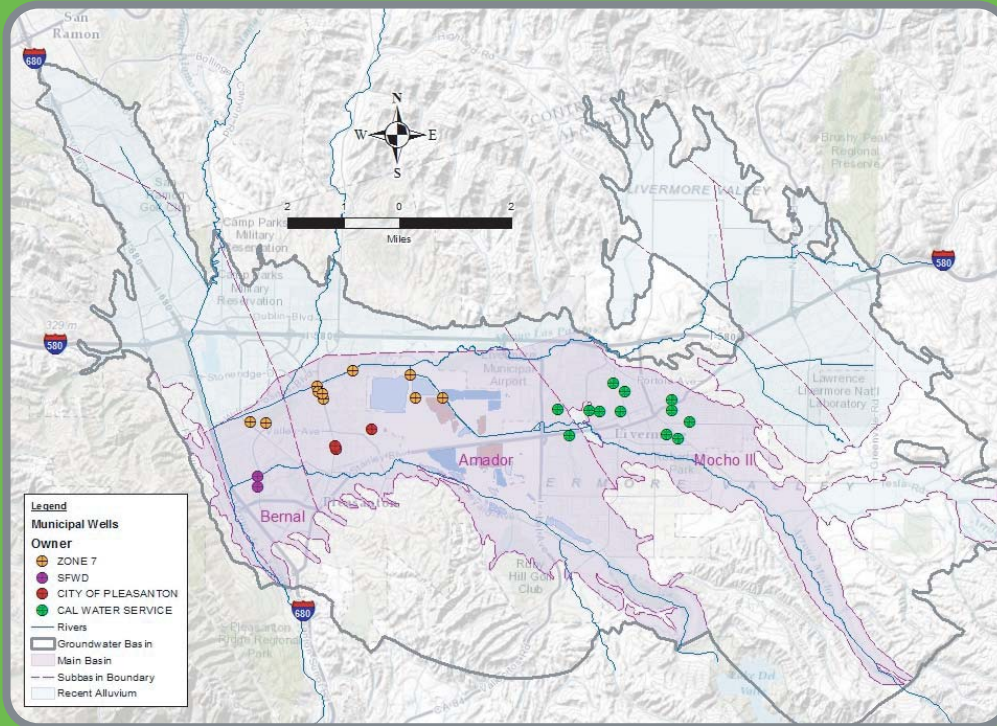


ANNUAL REPORT FOR THE GROUNDWATER MANAGEMENT PROGRAM 2014 WATER YEAR

LIVERMORE VALLEY GROUNDWATER BASIN



JULY 2015



Zone 7 Water Agency

**Annual Report for the
Groundwater Management Program
2014 Water Year (October 2013 – September 2014)
Livermore Valley Groundwater Basin**

ZONE 7 WATER AGENCY

100 North Canyons Parkway

Livermore, CA 94551

(925) 454-5000

PREPARED BY:

ZONE 7 WATER AGENCY STAFF

Contributors:

Kurt Arends, P.E. – *Assistant General Manager-Engineering*

Jarnail Chahal, P.E. – *Engineering Manager*

Jill Duerig, P.E. – *General Manager*

Mike Garguilo – *Water Resources Technician*

Ryan Gromer – *Water Resources Technician*

Wyman Hong – *Water Resources Technician*

Matt Katen, P.G., H.G. – *Principal Geologist*

Tom Rooze, P.G., E.G. – *Associate Geologist*

Sal Segura, P.E. – *Associate Engineer*

Colleen Winey, P.G. – *Assistant Geologist*

Table of Contents

<u>Executive Summary</u>	<u>Page</u>
Introduction	1
Climatological	2
Surface Water	3
Chain of Lakes	3
Groundwater Elevations	5
Groundwater Quality	6
Land Surface Elevation	8
Wastewater and Recycled Water	8
Land Use	9
Groundwater Storage Management for Sustainability	9
Water Supply and Management	9
Water Quality Sustainability	11

Executive Summary Figures

<i>Figure ES-1: Livermore Valley Groundwater Basin</i>	<i>1</i>
<i>Figure ES-2: Sta. 15E Rainfall (inches), 1974-2014 Water Years</i>	<i>2</i>
<i>Figure ES-3: Stream Recharge Volumes (AF), 1974 to 2014 Water Years</i>	<i>3</i>
<i>Figure ES-4: Key Well Water Levels in Amador West Subbasin (1973 to 2014)</i>	<i>5</i>
<i>Figure ES-5: Water Levels above Historical Lows (Fall 2014 Water Year)</i>	<i>6</i>
<i>Figure ES-6: Average Nitrate Concentration by Subbasin (2014 Water Year)</i>	<i>7</i>
<i>Figure ES-7: Surface Elevation and Groundwater Levels at Mocho Wellfield</i>	<i>8</i>
<i>Figure ES-8: Groundwater Storage (1974 to 2014 Water Years)</i>	<i>9</i>
<i>Figure ES-9: Main Basin Sustainability</i>	<i>10</i>
<i>Figure ES-10: Main Basin Salt Loading and Theoretical TDS Concentration (1974 to 2014 Water Years)</i>	<i>11</i>

Sections

1	Background.....	1-1
1.1	<i>Introduction.....</i>	<i>1-1</i>
1.2	<i>Groundwater Management Plan Elements</i>	<i>1-2</i>
1.3	<i>Groundwater Management Objectives.....</i>	<i>1-3</i>
1.4	<i>Hydrogeologic Setting.....</i>	<i>1-4</i>
1.4.1	Geology	1-4
1.4.2	Main Basin and Sub-Basins	1-5
1.4.3	Aquifer Zones.....	1-5
1.4.4	Groundwater Characteristics	1-6

2	Climatological	2-1
2.1	<i>Program Description.....</i>	2-1
2.2	<i>2014 Results</i>	2-1
3	Surface Water	3-1
3.1	<i>Program Description.....</i>	3-1
3.2	<i>2014 Results</i>	3-1
3.2.1	Arroyo Valle.....	3-2
3.2.2	Arroyo Mocho	3-3
3.2.3	Arroyo Las Positas	3-5
3.2.4	Arroyo De La Laguna.....	3-6
4	Chain of Lakes	4-1
4.1	<i>Program Description.....</i>	4-1
4.2	<i>2014 Results</i>	4-2
4.3	<i>Chain of Lakes Recharge Projects</i>	4-3
5	Groundwater Elevations.....	5-1
5.1	<i>Program Description.....</i>	5-1
5.1.1	Objectives	5-1
5.1.2	Program Changes for 2014.....	5-6
5.2	<i>2014 Results</i>	5-6
5.2.1	Upper Aquifer Zone	5-7
5.2.2	Lower Aquifer Zone	5-8
6	Groundwater Quality.....	6-1
6.1	<i>Program Description.....</i>	6-1
6.1.1	Objectives	6-2
6.1.2	Program Changes for 2014.....	6-4
6.2	<i>2014 Results</i>	6-4
6.2.1	Upper Aquifer Zone	6-4
6.2.2	Lower Aquifer Zone	6-7
7	Land Surface Elevation	7-1
7.1	<i>Program Description.....</i>	7-1
7.2	<i>2014 Results</i>	7-2
8	Wastewater and Recycled Water.....	8-1
8.1	<i>Program Description.....</i>	8-1
8.2	<i>2014 Results</i>	8-2
8.2.1	Municipal Wastewater and Recycled Water	8-2
8.2.2	Recycled Water Quality	8-3
8.2.3	Future Recycled Water Use.....	8-4

8.2.4	Other Applied Wastewater	8-4
9	Land Use.....	9-1
9.1	<i>Program Description.....</i>	<i>9-1</i>
9.2	<i>2014 Results</i>	<i>9-2</i>
10	Groundwater Storage Management for Sustainability	10-1
10.1	<i>Groundwater Storage Calculation Methods</i>	<i>10-1</i>
10.2	<i>Groundwater Elevation Method.....</i>	<i>10-2</i>
10.3	<i>Hydrologic Inventory Method.....</i>	<i>10-2</i>
10.3.1	Overview	10-2
10.3.2	Supply Components	10-3
10.3.3	Demand Components	10-6
10.4	<i>Total Operational Storage</i>	<i>10-10</i>
11	Groundwater Supply Sustainability	11-1
11.1	<i>Water Supply Overview.....</i>	<i>11-1</i>
11.2	<i>Natural Groundwater Balance.....</i>	<i>11-1</i>
11.2.1	Natural Sustainable Supply	11-1
11.2.2	Natural Sustainable Demand.....	11-2
11.2.3	Long-Term Net Sustainable Yield	11-3
11.3	<i>Zone 7 Supply and Demand</i>	<i>11-4</i>
11.3.1	Supplemental Sources	11-4
11.3.2	Conjunctive Use Program	11-7
11.3.3	Zone 7 Groundwater Pumping	11-8
11.3.4	Long-Term Net Zone 7 Recharge/Pumping.....	11-9
11.4	<i>Groundwater Model.....</i>	<i>11-10</i>
11.4.1	Groundwater Model Improvements	11-11
12	Water Quality Sustainability.....	12-1
12.1	<i>Salt Management.....</i>	<i>12-1</i>
12.1.1	Salt Management Plan.....	12-1
12.1.2	Salt Management Strategy.....	12-1
12.1.3	Average Salt Concentrations	12-2
12.1.4	2014 Salt Loading	12-4
12.1.5	Groundwater Demineralization	12-4
12.2	<i>Nutrient Management.....</i>	<i>12-5</i>
12.2.1	Nutrient Management Strategy	12-5
12.2.2	Average Nitrate Concentration.....	12-6
12.2.3	Nutrient Loading	12-7
12.3	<i>Groundwater Model.....</i>	<i>12-8</i>

12.4	<i>Septic Tank Management</i>	12-8
12.5	<i>Well Ordinance Program</i>	12-9
12.6	<i>Toxic Site Surveillance Program</i>	12-10
12.6.1	Program Description.....	12-10
12.6.2	Summary for 2014.....	12-12
13	Bibliography	13-1

List of Figures

<u>In Text</u>	<u>Page</u>
<i>Figure 1-A: Map of Livermore Valley Groundwater Basin</i>	1-1
<i>Figure 1-B: Groundwater Management Planning Act Requirements</i>	1-2
<i>Figure 4-A: Mining Pond Operators and Owners</i>	4-1
<i>Figure 4-B: Map of Future Chain of Lakes</i>	4-4
<i>Figure 4-C: Near-term recommendations for Lakes H, I, and Cope from Preliminary Lake Use Evaluation</i>	4-5
<i>Figure 5-A: Map of Key Wells for the 2014 Water Year</i>	5-2
<i>Figure 5-B: Table of Key Wells for the 2014 Water Year</i>	5-2
<i>Figure 5-C: Map of CASGEM Wells in Main Basin for 2014 WY</i>	5-4
<i>Figure 5-D: Map of CASGEM Wells in Alameda Co. Portion of Tracy Subbasin for WY 2014</i>	5-4
<i>Figure 5-E: DSRSD Wells Included in the 2014 Water Year Groundwater Elevation Program</i>	5-6
<i>Figure 5-F: Change in Groundwater Elevation in Key Wells from Fall 2013 to Fall 2014</i>	5-7
<i>Figure 6-A: Table of DSRSD Wells Included in the 2014 Water Year Program</i>	6-3
<i>Figure 8-A: Recycled Water Volumes (AF) for the 2014 Water Year</i>	8-2
<i>Figure 8-B: Wastewater Quality (mg/L, except where noted) for the 2014 Water Year</i>	8-3
<i>Figure 8-C: Wastewater Volumes (AF) for the 2014 Water Year</i>	8-5
<i>Figure 8-D: Wastewater Quality (mg/L, except where noted) for the 2014 Water Year</i>	8-5
<i>Figure 10-A: Groundwater Supply and Demand Components</i>	10-3
<i>Figure 10-B: Stream Recharge Components</i>	10-4
<i>Figure 10-C: Areal Recharge Components</i>	10-4
<i>Figure 10-D: Subsurface Groundwater Flow</i>	10-5
<i>Figure 10-E: Zone 7 Groundwater Pumping</i>	10-7
<i>Figure 10-F: Map of Municipal Wells</i>	10-8
<i>Figure 10-G: Groundwater Pumping By Others</i>	10-9
<i>Figure 10-H: Mining Area Demand Components</i>	10-9
<i>Figure 10-I: Groundwater Storage Summary (in Thousand AF)</i>	10-10
<i>Figure 11-A: Natural Sustainable Yield Supply Components</i>	11-2
<i>Figure 11-B: Natural Sustainable Yield Demand Components</i>	11-2
<i>Figure 11-C: Long-Term Net Natural</i>	11-4
<i>Figure 11-D: Supplemental Sources for the 2014 Calendar Year</i>	11-6
<i>Figure 11-E: Long-Term Net Zone 7 Recharge/Pumping</i>	11-9
<i>Figure 11-F: Groundwater Basin Management: Historical Groundwater Elevations at Fairgrounds Key Well</i>	11-10
<i>Figure 12-A: Average TDS Concentrations by Node and Basin</i>	12-2

<i>Figure 12-B: Main Basin Salt Loading Calculation Components</i>	12-3
<i>Figure 12-C: Salts Removed by Zone 7's MGD Operations</i>	12-5
<i>Figure 12-D: Average Nitrate Concentrations by Node and Basin</i>	12-7
<i>Figure 12-E: Sources and Losses of Nitrogen in Groundwater</i>	12-8
<i>Figure 12-F: Low-Threat UST Case Closure Policy Criteria</i>	12-12

Attached

<i>Figure 1-1: Generalized Geologic/Tectonic Map of the Livermore Valley</i>
<i>Figure 1-2: Recharge Layer and Confining Layer Map</i>

<i>Figure 2-1: Climatological Monitoring Stations with Average Rainfall</i>
<i>Figure 2-2: Table of Climatological Stations, 2014 Water Year</i>
<i>Figure 2-3: Graph of Livermore Rainfall</i>
<i>Figure 2-4: Monthly Precipitation Data, 2014 Water Year</i>
<i>Figure 2-5: Historical Monthly Precipitation, Monitoring Station 15E, 1987 to 2014 Water Years</i>
<i>Figure 2-6: Monthly Evapotranspiration Data, 2014 Water Year</i>
<i>Figure 2-7: Historical Monthly Pan Evaporation, Monitoring Station Lake del Valle, 1969 to 2014 Water Years</i>

<i>Figure 3-1: Map of Surface Water Sites, 2014 Water Year</i>
<i>Figure 3-2: Table of Surface Water Monitoring Stations and Monitoring Frequencies, 2014 Water Year</i>
<i>Figure 3-3: Stream Gage Details, Recorder Type Stations, 2014 Water Year</i>
<i>Figure 3-4: Monthly Streamflows, Recorder Stations, 2014 Water Year</i>
<i>Figure 3-5: Table of Surface Water Quality Results, 2014 Water Year</i>

<i>Figure 4-1: Map of Gravel Mining Pits</i>
<i>Figure 4-2: SemiAnnual Water Levels in Mining Area Ponds, 2014 Water Year</i>
<i>Figure 4-3: Water Quality Results for Mining Area Water Samples, 2014 Water Year</i>

<i>Figure 5-1: Map of Wells in 2014 Groundwater Elevation Program</i>
<i>Figure 5-2: Groundwater Elevation Program Wells with Monitoring Frequency</i>
<i>Figure 5-3: Well Construction Details</i>
<i>Figure 5-4: Map of Historical Lows in Lower Aquifer (Update Mar 2014)</i>
<i>Figure 5-5: Table of Semiannual Groundwater Levels, Fall 2012 To Fall 2014</i>
<i>Figure 5-6: Historical Key Well Hydrographs, 1901 to 2014 Water Years</i>
<i>Figure 5-7: Two-Year Key Well Hydrographs, 2012 Through 2014 Water Years</i>
<i>Figure 5-8: Groundwater Gradient Map, Upper Aquifer, Spring 2014</i>
<i>Figure 5-9: Groundwater Gradient Map, Upper Aquifer, Fall 2014</i>
<i>Figure 5-10: Groundwater Gradient Map, Lower Aquifer, Spring 2014</i>
<i>Figure 5-11: Groundwater Gradient Map, Lower Aquifer, Fall 2014</i>
<i>Figure 5-12: Map of Groundwater Levels Above Historical Lows, Lower Aquifer, Fall 2014</i>

<i>Figure 6-1: Map of Wells in 2014 Groundwater Quality Program</i>
<i>Figure 6-2: Groundwater Quality Program Wells with Sampling Frequency</i>
<i>Figure 6-3: Table of Water Quality Results, 2014 Water Year</i>
<i>Figure 6-4: Map of TDS Concentrations; Upper Aquifer; 2014 Water Year</i>

Figure 6-5: Map of Nitrate Concentrations; Upper Aquifer; 2014 Water Year
Figure 6-6: Map of Boron Concentrations; Upper Aquifer; 2014 Water Year
Figure 6-7: Map of TDS Concentrations; Lower Aquifer; 2014 Water Year
Figure 6-8: Map of Nitrate Concentrations; Lower Aquifer; 2014 Water Year
Figure 6-9: Map of Boron Concentrations; Lower Aquifer; 2014 Water Year
Figure 6-10: Graphs of TDS Concentrations in Key Wells, 1974 to 2014 Water Years
Figure 6-11: Hydro-Chemo Graph for 3S/1E 18A 6 (Hopyard 6), Bernal Subbasin, Lower Aquifer
Figure 6-12: Hydro-Chemo Graph for 3S/1E 9M 3 (Mocho 2), Amador West Subbasin, Lower Aquifer
Figure 6-13: Hydro-Chemo Graph for 3S/2E 7P 3), Amador East Subbasin, Lower Aquifer
Figure 6-14: Hydro-Chemo Graph for 3S/2E 8P 1, Mocho II Subbasin, Lower Aquifer
Figure 6-15: Mocho Wellfield Municipal Wells, Graphs of Groundwater Concentrations, Elevations, and Pumping

Figure 7-1: Benchmark Locations, 2014 Land Surface Elevation Monitoring Program
Figure 7-2: Survey Points and Descriptions, 2014 Water Year
Figure 7-3: Kier & Wright Survey Measurements, 2014 Water Year
Figure 7-4: Ground Surface Elevation Change, Fall 2013 to Fall 2014
Figure 7-5: Net Land Surface Elevation Changes; Hopyard Wellfield
Figure 7-6: Net Land Surface Elevation Changes; Mocho Wellfield
Figure 7-7: Net Land Surface Elevation Changes; Stoneridge Well
Figure 7-8: Net Land Surface Elevation Changes; Chain of Lakes Wellfield
Figure 7-9: Net Land Surface Elevation Changes; Busch Valley Well
Figure 7-10: Net Land Surface Elevation Changes; Las Positas Avenue
Figure 7-11: Net Land Surface Elevation Changes; Santa Rita Avenue
Appendix 7-1: Ground Movement Study – Livermore Valley

Figure 9-1: Livermore Valley Land Use, 2014 Water Year

Figure 10-1: Mean Groundwater Elevations by Node, Upper and Lower Aquifers, Fall 2014
Figure 10-2: Nodal Constants for Storage Calculations
Figure 10-3: Groundwater Elevation and Storage, Nodal Groundwater Elevation Method, 1963 to 1991 Water Years
Figure 10-4: Groundwater Elevation and Storage, Nodal Groundwater Elevation Method, 1992 to 2014 Water Years
Figure 10-5: Groundwater Storage, Hydrologic Inventory Method, 2014 Water Year
Figure 10-6: Groundwater Supply and Demand, 2014 Water Year
Figure 10-7: Historical Groundwater Storage, Hydrologic Inventory Method, 1974 to 2014 Water Years
Figure 10-8: Graphs of Historical Groundwater Storage, Hydrologic Inventory Method, 1974 to 2014 Water Years
Figure 10-9: Groundwater Production from Municipal and Other Supply Wells, 2014 Water Year
Figure 10-10: Main Basin Groundwater Production, 1974 to 2014 Water Years

Figure 11-1: Valley Water Production from Imported Water and Groundwater, 1974 to 2014 Water Years

Figure 12-1: Main Basin Salt Loading Calculations, 2014 Water Year

- Figure 12-2: Historical Salt Loading, 1974 to 2014 Water Years*
Figure 12-3: Graphs of Salt Loading and Concentrations, 1974 to 2014 Water Years
Figure 12-4: Toxic Site Surveillance; Case Priority System
Figure 12-5: Toxic Site Surveillance; Livermore Area Sites
Figure 12-6: Toxic Site Surveillance; Pleasanton and Sunol Area Sites
Figure 12-7: Toxic Site Surveillance; Dublin Area Sites
Figure 12-8: Toxic Site Surveillance; Active Sites Summary

Acronyms and Abbreviations

Abbrev	Description	Abbrev	Description
µg/L	Micro grams per liter	ETo	Evapotranspiration
ACCD	Alameda County Community Development Agency	ft	Feet
ACEH	Alameda County Environmental Health	GIS	Geographic information systems
ACWD	Alameda County Water District	GPD	Gallons per day
ADLLV	Arroyo De La Laguna at Verona	GPQ	Groundwater Pumping Quota
ADVP	Arroyo Del Valle Pleasanton	GWMP	Groundwater Management Plan
AF	Acre-feet	GWE	Groundwater Elevation
AF/yr	Acre-feet per year	HI	Hydrologic Inventory
ALP	Arroyo Las Positas	ISCO	In-situ chemical oxidation
ALP_ELCH	Arroyo Las Positas at El Charro	LAVWMA	Livermore-Amador Valley Water Management Agency
ALPL	Arroyo Las Positas near Livermore	LDV	Lake Del Valle
AMHAG	Arroyo Mocho Hageman	LLNL	Lawrence Livermore National Laboratory
AM_KB	Arroyo Mocho at Kaiser Bridge	LTCP	Low-Threat Underground Storage Tank Closure Policy
AMNL	Arroyo Mocho near Livermore	LWRP	Livermore Water Reclamation Plant
AMP	Arroyo Mocho Pleasanton	MCL	Maximum contaminant level
AVBLC	Arroyo Valle below Lang Canyon	mg/L	Milligrams per liter
AVNL	Arroyo Valle near Livermore	MGDP	Mocho Groundwater Demineralization Plant
BBID	Byron-Bethany Irrigation District	msl	Mean sea level
bgs	Below ground surface	MTBE	Methyl tertiary-butyl ether
BMOs	Basin management objectives	NMP	Nutrient Management Plan
BMPs	Best management practices	NPDES	National Pollutant Discharge Elimination System
BO	Basin objective	OWTS	Onsite wastewater treatment system
BTEX	Benzene, toluene, ethylbenzene, xylene	PCE	Tetrachlorethylene
CASGEM	California Statewide Groundwater Elevation Monitoring	POTW	Publically owned treatment works
CEC	Constituents-of-emerging-concern	ppb	Parts per billion
CIMIS	California Irrigation Management Information System	PPWTP	Patterson Pass Water Treatment Plant
COL	Chain of Lakes	PRP	Potential responsible party
CEQA	California Environmental Quality Act	RAP	Remedial Action Plan
cfs	Cubic feet per second	RO	Reverse osmosis
Cr	Chromium	RP	Responsible Party
CrIII	Trivalent chromium	RRE	Rural residential equivalent
CrIV	Hexavalent chromium	RWQCB	California Regional Water Quality Control Board
CVOC	Chlorinated volatile organic compound	SFEI	San Francisco Estuary Institute
CWS	California Water Service	SLIC	Spills, Leaks, Investigations, and Clean-ups
CY	Calendar year	SBA	South Bay Aqueduct
DCE	Dichloroethene	SFPUC	San Francisco Public Utilities Commission
DSRSD	Dublin San Ramon Services District	SMP	Salt Management Plan
DVWTP	Del Valle Water Treatment Plant	SNL	Sandia National Laboratories
DWR	California Department of Water Resources	SNMP	Salt Nutrient Management Plan
EBRPD	East Bay Regional Parks District	SWP	State Water Project
EIR	Environmental Impact Report	TAF	Thousand acre-feet
ESL	Environmental screening level	TBA	Tertiary-butyl alcohol

TCE	Trichloroethylene	UST	Underground storage tank
TDS	Total dissolved solids	VA	Veteran's Administration
TKN	Total Kjeldahl nitrogen	VC	Vinyl chloride
TPHd	Total petroleum hydrocarbons as diesel	VOC	Volatile organic compound
TPHg	Total petroleum hydrocarbons as gasoline	WDR	Waste discharge requirement
TSS	Toxic Sites Surveillance	WMP	Well Master Plan
TWG	The Wine Group	WWMP	Wastewater Management Plan
USGS	U.S. Geological Survey	WY	Water year (October 1 through September 30)

13 Bibliography

California Department of Water Resources (DWR) 1974. California's Groundwater, Bulletin 118-2, Evaluation of Ground Water Resources: Livermore and Sunol Valleys.

_____. 2003. California's Groundwater, Bulletin 118—Update 2003.

Camp Dresser and McKee Inc. 1982. Wastewater Management Plan for the Unsewered, Unincorporated area of Alameda Creek Watershed above Niles. Prepared for Zone 7 of Alameda County Flood Control and Water Conservation District.

California Regional Water Quality Control Board, San Francisco Bay Region, 2011, San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan).

Norfleet Consultants. 2004. Preliminary Stratigraphic Evaluation, West Side of the Main Basin, Livermore-Amador Groundwater Basin.

Solley, W. B., R. R. Pierce, H. A. Perlman (USGS). 1998. Estimated use of water in the United States in 1995. US Geological Survey circular; 1200. Denver, Colo: US Geological Survey. Report nr 06079007X. ix, 71p.

Zone 7 (Alameda Flood Control and Water Conservation District, Zone 7). 1982. Wastewater Management Plan for the Unsewered, Unincorporated Area of Alameda Creek Watershed above Niles, prepared by Zone 7 Water Agency, Clean Water Grant Project Number C-06-2777.

_____. 1987. Statement On Zone 7 Groundwater Management. August. Prepared by Zone 7 Board Committee.

_____. 1992. Main Groundwater Basin Natural Safe Yield, Internal Memo prepared by Zone 7 Water Agency.

_____. 2003. Draft Report, Well Master Plan, Prepared by CH2MHill for Zone 7 Water Agency.

_____. 2004. Salt Management Plan. Prepared by Zone 7 Water Agency.

- . 2005a. Groundwater Management Plan. Prepared by Jones & Stokes and Zone 7 Water Agency.
- . 2005b. Well Master Plan Conformed EIR, Prepared by ESA for Zone 7 Water Agency.
- . 2006a. Future Groundwater Demineralization Siting Study Report. Internal report prepared by Zone 7 Water Agency.
- . 2006s. Groundwater Model Update to Version 3.0. Internal memo prepared by Zone 7 Water Agency.
- . 2006c. Groundwater Modeling for Demineralization Plant Simulations. July. Internal report prepared by Zone 7 Water Agency.
- . 2006d. Annual Report for the Groundwater Management Program—2005 Water Year. Prepared by Zone 7, October 2006.
- . 2007. Annual Report for the Groundwater Management Program—2006 Water Year. Prepared by Zone 7, June 2007.
- . 2008a. Groundwater Outflow into the Alamo Canal and Arroyo de la Laguna, February 29, 2008, Internal memo prepared by Zone 7 Water Agency.
- . 2008b. Annual Report for the Groundwater Management Program—2007 Water Year. Prepared by Zone 7, June 2008.
- . 2009. Annual Report for the Groundwater Management Program—2008 Water Year. Prepared by Zone 7, May 7, 2009.
- . 2010. Annual Report for the Groundwater Management Program—2009 Water Year. Prepared by Zone 7, May 2010.
- . 2011a. Hydrostratigraphic Investigation of the Aquifer Recharge Potential for Lakes C and D of the Chain of Lakes, Livermore, California. Prepared by Zone 7 in cooperation with the Department of Water Resources' Local Groundwater Assistance Grant Program, May 2010.
- . 2011b. Annual Report for the Groundwater Management Program—2010 Water Year. Prepared by Zone 7, June 2011.

- . 2011c. 2011 Water Supply Evaluation. Prepared by Zone 7, July 2011.
- . 2012a. Toxic Sites Surveillance Annual Report 2011. Prepared by Zone 7, April 2012.
- . 2012b. Annual Report for the Groundwater Management Program—2011 Water Year. Prepared by Zone 7, July 2012.
- . 2013. Annual Report for the Groundwater Management Program—2012 Water Year. Prepared by Zone 7, May 2013.
- . 2014. Preliminary Lake Use Evaluation for the Chain of Lakes. Prepared by Zone 7, March 2014.

This Page Intentionally Left Blank

LIVERMORE VALLEY GROUNDWATER BASIN WEST-EAST CROSS-SECTION

