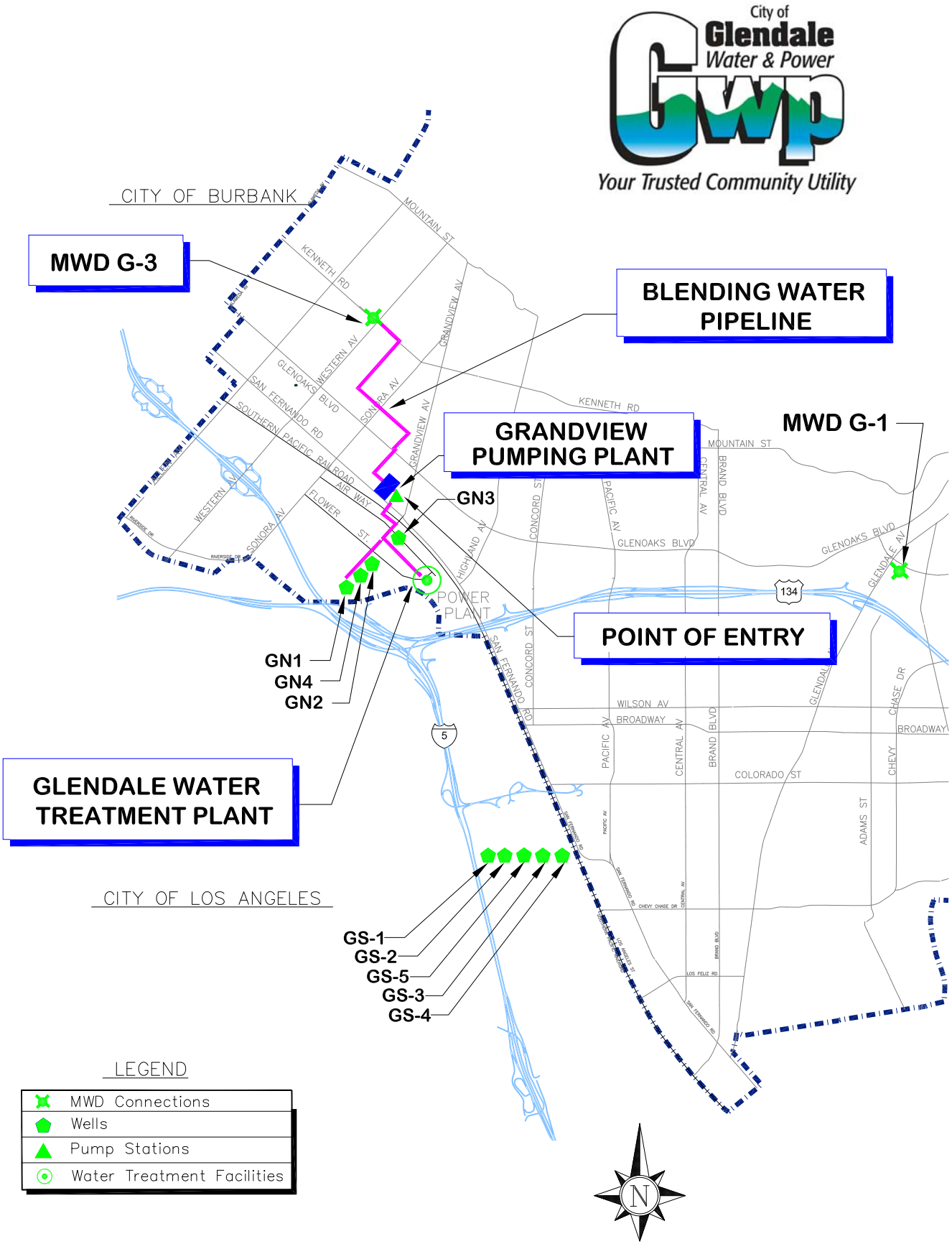
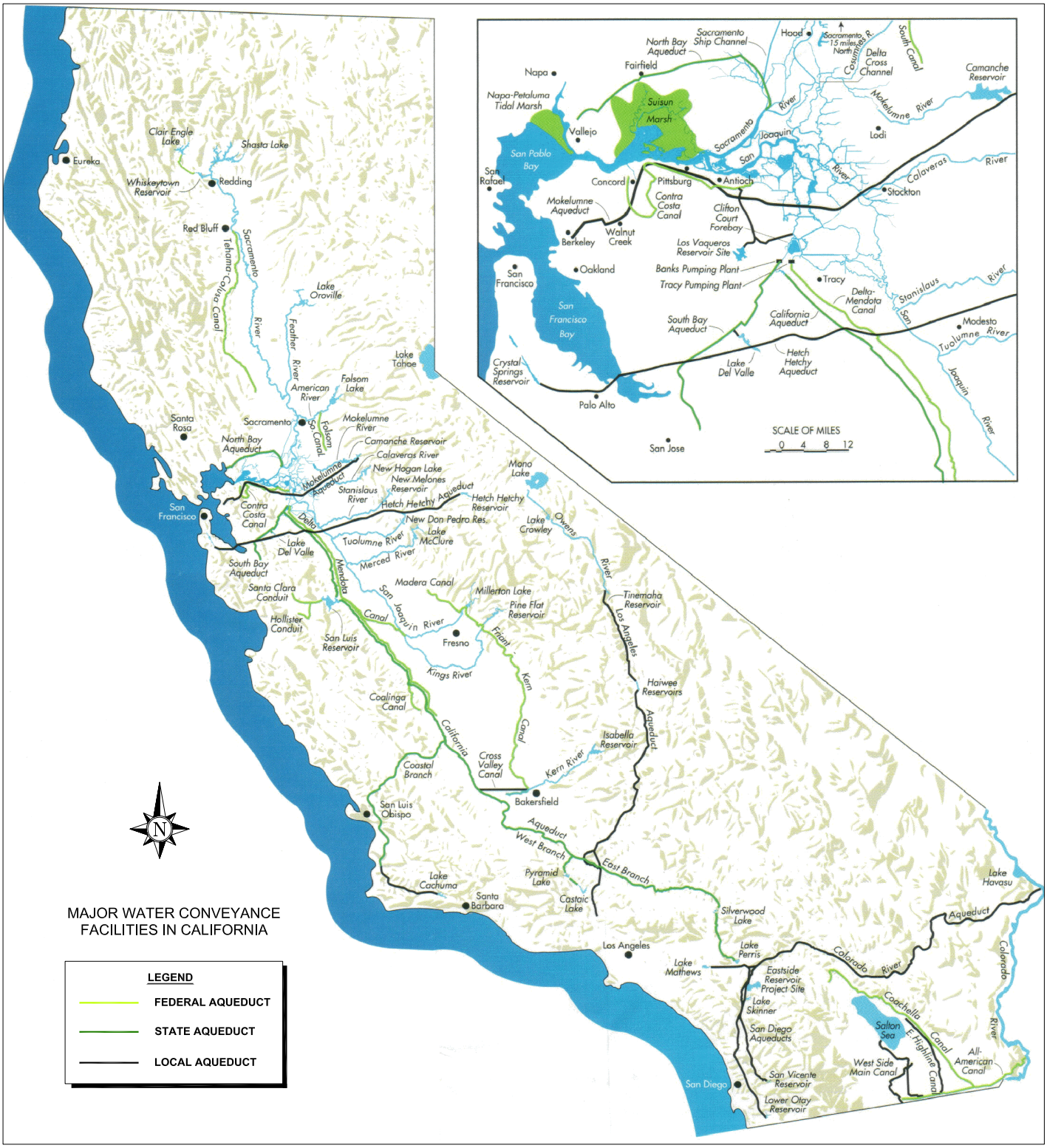


FIGURE 4


Clair Engle Lake
Shasta Lake
Eureka
Whiskeytown Reservoir
Redding
Red Bluff
Tehama-Colusa Canal
Sacramento River
Lake Oroville
Feather River
Lake Tahoe
American River
Folsom Lake
Santa Rosa
Sacramento
So. Canal
Folsom
Mokelumne River
North Bay Aqueduct
Camanche Reservoir
Calaveras River
New Hogan Lake
New Melones Reservoir
Mokelumne Aqueduct
Stanislaus River
Hetch Hetchy Aqueduct
Hetch Hetchy Reservoir
San Francisco
Contra Costa Canal
Delta
New Don Pedro Res.
Lake McClure
Lake Del Valle
Tuolumne River
Merced River
South Bay Aqueduct
Santa Clara Conduit
Madera Canal
Millerton Lake
Pine Flat Reservoir
Mendota
San Joaquin River Canal
Hollister Conduit
San Luis Reservoir
Fresno
Friant
Kern Canal
Kings River
Coalinga Canal
California Aqueduct
Coastal Branch
Cross Valley Canal
Kern River
Bakersfield
San Luis Obispo
West Branch
East Branch
Lake Cachuma
Santa Barbara
Pyramid Lake
Castaic Lake
Los Angeles
Mono Lake
Lake Crowley
Owens River
Tinemaha Reservoir
Los Angeles Aqueduct
Haiwee Reservoirs
Isabella Reservoir
Silverwood Lake
Lake Perris
Lake Mathews
Eastside Reservoir Project Site
Lake Skinner
San Diego Aqueducts
San Diego
San Vicente Reservoir
Lower Otay Reservoir
Lake Havasu
Colorado River Aqueduct
Colorado River
Coachella Canal
Salton Sea
All-American Canal
West Side Main Canal
San Pablo Bay
San Rafael
Napa
Napa-Petaluma Tidal Marsh
Vallejo
Fairfield
North Bay Aqueduct
Sacramento Ship Channel
Suisun Marsh
Hood
Sacramento R. 15 miles North
Delta Cross Channel
Sacramento River
San Joaquin River
South Canal
Camanche Reservoir
Mokelumne River
Lodi
Concord
Pittsburg
Antioch
Stockton
Calaveras River
Mokelumne Aqueduct
Contra Costa Canal
Clifton Court Forebay
Berkeley
Walnut Creek
Los Vaqueros Reservoir Site
Oakland
San Francisco
Banks Pumping Plant
Tracy Pumping Plant
Tracy
Delta-Mendota Canal
Stanislaus River
San Joaquin River
Modesto
Tuolumne River
San Francisco Bay
South Bay Aqueduct
California Aqueduct
Crystal Springs Reservoir
Lake Del Valle
Hetch Hetchy Aqueduct
Palo Alto
San Jose
SCALE OF MILES
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N
MAJOR WATER CONVEYANCE FACILITIES IN CALIFORNIA
LEGEND
FEDERAL AQUEDUCT
STATE AQUEDUCT
LOCAL AQUEDUCT

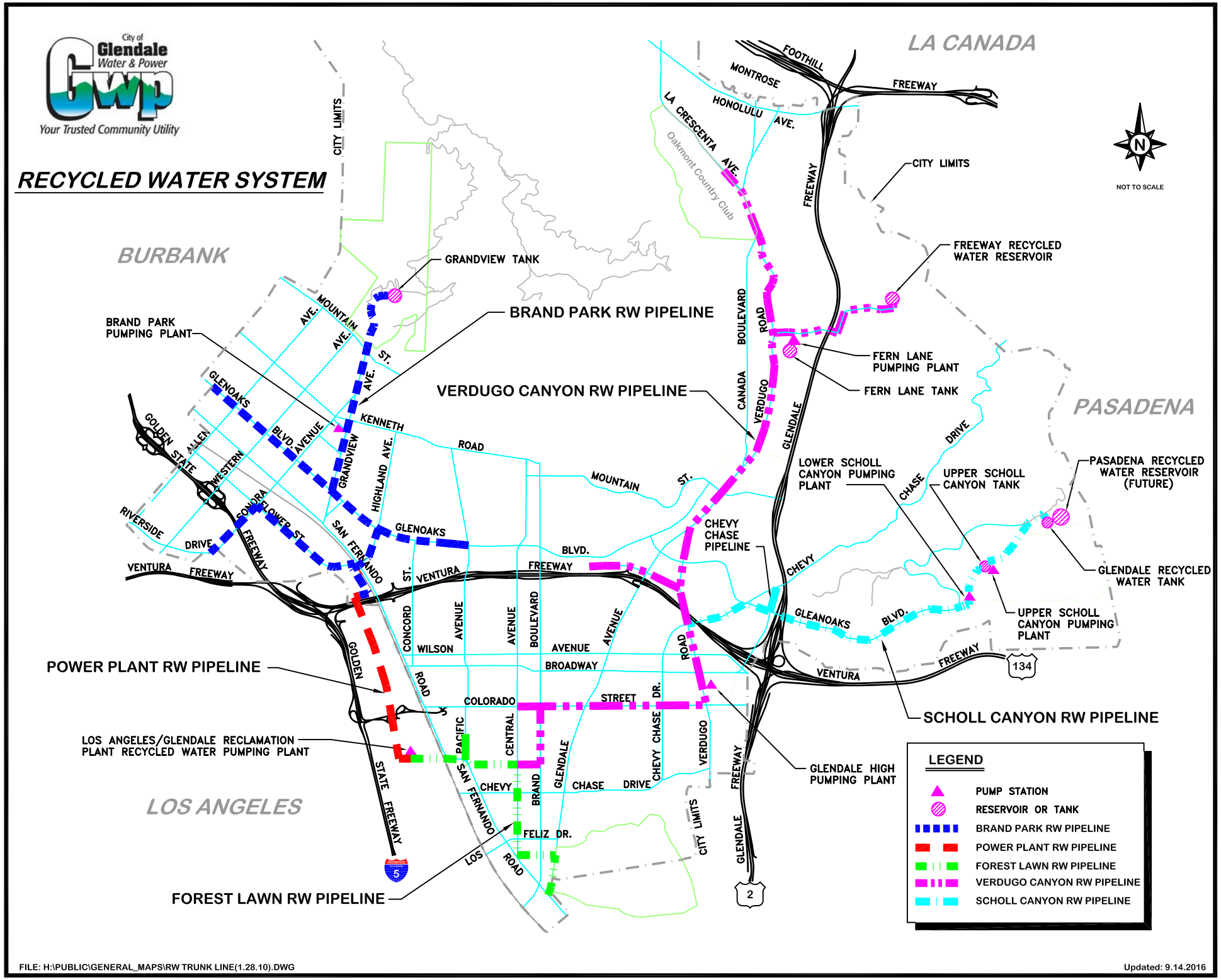

FIGURE 5

FILE: H:\PUBLIC\GENERAL_MAPS\RW TRUNK LINE(1.28.10).DWG

Updated: 9.14.2016

FIGURE 6

CITY OF GLENDALE

Recycled Water Account Information

User Count	PROJECT NAME	ADDRESS	ACCOUNT NUMBER	NO. OF METER	DELIVERY DATE	TYPE OF USE
		FOREST LAWN PROJECT (A - 1)				
1	City of Glendale	1600 S Brand Boulevard	20241950-00	1	1995	Irrigation
2	Forest Lawn Memorial Park	1712 S Glendale Avenue	31192010-00	1	1992	Irrigation
2	Forest Lawn Memorial Park	3690 San Fernando Road	50009222-00	1	1992	Irrigation
3	Silver Crest Homes	316 W Windsor Road	50001202-00	1	2000	Irrigation
4	Cerritos Elementary School	120 E Cerritos Avenue	50006840-00	1	2006	Irrigation
4	Cerritos Elementary School	1715 S Glendale Avenue	50008277-00	1	2006	Irrigation
5	Cerritos School Park	3690 San Fernando Road	50008056-00	1	2007	Irrigation
6	Edison Elementary & Pacific Park	501 Riverdale Drive	50005134-00	1	Mar 2007	Irrigation
7	STEVE HODGE	3900 San Fernando Road	50018671-00	1	Apr 2015	Irrigation
		POWER PLANT PROJECT (A - 2)				
7	CalTrans	943 W Doran Street	22516764-00	1	1978	Irrigation
8	Grayson Power Plant - GWP	800 Air Way	50005630-00	1	1978	Cooling Towers
9	Glendale Water & Power - UOC	800 Air Way	50012227-00	1	2010	Irrigation
10	Public Works - Parkway Irrigation	(No AMI Meter)	-	0	-	Irrigation
		BRAND PARK PROJECT (A - 3)				
11	Glenoaks Median (9 meters)	2008 W Glenoaks Boulevard	12356670-00	1	1996	Irrigation
11	Glenoaks Median (9 meters)	1818 W Glenoaks Boulevard	12382290-00	1	1996	Irrigation
11	Glenoaks Median (9 meters)	1108 W Glenoaks Boulevard	12513010-00	1	1996	Irrigation
11	Glenoaks Median (9 meters)	978 W Glenoaks Boulevard	12520700-00	1	1996	Irrigation
11	Glenoaks Median (9 meters)	720 W Glenoaks Boulevard	12576220-00	1	1996	Irrigation
11	Glenoaks Median (9 meters)	618 W Glenoaks Boulevard	12581960-00	1	1996	Irrigation
11	Glenoaks Median (9 meters)	532 W Glenoaks Boulevard	12583040-00	1	1996	Irrigation
11	Glenoaks Median (9 meters)	1628 W Glenoaks Boulevard	22453700-00	1	1996	Irrigation
11	Glenoaks Median (9 meters)	1400 W Glenoaks Boulevard	22482860-00	1	1996	Irrigation
12	Brand Park	1700 W Mountain Street	31091775-00	1	1997	Irrigation
13	Pelanconi Park	905 Cleveland Road	31092075-00	2	1996	Irrigation
14	Grandview Memorial Park	1341 Glenwood Road	32191200-02	2	2001	Irrigation
14	Grandview Memorial (Heritage Cemetery Management I)	1341 Glenwood Road	50017872-01	1	2009	Irrigation
15	Disney Complex (Dual Plumbed-Future)	1101 Flower Street	50006720-00	1	2007	Irrigation
16	San Fernando Landscape Project	5775 San Fernando Road	50009365-00	1	Jan 2009	Irrigation
17	Fairmont Street Extension Project	907 Flower Street	50012000-00	2	Mar 2010	Irrigation
18	Walt Disney Co.	900 Grand Central Ave	50018286-00	1	Sep 2012	Irrigation
18	Walt Disney Co.	1200 Grand Central Ave	50018254-00	1	Aug 2012	Irrigation
19	Power Plant	630 Kellogg Ave	33091005-00	1	May 2007	Irrigation
20	Glendale Narrow Riverwalk	900 Flower St.	50010892-00	1	Feb 2013	Irrigation
		VERDUGO SCHOLL PROJECT (B)				
21	Colorado Blvd - Parkway Irrigation	815 E Colorado Street	31492805-00	1	1997	Irrigation
21	Colorado Blvd - Parkway Irrigation	1311 E Colorado Street	10512470-00	1	1997	Irrigation
21	Colorado Blvd - Parkway Irrigation	1401 E Colorado Street	10511248-00	1	1997	Irrigation
22	CalTrans	1970 E Glenoaks Blvd (E/S,W/S I2)	10661215-00	2	1995	Irrigation
22	Caltrans	406 N Verdugo Rd (at Chevy Chase Dr)	10915398-00	1	1995	Irrigation
22	Caltrans	709 Howard Street (at Monterey Road)	11621385-00	1	1995	Irrigation
22	Caltrans	2000 E Chevy Chase Drive (at Harvey)	20613615-00	1	1995	Irrigation
22	Caltrans	Chevy Chase / 134 Fwy	50012010-00	1	Jul-16	Irrigation

CITY OF GLENDALE

Recycled Water Account Information

User Count	PROJECT NAME	ADDRESS	ACCOUNT NUMBER	NO. OF METER	DELIVERY DATE	TYPE OF USE
23	741 S. Brand Median	741 S Brand Boulevard (Median)	10228900-00	1	1995	Irrigation
24	Montecito Park	2978 N Verdugo Road (at Sparr)	21026940-01	1	1995	Irrigation
25	N. Verdugo Rd Median/La Cresenta Ave	3220 N Verdugo Road/Median/ La Crescenta Avenue *OPP	21130300-00	1	1996	Irrigation
26	Verdugo Rd/Canada (North Median)	3021 N Verdugo/Canada Median	21452650-00	1	1996	Irrigation
27	Verdugo Rd/Canada South Overpass	1388 N Verdugo/Canada (South) Overpass	21615900-01	1	1995	Irrigation
28	Parque Vaquero	1285 N Verdugo Road	21680110-00	1	1998	Irrigation
29	701 N. Glendale Ave - Median @ Monterey Rd	701 N Glendale Avenue (Median)	21688594-00	1	1995	Irrigation
30	Civic Auditorium	1401 N Verdugo Road	31091125-00	1	1996	Irrigation
31	Sports Complex	2200 Fern Lane	31091370-00	1	1998	Irrigation
32	Adult Recreation Center	201 E Colorado Street	31092175-00	1	1995	Irrigation
33	Glenoaks Park	2531 E Glenoaks Boulevard	31092325-00	1	1995	Irrigation
34	Scholl Canyon Park	2849 E Glenoaks Boulevard	31092375-00	1	1996	Irrigation
35	Scholl Canyon Ballfield	3200 E Glenoaks Boulevard	31092600-00	1	1997	Irrigation
36	Glendale High School	1440 E Broadway	31691142-00	1	1995	Irrigation
37	Wilson Junior High School	1220 Monterey Road	31692740-00	1	1995	Irrigation
38	Glendale Adventist Hospital	1520 E Chevy Chase Drive	31791090-00	1	1997	Irrigation / Cooling Towers
39	Glenoaks Elementary School	2015 E Glenoaks Boulevard	31791182-00	1	1998	Irrigation
40	Glendale Community College	1500 N Verdugo Road	31891780-00	2	1996 & 2004	Irrigation / Toilet Flushing
41	Oakmont Country Club	3100 Country Club Drive	31893000-00	1	1996	Irrigation
42	Central Library	222 E Harvard Street	32093752-00	2	1995	Irrigation
43	Armory	220 E Colorado Street	32290830-00	1	1996	Irrigation
44	Scholl Canyon Golf Course	3800 E Glenoaks Boulevard	33093165-01	2	1998	Irrigation
45	Scholl Canyon Landfill (PW)	3798 E Glenoaks Boulevard	33093180-01	2	1996	Irrigation/ Soil Compaction/ Dust Control
45	Scholl Canyon Landfill (PW)	3798 E Glenoaks Boulevard	50019056-00	1	1996	Irrigation/ Soil Compaction/ Dust Control
45	Scholl Canyon Landfill (PW)	3798 E Glenoaks Boulevard	50008945-00	1	1996	Irrigation
46	Scholl Canyon Landfill (LACSD)	2847 E Glenoaks Boulevard	50008944-00	1	1997	Irrigation/ Soil Compaction/ Dust Control
47	Fern Lane (Freeway Tank + Median)	1926 Fern Lane	50005823-00	1	1997	Irrigation
48	Glendale Retirement Home	1551 E Chevy Chase Drive	50008949-00	1	Jul-09	Irrigation
49	Americana at Brand LLC	233 S Brand Boulevard	50009495-00	1	Apr-09	Irrigation
50	Monterey Community Garden	870 Monterey Road	50010690-00	1	Aug-09	Irrigation
51	City of Glendale - CCBG	827 Monterery Road	50012392-00	1	Jan-11	Irrigation
52	PUBLIC WORKS PARKING SECTION	101 E HARVARD ST	50020070-00	1	Apr-15	Irrigation
53	GWP - WATER DIVISION	210 S VERDUGO RD	3169126600	1	Jun-07	Irrigation

APPENDIX D

CITY OF SAN FERNANDO

PUMPING AND SPREADING PLAN

2016-17 through 2020-21 Water Years

CITY OF SAN FERNANDO

GROUNDWATER PUMPING AND SPREADING PLAN

OCTOBER 1, 2016 TO SEPTEMBER 30, 2021

2016-2017 Water Year

Prepared by:

Public Works Department

Water Division

117 Macneil Street

San Fernando, California 91340

September 2017

TABLE OF CONTENTS

I. INTRODUCTION

The ground water rights of the City of San Fernando were defined by the JUDGMENT in Superior Court Case No. 650079, entitled "The City of Los Angeles, a Municipal Corporation, Plaintiff, vs. City of San Fernando, et. al., Defendants." The Final Judgment was signed on January 26, 1979.

On August 26, 1983, the Watermaster reported to the court pursuant to Section 10.2 of the Judgment that the Sylmar Basin was in condition of overdraft. On October 1, 1984, San Fernando and Los Angeles were assigned equal rights to pump the safe yield of the Basin (6,210 acre-feet) thus, San Fernando and Los Angeles were each allowed to pump approximately 3,105 acre-feet per year. Thereafter, on October 1, 1996, the safe yield of the Basin was determined to be 6,510 acre-feet per year. A stipulation approved by the Court, on December 13, 2006, allows for a temporary increase in the safe yield of the Basin to 6,810 AF/Y beginning October 1, 2006. Therefore, San Fernando and Los Angeles are now allowed to each pump approximately 3,405 acre-feet per year.

In 1993, significant revisions were made to the Upper Los Angeles River Area (ULARA) Policies and Procedures with the addition of Section 2.9, Groundwater Quality Management. This addition has been made by the Watermaster and the Administrative Committee to affirm its commitments to participate in the cleanup and limiting the spread of contamination in the San Fernando Valley. This report is in response to Section 2.9.4, Groundwater Pumping and Spreading Plan.

The Groundwater Pumping and Spreading Plan is based on the water year, October 1 to September 30. The Draft Plan for San Fernando will be submitted in May to the Watermaster for the current water year.

II. WATER DEMAND

The annual total water demand for the last five years and the projected annual water demand for the next five years are shown on Table 2.1.

Water demand during the early 1990's was affected by drought conditions in the Southern California region. However, the City of San Fernando has imposed voluntary conservation since 1977.

Projected water demands for the next five years is expected to slightly decrease or remain the same due to conservation efforts.
The projected water demand may vary significantly due to weather conditions, economic conditions and/or social conditions in the San Fernando area. A variance of $\pm$ 10 percent can be expected.

III. WATER SUPPLY

The water supply for the City of San Fernando is composed of locally produced and treated groundwater. Supplemental water is purchased from the Metropolitan Water District of Southern California (MWD). In case of emergency, there is an existing 6-inch water connection to the City of Los Angeles (DWP) water system at 12900 Dronfield Avenue, in Sylmar.

A. MWD: Treated water is purchased from the MWD to supplement ground water supplies. Historic and projected use of MWD water is shown in Table 2.1.

B. Production Wells: The City of San Fernando owns and operates three (3) wells that are on "active status" with the Department of Health Services as indicated below:

1. ***Well 2A***
   Location: 14060 Sayre Street, Sylmar
   Capacity: 2100 GPM

2. ***Well 4A***
   Location: 12900 Dronfield Avenue, Sylmar
   Capacity: 310 GPM

3. ***Well 3***
   Location: 13003 Borden Avenue, Sylmar
   Capacity: 1200 GPM
   This well shown is on "stand-by status" with the Department of Public Health Services and quarterly samples are collected by waste pumping.

4. ***Well 7A***
   Location: 13180 Dronfield Avenue, Sylmar
   Capacity: 900 GPM
   This well was placed on "inactive status" with the State Water Resources Control Board Division of Drinking Water and has been physically disconnected from the water system. Plans are to activate this well by the end of 2017 and start-up a new Envirogen ion exchange nitrate removal unit to be located at 12900 Dronfield Avenue, Sylmar CA.

C. Quantity (Acre-Feet) of Water Pumped From Each Well (2015-2016)

1.	Well 2A	2,427.70
2.	Well 3	.26
3.	Well 4A	337.58
4.	Well 7A	0
	Total	2,765.54

D. Wells Groundwater Level Data

1.	Well 2A	1078.5 Taken 4/13 (Transducer out of service)
2.	Well 3	1102.2 Taken 12/16
3.	Well 4A	1078.1 Taken 12/16
4.	Well 7A	1095.3 Taken 12/16

E. Well Locations

Well 2A - 14060 Sayre Street, Sylmar

Well 3 - 13003 Borden Street, Sylmar

Well 4A - 12900 Dronfield Avenue, Sylmar

Well 7A 13180 Dronfield Avenue, Sylmar

IV JUDGMENT CONSIDERATIONS

A. Native and Imported Return Water

The safe yield of the Sylmar Basin was 6,810 acre-feet and the cities of San Fernando and Los Angeles have equal rights to pump from this basin. After subtracting the overlaying pumping rights of two private parties, San Fernando and Los Angeles were each allowed to pump approximately 3,405 acre-feet per year.

A stipulation approved by the Court May 01, 2013 allows for a temporary increase in the safe yield of the Basin to 7,140 AF/Y beginning October 1, 2012. Therefore, San Fernando and Los Angeles are now allowed to each pump approximately 3,570 acre-feet per year, for the next five years (2011-12 through 2016-17)

B. Stored Water Credit

San Fernando and Los Angeles each have the right to store water in the Sylmar Basin and the right to extract equivalent amounts.
As of 2011-12 through 2017-18 water years the City of San Fernando has a "frozen" water credit of 404 acre feet.

TABLE 2.1
FIVE-YEAR HISTORIC AND PROJECTED WATER DEMAND
PUMPED AND IMPORTED WATER
CITY OF SAN FERNANDO

(Acre – Feet)

FY	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
DEMAND										
WELLS	3,202	3,279	3,352	2,736	2,766	2,800	2,900	2,900	2,900	2,900
MWD	106	82	9	100	0	0	0	0	0	0
TOTAL	3,308	3,361	3,361	2,836	2,766	2,800	2,900	2,900	2,900	2,900
ACTUAL						**PROJECTED**				

APPENDIX A

WATER QUALITY DATA

SEE ATTACHED WATER QUALITY REPORT, 2016

CITY OF SAN FERNANDO

- WELL NO. 3
- WELL NO. 4A
- WELL NO. 2A
- WELL NO. 7A

APPENDIX B

POLICIES AND PROCEDURES

(By ULARA)

WATERMASTER SERVICE

UPPER LOS ANGELES RIVER AREA

POLICIES AND PROCEDURES

February 1998

APPENDIX E

CRESCENTA VALLEY WATER DISTRICT

PUMPING AND SPREADING PLAN

2016-17 through 2020-21 Water Years

CRESCENTA VALLEY WATER DISTRICT

GROUNDWATER PUMPING & SPREADING PLAN

FOR

WATER YEARS

OCTOBER 1, 2016 TO SEPTEMBER 30, 2021

Prepared by:
David S. Gould, P.E.
District Engineer

Prepared for:
ULARA Watermaster's Office

May 2017

I. INTRODUCTION

The ground water rights of the Crescenta Valley Water District (CVWD) were defined by the JUDGEMENT in Superior Court Case No. 650079, entitled "The City of Los Angeles, a Municipal Corporation, Plaintiff, vs. City of San Fernando, et. al., Defendants". The Final Judgment was signed on January 26, 1979.

This report as prepared by CVWD is in response to Section 5.4, Groundwater Pumping and Spreading Plan. This report refers to groundwater pumping only since there is no groundwater spreading performed by CVWD.

The Groundwater Pumping Plan is based on the water years October 1, 2016 to September 30, 2021.

II. WATER DEMAND

The annual total water demand for the last five (5) years and the projected annual water demand for the next five (5) years are shown in Table 2.1.

Water demands between WY 2011/12 and WY 2015/16 were affected by a number of factors including less than average annual rainfall, a five-year statewide drought, and water conservation efforts within the Crescenta Valley.

Demands in the CVWD's service area vary due to seasonal conditions, which is part of the residential character of the District and a large percentage of water consumption is used outdoor landscaping.

CVWD anticipated an increase in water demand of approximately 4% to 5% in WY 16/17 and a steady 5% annual increase in demand from WY 17/18 – WY 20/21 as the State slowly comes out of drought conditions.

In WY 2015/16, CVWD saw a decrease of -1.5% in water demand as compared to WY 2014/15, which is related to the State declaring the end of the drought and CVWD's customers responds to water conservation measures.

Statewide Drought and Water Conservation:

From October 2015 to May 2016 during WY 2015/16, CVWD increased their water conservation efforts in accordance with the State and Metropolitan Water District of Southern California (MWD) conservation mandates. In May 2016, water conservation measures State-wide were suspended due to the large amount of rainfall in Northern California. CVWD saw an increase in water demand from May 2016 to September 2016.

CVWD anticipates that water conservation measures as directed by the State may be discontinued during WY 16/17 since it will depend on the amount of rainfall in Southern California from November 2016 to March 2017.

III. WATER SUPPLY

A. Existing Water Supply Overview:

The water supply for CVWD is composed of locally produced and treated groundwater, and imported water from MWD purchased on a wholesale basis from Foothill Municipal Water District (FMWD). In WY 2015/16, CVWD had an overall ratio of 53% local groundwater and 47% imported water from FMWD.

In WY 2015/16, CVWD saw a decrease in groundwater production of 15.7% as compared to WY 2014/15. CVWD's wells produced 1,711 ac-ft, which is 1,583 ac-ft under adjudicated right of 3,294 AFY. CVWD did produce an additional 259 ac-ft from the Rockhaven Well, which will be included in Glendale's annual groundwater production.

In general, the well levels in the Verdugo Basin decreased over WY 2015/16, which is attributed to below average rainfall (13.49" total rainfall or 41% below average rainfall) for the fifth consecutive year. It was observed that static well levels had decreased on an average of 5 - 10 feet from the previous year and an overall decrease of 10 – 15 feet over the last 5-years.

CVWD started well rehabilitation at Well 8 at the end of WY 2015/16 and is planning to complete the work in WY 2016/17. In addition, CVWD is planning to perform well rehabilitation on Well 7 in WY 16/17 to obtain better well efficiency and to potentially increase groundwater production.

B. PRODUCTION WELLS

Currently CVWD has twelve (12) active wells in operation. Historic and projected production from these wells is shown in Table 3.1.

The well capacity for WY 2015/16 varied from a high of 2.4 MGD to a low of 1.5 MGD and the average was 2.00 MGD, which is 53% less than the well design capacity of 4.2 MGD.

This is largely due to declining water levels and Wells 9, 10, 12 & 16 being out of service at various times throughout the year for rehabilitation and bacteriological issues.

B.1 Nitrate (NO_3) in Production Wells

CVWD's groundwater wells produce water which typically contains nitrate (as NO_3) levels above the 45 mg/L maximum contaminant level (MCL) as set by the EPA and the State Water Resources Control Board, Division of Drinking Water (DDW).

B.1.1 Glenwood

The Glenwood Nitrate Removal Treatment Plant is an ion-exchange process used to treat and remove nitrates from CVWD's well water. Untreated water and water treated at the Glenwood Plant are blended to produce water with a nitrate level less than the MCL.

In WY 2015/16, the ion-exchange plant was in operation for nine (9) of the twelve (12) months and produced 533 ac-ft of treated water, which allows CVWD to maximize the use of local groundwater.

B.1.2 Mills

Water production at CVWD's Mills Plant is blended with FMWD water to decrease the nitrate levels below the MCL.

B.2 Methyl tertiary-butyl ether (MTBE) in Wells

In 2004, CVWD detected low levels of MTBE in Well 5 during routine sampling. In 2006, Well 7 was taken out of service because of MTBE above the 13 ug/L MCL. In 2008, Well 5 was taken out of service when the MTBE level reached 14 ppb, which is above the MCL of 13 ppb. MTBE levels have decreased below the MCL and Wells 5 & 7 have been back in service since 2010.

B.2.1 MTBE Levels

In WY 2015/16, the MTBE levels in CVWD's wells were between Non-Detect (ND) and 0.21 ug/L.

B.2.2 Verdugo Basin MTBE Task Force

In 2006, CVWD made a request to the Watermaster's office to create the Verdugo Basin MTBE Task Force. CVWD has been working with RWQCB, DDW, stakeholders, and RP's on remediation and clean-up of the MTBE.

In WY 2015/16, the Task Force did not meet. The Task Force will reconvene at any time MTBE levels are higher than 1.0 ug/L.

B.2.3 Groundwater Recharge - Rainfall

CVWD has observed less than average rainfall amounts in the Verdugo Basin over the past five (5) years as shown in the table below. In WY 2015/16, the rainfall was 13.49 inches, which was 40% below the annual average of 22.7 inches.

CVWD Annual Rainfall Total	
Water Year	**Total Rainfall (In)**
15-16	**13.49**
14-15	**14.28**
13-14	**9.11**
12-13	**12.25**
11-12	**14.17**

The forecast for WY 2016/17 is a normal year for rainfall and CVWD is planning to decrease its water conservation efforts next year.

C. WELL REPLACEMENT PROGRAM

The age of the District's active wells range from 16 to 85 years old and are mostly beyond their useful life. CVWD has included in its 10-year CIP program a project to install a new water production well within the next 3 – 5 years to replace its aging well system.

C.1 Rockhaven Well Project

CVWD worked with Glendale Water and Power (GWP) to activate the Rockhaven Well (CVWD Well 16) located at 2740 Hermosa Ave. The Rockhaven Well project was a joint project between CVWD and GWP to activate a groundwater well which was constructed by GWP and has not been put into service due to water quality (nitrate) issues. The project uses CVWD's existing Nitrate Treatment Removal Facility to treat the local groundwater to Federal and State water standards.

The project provides for the use of potable water from a local water source, reduces dependence on MWD, and provides additional benefit of reducing the amount of nitrates within the Verdugo Basin. The project is estimated to produce about 480 ac-ft per year of additional local water. The historic and projected Rockhaven Water production is shown in Table 3.5.

CVWD and GWP received a 2014 Drought Grant as part of Proposition 84 for funding for the design and construction of the Rockhaven Well project. The grant funding was approved November 2015. The design and construction of the Rockhaven Well project was completed in March 2016.

C.2 Reactivation of Well 2 with a New Nitrate Treatment Removal Facility

CVWD received a 2015 Integrated Regional Water Management (IRWM) Grant from the Department of Water Resources (DWR) in March 2016 to reactivate Well 2 and install a new nitrate removal treatment facility at CVWD's Ordunio Reservoir site. Well 2 was drilled in 1927 and taken out of service in 1977 due to nitrate levels above the MCL and lack of a nitrate removal treatment facility. The project will produce about 150 gpm or 240 ac-ft/yr. It is currently under design and it should be completed in April 2018.

D. WELL REHABILITATION PROGRAM

CVWD continues performing well rehabilitation on its existing wells to maintain well capacity and extend the life of the wells. In WY 2015/16, CVWD started well rehabilitation on Well 8, and is planning rehabilitating Well 7 in WY 2016/17.

E. GLENWOOD NITRATE REMOVAL PLANT

The Glenwood ion-exchange nitrate removal plant was placed into operation in 1990. CVWD replaced the ion-exchange resin in WY 2010/11 during its annual maintenance shut-down.

During WY 2015/16, the plant was in operation nine (9) months of the year to maximize the use of groundwater production and this trend will continue in WY 2016/17, unless there are maintenance issues requiring the plant to discontinue operation. The historic and projected production from the Glenwood Plant is shown in Table 3.2.

F. PICKENS GRAVITY TUNNEL PRODUCTION

A small portion of the total demand for CVWD is supplied by the Pickens Gravity Tunnel. Historic and projected production from Pickens Tunnel is shown in Table 3.3.

G. FMWD/MWD – IMPORTED WATER

In WY 2015/16, the amount of imported water purchased from MWD via FMWD increased from previous years because of an overall decrease in groundwater production. Proportionally, the ratio of groundwater to import water in WY 2015/16 was 53/47, which shows a decrease in ground water production from previous years.

In WY 2016/17, CVWD anticipates an increase in the amount of imported water received from FMWD as groundwater production decrease and water demands slightly increase.

Historic and projected use of FMWD/MWD water shown in Table 3.4.

H. CITY OF GLENDALE INTERCONNECTION

In 2004, CVWD completed the installation of a new water supply interconnection with the City of Glendale. This connection allowed CVWD to increase its water supply capacity by 5.0 cfs or 3.2 mgd. An agreement between the City of Glendale, FMWD, and CVWD was signed in 2004, where CVWD will pay FMWD for the water and the City of Glendale for the maintenance and operation of bringing the water to CVWD.

In WY 2015/16, CVWD used 2.80 MG (8.6 ac-ft) of water from the Glendale/CVWD interconnection (GCI) in February & March 2016. This was used for emergency water supply due to a FMWD/MWD water shutdown for repairs.

I. CITY OF LOS ANGELES INTERCONNECTION

In 2006, CVWD received a Proposition 50, Water Security Grant from CDPH to install an emergency water supply connection with the City of Los Angeles. The new connection will provide 2.2 cfs or 1.44 mgd. In addition, the new interconnection and associated facilities will allow CVWD to provide water during an emergency to FMWD and its sub-agencies in case of a local disaster or when MWD's Weymouth plant is out of service.

Project under construction and should be completed in WY 2016/17.

J. STORMWATER RECHARGE FEASILIBLITY STUDY

CVWD's Verdugo Basin Groundwater Recharge, Storage, and Conjunctive Use Feasibility Study was completed in 2005 and recommended methods of stormwater recharge and storage within the basin. In WY 2012/13, CVWD received a Local Groundwater Assistance (LGA) grant from the Department of Water Resources (DWR) to perform a feasibility study for stormwater recharge within the Verdugo Basin.

The study is a cooperative effort with the City of Glendale, the County of Los Angeles, and other local stakeholders to determine if stormwater can be stored at Crescenta Valley County Park. The feasibility study started in August 2013 and has been ongoing through WY 15/16. The study should be completed by October 2016.

IV. JUDGEMENT CONSIDERATIONS

The adjudicated rights of CVWD from the Verdugo Basin are 3,294 acre-feet per year:

- WY 1978/79 to WY 1991/92 - CVWD pumped 1,700 to 2,900 ac-ft/yr.
- WY 1993/94 to WY 2000/01 - CVWD pumped over its adjudicated right, up to 500 ac-ft/yr, which was allowed by the Watermaster's office.
- WY 2001/02 to WY 2003/04 - CVWD pumped below its adjudication by due to declining basin production.
- WY 2004/05 - CVWD increased its water production because of higher than normal rainfall and was able to pump over the adjudication by 16 ac-ft.
- WY 2005/06 - CVWD pumped over the adjudication by 59 ac-ft. CVWD and the City of Glendale agreed upon compensation for the amount of water pumped over the adjudication for WY 2004/05 & WY 2005/06.
- WY 2006/07 - CVWD planned to maintain well production within the adjudication, however due to operator error, CVWD pumped over the adjudication by 11 ac-ft. CVWD and Glendale agreed upon compensation for the amount of water pumped based on the WY 2005/06 agreement.
- WY 2007/08 - CVWD adjusted its pumping schedule to maintain well production within the adjudication, and was 15 ac-ft below, since Well 7 was out of service for high MTBE levels.
- WY 2008/09 – CVWD pumped below its adjudication by 330 ac-ft, due to Well 5 being out of service for high MTBE levels and Well 9 being out of service due to bacteriological problems.

IV. JUDGEMENT CONSIDERATIONS (Cont.)

- WY 2009/10 - CVWD pumped below its adjudication by 640 ac-ft, which was due to Well 5 being out of service for high MTBE levels, Well 9 being out of service due to bacteriological problems, and Well 11 being out of service due to pump failure.
- WY 2010/11 - CVWD pumped below its adjudication by 368 ac-ft, which was due to Well 5 being out of service for high MTBE levels for three (3) months and decrease in water demand.
- WY 2011/12 - CVWD pumped below its adjudication by 195 ac-ft, this increase in production over previous years was due mainly to an increase in well efficiency from rehabilitation.
- WY 2012/13 - CVWD pumped below its adjudication by 368 ac-ft due to Well 1 and 12 being out of service for rehabilitation, declining well levels, and declining water demands.
- WY 2013/14 - CVWD pumped below its adjudication by 1,038 ac-ft due to Well 5, 8, 9, 11 and 12 being out of service for rehabilitation, recurring bacteriological problems, and declining water levels.
- WY 2014/15 - CVWD pumped below its adjudication by 1,265 ac-ft due to Well 10, 11 and 12 being out of service for rehabilitation, recurring bacteriological problems, and declining water levels.
- WY 2015/16 - CVWD pumped below its adjudication by 1,583 ac-ft due to Wells 9, 10, 12 & 16 being out of service for rehabilitation, recurring bacteriological problems, and declining water levels.

TABLE 2.1

HISTORIC AND PROJECTED
WATER DEMAND
(Acre-Feet)

2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
4,633	4,607	4603	3,744	3,687	3,867	4,070	4,290	4,490	4,710
ACTUAL					PROJECTED				

TABLE 3.1

HISTORIC AND PROJECTED
COMBINED WELL AND TUNNEL GROUNDWATER PRODUCTION
(Acre-Feet)

2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
3,099	2,926	2,256	2,029	1,711	1,390	1,660	1,845	1,980	2,130
ACTUAL					PROJECTED				

TABLE 3.2

HISTORIC AND PROJECTED
GLENWOOD NITRATE REMOVAL PLANT PRODUCTION BEFORE BLENDING
(Acre-Feet)

2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
447	488	150	186	174	255	300	300	300	300
ACTUAL					PROJECTED				

NOTES:

(1) The Glenwood Treatment Plant has a capacity of 2.1 MGD of blended water.

(2) The Glenwood Treatment Plant began operation January 1990.

TABLE 3.3

HISTORIC AND PROJECTED
PICKENS TUNNEL WATER PRODUCTION
(Acre-Feet)

2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
59	61	59	58	57	54	55	55	55	55
ACTUAL					PROJECTED				

TABLE 3.4

HISTORIC AND PROJECTED
FMWD/MWD TREATED WATER PRODUCTION
(Acre-Feet)

2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
1,534	1,682	2,348	1,716	1,717	2,100	1,945	1,910	1,910	1,980
ACTUAL					PROJECTED				

TABLE 3.5

HISTORIC AND PROJECTED
GWP (Rockhaven) WELL WATER PRODUCTION
(Acre-Feet)

2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
0	0	0	0	259	378	465	535	600	600
ACTUAL					PROJECTED				

NOTES:

(1) Rockhaven Well (Well 16) was put into service in March 2016.

(2) Rockhaven Well Production to be included in GWP's adjudicated right.

APPENDIX F

ANNUAL MUNICIPAL EXTRACTIONS IN ULARA

1979-2016

ANNUAL MUNICIPAL EXTRACTIONS IN ULARA
1979-80 through 2015-16
(acre-feet)

Water Year	San Fernando Basin*				Sylmar Basin			Verdugo Basin			ULARA TOTAL
	Burbank	Glendale	Los Angeles	TOTAL	Los Angeles	San Fernando	TOTAL	CVWD	Glendale	TOTAL	
2015-16	9,442	7,270	73,898	90,610	683	2,766	3,448	1,704	1,172	2,876	96,935
2014-15	10,008	7,054	72,633	89,696	0	2,736	2,737	2,019	1,145	3,164	95,597
2013-14	10,150	7,241	79,768	97,158	668	3,352	4,021	2,246	1,393	3,639	104,817
2012-13	11,387	7,176	52,751	71,314	1,673	3,284	4,957	2,917	1,670	4,587	80,858
2011-12	9,997	7,876	49,273	67,145	1,093	3,202	4,295	3,090	1,982	5,073	76,513
2010-11	10,398	7,476	43,951	61,825	964	3,082	4,046	2,917	1,827	4,744	70,615
2009-10	10,048	7,935	59,958	77,941	2,544	3,143	5,687	2,645	2,135	4,780	88,408
2008-09	9,966	7,151	52,896	70,013	868	3,473	4,341	2,957	2,087	5,043	79,397
2007-08	6,816	7,411	50,009	64,236	2,997	3,670	6,667	3,270	2,687	5,957	76,860
2006-07	9,780	7,622	76,251	93,653	3,919	2,894	6,813	3,294	2,568	5,862	106,329
2005-06	10,108	7,374	38,042	55,523	2,175	2,857	5,032	3,343	2,390	5,733	66,287
2004-05	6,399	7,792	49,085	63,276	1,110	3,143	4,253	3,302	2,357	5,659	73,188
2003-04	9,660	7,282	68,626	85,568	3,033	3,454	6,487	2,568	2,117	4,685	96,740
2002-03	9,170	8,507	73,376	91,053	3,549	3,357	6,906	2,836	1,613	4,449	102,408
2001-02	10,540	6,838	66,823	84,200	1,240	3,766	5,005	3,266	2,129	5,396	94,601
2000-01	10,128	6,886	65,409	82,423	2,606	3,696	6,301	3,422	2,227	5,649	94,374
1999-00	12,547	1,023	98,016	111,586	2,634	3,807	6,441	3,699	2,727	6,426	124,453
1998-99	10,729	31	123,207	133,966	4,536	3,528	8,064	3,797	2,627	6,424	148,455
1997-98	3,964	28	85,292	89,284	3,642	3,308	6,950	3,747	2,820	6,567	102,802
1996-97	11,171	20	89,935	101,126	2,482	3,259	5,741	3,672	2,674	6,346	113,213
1995-96	8,067	26	72,286	80,379	2,766	2,985	5,752	3,705	2,133	5,838	91,969
1994-95	3,052	53	55,478	58,583	2,311	3,421	5,732	3,708	1,633	5,341	69,656
1993-94	2,773	115	60,480	63,368	2,052	3,398	5,451	3,634	1,402	5,037	73,855
1992-93	1,354	91	34,973	36,419	1,369	2,145	3,514	2,557	990	3,547	43,480
1991-92	39	489	75,684	76,213	3,292	2,826	6,118	2,631	633	3,264	85,596
1990-91	1,278	2,755	67,032	71,065	3,281	2,266	5,546	2,615	1,230	3,845	80,456
1989-90	16	1,500	79,949	81,465	2,626	2,763	5,389	2,903	1,329	4,232	91,086
1988-89	29	1,315	126,630	127,974	3,259	2,199	5,459	2,285	2,064	4,349	137,781
1987-88	30	1,020	104,419	105,470	3,133	777	3,911	2,268	2,096	4,364	113,745
1986-87	29	5,758	85,845	91,632	3,113	3,026	6,139	2,255	2,619	4,874	102,645
1985-86	123	5,819	80,963	86,904	3,075	3,166	6,241	2,075	3,418	5,493	98,639
1984-85	2,863	3,086	95,641	101,591	3,130	3,102	6,232	1,997	3,837	5,834	113,657
1983-84	1,063	1,708	112,840	115,611	3,106	3,907	7,013	2,009	3,551	5,560	128,184
1982-83	2,187	1,028	65,178	68,394	3,048	3,133	6,181	1,759	3,427	5,187	79,761
1981-82	523	952	83,207	84,682	3,486	3,290	6,775	1,876	3,732	5,607	97,065
1980-81	595	1,129	91,067	92,791	4,117	3,380	7,497	2,140	2,122	4,262	104,550
1979-80	677	934	57,304	58,915	3,111	2,991	6,102	1,873	1,434	3,307	68,325
Average	5,868	3,994	73,464	83,326	2,505	3,096	5,601	2,784	2,162	4,946	93,873

*Includes municipal pumping only.

- All values published in this table supersede values published in previous Groundwater Pumping and Spreading Plans for ULARA. Any errors discovered in previously published tables have been resolved upon discovery.