Livermore Valley Groundwater Basin

Sustainable Groundwater Management Annual Report

2022 Water Year (October 2021 – September 2022)

Submitted by:

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Abbreviations

ACEH	Alameda County Environmental Health
AF	acre-feet
AFY	acre-feet per year
ARM	Areal Recharge Spreadsheet Model
BBID	Byron-Bethany Irrigation District
CCR	California Code of Regulations
CIP	Capital Improvement Program
COC	Constituents of Concern
COL	Chain of Lakes
CWS	California Water Service
CY	calendar year
DDW	Division of Drinking Water
DSRSD	Dublin San Ramon Service District
DWR	Department of Water Resources
EIR	Environmental Impact Report
ft	feet
ft bgs	feet below ground surface
ft msl	feet above mean sea level
GAMA	Groundwater Ambient Monitoring and Assessment
GPQ	Groundwater Pumping Quota
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWE	Groundwater Elevation
HCM	Hydrogeologic Conceptual Model
HI	Hydrologic Inventory
ICSW	Interconnected Surface Water
IDC	Integrated Water Flow Model Demand Calculator
LAVWMA	Livermore-Amador Valley Water Management Agency
mg/L	Milligrams per liter
MGDP	Mocho Groundwater Demineralization Plant
MO	Measurable Objective
MT	Minimum Threshold
NMP	Nutrient Management Plan
NO3	Nitrate Ion
OWTS	Onsite wastewater treatment system
PFAS	Per- and polyfluoroalkyl substances
RMS	Representative Monitoring Site
SBA	South Bay Aqueduct
SFPUC	San Francisco Public Utilities Commission
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SMP	Salt Management Plan
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TDS	Total Dissolved Solid
UR	Undesirable Result
WMP	Well Master Plan
WY	Water Year

1. Executive Summary

The Livermore Valley Groundwater Basin (also referred to herein as "the Basin"), California Department of Water Resources (DWR) Basin No. 2-010, is classified as a "medium priority" basin (DWR, 2019). Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7 Water Agency or Zone 7) is the exclusive Groundwater Sustainability Agency (GSA) for the Basin and has managed local surface and groundwater resources for beneficial uses and users for more than 50 years.

Zone 7 submitted an Alternative Groundwater Sustainability Plan (Alternative GSP) for the Basin in December 2016. Subsequently, DWR reviewed and approved the Alternative GSP in July 2019. Zone 7 submitted the first Five-Year periodic evaluation to the Alternative GSP (2021 Alternative GSP; Zone 7 GSA, 2021, also referenced as 2022 Alternative GSP in other reports) in December 2021, which is currently under review. This 2022 Water Year (WY) Annual Report for the Basin was prepared in compliance with California Code of Regulations (CCR) 23 §356.2 and covers the period from 1 October 2021 through 30 September 2022. **Appendix A** provides a summary of the required information and corresponding location(s) in the report. **Appendix B** provides supplemental data/information including additional water quality, land subsidence, and water budget data.

General information about the Basin is provided in **Section 2**. The Basin encompasses approximately 69,600 acres (109 square miles) in Alameda and Contra Costa counties, and includes three Management Areas, defined by varying geologic, hydrogeologic, and groundwater conditions: the Main Basin Management Area (Main Basin), the Fringe Management Area (Fringe Area), and the Upland Management Area (Upland Area), as shown in **Figure 1**. Principal Aquifer units include the Upper Aquifer and Lower Aquifer within the Main Basin, the Fringe Aquifer within the Fringe Area, and the Upland Aquifer within the Upland Area.

Recent groundwater elevation trends within the Basin are detailed in **Section 3**. Groundwater elevation contours are shown for Spring 2022 (seasonal high) and Fall 2022 (seasonal low) groundwater conditions by Principal Aquifer unit on **Figure 2** through **Figure 5**. As indicated by the contours, groundwater flow directions and magnitudes did not vary greatly between the seasonal high to seasonal low periods in 2022 WY. However, for the third consecutive year, seasonal low groundwater elevations within the Basin continued to decline from the previous year because of below average groundwater recharge (from rainfall and stream sources), above-average municipal pumping, and additional dewatering from deeper mining excavations. As further described in **Section 3** and in **Appendix B** (Section 5), water levels decreased by as much as 15 feet (ft) in the Upper Aquifer and 45 ft in the Lower Aquifer within portions of the Main Basin from Fall 2021 to Fall 2022. In general, groundwater elevations in the western (Bernal Subarea) and eastern (Mocho II Subarea) portions of the Main Basin remained well above historic lows (up to about 140 ft). However, there were some areas in the Amador Subarea where water levels dropped up to 45 feet below historic lows.

The 2021 Alternative GSP established 12 Representative Monitoring Sites for Chronic Lowering of Groundwater Levels (RMS-WL) and 14 Representative Monitoring Sites for Depletions of Interconnected Surface Water (RMS-ICSW). Hydrographs comparing recent groundwater elevations to the Sustainable Management Criteria (SMCs) defined at each RMS-WL and RMS-ICSW location are shown on **Figure 6** and **Figure 7**, respectively. As shown in **Table 1**, groundwater levels at all RMS-WL locations remained above their respective Minimum Thresholds (MTs) throughout the 2022 WY. Water levels remained above the Measurable Objectives (MOs) in all the RMS-WL wells except for 3S1E12K003 (12K3, RMS-WL for the Amador East Subarea Lower Aquifer), which dropped below the MO in June 2022 and recorded a seasonal low at 25.3 ft below the MO on September 2, 2022.

As shown in **Table 2**, groundwater levels dropped below MTs at one RMS-ICSW (3S2E23E001 [23E1]) and below MOs at four additional RMS-ICSW (3S2E30D002 [30D2], 3S2E29F004 [29F4], 3S2E33C001 [33C1], and 3S2E16E004 [16E4]) during the seasonal low (i.e., Fall) 2022 WY monitoring event; however, all RMS-ICSW wells were measured above their MTs and MOs during the seasonal high (i.e., Spring) 2022 WY monitoring event. As such, no Undesirable Results (URs) were observed within the Basin during the 2022 WY.

Groundwater and surface water supplies and uses within the Basin during the 2022 WY are detailed in **Sections 4, 5,** and **6**. Basin-wide groundwater extractions totaled approximately 21,482 acre-feet (AF) during the 2022 WY, 95% (20,377 AF) of which was used for municipal supplies. Zone 7 extracted 72% (15,286 AF, including 645 AF for Dublin San Ramon Service District [DSRSD]) of the total extraction (**Table 3** and **Table 4**). General locations of groundwater extractions are shown on **Figure 8**.

In addition to groundwater extraction, Zone 7 imported a total of 18,497 AF of surface water supplies to the Basin in 2022 WY (**Table 5**). Total water use within the Basin for the 2022 WY consisted of 41% groundwater, 45% imported water, and 14% recycled water (**Table 6**, **Figure 9** and **Figure 10**).

Due to the recent drought, in the 2021 WY Zone 7 pumped 15,795 AF followed by 14,641 AF in the 2022 WY, the two highest pump totals in Zone 7's history. These totals do not include the water Zone 7 pumps for DSRSD (usually 645 acre-feet per year [AFY]), which is considered part of the "natural" demand (i.e., an outflow allocated to natural recharge) as further described in *Section 9 Water Budget Information* of the 2021 Alternative GSP. During that same time, Zone 7 was only able to artificially recharge 277 AF and 1,301 AF in the 2021 and 2022 WYs, respectively. However, since 1974, Zone 7 has artificially recharged 20,017 AF more than it has pumped.

Changes in groundwater storage over the 2022 WY were estimated using both the Groundwater Elevation (GWE) method and the Hydrologic Inventory (HI) method, as further described in **Section 7**. Taking an average of the two methods, the total groundwater in storage at the end of 2022 WY was calculated to be 216.5 thousand acre-feet (TAF), which is about 6.6 TAF less than the 2021 WY average total storage value (**Table 7**). **Figure 11** shows the change in storage from Fall 2021 to Fall 2022 for each Main Basin node. **Figure 12** shows the annual change in

groundwater storage and cumulative change in groundwater storage for the Basin along with the water year type from 1974 WY through 2022 WY. Using the Water Year Type methodology developed by DWR (DWR, 2021), the 2022 WY is considered a Below Normal (BN) water year, and the change in groundwater storage for the Basin (-6.6 TAF) was similar to that observed in other recent below normal years.

Section 8 presents a summary of Alternative GSP Implementation during 2022 WY. The 2021 Alternative GSP outlined potential Projects and Management Actions (P/MAs) currently being implemented or otherwise proposed for future implementation. The P/MAs identified in the 2021 Alternative GSP generally fall into the following four categories: (1) water supply augmentation, (2) water demand reduction, (3) improvement of groundwater quality, and (4) data gap-filling activities. A brief description of the status of each P/MA as through the 2022 WY is listed in **Section 8.2**.

Table 8 summarizes the SMCs and their 2022 WY status for each Sustainability Indicator defined for the Basin. As further detailed in **Table 8**, no URs occurred during the 2022 WY for any of the five Sustainability Indicators with SMCs defined in the 2021 Alternative GSP.

To avoid duplication, material included in the 2021 Alternative GSP has not been repeated here, but specific sections are referenced when more background detail may be desired.

2. General Information

☑ *§ 356.2 (a)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(a) General information, including an executive summary and a location map depicting the basin covered by the report.

On 16 September 2014, the California legislature enacted the Sustainable Groundwater Management Act (SGMA), the primary purpose of which is to achieve and/or maintain sustainability within the state's high and medium priority groundwater basins. The Livermore Valley Groundwater Basin, DWR Basin No. 2-010, is classified as a "medium priority" basin (DWR, 2019) and is not subject to the critical conditions of overdraft. Under its authority as the Exclusive GSA of the Basin, Zone 7 submitted an Alternative GSP for the Basin in December 2016, which was approved by DWR in July 2019, and the first Five-Year Update to the Alternative GSP in December 2021, which is currently under review.

This 2022 WY Annual Report for the Basin has been prepared in compliance with CCR 23 § 356.2. The 2022 WY includes the period from October 1, 2021 through September 30, 2022. This report also contains available and appropriate historical information back to Calendar Year (CY) 2015, as required by CCR 23 §356.2 (b), to provide information and data related to Basin conditions through the current reporting year. All the data included in this report are conveyed based on the 2022 WY; however, due to other reporting obligations, some information in this report (e.g., retailer groundwater pumping quota and surface water supply volumes) is compiled and reported on a CY basis (i.e., January 1 through December 31, 2022).

Zone 7 provides water management in the Basin as part of its mission to deliver safe, reliable, efficient, and sustainable water services, and more specifically addresses Strategic Plan initiatives *#7 – Manage as the GSA and implement the groundwater management plan* and *#8 – Study and refine knowledge of the groundwater basins*. Zone 7 has managed local surface and groundwater resources for beneficial uses for more than 50 years.

The Zone 7 service area is located about 40 miles southeast of San Francisco and encompasses an area of approximately 425 square miles of the eastern portion of Alameda County, including the Livermore-Amador Valley, Sunol Valley, and portions of the Diablo Range (**Figure 1**). Zone 7 also serves a portion of Contra Costa County (Dougherty Valley in San Ramon) through an out-of-service-area agreement with Dublin San Ramon Service District (DSRSD).

As shown on **Figure 1**, the Basin encompasses approximately 69,600 acres (109 square miles) in Alameda and Contra Costa counties, and includes three Management Areas based on varying geologic, hydrogeologic, and groundwater conditions: the Main Basin, Fringe Area, and Upland Area. The Basin is boarded on the northwest by the San Ramon Valley Basin (Basin No. 2-07), a

very-low priority basin that extends to the northwest in Contra Costa County, and on the southwest by the Sunol Valley Basin (Basin No. 2-11), which is also a very-low priority basin.

Available hydrogeologic information indicates that the Basin is bounded by the Calaveras Fault on the west, the Greenville Fault on the east, and bedrock deposits of the Plio-Pleistocene Tassajara and Livermore Formations to the north and south, respectively. Principal Aquifer units include the Upper Aquifer and Lower Aquifer within the Main Basin, the Fringe Aquifer within the Fringe Area, and the Upland Aquifer within the Upland Area. The Upper Aquifer consists of recent (Holocene) alluvial fill materials and extends continually across the Main Basin at depths up to 190 feet below ground surface (ft bgs), containing groundwater typically under unconfined conditions. The Lower Aquifer exists below a confining aquitard with thicknesses ranging from less than 5.0 ft up to 50 ft in the central and eastern parts of the Main Basin. The Lower Aquifer consists of Quaternary alluvial fill materials and the productive upper portion of the Livermore Formation, extending to depths of up to 800 ft bgs in the central Main Basin. A large majority of groundwater production occurs within the Lower Aquifer of the Main Basin. The Fringe Aquifer and Upland Aquifer are demonstrated to be of lower productivity and quality than the aquifers of the Main Basin, and groundwater production is limited to domestic and agricultural uses in these areas.

Sources of recharge to the Basin include rainfall recharge, applied water recharge, stream recharge, subsurface groundwater inflow, and pipe leakage. Groundwater outflows from the Basin include municipal pumping, agricultural pumping, mining use, and subsurface groundwater outflow. A historical water budget period (1974-2020 WYs) presented in the 2021 Alternative GSP shows that long-term sustainability has been maintained in the Basin for at least 45 years, as groundwater storage conditions have remained generally stable to increasing and have shown resilience following dry periods.

Detailed information regarding the Plan Area, Hydrogeologic Conceptual Model, and historical and recent Groundwater Conditions are provided in the 2021 Alternative GSP.

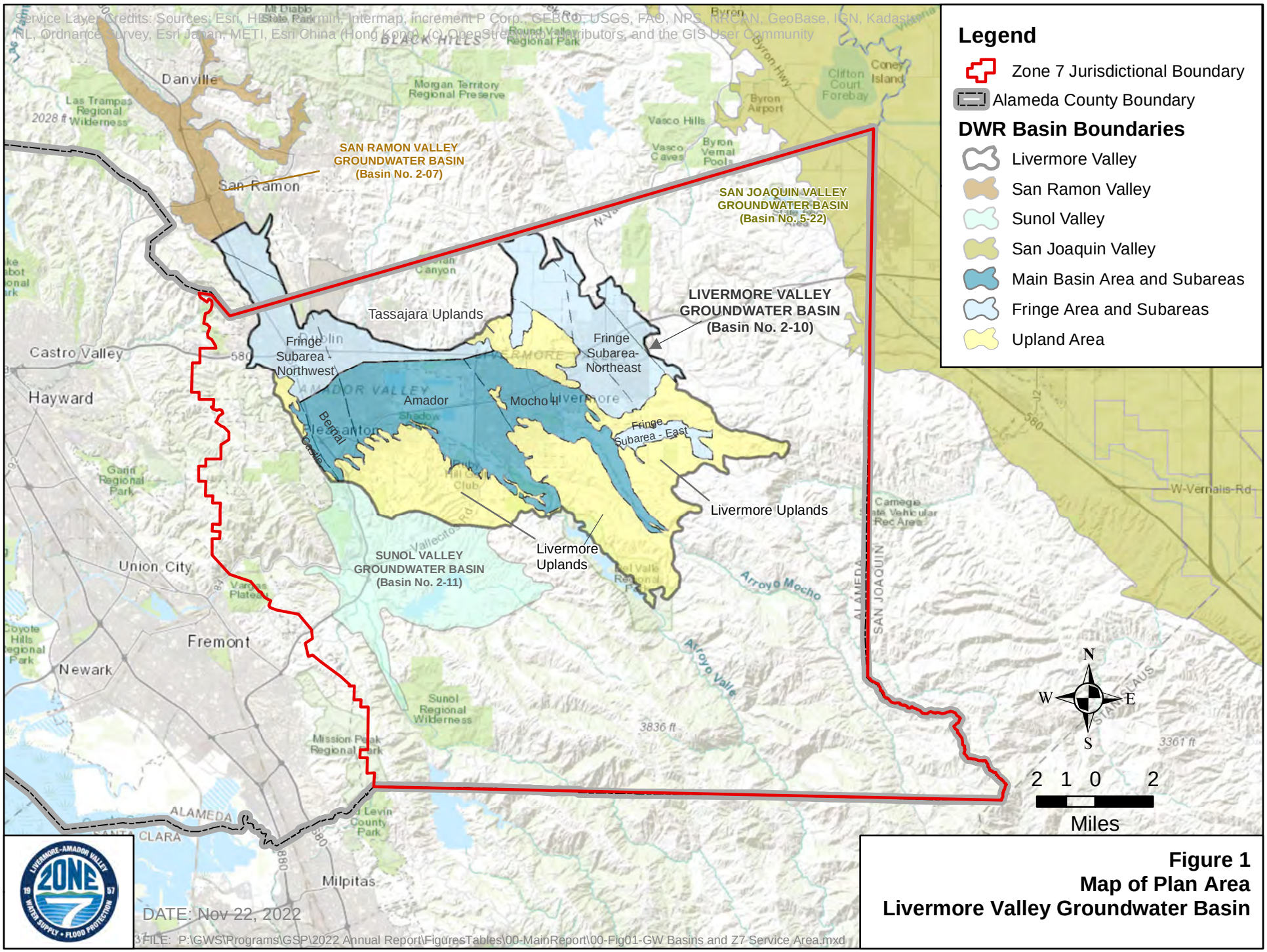

Figure 1
Map of Plan Area
Livermore Valley Groundwater Basin

3. Groundwater Elevation Data

3.1. Description

☑ *§ 356.2 (b) (1)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:

(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.

(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.

Zone 7 has conducted an extensive program of groundwater level monitoring throughout the Basin since the mid-1970s. Background information regarding the Groundwater Elevation Monitoring Program is provided in *Section 14.2.1 Monitoring Network for Chronic Lowering of Groundwater Levels* of the 2021 Alternative GSP. This program includes the measurement of groundwater levels in monitoring and production wells to confirm that management objectives are met, to assess groundwater supplies, and to define any new management objectives needed to maintain sustainability. The program focuses on the Main Basin, where groundwater is pumped for municipal uses; however, water levels are also measured in the Fringe and Upland Areas.

Approximately 236 wells were included in Zone 7's Groundwater Elevation Monitoring Program during the 2022 WY. Groundwater elevations in most of these wells were measured at least two times throughout the water year, during both seasonal high (Spring) and seasonal low (Fall) groundwater conditions. Seasonal high (Spring) and seasonal low (Fall) 2022 WY groundwater elevation contour maps are presented in **Section 3.3** for each Principal Aquifer[1] in the Basin using water level measurements from the wells in the Groundwater Elevation Monitoring Program.

3.2. Representative Monitoring Sites

The Basin currently has 12 RMS-WLs and 14 RMS-ICSWs which represent a subset of the Groundwater Elevation Monitoring Program. Updated hydrographs of groundwater elevations are presented in **Section 3.4** for each of the wells included in the RMS-WL and RMS-ICSW monitoring networks. Seasonal high and seasonal low water levels at the RMS-WL and RMS-ICSW sites are compared to their corresponding SMCs in **Table 1** and **Table 2**.

[1] Insufficient monitoring wells currently exist in the Upland Area to prepare contour maps for the Upland Aquifer.

Table 1 compares water level measurements from the seasonal high (Spring) and seasonal low (Fall) 2022 WY monitoring events to the MTs and MOs defined at RMS-WL wells in the 2021 Alternative GSP. The table also shows the change in elevation from the previous year's seasonal low to this year's seasonal low. Groundwater elevations in all Main Basin RMS-WL wells dropped relative to 2021 WY conditions, especially in the Lower Aquifer (up to 40.8 ft). Water levels remained above the MOs in all RMS-WL wells except for 3S1E12K003 (RMS-WL for the Amador East Subarea Lower Aquifer) which dropped below the MO in June 2022 and had a seasonal low at 25.3 ft below the MO on September 2, 2022 (but was still 13.6 ft above the MT). Zone 7 closely monitored the water level in this RMS-WL well as it approached and declined below the MO. In response, Zone 7 performed several management actions as further described in **Appendix B** (Section 11.3). As a result, and assisted by rainfall later in the month, the water level in this RMS-WL began increasing after September 2, 2022 and rose above the MO in December 2022.

In the Fringe Aquifer, water elevations in the RMS-WL wells stayed relatively constant throughout the 2022 WY, generally varying by less than 3.0 ft compared to groundwater levels in the RMS-WL wells in 2021 WY. The RMS-WL in the Upland Area (3S2E21K009 [21K9]) could not be accessed for the seasonal high (i.e., Spring) 2022 WY monitoring event; however, the water level was over 6.0 ft above the MO and MT for the seasonal low (i.e., Fall) 2022 WY monitoring event.

Table 2 compares water level measurements from the seasonal high and seasonal low 2022 WY monitoring events to the MTs and MOs defined at RMS-ICSW wells in the 2021 Alternative GSP. The table also shows the change in elevation from the previous year's seasonal low to this year's seasonal low. Groundwater levels dropped below MTs at one RMS-ICSW (3S2E23E001 [23E1]) and below MOs at four additional RMS-ICSW (Wells 3S2E30D002 [30D2], 3S2E29F004 [29F4], 3S2E33C001 [33C1], and 3S2E16E004 [16E4]) during the seasonal low (i.e., Fall) 2022 WY monitoring event; however, all RMS-ICSW wells were above their MTs and MOs during the seasonal high (i.e., Spring) 2022 WY monitoring event. As further described in **Section 8.1**, the MT exceedance observed at Well 3S2E23E001 does not currently constitute a UR per the definition provided in *Section 13.6.1 Undesirable Results for Depletions of Interconnected Surface Water* of the 2021 Alternative GSP.

3.3. Groundwater Elevation Contour Maps

3.3.1. Upper Aquifer and Fringe Aquifer

Figure 2 and **Figure 3** show 2022 WY groundwater elevation contours in the Upper Aquifer and Fringe Aquifer during seasonal high (Spring) and seasonal low (Fall) conditions, respectively. Similar groundwater gradient maps that include groundwater elevations at each of the wells are included in **Appendix B** (Figures 5-4 and 5-5, respectively). The groundwater gradient in the Upper Aquifer was generally from east to west and ranged from 0.005 to 0.025 ft/ft.

Quarry dewatering (mining) operations in the Amador Subarea create groundwater depressions in pits where water is pumped and mounds in pits that are not clay-lined and where excess water is stored. The water from the dewatering of MA-P042 and MA-P046 (future Lakes B and J, respectively) was discharged into other adjacent clay-lined mining pits. Normally, water from

MA-R028 (future Lake D) is eventually discharged into Cope Lake after which it is conveyed into Lake I and recharged back into the Basin. However, the mining company that currently excavates in this portion of the mining area (Vulcan Materials) did not discharge into Cope Lake in the 2022 WY due to a combination of a below normal WY type and the addition of MA-R024A as a silt pond with a large storage capacity. Most of the groundwater elevation head change (the steepest groundwater gradient) occurs in the central area of the Basin, where the mining pits are being excavated, and did not appear to vary significantly between the seasonal low and seasonal high periods of the 2022 WY.

Water levels in wells in the southwestern portion of the Basin near the Arroyo de la Laguna (as indicated primarily by the Bernal Subarea Upper Aquifer Key Well 3S1E20C007 [20C7] and well 3S1E29M004 [29M4]) were below the upper threshold groundwater elevation at which Basin overflow occurs (i.e., about 295 feet above mean sea level [ft msl]). Consequently, no water overflowed from the Upper Aquifer into the Arroyo de la Laguna and exited the Basin during the 2022 WY.

In the Fringe Aquifer, water elevations stayed relatively constant throughout the 2022 WY, generally varying by less than 5.0 ft compared to groundwater levels in 2021 WY (shown in **Appendix B** Figure 5-6). For more information regarding historic groundwater elevations and trends observed for the Fringe Area, refer to *Section 8.3 Current and Historical Groundwater Conditions* of the 2021 Alternative GSP.

3.3.2. Lower Aquifer

Figure 4 and **Figure 5** show 2022 WY groundwater elevation contours in the Lower Aquifer during seasonal high (Spring) and seasonal low (Fall) conditions, respectively. Similar groundwater gradient maps that include groundwater elevations at each of the wells are included in **Appendix B** (Figures 5-8 and 5-9, respectively). Flow directions and magnitudes indicated by the groundwater elevation contours did not vary greatly between the seasonal low and seasonal high conditions during the 2022 WY. In general, the groundwater gradient runs toward the center of the Basin where there are piezometric depressions created around several municipal wellfields and two mining pits (MA-P042 [Lake B] and MA-R028 [Lake D]) that appear to extend into the Lower Aquifer. The lowest groundwater elevation in the Lower Aquifer was observed near the MA-R028 (Lake D) mining excavation pond (166 ft msl).

For the third consecutive year, seasonal low groundwater elevations in the Lower Aquifer continued to decline from the previous year because of below average groundwater recharge (from rainfall and stream sources), above-average municipal pumping, and additional dewatering from deeper mining excavations. Lower Aquifer water levels dropped significantly (by as much as 45 ft) within portions of the Main Basin from Fall 2021 to Fall 2022. In general, groundwater elevations in the western (Bernal Subarea) and eastern (Mocho II Subarea) portions of the Main Basin remained well above historic lows (up to about 140 ft). However, there were some areas in the Amador Subarea where water levels dropped by as much as 45 ft below historic lows (see **Appendix B** Section 5.2.4).

For more information on general groundwater gradient and water level trends, see *Section 8 Current and Historical Groundwater Conditions* of the 2021 Alternative GSP and **Appendix B** (Section 5).

3.4. Groundwater Elevation Hydrographs

Groundwater levels for the 2022 WY followed a typical seasonal pattern observed from the historical data, rising in the beginning of the year with rainfall recharge and minimal pumping occurring, levelling off in late spring, and then dropping during the second half of the water year as rainfall ceased and pumping demands increased. Groundwater elevations generally decreased at all RMS-WL wells in the Main Basin compared to water levels during the 2021 WY. For reference, Zone 7 identified the 2022 WY as a below-normal WY based on the methodology developed by DWR (DWR, 2021). Historical water year types are provided in **Figure 12**.

Figure 6 and **Figure 7** show hydrographs of historical and recent groundwater elevations at all RMS-WL and RMS-ICSW wells, respectively. These hydrographs further demonstrate the seasonal trends observed in both the Upper/Fringe Aquifers and the Lower Aquifer. The seasonal fluctuations are greater in the Lower Aquifer where more pumping occurs to meet seasonal demands in the warmer months, and when surface water treatment plant outages occur.

Groundwater elevations will continue to be monitored at all RMS-WL and RMS-ICSW sites per the monitoring plans described in *Section 14 Monitoring Network* of the 2021 Alternative GSP.

TABLE 1
GROUNDWATER ELEVATIONS AT REPRESENTATIVE MONITORING SITES
FOR CHRONIC LOWERING OF GROUNDWATER ELEVATIONS
2022 WATER YEAR
LIVERMORE VALLEY GROUNDWATER BASIN

RMS Well		*Management Area/Unit*			*2022 Water Year (in ft)*					*SMCs for GWE (ft above Mean Sea Level)*				
Well Name	*Map*	*Area*	*Subarea*	*Aquifer*	*Season High GWE*	*Season Low GWE*	*Change from 2021**	*Height above MT*	*Height above MO*	*MT*	*IM-5*	*IM-10*	*IM-15*	*MO*
3S1E20C007	20C7	Main	Bernal	Upper	268.4	257.3	-7.3	112.5	77.8	144.8	153.4	162.1	170.8	179.5
3S1E20C008	20C8	Main	Bernal	Lower	266.7	233.6	-17.0	88.8	54.1	144.8	153.4	162.1	170.8	179.5
3S1E09P005	9P5	Main	Amador West	Upper	279.3	268.5	-9.7	88.7	61.8	179.8	186.5	193.2	199.9	206.7
3S1E09P010	9P10	Main	Amador West	Lower	270.5	241.1	-13.2	61.4	34.5	179.8	186.5	193.2	199.9	206.7
3S1E11G001	11G1	Main	Amador East	Upper	298.7	285.9	-7.9	104.9	66.0	181.0	190.7	200.4	210.2	219.9
3S1E12K003	12K3	Main	Amador East	Lower	261.6	194.6	-40.8	13.6	-25.3	181.0	190.7	200.4	210.2	219.9
3S2E08K002	8K2	Main	Mocho II	Upper	425.9	414.8	-2.6	159.7	121.7	255.1	264.6	274.1	283.6	293.1
3S2E08H003	8H3	Main	Mocho II	Lower	423.8	406.8	-9.6	151.6	113.6	255.1	264.6	274.1	283.6	293.1
3S1E06F003	6F3	Fringe	Northwest	Upper	324.9	323.5	-0.3	18.6	8.9	305.0	307.4	309.8	312.2	314.6
2S2E34E001	34E1	Fringe	Northeast	Upper	495.8	493.7	0.2	5.5	2.5	488.2	489.0	489.7	490.5	491.2
3S2E24A001	24A1	Fringe	East	Upper	697.9	696.8	-2.8	21.3	18.5	675.5	676.2	676.9	677.6	678.3
3S2E21K009	21K9	Upland	Upland	Upper	NA	476.7	0.5	6.6	6.6	470.1	470.1	470.1	470.1	470.1

RMS = Representative Monitoring Site
GWE = Groundwater Elevation (in ft above Mean Sea Level)
SMC = Sustainable Management Criteria
IM = Interim Milestone
MO = Measurable Objective
MT = Minimum Threshold
NA = Not Available (no access to well in Spring)
* = 2022 Seasonal Low minus 2021 Seasonal Low

Main
Fringe
Upland

TABLE 2
GROUNDWATER ELEVATIONS AT REPRESENTATIVE MONITORING SITES FOR INTERCONNECTED SURFACE WATER
2022 WATER YEAR
LIVERMORE VALLEY GROUNDWATER BASIN

RMS Well		Management Area/Unit			2022 Water Year (in ft)					SMCs for ICSW (ft above MSL)				
Well Name	Map	Area	Subarea	Aquifer	Season High GWE	Season Low GWE	Change from 2021*	Height above MT	Height above MO	MT	IM-5	IM-10	IM-15	MO
3S2E30D002	30D2	Main	Amador	Upper	410	403.8	-1.83	2.8	-2.7	401	403.8	404.7	405.6	407
3S1E16P005	16P5	Main	Amador	Upper	315.31	307.11	22.22	21.91	21.91	285	285.2	285.2	285.2	285
3S2E33G001	33G1	Main	Amador	Upper	502.47	502.16	-0.16	1.16	0.86	501	501.1	501.2	501.2	501
3S2E29F004	29F4	Main	Amador	Upper	446.16	444.55	0	6.75	-0.05	438	441.2	442.3	443.5	445
3S2E33C001	33C1	Main	Amador	Upper	487.9	485.26	-0.07	3.16	-0.94	482	484.2	484.8	485.5	486
3S1E02N006	2N6	Main	Camp	Upper	337.92	336.94	0.22	5.44	3.04	332	333.9	333.9	333.9	334
3S2E16E004	16E4	Main	Mocho II	Upper	481.96	466.92	-0.09	0.02	-0.08	467	466.9	466.9	466.9	467
3S2E23E001	23E1	Main	Mocho II	Upper	596.88	594.37	0	-1.03	-1.03	595	595.4	595.4	595.4	595
4S2E01A001	1A1	Main	Mocho II	Upper	800.81	793.06	-2.9	11.86	11.86	781	781.2	781.2	781.2	781
2S2E27P002	27P2	Fringe	Spring	Upper	503.11	501.57	0.45	0.57	0.57	501	501	501	501	501
2S2E34E001	34E1	Fringe	May	Upper	495.48	493.7	0.17	2.5	0.7	491	492.1	492.4	492.7	493
3S1E05K006	5K6	Fringe	Camp	Upper	330.87	328.94	-0.76	2.94	0.74	326	328.2	328.2	328.2	328
3S1E02R001	2R1	Fringe	Camp	Upper	357.29	356.89	2.92	11.59	3.29	345	349.4	350.8	352.2	354
3S2E32E007	32E7	Upland	Upland	Upper	592.62	592.14	-0.4	0.74	0.74	591	591.4	591.4	591.4	591

RMS = Representative Monitoring Site
GWE = Groundwater Elevation (in ft above Mean Sea Level)
SMC = Sustainable Management Criteria
ICSW = Interconnected Surface Water
MSL = Mean Sea Level
IM = Interim Milestone
MO = Measurable Objective
MT = Minimum Threshold
* = 2022 Seasonal Low minus 2021 Seasonal Low

Main
Fringe
Upland

LEGEND

2022 Program Wells (Upper Aquifer)

- Supply
- Monitor
- Nested
- Mining Pond
- SGMA Representative Wells

Mining Pond Areas 2022

- Static (= groundwater elevation)
- Pumped From
- Pumped Into
- Clay-lined
- Contours (Interval = 10')
- Hatch pattern towards lower elevation
- Main Basin
- Fringe Area
- Upland Area

N
W E
S

0 2 4
Miles

DATE: Mar 6, 2023
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Figure 2
Groundwater Gradient Map
Upper Aquifer, Seasonal High, Spring 2022
Livermore Valley Groundwater Basin

LEGEND

2022 Program Wells - Upper Aquifer

- Supply
- Monitor
- Nested
- Mining Pond
- SGMA Representative Wells

Mining Pond Areas 2022

- Static (= groundwater elevation)
- Pumped From
- Pumped Into
- Clay-lined

- Contours (Interval = 10')
- Hatch pattern towards lower elevation
- Streams
- Main Basin
- Fringe Area
- Upland Area

N
W E
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Figure 3
Groundwater Gradient Map
Upper Aquifer; Seasonal Low, Fall 2022
Livermore Valley Groundwater Basin

ABBREVIATIONS FOR MUNICIPAL WELLS
COL = Chain of Lakes (Zone 7)
M = Mocho (Zone 7)
H = Hopyard (Zone 7)
St = Stoneridge (Zone 7)
CWS = Cal Water Service
P = Pleasanton
SF = San Francisco Public Utilities Commission

LEGEND

2022 Program Wells (Lower Aquifer)
- Supply
- Monitor
- Municipal
- Nested
- Mining
- SGMA Representative Wells

Mining Pond Areas 2022
- Static (= groundwater elevation)
- Pumped From
- Pumped Into
- Clay-lined
- Contours (Interval = 10')
- Hatch pattern towards lower elevation
- Streams
- Township-Range Line
- Main Basin
- Fringe Area
- Upland Area

3S/1E
3S/2E
4S/1E
4S/2E
AMADOR VALLEY
LIVERMORE VALLEY
PLEASANTON RIDGE

N
W
E
S

0 4,000 8,000
Feet

DATE: Mar 6, 2023
FILE: R:\SWSI Programs\GSP\2022 Annual Report\FiguresTables\00-MainReport\00-Fig04-GradientLowerSpring22.mxd

Figure 4
Groundwater Gradient Map
Lower Aquifer; Seasonal High, Spring 2022
Livermore Valley Groundwater Basin

ABBREVIATIONS FOR MUNICIPAL WELLS
COL = Chain of Lakes (Zone 7)
M = Mocho (Zone 7)
H = Hopyard (Zone 7)
St = Stoneridge (Zone 7)
CWS = Cal Water Service
P = Pleasanton
SF = San Francisco Public Utilities Commission

LEGEND

2022 Program Wells (Lower Aquifer)
- Supply
- Monitor
- Municipal
- Nested
- Mining
- SGMA Representative Wells

Mining Pond Areas 2022
- Static (= groundwater elevation)
- Pumped From
- Pumped Into
- Clay-lined

- Contours (Interval = 10')
- Hatch pattern towards lower elevation
- Streams
- Township-Range Line
- Main Basin
- Fringe Area
- Upland Area

3S/1E
3S/2E
4S/1E
4S/2E

N
W
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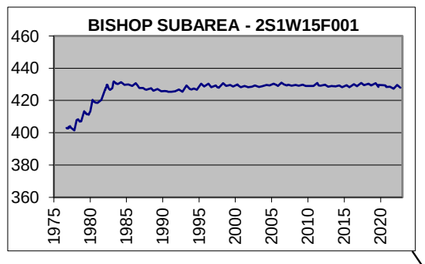
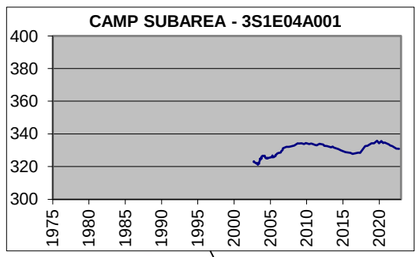
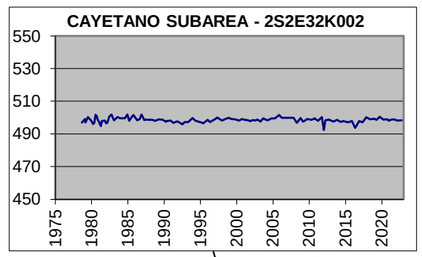
0 4,000 8,000
Feet

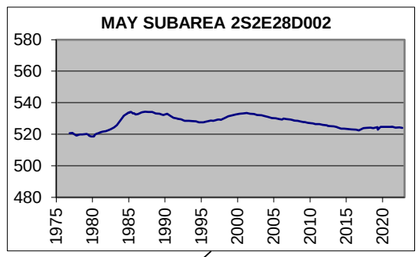
DATE: Mar 6, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\00-MainReport\00-Fig05-GradientLowerFall22.mxd

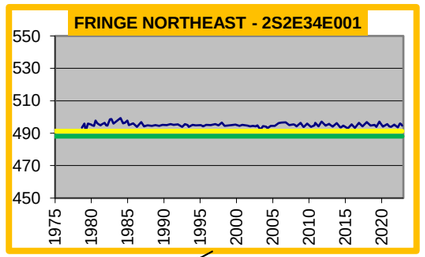
Figure 5
Groundwater Gradient Map
Lower Aquifer; Seasonal Low, Fall 2022
Livermore Valley Groundwater Basin

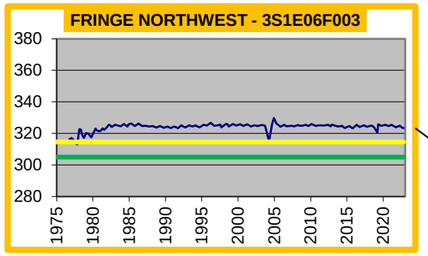


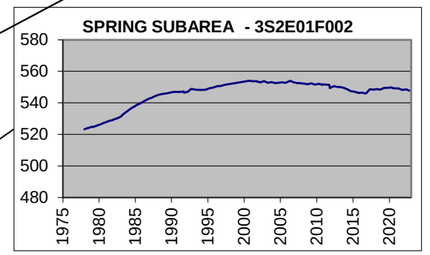


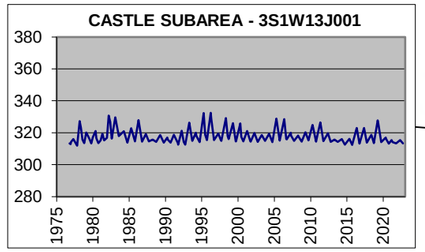


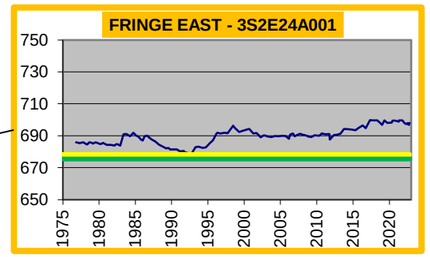


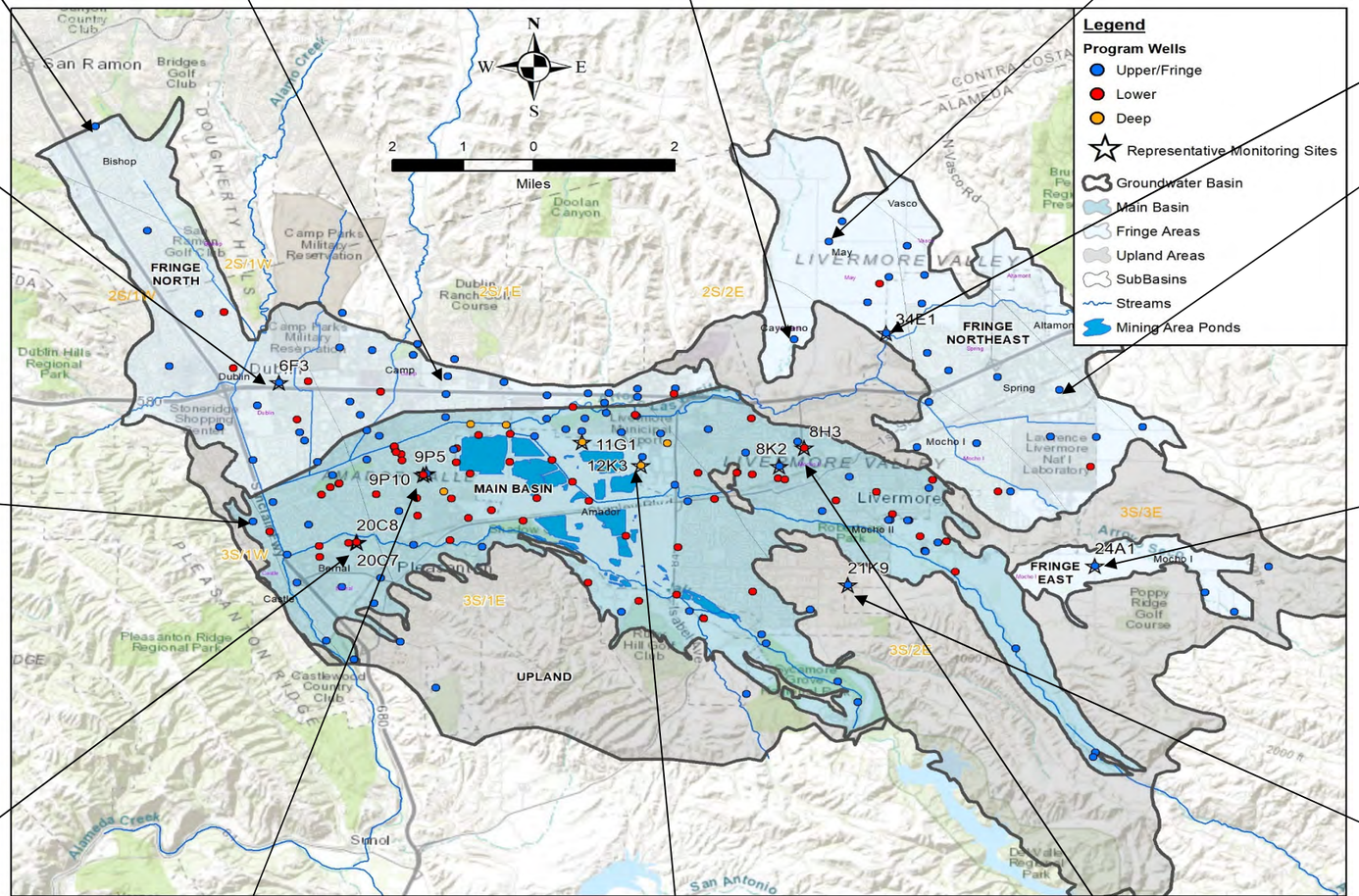


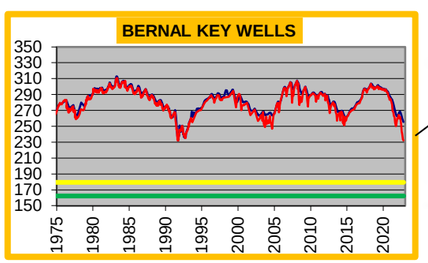


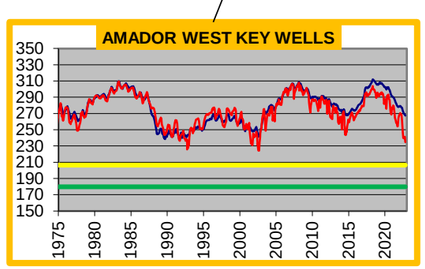


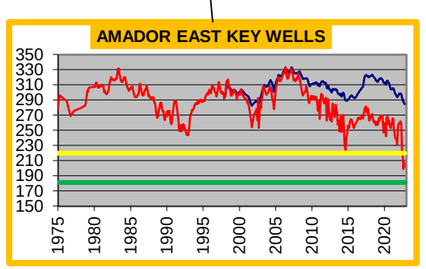


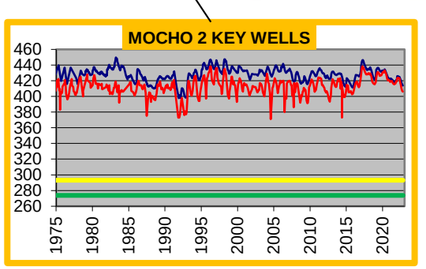


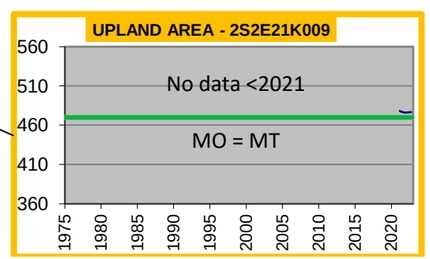










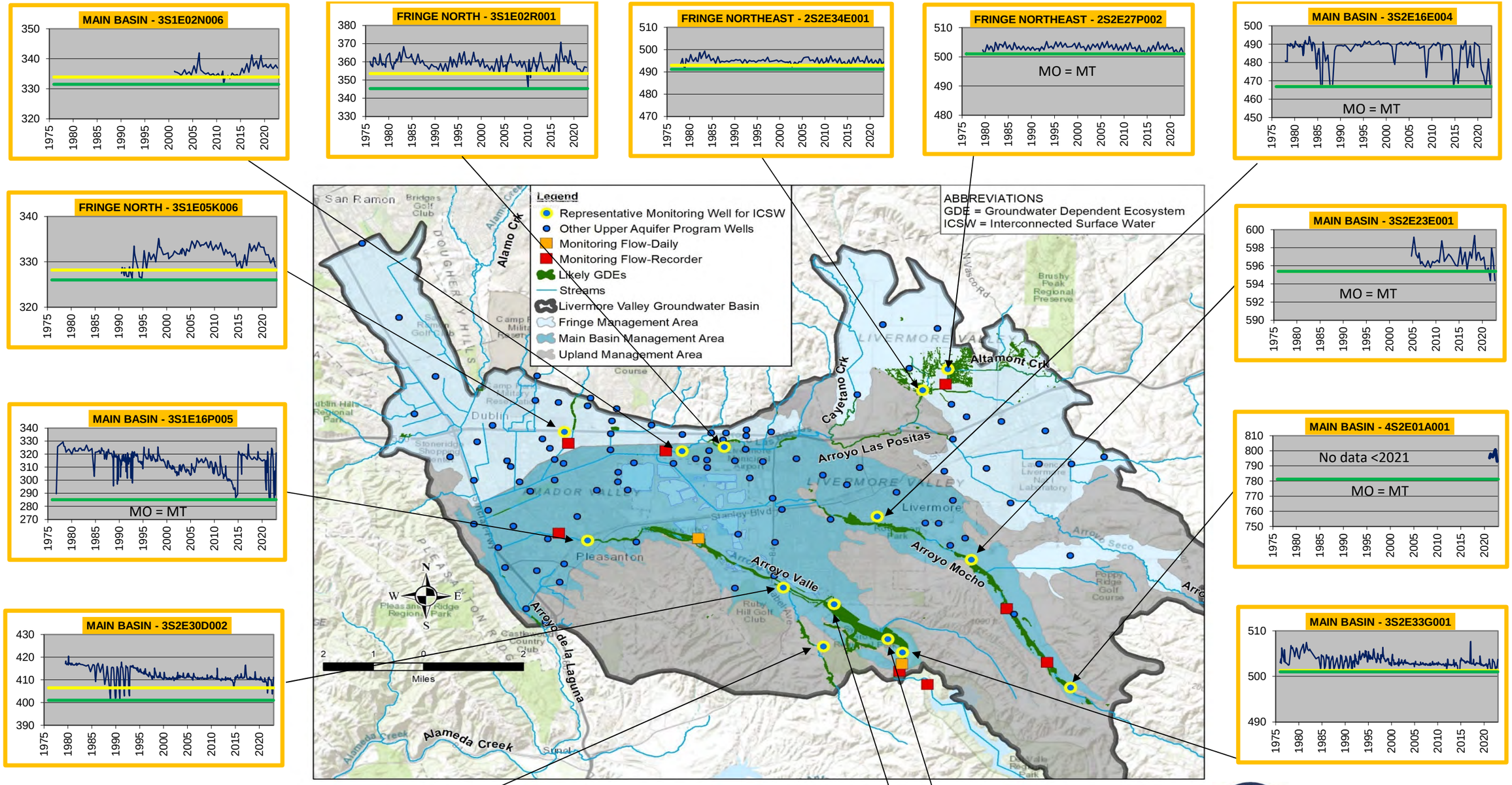


LEGEND

Orange	Representative Monitoring Site
Blue	Upper Aquifer
Red	Lower Aquifer
Yellow	Measurable Objective (MO)
Green	Minimum Threshold (MT)

Elevations in feet above Mean Sea Level
Vertical gridlines in graphs every 20 feet

Figure 6
Hydrographs for Groundwater Elevations 1975-2022
Livermore Valley



LEGEND

Orange	Representative Monitoring Site
Blue	Upper Aquifer
Yellow	Measurable Objective
Green	Minimum Threshold

Elevations in feet above Mean Sea Level
Vertical gridlines in graphs every 10 feet

Figure 7
Hydrographs for Interconnected Surface Water 1975-2022
Livermore Valley Groundwater Basin

4. Groundwater Extraction Data

☑ *§ 356.2 (b) (2)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.

Since the 1960s, Zone 7 has actively embraced a "conjunctive use" approach to Basin management by integrating local and imported surface water supplies with the local conveyance, storage, and groundwater recharge features. Zone 7's annual groundwater production and artificial recharge operations vary with the availability of surface water, treatment plant capacity, and the available groundwater storage space.

Due to the recent drought, in the 2021 WY Zone 7 pumped 15,795 AF followed by 14,641 AF in the 2022 WY, the two highest pump totals in Zone 7's history. These totals do not include the water Zone 7 pumps for DSRSD (usually 645 AFY), which is considered part of the "natural" demand (i.e., basin outflow allocated to natural recharge) as further described in *Section 9 Water Budget Information* of the 2021 Alternative GSP. During that same time, Zone 7 was only able to artificially recharge 277 and 1,301 AF in the 2021 and 2022 WYs, respectively. However, since 1974, Zone 7 has artificially recharged 20,017 AF more than it has pumped.

Table 3 below shows the Basin-wide, 2022 WY groundwater extraction data by water use sector and measurement method; reported units are in AF. Groundwater extractions within the Basin totaled approximately 21,482 AF during the 2022 WY, of which 95% was for the municipal sector.

Table 3. Summary of Groundwater Extractions by Source and Sector

Water Use Sector / Entity	2022 WY Groundwater Extractions (AF)	Measurement Method	Estimated Accuracy (AF)
Total Municipal Pumping	**20,377**	**See below**	**See below**
Zone 7 Production (i.e., excluding DSRSD, waste, brine)	14,626	Metered by Zone 7	10
Zone 7 Pumping for DSRSD	645	DSRSD Groundwater Pumping Quota	1
City of Pleasanton	2,587	Metered by Pleasanton	10
California Water Service – Livermore (CWS)	1,756	Metered by CWS	10
San Francisco Public Utilities Commission (SFPUC)	406	Metered by SFPUC	10
Fairgrounds	357	Metered by Fairgrounds	10
Domestic Pumping	**107**	**Estimated**	**50**
Pumping for Ag/Golf	**998**	**Estimated**	**100**
Total	***21,482***	**-**	**-**

AF = acre-feet
Ag = Irrigated Agriculture

Approximately 23% of the municipal pumping comes from groundwater pumped by Zone 7's retailers (i.e., the City of Pleasanton, City of Livermore, CWS, and DSRSD). The retailers are permitted by contract to pump a Groundwater Pumping Quota (GPQ) (accounted for on a CY basis) without having to pay a replenishment fee to Zone 7. They can carry forward any unpumped GPQ (up to 20% of their GPQ). The retailer's GPQ and total pumping for the 2022 CY (in AF) are shown in **Table 4** below. None of the retailers pumped more than their respective GPQ in 2022 CY.

Table 4. Retailer Groundwater Extractions vs. Groundwater Pumping Quota (GPQ)*

Retailer	GPQ (AF)	Carryover from 2021 CY (AF)	Pumped in 2022 CY (AF)	Carryover to 2023*** (AF)
City of Pleasanton	3,500	565	2,458	700
Cal Water Service	3,069	614	2,124	614
DSRSD (pumped by Zone 7)	645	0	645	0
City of Livermore (not used)**	31	-	0	-
Total	**7,214**	**1,179**	**5,227**	**1,314**

* = All values accounted for and reported on a Calendar Year (CY) basis
** = Livermore no longer pumps groundwater, GPQ not included in totals or carryover.
*** = Maximum of 20% of GPQ can be carried over
AF = acre-feet

Figure 8 shows the general location and volume of groundwater extractions occurring throughout the Basin in 2022 WY. A large majority of groundwater production is municipal pumping and occurs within the Lower Aquifer of the Main Basin. There are no municipal supply wells within the Fringe and Upland Areas. There are domestic wells within the Basin, but the pumping volumes from these domestic wells are minimum (i.e., less than 2.0 AFY per well). Agricultural pumping is estimated by the Areal Recharge Model, which is discussed in detail in *Section 9 Water Budget Information* of the 2021 Alternative GSP.

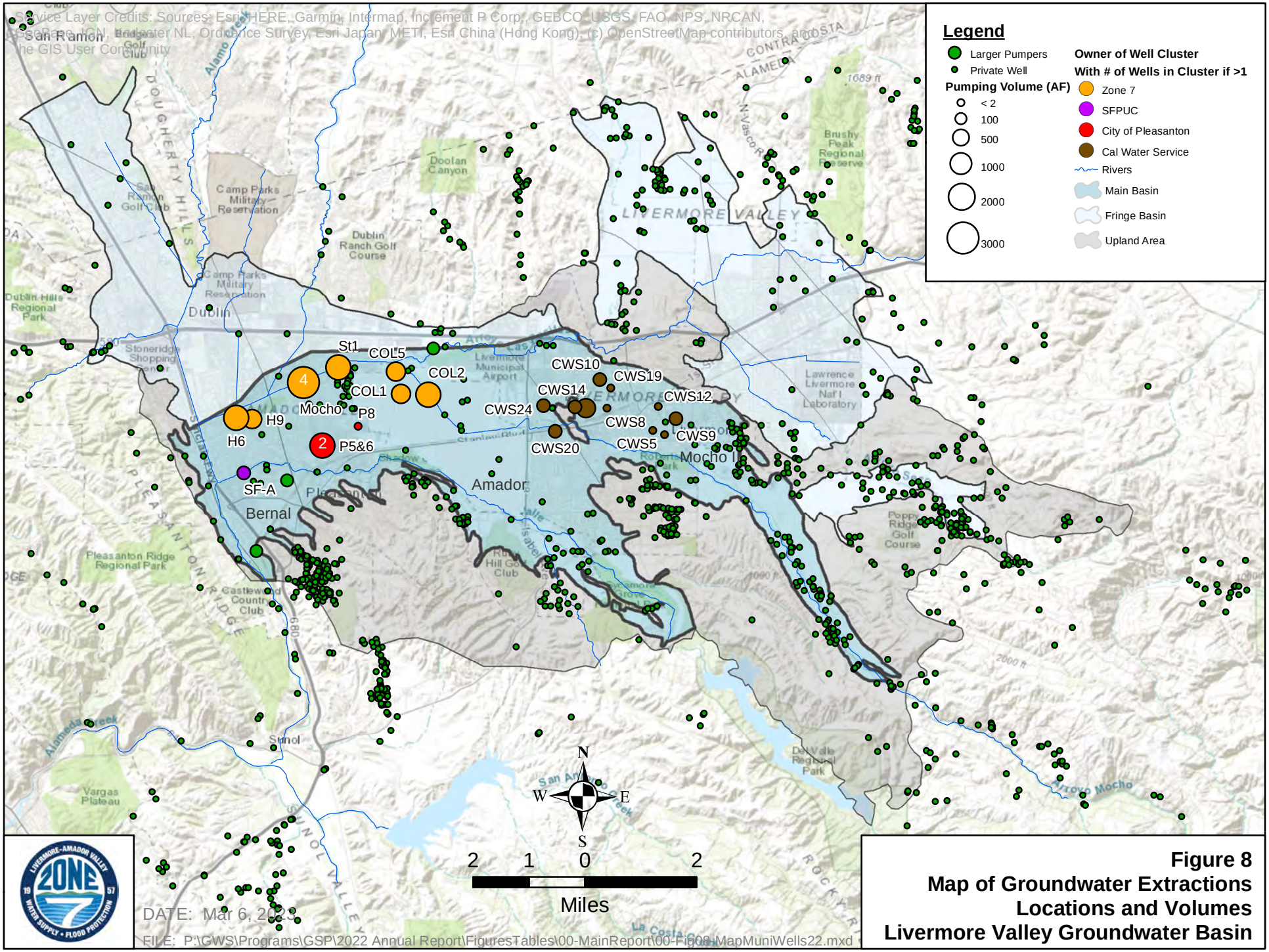


Figure 8
Map of Groundwater Extractions Locations and Volumes
Livermore Valley Groundwater Basin

5. Surface Water Supply

☑ *§ 356.2 (b) (3)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.

Zone 7 ensures that local water supplies (e.g., groundwater) are not depleted by importing approximately 80% of the Basin's water supply from the State Water Project (SWP) to be delivered to Zone 7's retailers and agricultural customers, and by recharging the Main Basin with surplus surface water when available ("artificial recharge"). Details regarding the surface water supply sources and contract amounts are provided in *Section 7.7.6 Source and Point of Delivery for Imported Water Supplies* of the 2021 Alternative GSP.

In accordance with DWR's accounting time-interval of SWP water, the allocation totals are accounted for by Calendar Year. The SWP allocation for the 2022 CY was 5% of Zone 7's maximum allocation (80,619 AF). **Table 5** shows Zone 7's imported water supplies for 2022 CY and the amounts being carried over to the 2023 CY. All deliveries of imported surface water are measured with electromagnetic flow meters and are accurate to within 1%.

Table 5. Imported and Local Surface Water Supplies by Source and Sector (AF)*

Source	Available at end of 2021**	Added in 2022	Used in 2022	Carryover to 2023
State Water Project	**5,931**	**12,781**	**6,531**	**12,181**
Table A (5% Allocation for 2022)	0	4,031	0	4,031
Article 56	1,506	0	1,506	0
San Luis Reservoir	4,425	8,750	5,025	8,150
Kern Groundwater Basin	**105,475**	**600**	**18,320**	**87,755**
Semitropic Delivered to Zone 7	75,570	0	4,990	70,580
Semitropic to San Luis Reservoir	0	600	5,300	-4,700
Cawelo Delivered to Zone 7	29,905	0	4,580	25,325
Cawelo To San Luis Reservoir	0	0	3,450	-3,450
Other Imported	**0**	**2,396**	**2,396**	**0**
Yuba/Dry Year Transfer Program	0	896	896	0
Mojave Water Agency Transfer	0	1,500	1,500	0
TOTAL IMPORTED (not including water to San Luis Reservoir)	**111,406**	**15,177**	**18,497**	**108,086**
TOTAL LOCAL: Lake Del Valle (AV Water Rights)	**2,300**	**3,790**	**3,790**	**2,300**
TOTAL IMPORTED AND LOCAL	**113,706**	**18,967**	**22,287**	**110,386**

* = All values accounted for and reported on a Calendar Year (CY) basis
** = updated slightly from previous year's report (113,966 AF Total)
AF = acre-feet
AV = Arroyo Valle

6. Total Water Use

☑ *§ 356.2 (b) (4)*

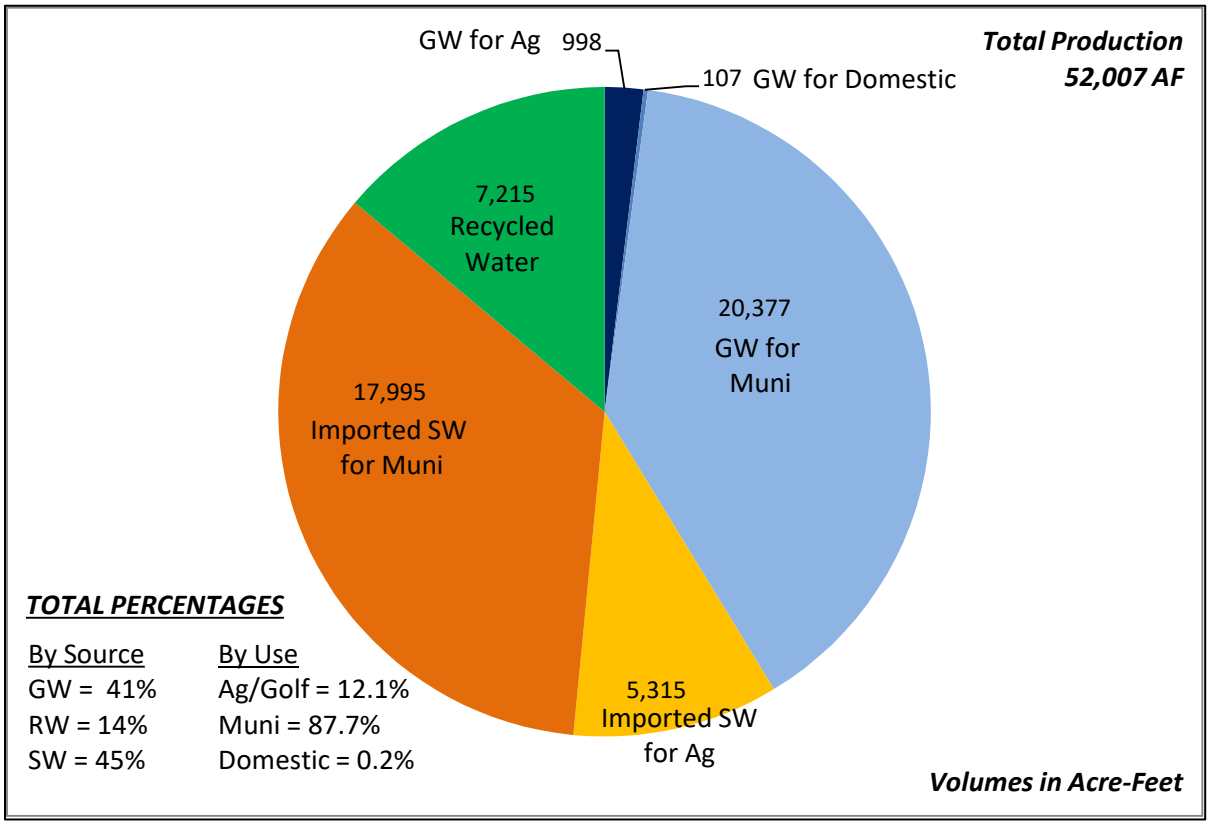
Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.

The volume of water produced and used in the Basin over the 2022 WY is shown by water source type and by water use sector in **Figure 9** and **Table 6** below.

Figure 9: Pie-Chart Summary of Total Water Use by Source and Sector



Ag = Agriculture; Muni = Municipal; GW= Groundwater; RW = Recycled Water; SW = Surface Water

Total groundwater production in the Basin (including by Zone 7, retailers, agriculture, domestic, etc.) supplied about 41% of the total Basin-wide water demand in the 2022 WY. Total surface water used in the Basin supplied about 45% of the total Basin-wide water demand, which allowed

23,310 AF of groundwater to be conserved instead of being pumped to meet this demand. The final 14% of water demands were satisfied by recycled water supplies, 100% of which were used for urban irrigation.

Of the total water use within the Basin during the 2022 WY (including groundwater, surface water, and recycled water), about 87.7% was used by the municipal sector, 12.1% was used by the agricultural sector (including golf courses), and 0.2% was used by the domestic sector. A more detailed breakdown of water supply and uses by source and sector within the Basin is provided in **Figure 10**.

Table 6. Summary of Total Water Use by Source and Sector

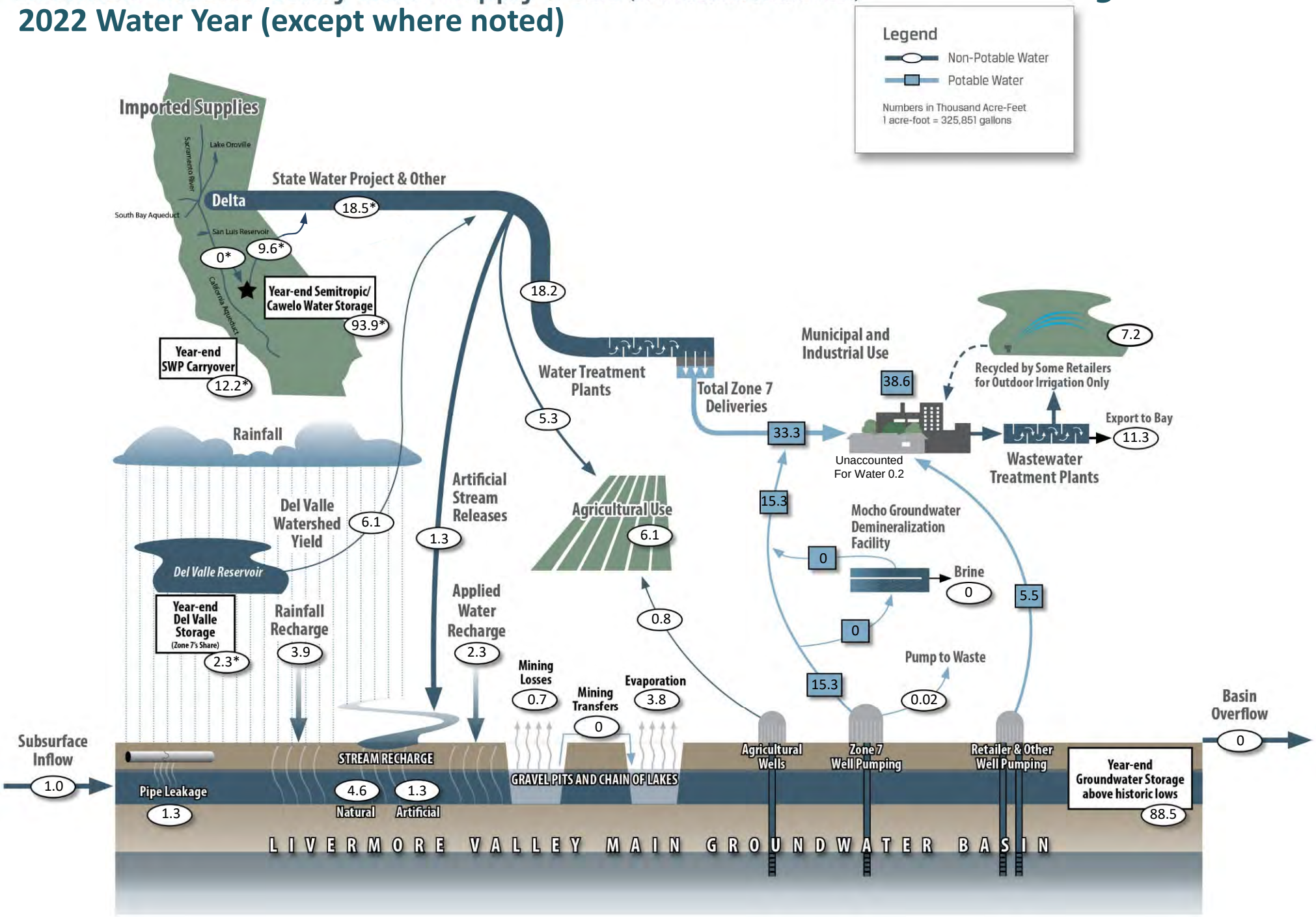
Water Use Sector	Water Source	2022 WY Water Use (AF)
Municipal	Groundwater	20,377
	Imported Surface Water	17,995
	Recycled Water	7,003
Agriculture/Golf	Groundwater	998
	Imported Surface Water	5,315
	Recycled Water	212
Domestic	Groundwater	107
Total		**52,007**

AF = acre=feet

Methods of measurement and accuracy of measurements for groundwater extraction and surface water data are summarized in **Section 4** and **Section 5** respectively.

Livermore-Amador Valley Water Supply & Use (in Thousands of Acre-Feet)
2022 Water Year (except where noted)

Figure 10



* 2022 Calendar Year

7. Change in Groundwater Storage

☑ *§ 356.2 (b) (4)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(4) Change in groundwater in storage shall include the following:

(A) Change in groundwater in storage maps for each principal aquifer in the basin.

(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.

To avoid significant depletion of groundwater storage, Zone 7 operates the Basin such that groundwater storage remains between a full Basin volume (254 TAF) and the historic low storage volume (128 TAF), or about one half of total storage volume. This 126 TAF (254 TAF – 128 TAF) is considered the Operational Storage. Groundwater below this historic low storage volume is regarded as Reserve Storage that is unavailable during nonemergency conditions. Most of the groundwater storage is contained in the Main Basin, which is characterized by the largest saturated thickness of aquifer materials.

Zone 7 uses two methods for calculating groundwater storage in the Basin: The GWE method and the HI method. The GWE method uses groundwater level data and storage coefficients for "nodes" (originally developed by DWR in 1974) to estimate the total volume of water in the Basin (see *Section 8.4 Groundwater Storage* of the 2021 Alternative GSP). The HI method, also known as the Water Budget, involves an accounting of all inflows and outflows and derivation of the change in storage as the residual of the water budget equation (see *Section 8.4 Groundwater Storage* of the 2021 Alternative GSP). Storage volumes from the two methods are averaged to quantify the total storage of the Basin. Both methods were improved and/or adjusted this water year (the most significant change was to the HI method as described below) so the previous year's totals presented in this year's report may be different than those presented last year's report.

The GWE method yielded a total storage of 218.0 TAF at the end of 2022 WY, which is 1.9 TAF less than the GWE value calculated for the 2021 WY. **Figure 11** shows the change in storage from Fall 2021 to Fall 2022 for each Main Basin node.

The HI method produced a total storage value of 214.9 TAF for the end of 2022 WY, which is 11.4 TAF less than the end of 2021 WY HI value. **Figure 12** shows the annual change in groundwater storage and cumulative change in groundwater storage for the Basin along with the water year type from 1974 WY to 2022 WY.

The total groundwater storage for the Basin is computed by averaging the storage estimates from the GWE and HI methods. As shown in **Table 7** below, the average total groundwater in storage

at the end of 2022 WY was calculated to be 216.5 TAF, which is about 6.6 TAF less than the 2021 WY average total storage value of 223.1 TAF. This equates to approximately 88.5 TAF of groundwater available as Operational Storage, which is about 70% of the total operational storage capacity (i.e., 126 TAF).

Table 7: Groundwater Storage Summary, 2022 WY (in TAF)*

Storage Calculation Method	End of 2021 WY	End of 2022 WY	Change in Storage
GWE Method	219.9	218.0	-1.9
HI Method	226.3	214.9	-11.4
TOTAL STORAGE (Average of GWE and HI Methods)	223.1	216.5	-6.6
Operational Storage**	95.1	88.5	-6.6

* Numbers rounded to nearest tenth TAF
** Operational Storage = Total Storage - Reserve Storage (i.e., 128 TAF)
GWE = Groundwater Elevation
HI = Hydrologic Inventory
TAF = Thousand acre-feet

Historically the difference groundwater storage values calculated by both the GWE and HI Methods have typically been within about 6.0 TAF. However, starting in about 2016 the difference between the HI and GWE methods increased to over 10 TAF in some years. As part of the 2021 Alternative GSP Update, Zone 7 migrated its in-house Aerial Recharge Model (ARM), which calculated rainfall and irrigation recharge, to the DWR's Integrated Water Flow Model Demand Calculator (IDC) model platform. Starting this year, the new IDC model was used to recalculate the rainfall and irrigation recharge values back to the 2016 WY, the results of which have been presented in the figures and tables in this year's report. As a result, the difference between the HI and GWE methods was only 3.1 TAF at the end of the 2022 WY.

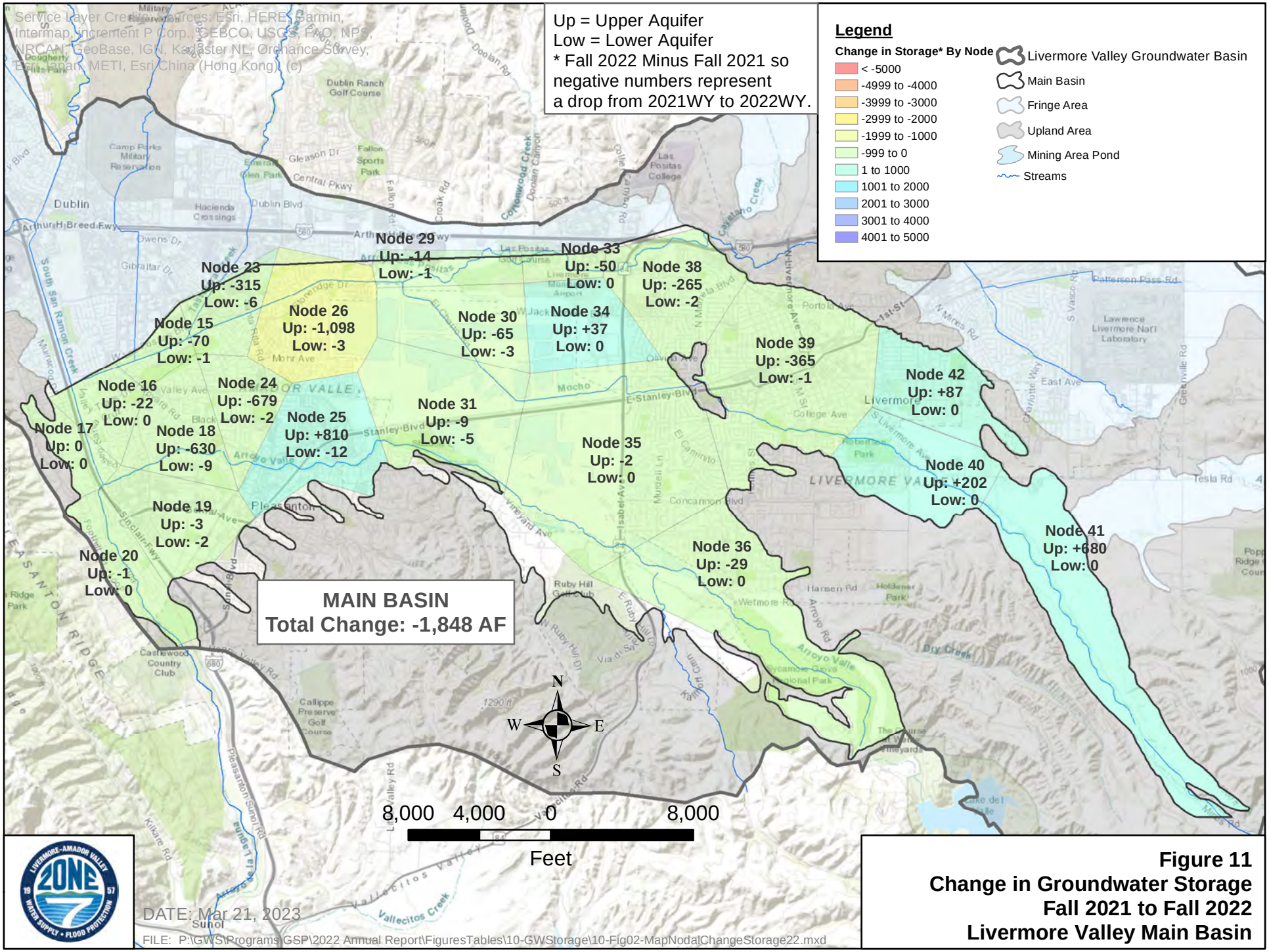
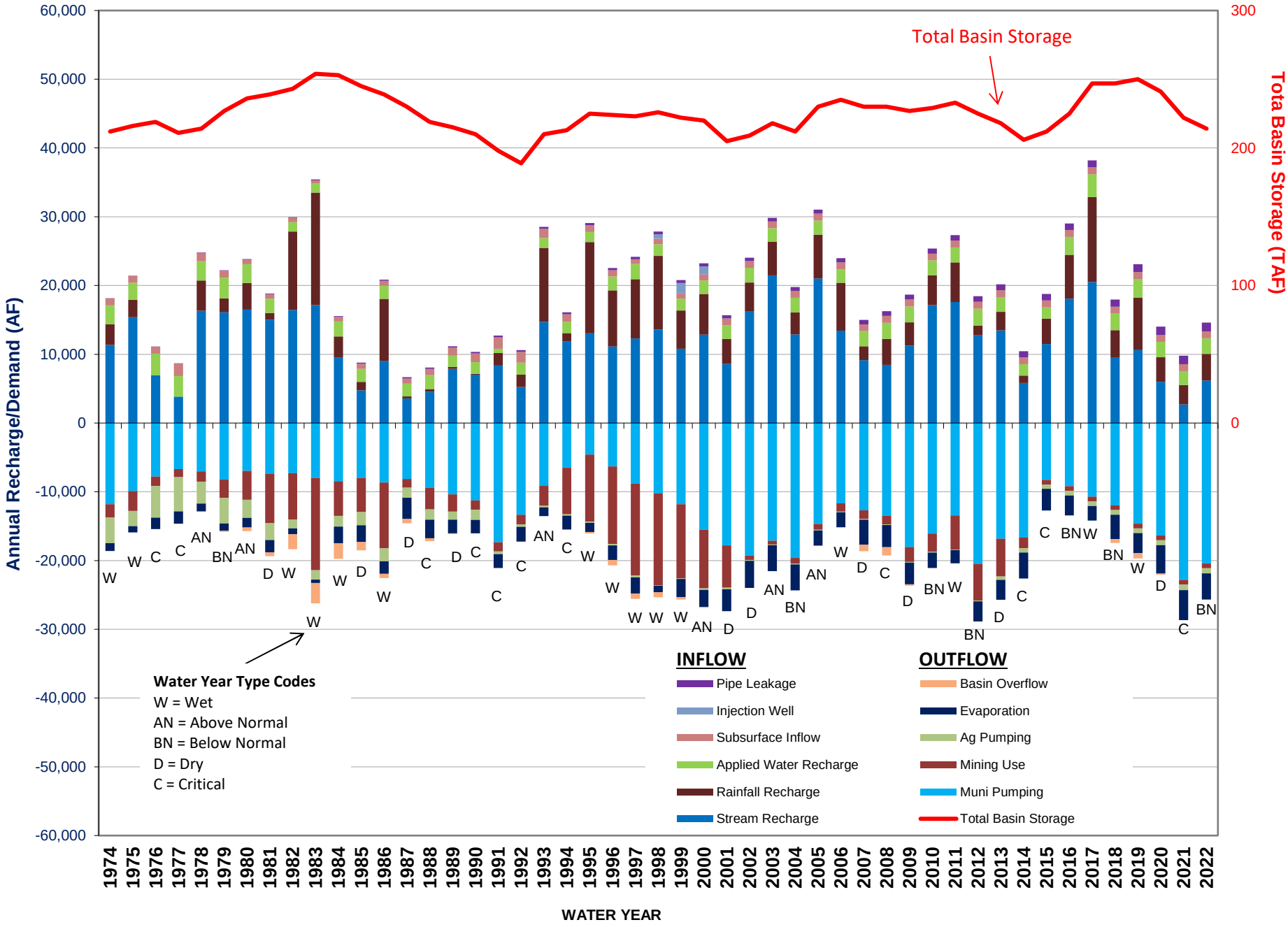


Figure 11
Change in Groundwater Storage
Fall 2021 to Fall 2022
Livermore Valley Main Basin

FIGURE 12
GRAPH OF GROUNDWATER STORAGE 1974 - 2022 WATER YEARS
LIVERMORE VALLEY GROUNDWATER BASIN



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2/23/2023

8. Plan Implementation

☑ *§ 356.2 (b) (4)*

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.

8.1. Progress Towards Alternative GSP Implementation

8.1.1. Description

Table 8 summarizes the five Sustainability Indicators for which SMCs are defined within the Basin[2], their associated URs, and MTs as presented in the 2021 Alternative GSP. The table also includes the 2022 WY status for each indicator and any action taken in the 2022 WY or planned for the upcoming water year.

8.1.2. Chronic Lowering of Groundwater Levels

As described in **Section 3** and shown in **Table 1**, water levels at all RMS-WL wells continued to remain above their respective MTs. Water levels remained above the MOs in all RMS-WL wells except for 3S1E12K003 (RMS-WL for the Amador East Subarea Lower Aquifer) which dropped below the MO in June 2022 and had a seasonal low at 25.3 ft below the MO on September 2, 2022 (but was still 13.6 ft above the MT). As the water level in this RMS-WL well approached and declined below the MO, Zone 7 increased the monitoring interval from monthly to weekly. In response, Zone 7 proactively managed pumping volumes to allow water levels to recover in the area. As a result of the management action, and assisted by natural recharge from precipitation events, the water level in this RMS-WL began to rise from its lows after September 2, 2022, and recovered above the MO in December 2022.

8.1.3. Depletion of Groundwater Storage

As described in *Section 13.2 Reduction of Groundwater Storage* of the 2021 Alternative GSP, the wells and criteria used to define URs for Depletion of Groundwater Storage are consistent with those used to define URs for Chronic Lowering of Groundwater. As described above in **Section 8.1.2**, water levels at all RMS-WL wells continued to remain above their respective MTs, but the water level dropped below its MO in one Lower Aquifer RMS-WL during the seasonal low (i.e., September) 2022 WY monitoring event. In response, Zone 7 increased the monitoring interval in the RMS-WL and proactively managed pumping volumes allowing the well to recover above the MO by December 2022.

[2] Seawater intrusion is not occurring in the Basin and thus no SMCs have been defined for this Sustainability Indicator.

8.1.4. Degradation of Groundwater Quality

As described in **Table 8,** Total Dissolved Solids (TDS) was detected above the MT (by 24 milligrams per Liter [mg/L]) in one RMS-WQ (3S2E08H003 [8H3], which was also above the MT in 2021 WY) during the 2022 WY. No other Constituents of Concern (COCs), including Nitrate, Boron, and Chromium, were detected above their corresponding MTs in any other RMS-WQs. As described in *Section 13.4.1 Undesirable Results for Degraded Water Quality* of the 2021 Alternative GSP, *URs for Degraded Water Quality are defined to occur within the Basin if and when MTs are exceeded for any of the identified COCs in greater than 25% the RMS-WQs at least two (2) consecutive years as a result of groundwater recharge or extraction, such that they cannot be managed to provide drinking water supply (i.e., that treatment or blending is not possible or practicable).* Thus, the one TDS MT exceedance experienced in the RMS-WQ monitoring network during the 2022 WY monitoring event does not constitute a UR per the definition in the 2021 Alternative GSP.

The SMCs for per- and polyfluoroalkyl substances (PFAS) have not been established, as Maximum contaminant levels (MCLs) are not yet available. However, Zone 7 is complying with the State Water Board's orders concerning PFAS compounds and meeting Response Levels established by the State Water Board's Division of Drinking Water. In addition, Zone 7 has developed a PFAS management strategy consisting of PFAS monitoring, blending and treating, managing water quality, and diversifying groundwater resources. Zone 7 will continue to sample for PFAS compounds, identify possible sources, and perform PFAS mobilization modeling. SMCs for PFAS will be addressed in the next Alternative GSP update once additional data have been collected and regulatory criteria established. Zone 7 will continue to monitor the other COCs within the Basin and implement the Salt Management Plan (SMP, Zone 7, 2004) and Nutrient Management Plan (NMP, Zone 7, 2015).

8.1.5. Land Subsidence

For land subsidence monitoring, MTs were not exceeded at any applicable proxy RMS-WL sites, and elastic fluctuations in ground surface elevations were measured at rates within 0.1 ft throughout the 2022 WY.

8.1.6. Depletion of Interconnected Surface Waters

As described in **Section 3** and shown in **Table 2**, water levels dropped below MTs at one RMS-ICSW (3S2E23E001 [23E1]) and below MOs at four additional RMS-ICSW (3S2E30D002 [30D2], 3S2E29F004 [29F4], 3S2E33C001 [33C1], and 3S2E16E004 [16E4]) during the seasonal low (i.e., Fall) 2022 WY monitoring event; however, all RMS-ICSW wells were measured above their MTs and MOs during the seasonal high (i.e., Spring) monitoring event. As described in *Section 13.6.1. Undesirable Results for Depletions of Interconnected Surface Water* of the 2021 Alternative GSP, URs for Depletions of ICSW *will be experienced if and when Depletions of [ICSW] occur as a result of unsustainable groundwater extraction such that groundwater levels decline below their MTs in greater than 40% of the RMS-ICSW for more than two consecutive years.* Thus, the one MT exceedance experienced in the RMS-ICSW monitoring network during the Fall 2022 monitoring

event does not constitute a UR per the definition in the 2021 Alternative GSP.

Table 8: Sustainable Management Criteria Status, 2022 WY

Sustainability Indicator	Undesirable Results Criteria	Minimum Threshold	2022 WY Status	Action Taken
Chronic Lowering of Groundwater Levels	Water levels in greater than 25% of the RMS-WLs decline below their respective MTs for two consecutive years.	Historic low minus maximum annual rate of groundwater level change, or historic low if maximum annual rate of groundwater level change is not available.	MTs were not exceeded at any RMS-WLs, see **Figure 6**. MOs were exceeded only in 3S1E12K003 (RMS-WL for the Amador East Subarea Lower Aquifer) which dropped below the MO in June 2022 and had a seasonal low at 25.3 ft below the MO on September 2, 2022.	Increase measurement interval (monthly to weekly), reduce pumping, and continue to monitor maintain artificial recharge operations. Water Levels at 3S1E12K003 increased to above the MO by December 2022.
Depletion of Groundwater Storage	Water levels in greater than 25% of the RMS-WLs decline below their respective MTs for two consecutive years. Not applicable to Upland Management Area.	Water Level SMCs used as proxy.	MTs were not exceeded at any RMS-WLs, see **Figure 6**. MOs were exceeded only in 3S1E12K003 (RMS-WL for the Amador East Lower Aquifer) which dropped below the MO in June 2022 and had a seasonal low at 25.3 ft below the MO on September 2, 2022.	Increase measurement interval (monthly to weekly), reduce pumping, and continue to monitor maintain artificial recharge operations.
Degradation of Groundwater Quality	If MTs are exceeded for any of the identified constituents of concern in greater than 25% of the RMS-WQs at least two (2) consecutive years as a result of SGMA-related groundwater management activities such that they cannot be managed to provide drinking water supply (i.e., that treatment or blending is not possible or practicable).	TDS > 1,000 milligrams per liter (mg/L) or 2015 Baseline concentration plus maximum deviation, whichever is greater.	TDS was detected above the MT (by 24 mg/L) in RMS-WQ 3S2E08H003; however, TDS was not detected above the MT in any other RMS-WQs and no URs have been triggered within the Basin.	Continue to monitor and increase municipal supply pumping, implement SMP, increase operation of Mocho Groundwater Demineralization Plant (MGDP), and conduct artificial groundwater recharge with low TDS water.
		NO3 (as N) > 10 mg/L or 2015 Baseline concentration plus maximum deviation, whichever is greater.	Nitrate was not detected above the MT in any RMS-WQs	Continue to monitor and implement NMP.

Sustainability Indicator	Undesirable Results Criteria	Minimum Threshold	2022 WY Status	Action Taken
Degradation of Groundwater Quality (continued)		Boron > 1.4 mg/L, or 2015 Baseline concentration plus maximum deviation, whichever is greater.	Boron was not detected above the MT in any RMS-WQs	Continue to monitor.
		Total Chromium > 0.050 mg/L, or 2015 Baseline concentration plus maximum deviation, whichever is greater.	Chromium was not detected above the MT in any RMS-WQs	Continue to monitor.
		SMCs for PFAS in development	Zone 7 continued to sample for PFAS compounds, worked to implement PFAS management strategy, adjusted pumping to meet new regulations, investigated treatment options, and performed PFAS groundwater modeling.	Continue to monitor
Land Subsidence	Water Level SMCs used as proxy for Main Basin and Fringe Management Area, and no more than 0.4 ft of irreversible land surface elevation decrease in one year. Not applicable to Upland Management Area.	Water Level SMCs used as proxy and irreversible land surface elevation decrease of 0.4 ft.	MTs were not exceeded at any applicable RMS-WLs and Elastic fluctuations were detected at rates within 0.1 ft throughout the 2022 WY.	Continue to monitor
Depletion of Interconnected Surface Waters	If groundwater levels decline below their MTs in greater than 40% of the RMS-ICSWs for more than two consecutive years.	Historic low water levels or to be determined if historical water levels are not available.	One MT exceedance was recorded in RMS-ICSW 3S2E23E001 during the seasonal low (Fall) 2022 WY monitoring event; however, no URs have been triggered within the Basin.	Continue to monitor

8.2. Implementation of Projects and Management Actions

8.2.1. Overview

This section provides an update on the P/MAs described in *Section 15 Projects and Management Actions* of the 2021 Alternative GSP. As demonstrated in the 2021 Alternative GSP and in this Annual Report, Zone 7 continues to sustainably manage the Basin through numerous interrelated programs to assess, manage, monitor, and protect groundwater supplies. Using the data collected from its robust monitoring programs, Zone 7 adaptively manages its groundwater supplies by considering current hydrologic conditions, water demands, water quality conditions, and future water supply/demand forecasts. In addition to continuing the monitoring programs that are critical to Zone 7's sustainable groundwater management, Zone 7 is also working to implement its PFAS management strategy as well as Salt and Nutrient management plans, improve long-term surface water supply reliability, maximize conjunctive use opportunities, provide watershed protection, and support water recycling operations.

8.2.2. Water Supply Augmentation Projects

8.2.2.1. Existing Imported Water Supplies

Imported surface water supplies secured by Zone 7 for the 2022 WY are shown in **Table 5** and **Figure 10** and are summarized below include:

- The State Water Project (SWP deliveries via the South Bay Aqueduct [SBA] allocation for the 2022 CY was 5% of Zone 7's maximum allocation (80,619 AF) or 4,031 AF.
- Zone 7 imported 5,025 AF of water that was banked at San Luis Reservoir via the SBA.
- Zone 7 imported 9,570 AF of its total 105,475 AF banked in the Kern Groundwater Basin (Semitropic and Cawelo Water Districts) and transferred 8,750 AF from the Kern County Subbasin to San Luis Reservoir.
- Zone 7 imported 896 AF from the Lover River Yuba Accord (Yuba) and 1,500 AF from the Mojave Water Agency.
- Total imported surface water supplies in the 2022 CY (18,497 AF) made up 48% of regional water demands.
- Total groundwater production in the Basin (including by Zone 7, retailers, agriculture, domestic, etc.) supplied about 41% of the total Basin-wide water demand in the 2022 WY.
- Of the 15,286 AF of groundwater pumped by Zone 7 (including pumped by Zone 7 for DSRSD) during the 2022 WY, about 15,271 AF went into production; the remainder of which is accounted for in pumping losses and exported brine from the groundwater demineralization process.

- Zone 7's total produced groundwater was about 46% of the total treated water production that Zone 7 delivered to its retailers during the 2022 WY (on average, groundwater makes up about 16% of Zone 7's annual treated water deliveries).

8.2.2.2. Future Water Supply Projects

Zone 7 continued its strategy of securing the long-term reliability of the water supply system to meet the needs of both existing and future customers as summarized below:

- In 2022, Zone 7 continued its petition to extend Zone 7's water rights permit for diverting surface water captured in Lake Del Valle from the upper Arroyo Valle. Under the existing permit, Zone 7's average annual yield from the upper Arroyo Valle is about 7,300 AFY. A diversion structure from Arroyo Valle into Lake A, and a pipeline connecting Lake A to other lakes in the Chain of Lakes (COLs), are included in Zone 7's Capital Improvement Plan (CIP, 2018-2028). Once constructed, these projects will facilitate the capture and storage of additional water from the Del Valle Watershed up to about 3,000 AFY on average.

- Zone 7 continues to support the Delta Conveyance Project, the State of California's proposed project to upgrade the SWP system infrastructure and operations and improve its long-term reliability while protecting the Sacramento-San Joaquin Delta (Delta) ecosystem. At this time, while the project's design is still being re-evaluated, Zone 7 is assuming that some form of the Delta Conveyance Project would be in-service by 2040.

- Zone 7 is also continuing to evaluate alternative water supply and storage options such as the Bay Area Regional Desalination Project, potable reuse, Los Vaqueros Expansion, Sites Reservoir, and water transfers. Ultimately, Zone 7 may choose to implement one or several of these options depending on the results of the studies and planning efforts, the amounts and timing of development and conservation, and the determination of costs and benefits to the Basin.

- Finally, Zone 7 continues to evaluate the feasibility of an intertie with another major water agency (e.g., East Bay Municipal Utilities District or SFPUC). An outage of the SBA, or major disruptions in the Delta, would prevent Zone 7 access to most of its water supplies, leaving only groundwater, water in the Chain of Lakes, and water in Lake Del Valle available to meet its demands. An intertie with another agency could provide an additional source of water during an emergency or drought and could also facilitate water transfers.

8.2.2.3. Conjunctive Use

Zone 7 implements conjunctive use practices within the Basin to the greatest extent possible given current hydrologic conditions and imported water supply availability. During the 2022 WY, Zone 7 released 1,773 AF from the SBA into the Arroyo Valle for artificial recharge and water rights, of which 1,301 AF was recharged.

Additionally, Zone 7 recently commissioned a technical study to assess the potential to increase conjunctive use in the Basin, including expansion of artificial recharge operations within the COL, and an Update to its Water Supply Evaluation (Zone 7, 2019).

8.2.2.4. Well Master Plan (WMP, Zone 7, 2003)

During the 2022 WY, Zone 7 staff continued the process of reevaluating Zone 7's supply well needs. Site specific evaluation and future well construction will depend on the outcome of water supply needs, PFAS investigations, and future regulatory requirements. Once the evaluation is complete, staff plans to begin WMP update in the upcoming fiscal year.

8.2.2.5. Chain of Lakes Recharge Projects

During the 2022 WY, Zone 7 continued to work with Hanson Aggregates (former quarry operator for Lakes H, I, and Cope) while they continue to finalize reclamation on Lake H.

One of the conditions of approval in CEMEX's 2021 amendment to Surface Mining Permit 23 is to install up to three new monitoring wells with guidance from Zone 7 on location and screened intervals. Zone 7 and CEMEX are working together on these wells which should be installed in the 2023 WY.

8.2.3. Water Demand Reduction Management Actions

8.2.3.1. Existing and Future Non-Potable Recycled Water Use

Both the City of Livermore and DSRSD plan to expand the use of recycled water for turf and landscape irrigation projects over the next few years. The City of Pleasanton purchases recycled water from DSRSD and/or Livermore for irrigation of city parks and landscapes located within the Main Basin. In 2022 WY, Livermore and DSRSD recycled about 7,215 AF, approximately 14% of the total water use for the Basin.

Zone 7 continues to collaborate with Livermore, DSRSD, and Pleasanton to mitigate any additional potential impacts to groundwater quality from the future planned recycled water use.

8.2.3.2. Water Conservation

Throughout the 2022 WY, Zone 7 continued its regional coordination of conservation programs, including community workshops and other education/training events, school education programs, and rebates and water-saving giveaway programs, with adjustments made for pandemic conditions.

8.2.3.3. Groundwater Pumping Quota (GPQ) Program

The retailers are permitted by contract to pump a GPQ (accounted for on a CY basis) without having to pay a replenishment fee to Zone 7. They can carry forward any un-pumped GPQ (up to 20% of their GPQ). The retailer's GPQ, along with their groundwater pumping volumes for the 2022 CY, are shown in **Table 4**. None of the retailers pumped more than their respective GPQ in 2022 CY.

8.2.4. Projects to Improve Drinking Water Quality in Zone 7 Service Area

8.2.4.1. Well Ordinance Program

During the 2022 WY, Zone 7 issued 136 drilling permits, six permits less than in the 2021 WY. **Table 9** details the breakdown of the types of permits issued during the 2022 WY and their quantities.

Table 9: Well Ordinance Permits Issued in the 2022 WY

Permit Type	Quantity
Geotechnical Investigations	78
Well Destructions	17
Contamination Investigations/Remediation	8
Water Supply Wells	17
Groundwater Monitoring	15
Cathodic Protection Wells	1
Total	***136***

- 17 water supply well permits were issued in the 2022 WY. The pre-drought average was 25 per year.

- About 74% of the permitted well work was physically inspected by Zone 7 permit compliance staff; the remaining 26% proceeded with self-monitoring and reporting efforts when a licensed professional was supervising the project.

8.2.4.2. Toxic Site Surveillance Program

In the 2022 WY, Zone 7 tracked the progress of 47 active sites where contamination has been detected in groundwater or is threatening groundwater. Four of these active sites have a contaminant plume that is within 2,000 ft of a water supply well or a surface water source and are therefore classified as "High Priority" cases due to their impact or threat of impact on potable groundwater supplies. Zone 7's database also contains 277 other contamination cases that have been either "Closed" or classified as "No Action Required" because they have been sufficiently cleaned up and/or pose minimal threat to drinking water supplies.

8.2.4.3. Salt Management

Zone 7's long-term salt management strategy includes monitoring and increasing municipal supply pumping, increasing operation of the Mocho Groundwater Demineralization Plant (MGDP), and conducting artificial groundwater recharge with low TDS water. **Table 10** below shows the salt loading summary for the 2022 WY. As mentioned above in **Section 7**, groundwater storage volumes from the 2016 WY to present were recalculated for this year's report. Therefore,

the previous year's salt totals presented in this year's report may be slightly different than those presented in last year's report.

Table 10: Salt Loading Summary for 2022 WY

Category	Volume (AF)	Salt Mass (Tons)	TDS Concentration (mg/L)	Change in Concentration from 2021 WY (mg/L)
Inflow	14,538	16,905	856	-50
Outflow	25,995	16,569	469	-14
Net (In – Out)	-11,457	336		
Basin Total	**214,880**	**227,022**	**778**	**40**

AF = acre-feet
mg/L = milligrams per Liter

- In the 2022 WY, the total salt mass added to the Main Basin by all the inflow (Supply) components was approximately 16,905 tons, whereas the total mass of salts removed from the Basin by all the outflow (Demand) components is estimated at 16,569 tons; a net increase of 336 tons.

- The salt load increase and groundwater storage decrease during the 2022 WY caused the end-of-water-year theoretical average TDS concentration for the Main Basin to increase by 40 mg/L from the previous WY average.

8.2.4.4. Groundwater Demineralization Program

The MGDP was operated sparingly throughout the 2022 WY to conserve water during the drought:

- During the 2022 WY, the MGDP produced 2.0 AF of brine (compared to 143 AF in the 2021 WY) that resulted in the export of about 7 tons of salt from the Main Basin through the Livermore-Amador Valley Water Management Agency (LAVWMA) pipeline (compared to 448 tons in the 2021 WY).

- Since its inception, the MGDP has exported over 19,086 tons of salt from the Livermore Valley.

8.2.4.5. Per- and Polyfluoroalkyl Substances (PFAS)

- In 2022, DDW established a RL (20 ng/L) and NL (3 ng/L) for PFHxS.

- Of the eight Zone 7 municipal wells sampled in 2022 WY, five had concentrations above the PFHxS RL. To meet the new guidelines, the Mocho wells are being treated by the existing

MGDP; and Zone 7 has stopped pumping from the Stoneridge and COL wells until construction of PFAS treatment systems are completed at these wells. The PFAS treatment system for the Stoneridge Well is currently under construction and scheduled to be operational in summer 2023, and the design of PFAS treatment system for COL well has been completed. Zone 7 submitted a Proposition 68, Round 2 Sustainable Groundwater Management (SGM) Implementation grant application to DWR in December 2022 for a project that includes funding development costs for the Stoneridge Well PFAS Treatment Facility and conducting PFAS fate and transport modeling, amongst other SGM Implementation activities as further described in **Section 8.2.5** below.

8.2.4.6. Nutrient Management

During the 2022 WY, Zone 7 continued working with Alameda County Environmental Health (ACEH) to implement the NMP measures. One of these measures is that Zone 7 regulates commercial onsite wastewater treatment systems (OWTS, a.k.a., septic systems) to manage nitrate loading in the groundwater. In the 2022 WY, Zone 7 received three applications for nonresidential OWTS: Zone 7's board approved one application, another application was eligible to be approved at the staff level, and Zone 7 is working with ACEH to process the remaining application.

8.2.5. Data Gap-Filling and Other Alternative GSP Implementation Projects

In 2022 Zone 7 conducted the following data gap filling activities and/or projects and will be seeking grant funding to fill additional data gaps:

- **Refinement and update of numerical groundwater flow model:** As part of the 2021 Alternative GSP, Zone 7 purchased a license for RockWorks (a three dimensional geologic modeling software platform), transferred the existing e-log and geology database, extended the hydrogeologic conceptual model (HCM) to include the Fringe and Upland Areas, and prepared three new cross sections that trace through the major groundwater production areas of the Basin. Zone 7 migrated its existing ARM to DWR's IDC platform and extended the model to include the entire Basin. For this year, the IDC was used to calculate recharge values for the 2022 WY and recalculate the 2016 to 2021 WYs values (see **Appendix B** Section 10.2). As mentioned above, in December 2022 Zone 7 submitted a DWR Proposition 68 SGM Implementation grant application for a Project that includes upgrading its groundwater model to incorporate these new data as well as the data collected from DWR's Airborne Electromagnetic[AEM] Survey (Survey Area Six), available online at https://data.cnra.ca.gov/dataset/aem.
- **Groundwater Contaminant Mobilization Study:** Starting in 2021 and continuing into 2022, Zone 7 used its existing groundwater model to develop water quality fate and transport simulations to evaluate existing and future groundwater operations and the impact of constituents (including PFAS) that pose existing and/or anticipated challenges. The results from the first phase of this study, which focuses on PFAS mobilization, were presented at a Board Workshop on August 2022. Both the presentation and the technical

memorandum are available online at https://www.zone7water.com/pfas. As mentioned above, in December 2022 Zone 7 submitted a DWR Proposition 68 SGM Implementation grant application for a project that includes conducting additional PFAS fate and transport modeling to further enhance its ongoing PFAS management and mitigation strategies and capabilities.

- **Well Metering and Pumping Record**: Zone 7 assessed the need for well metering and groundwater pumping data collection. Based on this assessment, Zone 7 now requires well metering and reporting to Zone 7 for all new well permits.
- **Water Supply Risk Model:** Zone 7 continues to develop its new robust risk model using RiverWare software. This model will run on a monthly time step, and it will be able to represent the seasonal availability of supplies including local runoff, imported surface water, recovered water from groundwater banks and local groundwater in an integrated manner. Additionally, the risk model can be used in conjunction with the groundwater model to analyze sustainable management of the Basin.

9. References and Technical Studies

DWR, 2019, Sustainable Groundwater Management Act 2019, Basin Prioritization Process and Results. April 2019, 64 pp.

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

———, 2004, Salt Management Plan, Prepared by Zone 7 Water Agency.

———, 2015, Nutrient Management Plan, Livermore Valley Groundwater Basin. Prepared by Zone 7, July 2015.

———, 2019, 2019 Water Supply Evaluation Update. Prepared by Zone 7, April 2019.

———, 2021, Alternative Groundwater Sustainability Plan 2021 Update for the Livermore Valley Groundwater Basin. Zone 7 Water Agency. December 2021. https://www.zone7water.com/alternative-groundwater-sustainability-plan-and-updates

APPENDICES

Appendix A. Annual Report Submittal Checklist
Appendix B. Supplemental Information

Appendix A

Annual Report Submittal Checklist

Groundwater Sustainability Plan Annual Report Elements Guide

Basin Name	Livermore Valley Groundwater Basin (DWR No. 2-010)		
GSP Local ID			
California Code of Regulations - GSP Regulation Sections	***Groundwater Sustainability Plan Elements***	**Document *page number(s) that address the applicable GSP element.***	***Notes: Briefly describe the GSP element does not apply.***
Article 5	**Plan Contents**		
Subarticle 4	***Monitoring Networks***		
§ 354.40	**Reporting Monitoring Data to the Department**		
	Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.	15:16	
	Note: Authority cited: Section 10733.2, Water Code. Reference: Sections 10728, 10728.2, 10733.2 and 10733.8, Water Code.		
Article 7	**Annual Reports and Periodic Evaluations by the Agency**		
§ 356.2	**Annual Reports**		
	Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:		
	(a) General information, including an executive summary and a location map depicting the basin covered by the report.	5:10	
	(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:		
	(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:		
	(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.	17:20	
	(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.	21:22	
	(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.	23:26	
	(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.	27:28	
	(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.	29:31	
	(5) Change in groundwater in storage shall include the following:		

Groundwater Sustainability Plan Annual Report Elements Guide

Basin Name	Livermore Valley Groundwater Basin (DWR No. 2-010)		
GSP Local ID			
California Code of Regulations - GSP Regulation Sections	***Groundwater Sustainability Plan Elements***	**Document *page number(s) that address the applicable GSP element.***	***Notes: Briefly describe the GSP element does not apply.***
	(A) Change in groundwater in storage maps for each principal aquifer in the basin.	32:34	
	(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.	35	
	(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.	36:47	

Appendix B

Supplemental Information

APPENDIX B: Supplemental Information

Livermore Valley Groundwater Basin

Sustainable Groundwater Management Annual Report

Water Year 2022 (October 2021 – September 2022)

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Acronyms and Abbreviations

Abbrev	Description	Abbrev	Description
µg/L	Micrograms per Liter	HI	Hydrologic Inventory
ACCDA	Alameda County Community Development Agency	HRL	Health reference level
ACDEH	Alameda County Department of Environmental Health	InSAR	Interferometric Synthetic Aperture Radar
ACNP	Alamo Canal near Pleasanton	ISCO	In-situ chemical oxidation
ADLLV	Arroyo de la Laguna at Verona	LAMP	Local Agency Management Program
ADVP	Arroyo Del Valle Pleasanton	LAVWMA	Livermore-Amador Valley Water Management Agency
AF	Acre-feet	lbs	Pounds
AF/yr	Acre-feet per year	LDV	Lake Del Valle
ALP	Arroyo Las Positas	LLNL	Lawrence Livermore National Laboratory
ALP_ELCH	Arroyo Las Positas above El Charro	LRI	Livermore Rain Index
ALPL	Arroyo Las Positas near Livermore	LTCP	Low-Threat Underground Storage Tank Closure Policy
ALTC	Altamont Creek	LWRP	Livermore Water Reclamation Plant
AMHAG	Arroyo Mocho Hageman	MCL	Maximum contaminant level
AM_KB	Arroyo Mocho at Kaiser Bridge	mg/L	Milligrams per Liter
AMNL	Arroyo Mocho near Livermore	MGDP	Mocho Groundwater Demineralization Plant
AMP	Arroyo Mocho Pleasanton	MOU	Memorandum of Understanding
AOC	Area of Concern	msl	Mean sea level
AVADLL	Arroyo Valle at Arroyo de la Laguna	MTBE	Methyl tertiary-butyl ether
AVBLC	Arroyo Valle below Lang Canyon	N	Nitrogen
AVNL	Arroyo Valle near Livermore	NC	North Canyons
BBID	Byron-Bethany Irrigation District	NL	Notifications Level
bgs	Below ground surface	NMP	Nutrient Management Plan
BMPs	Best management practices	NO_3	Nitrate Ion
CaCO3	Calcium carbonate	OWTS	Onsite wastewater treatment system
CASGEM	California Statewide Groundwater Elevation Monitoring	PCE	Tetrachloroethylene
CCNP	Chabot Canal near Pleasanton	PFAS	Per- and polyfluoroalkyl substances
CCR	California Code of Regulations	PFBS	Perfluorobutanesulfonic acid
CEC	Constituents-of-emerging-concern	PFOA	Perfluorooctanoic acid
CEQA	California Environmental Quality Act	PFOS	Perfluorooctanesulfonic acid
cfs	Cubic feet per second	POTW	Publicly owned treatment works
CIMIS	California Irrigation Management Information System	ppb	Parts per billion
CIP	Capital Improvement Program	ppt	Parts per trillion
COLs	Chain of Lakes	PPWTP	Patterson Pass Water Treatment Plant
Cr	Chromium	PRG	Preliminary Remediation goals
CrVI	Hexavalent chromium	RL	Response Level
CWS	California Water Service	RO	Reverse osmosis
CY	Calendar year	RP	Responsible Party
DCE	Dichloroethene	RWQCB	California Regional Water Quality Control Board
DERWA	DSRSD-EBMUD Recycled Water Authority	SBA	South Bay Aqueduct
DDW	California State Water Resources Control Board Division of Drinking Water	SGMA	Sustainable Groundwater Management Act
DSRSD	Dublin San Ramon Services District	SFPUC	San Francisco Public Utilities Commission
DTSC	Department of Toxic Substances Control	SMP	Salt Management Plan

DVWTP	Del Valle Water Treatment Plant	SMP	Surface mining permit
DWR	California Department of Water Resources	SNMP	Salt Nutrient Management Plan
EBMUD	East Bay Municipal Utilities District	SVE	Soil vapor extraction
EBRPD	East Bay Regional Parks District	SWP	State Water Project
EIR	Environmental Impact Report	SWRCB	State Water Resources Control Board
EPA	Environmental Protection Agency	TAF	Thousand acre-feet
ESL	Environmental screening level	TCE	Trichloroethylene
ETo	Evapotranspiration	TDS	Total dissolved solids
ft	Feet	TKN	Total Kjeldahl nitrogen
Ft msl	Feet above mean sea level	TSS	Toxic Sites Surveillance
GDE	Groundwater-dependent ecosystem	USEPA	U.S. Environmental Protection Agency
GIS	Geographic information system	USGS	U.S. Geological Survey
GPQ	Groundwater Pumping Quota	VA	Veteran's Administration
GSA	Groundwater Sustainability Agency	WBIC	Weather-Based Irrigation Controller
GSP	Groundwater Sustainability Plan	WMP	Well Master Plan
GWMP	Groundwater Management Plan	WWMP	Wastewater Management Plan
GWE	Groundwater Elevation	WY	Water year (October 1 through September 30)

1 Climatological Monitoring

1.1 Program Changes

Historically, Station 15E (CM_015E or 15E) was used as the representative station for rainfall within Livermore Valley Groundwater Basin (Basin) because of its extensive historical record; however, CM_015E was relocated in 2020 and the data was no longer available in a consistent and regular basis. After evaluating data quality and availability, Zone 7 Water Agency (Zone 7) determined that data from the nearby Livermore Municipal Airport Station (CM_KLVK or KLVK) will be more reliable and representative. Therefore, starting in the 2021 Water Year (WY) KLVK was selected to replace CM_015E. Accordingly, Zone 7's Livermore Rainfall Index (LRI), which represents a long-term historical record for the Basin, will primarily consist of CM_015E data up through June 2020 and CM_KLVK data thereafter.

For more information on the Climatological Monitoring Program; see the following sections of Zone 7's *First Five-Year Periodic Evaluation to the Alternative Groundwater Sustainability Plan* (2021 Alternative GSP):

- **Section 5.2.1:** Existing Monitoring and Management Programs
- **Section 14.2.7.1:** Other Monitoring Networks – Climatological Monitoring Program

1.2 Results for the 2022 Water Year

Zone 7 uses a network of climatological stations (mapped on ***Figure 1-1*** and tabulated on ***Table 1-1***) to provide high-quality precipitation and evaporation data for water inventory calculation and management decisions, including both daily record stations and 15-minute record stations. Rainfall and evaporation information is provided in the following tables.

- ***Table 1-2*** - Monthly Precipitation Data, 2022 WY
- ***Figure 1-2*** – Graph of Livermore Index Rainfall, 2022 WY
- ***Table 1-3*** - Historical Monthly Precipitation (inches), Livermore Rainfall Index, 1871 to 2022 WY
- ***Table 1-4*** - Monthly Evapotranspiration Data, 2022 WY
- ***Table 1-5*** - Historical Monthly Pan Evaporation (inches), Lake Del Valle Station, Livermore

Using the Water Year Type methodology developed by the California Department of Water Resources (DWR; DWR, 2021), the 2022 WY is considered a 'Below Normal' WY. ***Figure 1-2*** shows

that the water year total for the Livermore Rainfall Index (LRI) was at 12.83 inches (89% of average). Total rainfall on the watershed was 88% of average. Total rainfall from individual stations ranged from 9.23 inches (80% of average) at Station CM_ALTC_BD to 25.56 inches (105% of average) at CM_044 (Lick Observatory in Santa Clara County).

The network average evapotranspiration (ETo) for the 2022 WY was 53.50 inches (114% of normal), ranging from 51.41 inches at the Lake del Valle Station (CM_LDV, 119% of normal) to 57.73 inches at the CIMIS Station 191 (CM_191, 112% of normal).

1.3 Attached Tables and Figures

Table 1-1: *Table of Climatological Stations, 2022 WY*
Table 1-2*: Monthly Precipitation Data, 2022 WY*
Table 1-3*: Historical Monthly Precipitation, Livermore Rainfall Index, 1871 to 2022 WYs*
Table 1-4*: Monthly Evapotranspiration Data, 2022 WY*
Table 1-5*: Historical Monthly Pan Evaporation, Lake del Valle Station, 1969 to 2022 WYs*

Figure 1-1*: Climatological Monitoring Stations with Average Rainfall*
Figure 1-2*: Graph of Livermore Index Rainfall*

TABLE 1-1
TABLE OF CLIMATOLOGICAL STATIONS
2022 WATER YEAR

PRECIPITATION NETWORK								
SITE ID	MAP LABEL	STATION NAME	LOCATION	OBSERVER	ELEV-ATION	ESTAB-LISHED	15 MIN RECORD	MEAN ANNUAL (IN)
CM_015E*	15E	NOAA Livermore	California Way, Livermore	NOAA	527	1871 to 2020	-	14.41
CM_017	17	Del Valle Plant	601 East Vallecitos Rd, Livermore	ZONE 7	640	1974	1978 to Present	15.67
CM_024	24	Patterson Plant	Patterson Pass Rd, Livermore	ZONE 7	680	1963	1969 to 2016	12.65
CM_034	34	Mocho Wellfield	Santa Rita Rd, Pleasanton	ZONE 7	340	1968	1970 to 2010	17.57
CM_044	44	Mt Hamilton	Lick Observatory, Mt. Hamilton	Lick Observatory	4209	1881	-	24.26
CM_101	101	Tassajara	Camino Tassajara Rd, Danville	Mrs. Joan Hansen	800	1912	-	18.32
CM_170	170	Parkside	Parkside Drive, Pleasanton	ZONE 7	330	1986	1986 to 2005	20.30
CM_191	191	CIMIS Station	Alameda County Fairgrounds Golf Course	DWR	335	2004	2004 to Present	16.36
CM_ALTC_BD	ALTC_BD	Altamont Creek	at ALTC_BD surface water station	ZONE 7	500	2015	2015 to Present	11.54
CM_AMNL	AMNL	Arroyo Mocho Near Livermore	at AMNL surface water station	ZONE 7	750	2015	2015 to Present	11.47
CM_AMP	AMP	Arroyo Mocho Pleaslanton	At AMP Surface Water Station	ZONE 7	335	2016	2016 to Present	11.65
CM_KLVK*	KLVK	Livermore Municipal Airport	Livermore Municipal Airport	NOAA	395	1998	-	13.13
CM_LG1_DB	LG1_DB	Line G-1 at Dublin BLVD	Dublin Blvd and Scarlett Dr, Dublin	ZONE 7	336	2019	2019 to Present	10.64
CM_LJ1_BDB	LJ1_BDB	Line J-1 Below Dublin BLVD	Dublin Doulevard, Dublin	ZONE 7	332	2019	2019 to Present	13.31
CM_NC	NC	North Canyons Office	Zone 7's North Canyons building	ZONE 7	450	2015	2015 to Present	10.67
CM_SGE	SGE	Sunol Glen Elementary	Sunol Glen Elementary School, Sunol	ZONE 7	253	2016	2016 to Present	13.94
CM_TC_BI580	TC_BI580	Tassajara Creek below I-580	Old Santa Rita Rd, Pleasanton	ZONE 7	342	2018	2019 to Present	10.57
EVAPORATION NETWORK								
SITE ID	MAP LABEL	STATION NAME	LOCATION	OBSERVER	ELEV-ATION	ESTAB-LISHED	15 MIN RECORD	MEAN ANNUAL (IN)
CM_LDV	LDV	Lake Del Valle	Lake Del Valle	DWR	760	1968	-	67.83
CM_LWRP	LWRP	Livermore Water Reclamation Plant	W. Jack London Blvd & Hwy 84, Livermore	LWRP	410	1974	-	72.35
CM_191	191	CIMIS Station	Alameda County Fairgrounds Golf Course	DWR	335	2004	2004 to Present	51.93

* Livermore Rainfall Index comprises of CM_015E to June 2020 and CM_KLVK thereafter.

Stations LDV and LWRP record evaporation using pan evaporation equipment. ETo is derived using : ETo= Pan Evaporation x 0.6402

TABLE 1-2
MONTHLY PRECIPITATION DATA
2022 WATER YEAR

MONTHLY PRECIPITATION IN INCHES

WATER YEAR MONTH	MONITORING STATION																2022 Network Average	% Historic Network Average
	LRI	17	24	34	44	101	170	191	ALTC	AMNL	AMP	LG1_DB	LJ1_BDB	NC	SGE	TC_BI580		
OCT	5.22	3.82	3.69	5.47	6.99	5.81	6.18	5.03	3.47	3.95	4.89	3.68	5.68	3.94	4.34	4.74	4.82	487.8%
NOV	0.71	0.47	0.63	0.72	0.82	1.07	0.86	0.69	0.50	0.19	0.59	0.47	0.48	0.45	0.36	0.51	0.59	34.1%
DEC	4.85	5.14	3.75	6.11	11.49	5.99	6.76	6.24	3.55	4.19	5.50	5.32	5.94	3.61	6.33	5.56	5.61	211.1%
JAN	0.02	0.01	0.00	0.03	0.21	0.17	0.10	0.06	0.01	0.01	0.02	0.01	0.03	0.00	0.03	0.00	0.04	1.4%
FEB	0.03	0.10	0.02	0.00	0.49	0.04	0.04	0.03	0.07	0.06	0.01	0.06	0.05	0.04	0.06	0.03	0.07	2.7%
MAR	0.48	0.40	0.90	0.53	0.92	0.56	0.56	0.50	0.35	0.39	0.44	0.42	0.42	0.57	0.51	0.46	0.52	20.2%
APR	1.03	1.15	0.24	1.70	2.18	2.12	1.88	1.66	0.69	0.93	1.31	1.21	1.53	0.85	2.18	1.27	1.35	101.5%
MAY	0.00	0.01	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.01	2.0%
JUN	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.8%
JUL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
AUG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
SEP	0.49	0.44	0.28	0.46	2.34	0.70	0.54	0.48	0.59	0.17	0.40	0.38	0.45	0.44	0.28	0.45	0.52	367.1%
TOTAL	**12.83**	**11.55**	**9.51**	**15.02**	**25.56**	**16.46**	**16.92**	**14.69**	**9.23**	**9.89**	**13.16**	**11.55**	**14.58**	**9.90**	**14.12**	**13.02**	**13.53**	
% AVG	**89%**	**74%**	**75%**	**85%**	**105%**	**90%**	**83%**	**90%**	**80%**	**86%**	**113%**	**99%**	**125%**	**85%**	**121%**	**112%**	**88%**	

* Not included in Network Average due to insufficient age

** Not enough data for average calculation.

LRI Livermore Rain Index (CM_015E to June 2020 and CM_KLVK thereafter)

DISTRIBUTION OF DAILY PRECIPITATION

Number of days with rainfall greater than reference

Rainfall (inches)	MONITORING STATION																2022 Network Average
	LRI	17	24	34	44	101	170	191	ALTC	AMNL	AMP	LG1_DB	LJ1_BDB	NC	SGE	TC_BI580	
>Trace	37	49	36	45	45	41	55	56	46	46	48	43	51	40	54	44	46
>0.1	26	22	15	22	35	24	23	27	22	21	24	24	26	21	27	25	24
>0.5	5	5	5	7	14	11	9	6	4	5	4	4	7	4	9	5	6
>1	2	2	1	3	7	2	2	2	1	1	3	2	2	2	2	2	2
>2	1	1	1	1	2	2	1	2	1	1	1	1	2	1	1	1	1

TABLE 1-3
HISTORICAL MONTHLY PRECIPITATION
LIVERMORE RAINFALL INDEX (LRI)
1871 to 2022 WATER YEARS

Water Year	OCTWY	NOVWY	DECWY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL OCT-SEP	TOTAL JULY-JUNE	% AVERAGE OCT-SEP
1871	NA	NA	NA	1.42	1.93	0.36	1.25	0.02	0.00	0.00	0.00	0.00	NA	NA	NA
1872	0.00	1.13	11.69	2.15	2.69	0.65	0.43	0.00	0.32	0.00	0.00	0.00	19.06	19.06	132%
1873	0.00	1.22	3.87	1.04	3.73	0.68	0.15	0.00	0.00	0.00	0.00	0.00	10.69	10.69	74%
1874	0.42	0.70	4.48	2.96	1.03	1.34	0.95	0.32	0.06	0.00	0.00	0.30	12.56	12.26	87%
1875	1.67	2.03	0.20	5.40	1.20	0.35	0.00	0.00	0.52	0.00	0.00	0.00	11.37	11.67	79%
1876	0.00	7.23	1.62	2.68	3.01	4.39	0.73	0.33	0.00	0.00	0.00	0.00	19.99	19.99	139%
1877	1.26	0.10	0.00	2.47	0.56	1.10	0.13	0.39	0.00	0.00	0.00	0.00	6.01	6.01	42%
1878	1.27	1.29	0.73	4.61	6.73	2.01	0.96	0.06	0.00	0.00	0.00	0.00	17.66	17.66	123%
1879	0.24	0.31	0.17	2.83	1.78	2.49	0.75	1.34	0.20	0.00	0.00	0.00	10.11	10.11	70%
1880	0.83	1.06	1.94	1.48	1.80	1.45	6.51	0.91	0.00	0.00	0.00	0.00	15.98	15.98	111%
1881	0.00	0.65	7.75	2.40	2.62	1.06	1.93	0.00	0.04	0.00	0.00	0.00	16.45	16.45	114%
1882	0.08	0.78	1.97	1.07	1.72	4.85	1.03	0.20	0.00	0.00	0.00	0.34	12.04	11.70	84%
1883	1.52	1.48	0.38	2.38	0.63	3.45	1.50	2.18	0.00	0.00	0.00	0.35	13.87	13.86	96%
1884	1.52	0.57	0.44	4.03	5.29	5.92	2.70	0.20	1.73	0.00	0.10	0.30	22.80	22.75	158%
1885	1.14	0.02	6.22	1.72	0.36	0.78	1.29	0.08	0.00	0.00	0.00	0.05	11.66	12.01	81%
1886	0.00	6.20	1.94	4.20	0.24	1.18	2.36	0.00	0.00	0.40	0.00	0.00	16.52	16.17	115%
1887	0.30	0.70	0.81	0.90	6.23	0.23	1.60	0.00	0.00	0.00	0.00	0.80	11.57	11.17	80%
1888	0.00	0.61	3.51	3.20	0.94	2.51	0.60	0.66	0.30	0.00	0.00	0.76	13.09	13.13	91%
1889	0.00	3.80	2.21	0.46	0.67	5.15	0.51	2.25	0.00	0.00	0.00	0.00	15.05	15.81	105%
1890	3.94	2.95	8.63	5.24	3.71	2.85	0.86	0.48	0.00	0.00	0.00	1.20	29.86	28.66	208%
1891	0.00	0.00	3.31	0.54	4.18	2.50	1.88	0.40	0.15	0.00	0.00	1.32	14.28	14.16	99%
1892	0.05	0.38	4.42	0.84	1.08	3.96	0.90	1.30	0.00	0.00	0.00	0.45	13.38	14.25	93%
1893	1.65	4.97	7.27	3.02	3.12	3.68	1.40	0.73	0.00	0.00	0.00	0.00	25.84	26.29	180%
1894	0.00	1.59	2.14	4.97	5.36	0.81	0.58	1.19	0.52	0.00	0.00	1.45	18.61	17.16	129%
1895	1.15	0.50	8.56	6.83	1.56	1.81	1.26	1.25	0.00	0.00	0.00	0.22	23.14	24.37	161%
1896	0.83	1.69	1.28	7.16	0.17	1.50	3.11	0.39	0.00	0.00	0.73	0.55	17.41	16.35	121%
1897	1.48	3.02	1.71	1.89	3.54	4.04	0.24	0.00	0.08	0.00	0.00	0.06	16.06	17.28	112%
1898	1.43	0.52	1.31	1.47	1.78	0.78	0.45	0.96	0.35	0.00	0.00	0.95	10.00	9.11	69%
1899	0.74	0.25	1.61	2.60	0.08	4.81	0.35	0.15	0.22	0.00	0.00	0.00	10.81	11.76	75%
1900	2.52	2.49	2.07	2.44	0.34	1.11	0.86	1.10	0.00	0.00	0.00	0.18	13.11	12.93	91%
1901	1.93	4.48	1.06	2.69	5.15	0.95	1.80	1.58	0.00	0.00	0.00	0.68	20.32	19.82	141%
1902	0.70	1.99	0.74	0.99	3.62	2.69	0.75	0.32	0.00	0.00	0.13	0.00	11.93	12.48	83%
1903	0.47	2.07	0.87	3.19	0.94	5.65	0.81	0.12	0.00	0.00	0.00	0.00	14.12	14.25	98%
1904	0.00	2.16	0.59	0.89	4.18	3.71	1.56	0.24	0.00	0.00	0.32	1.62	15.27	13.33	106%
1905	1.00	0.78	1.42	2.43	2.30	3.12	0.93	1.89	0.00	0.00	0.00	0.00	13.87	15.81	96%
1906	0.00	1.01	1.18	5.56	2.67	5.18	0.95	1.61	0.56	0.00	0.00	0.20	18.92	18.72	131%
1907	0.03	1.34	6.45	3.22	1.86	8.85	0.47	0.16	0.56	0.00	0.00	0.00	22.94	23.14	159%
1908	0.81	0.04	3.90	2.27	1.35	0.73	0.28	0.53	0.00	0.00	0.00	0.03	9.94	9.91	69%
1909	0.27	0.60	1.55	10.18	3.96	1.94	0.00	0.00	0.05	0.00	0.00	0.62	19.17	18.58	133%
1910	0.75	1.68	5.77	2.50	1.14	1.90	0.10	0.00	0.04	0.00	0.00	0.10	13.98	14.50	97%
1911	0.29	0.10	1.32	12.60	1.42	4.45	0.69	0.24	0.07	0.00	0.00	0.00	21.18	21.28	147%
1912	0.43	0.29	1.71	2.66	0.20	1.99	0.73	0.94	0.65	0.00	0.00	0.48	10.08	9.60	70%
1913	0.71	0.44	0.81	2.63	0.38	1.65	0.54	0.58	0.01	0.27	0.02	0.00	8.04	8.23	56%
1914	0.00	2.47	3.17	7.10	2.11	0.66	0.76	0.45	0.19	0.00	0.00	0.00	16.91	17.20	118%
1915	0.45	0.33	3.96	4.16	5.79	1.50	0.66	2.66	0.00	0.00	0.00	0.00	19.51	19.51	136%
1916	0.00	0.76	4.41	11.35	2.17	1.47	0.21	0.05	0.00	0.00	0.00	0.44	20.86	20.42	145%
1917	0.50	0.68	3.28	1.06	3.37	1.08	0.15	0.02	0.00	0.00	0.00	0.04	10.18	10.58	71%
1918	0.00	0.43	0.66	0.59	3.08	3.32	0.61	0.00	0.00	0.00	0.00	5.72	14.41	8.73	100%
1919	0.39	2.38	1.51	1.03	4.58	2.33	0.05	0.00	0.00	0.00	0.00	0.48	12.75	17.99	89%
1920	0.15	0.33	2.21	0.22	0.71	3.52	1.07	0.00	0.13	0.00	0.00	0.00	8.34	8.82	58%
1921	2.03	1.43	3.81	3.38	0.59	0.83	0.16	1.05	0.00	0.00	0.00	0.05	13.33	13.28	93%
1922	0.15	1.17	3.38	1.51	5.46	1.83	0.23	0.27	0.00	0.00	0.00	0.00	14.00	14.05	97%
1923	0.54	2.86	5.43	1.80	0.65	0.15	2.15	0.00	0.02	0.00	0.00	0.82	14.42	13.60	100%
1924	0.25	0.76	0.87	1.40	0.93	0.65	0.28	0.07	0.00	0.00	0.00	0.00	5.21	6.03	36%
1925	1.30	1.53	2.63	1.02	3.74	1.14	1.75	1.41	0.04	0.00	0.00	0.00	14.56	14.56	101%
1926	0.00	0.97	1.14	2.44	3.58	0.16	3.11	0.11	0.00	0.00	0.00	0.00	11.51	11.51	80%
1927	0.93	2.83	0.78	1.74	3.49	1.54	1.73	0.10	0.18	0.00	0.00	0.03	13.35	13.32	93%
1928	1.71	1.43	2.00	1.46	0.89	3.43	1.43	0.45	0.00	0.00	0.00	0.00	12.80	12.83	89%
1929	0.00	2.57	2.76	1.26	0.87	1.07	0.70	0.03	0.83	0.00	0.00	0.00	10.09	10.09	70%

TABLE 1-3
HISTORICAL MONTHLY PRECIPITATION
LIVERMORE RAINFALL INDEX (LRI)
1871 to 2022 WATER YEARS

Water Year	OCTWY	NOVWY	DECWY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL OCT-SEP	TOTAL JULY-JUNE	% AVERAGE OCT-SEP
1930	0.01	0.00	1.81	3.64	1.91	1.88	1.14	0.43	0.00	0.00	0.00	0.20	11.02	10.82	77%
1931	0.58	1.15	0.26	3.45	1.67	0.57	0.36	0.93	0.11	0.00	0.00	0.00	9.08	9.28	63%
1932	0.27	1.89	5.63	1.29	3.15	0.19	0.41	0.37	0.00	0.00	0.00	0.00	13.20	13.20	92%
1933	0.00	0.51	2.03	4.51	0.44	2.09	0.13	0.70	0.03	0.00	0.00	0.01	10.45	10.44	73%
1934	0.75	0.00	3.69	1.29	2.86	0.00	0.13	0.60	0.53	0.00	0.00	0.27	10.12	9.86	70%
1935	0.62	2.71	2.32	3.53	0.52	3.16	3.28	0.00	0.00	0.00	0.04	0.00	16.18	16.41	112%
1936	0.79	0.21	1.53	3.28	6.76	0.71	0.63	0.46	0.10	0.00	0.00	0.00	14.47	14.51	101%
1937	0.40	0.02	3.26	3.38	4.13	5.07	0.68	0.17	0.20	0.00	0.00	0.00	17.31	17.31	120%
1938	0.55	2.46	4.57	2.40	6.14	4.09	0.90	0.02	0.00	0.00	0.00	0.00	21.13	21.13	147%
1939	1.00	1.08	0.52	2.40	1.57	2.18	0.53	0.18	0.00	0.00	0.00	0.16	9.62	9.46	67%
1940	1.23	0.15	0.78	8.13	5.14	2.60	0.35	0.14	0.00	0.00	0.00	0.25	18.77	18.68	130%
1941	0.50	0.43	4.63	3.24	4.19	2.07	2.76	0.23	0.00	0.00	0.03	0.00	18.08	18.30	126%
1942	0.72	0.89	5.34	3.89	1.68	1.42	3.10	1.00	0.00	0.00	0.00	0.09	18.13	18.07	126%
1943	1.08	3.05	1.73	4.48	1.68	2.39	1.14	0.00	0.06	0.00	0.00	0.00	15.61	15.70	108%
1944	0.30	0.53	1.23	2.36	4.89	1.01	0.94	0.73	0.00	0.00	0.00	0.00	11.99	11.99	83%
1945	0.77	3.41	2.03	0.87	3.68	3.19	0.20	0.17	0.00	0.00	0.02	0.00	14.34	14.32	100%
1946	1.07	2.07	2.98	0.76	1.23	1.69	0.02	0.61	0.00	0.24	0.00	0.02	10.69	10.45	74%
1947	0.02	2.93	2.07	0.69	1.45	2.34	0.53	0.17	0.36	0.00	0.00	0.00	10.56	10.82	73%
1948	1.84	0.85	0.51	0.20	1.11	2.79	2.50	1.03	0.16	0.03	0.00	0.00	11.02	10.99	77%
1949	0.46	0.34	2.71	1.39	2.47	3.38	0.02	0.34	0.00	0.03	0.16	0.05	11.35	11.14	79%
1950	0.08	1.20	1.21	4.65	1.54	1.44	0.85	0.59	0.01	0.00	0.00	0.08	11.65	11.81	81%
1951	1.84	5.95	4.95	2.23	1.81	1.82	0.55	0.35	0.06	0.00	0.00	0.00	19.56	19.64	136%
1952	1.04	3.01	6.07	7.60	1.40	2.36	2.20	0.16	0.04	0.00	0.00	0.10	23.98	23.88	167%
1953	0.01	2.11	6.33	2.07	0.05	1.12	1.42	0.61	0.59	0.00	0.15	0.00	14.46	14.41	100%
1954	0.21	1.33	0.64	2.19	2.27	3.00	0.73	0.16	0.27	0.00	0.00	0.04	10.84	10.95	75%
1955	0.00	1.68	3.33	2.45	1.69	0.38	1.28	0.65	0.00	0.00	0.01	0.01	11.48	11.50	80%
1956	0.01	1.31	10.15	5.49	1.15	0.14	1.92	0.63	0.00	0.00	0.00	0.63	21.43	20.82	149%
1957	0.79	0.03	0.48	2.65	2.23	1.30	1.14	2.65	0.04	0.00	0.00	0.05	11.36	11.94	79%
1958	1.06	0.37	1.62	3.16	5.37	4.44	3.74	0.66	0.41	0.00	0.00	0.02	20.85	20.88	145%
1959	0.09	0.14	0.86	2.45	3.59	0.29	0.35	0.00	0.00	0.00	0.07	1.89	9.73	7.79	68%
1960	0.00	0.00	0.75	2.98	4.12	0.60	0.48	0.42	0.00	0.02	0.00	0.01	9.38	11.31	65%
1961	0.05	2.92	1.25	2.08	1.04	1.92	1.03	0.69	0.19	0.00	0.13	0.16	11.46	11.20	80%
1962	0.15	2.24	0.82	0.73	5.61	1.82	0.22	0.00	0.00	0.00	0.00	0.00	11.59	11.88	81%
1963	3.64	0.28	1.55	1.40	4.50	2.60	3.47	0.70	0.00	0.00	0.00	0.33	18.47	18.14	128%
1964	0.93	3.18	0.19	2.37	0.08	1.57	0.21	0.48	0.32	0.00	0.12	0.04	9.49	9.66	66%
1965	0.85	2.44	4.91	2.11	0.59	1.73	1.53	0.00	0.00	0.00	0.21	0.00	14.37	14.32	100%
1966	0.03	4.22	3.23	1.05	1.17	0.17	0.33	0.10	0.12	0.17	0.00	0.11	10.70	10.63	74%
1967	0.00	3.43	2.35	6.14	0.29	4.15	4.65	0.19	0.48	0.00	0.00	0.02	21.70	21.96	151%
1968	0.24	0.88	1.62	3.93	0.90	2.40	0.43	0.15	0.00	0.00	0.00	0.00	10.55	10.57	73%
1969	0.43	2.48	3.04	6.28	4.76	0.55	1.24	0.08	0.00	0.00	0.00	0.00	18.86	18.86	131%
1970	1.10	0.49	2.34	5.38	1.18	1.42	0.40	0.07	0.32	0.00	0.00	0.00	12.70	12.70	88%
1971	0.41	5.24	5.27	1.19	0.33	1.75	1.37	0.54	0.00	0.00	0.00	0.13	16.23	16.10	113%
1972	0.04	0.46	3.27	0.90	0.79	0.14	0.64	0.00	0.04	0.00	0.00	0.58	6.86	6.41	48%
1973	2.98	4.91	2.22	5.50	3.38	2.63	0.29	0.03	0.00	0.00	0.00	0.08	22.02	22.52	153%
1974	2.08	3.71	3.80	1.50	0.71	2.69	1.62	0.00	0.00	0.00	0.00	0.00	16.11	16.19	112%
1975	0.50	0.66	1.98	0.84	3.65	5.24	1.42	0.00	0.06	0.10	0.35	0.00	14.80	14.35	103%
1976	1.27	0.08	0.21	0.30	1.46	0.48	0.39	0.00	0.18	0.00	0.91	0.95	6.23	4.82	43%
1977	0.50	0.50	0.73	1.15	0.83	0.82	0.16	1.01	0.00	0.10	0.00	0.22	6.02	7.56	42%
1978	0.13	1.34	3.07	5.44	2.95	3.07	2.49	0.01	0.00	0.00	0.00	0.04	18.54	18.82	129%
1979	0.00	2.16	0.58	4.52	3.19	1.86	0.88	0.34	0.00	0.06	0.00	0.00	13.59	13.57	94%
1980	1.51	1.13	2.66	4.16	4.24	1.36	1.32	0.48	0.00	0.70	0.00	0.00	17.56	16.92	122%
1981	0.04	0.28	1.18	3.97	1.11	2.94	0.61	0.11	0.00	0.00	0.00	0.06	10.30	10.94	72%
1982	2.07	3.44	2.57	5.29	2.16	5.58	1.50	0.00	0.28	0.00	0.01	1.48	24.38	22.95	169%
1983	2.24	3.72	2.80	6.28	5.56	6.14	3.51	0.21	0.00	0.00	0.50	1.02	31.98	31.95	222%
1984	0.27	5.44	3.44	0.33	1.87	1.00	0.53	0.01	0.03	0.00	0.00	0.04	12.96	14.44	90%
1985	1.25	4.71	1.51	0.48	1.25	2.62	0.32	0.07	0.22	0.00	0.03	0.13	12.59	12.47	87%
1986	0.89	2.69	1.97	2.04	7.11	4.09	0.40	0.14	0.00	0.01	0.00	0.45	19.79	19.49	138%
1987	0.04	0.08	0.92	1.83	3.47	2.30	0.16	0.09	0.00	0.00	0.00	0.00	8.89	9.35	62%
1988	0.87	1.40	2.30	1.78	0.38	0.26	1.15	0.45	0.10	0.00	0.00	0.00	8.69	8.69	60%
1989	0.11	1.92	2.03	0.81	0.95	2.94	0.88	0.08	0.10	0.00	0.00	1.33	11.15	9.82	77%

TABLE 1-3
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LIVERMORE RAINFALL INDEX (LRI)
1871 to 2022 WATER YEARS

Water Year	OCTWY	NOVWY	DECWY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL OCT-SEP	TOTAL JULY-JUNE	% AVERAGE OCT-SEP
1990	1.13	1.02	0.10	1.54	2.46	0.87	0.37	1.78	0.00	0.02	0.00	0.06	9.35	10.60	65%
1991	0.08	0.39	1.45	0.31	2.20	5.87	0.34	0.35	0.08	0.00	0.21	0.04	11.32	11.15	79%
1992	1.65	0.31	1.19	1.39	4.61	1.97	0.43	0.00	0.09	0.00	0.00	0.00	11.64	11.89	81%
1993	0.90	0.15	4.99	6.41	4.53	2.91	0.63	0.51	0.30	0.00	0.00	0.00	21.33	21.33	148%
1994	0.57	2.00	1.81	0.94	3.33	0.15	1.20	1.78	0.04	0.00	0.00	0.00	11.82	11.82	82%
1995	0.58	3.08	1.36	6.64	0.33	6.66	1.02	0.92	0.70	0.00	0.00	0.00	21.29	21.29	148%
1996	0.00	0.01	5.37	5.17	4.10	2.34	1.91	1.05	0.00	0.00	0.00	0.00	19.95	19.95	139%
1997	1.08	2.55	4.43	5.81	0.15	0.06	0.15	0.29	0.17	0.00	0.42	0.00	15.11	14.69	105%
1998	0.28	4.23	1.95	5.47	7.30	2.37	1.37	2.00	0.13	0.00	0.00	0.18	25.28	25.52	176%
1999	0.54	2.48	0.73	3.23	3.33	1.67	0.99	0.08	0.01	0.00	0.03	0.04	13.13	13.24	91%
2000	0.15	1.26	0.25	4.61	4.87	1.25	0.59	0.69	0.18	0.00	0.01	0.24	14.10	13.92	98%
2001	1.97	0.49	0.45	1.92	2.89	1.22	1.80	0.00	0.12	0.00	0.00	0.09	10.95	11.11	76%
2002	0.37	1.92	5.09	0.72	0.62	1.65	0.16	0.68	0.00	0.00	0.00	0.00	11.21	11.30	78%
2003	0.00	2.65	7.01	0.66	1.31	1.07	3.09	0.95	0.00	0.00	0.29	0.00	17.03	16.74	118%
2004	0.02	2.02	3.57	2.19	4.01	0.39	0.18	0.11	0.00	0.00	0.00	0.58	13.07	12.78	91%
2005	2.77	0.89	3.01	2.81	3.55	3.41	1.53	1.03	0.05	0.00	0.00	0.25	19.30	19.63	134%
2006	0.17	0.65	5.40	2.22	1.32	4.79	2.60	0.34	0.00	0.00	0.00	0.00	17.49	17.74	122%
2007	0.20	1.68	2.25	0.52	3.92	0.33	0.44	0.11	0.00	0.00	0.00	0.21	9.66	9.45	67%
2008	1.12	0.71	2.05	4.79	1.89	0.10	0.02	0.00	0.00	0.00	0.00	0.00	10.68	10.89	74%
2009	0.33	1.40	1.56	1.34	3.31	2.29	0.23	0.51	0.11	0.00	0.00	0.31	11.39	11.08	79%
2010	2.79	0.21	2.02	3.53	2.36	1.57	2.10	0.24	0.00	0.00	0.00	0.00	14.82	15.13	103%
2011	1.00	2.02	3.87	0.78	2.69	4.10	0.22	0.46	1.07	0.00	0.00	0.00	16.21	16.21	113%
2012	1.06	0.93	0.04	1.52	0.52	2.57	2.01	0.02	0.12	0.00	0.00	0.01	8.80	8.79	61%
2013	0.27	3.40	4.22	1.07	0.47	0.33	0.44	0.14	0.04	0.00	0.00	0.33	10.71	10.38	74%
2014	0.00	1.30	0.38	0.08	2.58	1.25	0.98	0.00	0.01	0.00	0.00	0.22	6.80	6.91	47%
2015	0.17	1.19	8.23	0.00	1.62	0.25	0.78	0.50	0.33	0.00	0.01	0.05	13.13	13.29	91%
2016	0.02	2.49	2.55	3.95	0.69	3.30	2.14	0.21	0.00	0.00	0.00	0.00	15.35	15.41	107%
2017	3.34	1.37	2.62	8.10	6.07	2.09	1.93	0.03	0.02	0.00	0.00	0.00	25.57	25.57	178%
2018	0.18	2.20	0.06	3.30	0.57	4.44	1.68	0.01	0.00	0.00	0.00	0.00	12.44	12.44	86%
2019	0.18	1.64	1.54	2.66	6.31	2.58	0.30	1.63	0.00	0.00	0.00	0.22	17.06	16.84	119%
2020	0.00	0.97	2.91	0.96	0.00	2.45	0.82	0.26	0.00	0.00	0.11	0.00	8.48	8.59	59%
2021	0.00	0.33	1.10	2.74	0.40	0.89	0.13	0.00	0.00	0.00	0.00	0.00	5.59	5.70	39%
2022	5.22	0.71	4.85	0.02	0.03	0.48	1.03	0.00	0.00	0.00	0.00	0.49	12.83	12.34	89%
MAXIMUM	5.22	7.23	11.69	12.60	7.30	8.85	6.51	2.66	1.73	0.70	0.91	5.72	31.98	31.95	222%
MINIMUM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.21	4.82	36%
MEAN	0.73	1.62	2.65	2.88	2.44	2.16	1.07	0.46	0.11	0.01	0.03	0.23	14.41	14.44	100%

Livermore Rainfall Index (LRI) comprises of CM_015E to June 2020 and CM_KLVK thereafter.

TABLE 1-4
MONTHLY EVAPOTRANSPIRATION (ETo, in Inches)
2022 WATER YEAR

Month	Station			2022 Network Average	% Historic Network Average
	LDV*	LWRP*	191		
OCT	3.77	3.16	3.71	3.55	101.8%
NOV	1.47	1.45	2.04	1.65	94.4%
DEC	0.67	0.76	1.18	0.87	71.8%
JAN	1.09	1.41	1.86	1.46	121.5%
FEB	1.93	2.27	2.85	2.35	137.8%
MAR	3.09	3.12	4.19	3.47	121.4%
APR	4.08	3.83	5.58	4.50	109.8%
MAY	6.07	6.00	7.17	6.41	115.5%
JUN	7.00	7.00	7.67	7.23	110.3%
JUL	6.83	6.95	7.73	7.17	99.2%
AUG	6.28	6.63	7.09	6.67	103.2%
SEP	5.65	6.50	5.32	5.82	113.6%
TOTAL	**47.94**	**49.10**	**56.39**	**51.14**	
% AVG	**110%**	**106%**	**109%**	**108%**	

* Measured as Pan Evaporation and converted to ETo

ETo values for pan evaporation stations were approximated using : ETo= Pan Evaporation x 0.64

TABLE 1-5
HISTORICAL MONTHLY PAN EVAPORATION
LAKE DEL VALLE STATION, LIVERMORE (CM_LDV in Inches)
1969 to 2022 WATER YEARS

Water Year	OCTWY	NOVWY	DECWY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL OCT-SEP	TOTAL JULY-JUNE	% AVERAGE OCT-SEP
1969	3.20	2.50	1.54	0.66	1.08	4.89	5.92	9.99	7.84	11.38	11.77	8.32	69.09	NA	102%
1970	4.04	2.94	1.12	1.23	2.29	4.96	5.83	8.88	8.88	11.52	9.92	9.16	70.77	71.64	104%
1971	5.07	2.14	1.05	1.33	2.12	3.67	5.17	6.54	8.91	10.92	10.30	9.12	66.34	66.60	98%
1972	5.91	3.01	1.49	1.53	2.01	4.74	6.52	8.84	10.03	11.63	10.40	7.12	73.23	74.42	108%
1973	3.67	1.30	0.93	1.14	1.20	2.98	6.36	8.69	10.59	10.89	10.21	7.33	65.29	66.01	96%
1974	4.70	1.86	0.85	1.40	1.73	2.40	4.16	7.31	9.14	9.68	9.73	7.94	60.90	61.98	90%
1975	5.52	2.15	1.44	1.73	1.99	3.01	3.64	8.27	8.63	9.45	9.39	7.45	62.67	63.73	92%
1976	3.72	2.28	1.58	2.45	1.96	3.94	5.56	8.47	9.85	9.80	7.05	6.80	63.46	66.10	94%
1977	4.82	2.75	2.59	1.08	2.12	3.84	7.15	5.48	9.28	11.24	8.89	6.74	65.98	62.76	97%
1978	5.12	2.70	1.37	0.99	1.43	2.57	3.73	8.69	8.91	10.52	10.24	7.90	64.17	62.38	95%
1979	5.80	2.24	1.51	1.25	1.29	2.29	4.80	8.36	11.02	10.40	9.23	9.47	67.66	67.22	100%
1980	4.14	1.85	1.95	1.66	1.40	3.82	4.78	6.22	8.18	9.41	9.17	7.16	59.74	63.10	88%
1981	5.86	3.30	1.79	1.08	2.18	2.83	5.80	8.11	11.82	11.34	10.23	7.72	72.06	68.51	106%
1982	4.43	2.10	1.14	1.23	2.10	2.25	4.59	7.55	7.31	10.34	10.58	6.83	60.45	61.99	89%
1983	4.53	1.50	1.54	1.72	1.54	2.17	4.05	6.71	8.34	10.44	9.35	7.82	59.71	59.85	88%
1984	4.37	1.86	1.08	1.52	1.79	4.29	5.32	9.04	9.88	11.99	9.80	9.24	70.18	66.76	103%
1985	4.02	1.63	1.11	1.18	2.70	3.09	5.95	7.75	10.40	11.49	9.23	6.38	64.93	68.86	96%
1986	5.05	2.27	1.11	1.11	1.75	3.55	4.96	7.44	8.67	10.20	8.88	6.10	61.09	63.01	90%
1987	4.84	3.47	1.22	1.45	2.08	3.19	6.43	7.90	8.73	8.46	8.97	7.29	64.03	64.49	94%
1988	4.71	1.71	1.50	1.21	2.94	5.17	5.30	7.22	8.92	11.46	8.90	7.90	66.94	63.40	99%
1989	4.81	1.85	1.64	1.39	1.57	2.75	5.75	7.70	9.30	11.30	9.14	6.41	63.61	65.02	94%
1990	4.86	2.95	1.75	1.57	1.83	3.64	5.74	7.86	9.18	10.19	9.21	7.09	65.87	66.23	97%
1991	6.56	3.48	1.95	1.86	2.44	2.63	5.00	6.42	8.50	10.25	8.00	7.61	64.70	65.33	95%
1992	6.45	3.03	1.71	0.96	1.65	2.84	5.91	8.87	8.23	10.01	10.76	7.82	68.24	65.51	101%
1993	5.12	2.79	1.19	1.21	1.42	2.83	4.93	6.61	9.64	10.23	10.02	8.18	64.17	64.33	95%
1994	4.65	3.27	1.22	1.49	1.36	4.12	5.23	6.38	10.01	10.03	10.31	7.44	65.51	66.16	97%
1995	4.94	1.66	0.76	0.73	1.61	2.33	4.75	5.22	8.18	10.06	10.39	7.65	58.28	57.96	86%
1996	6.23	2.80	0.88	1.33	1.66	3.85	6.38	8.12	9.68	12.03	11.13	7.48	71.57	69.03	106%
1997	5.44	2.05	1.04	1.02	2.67	4.82	6.45	8.95	9.40	10.32	8.78	8.52	69.46	72.48	102%
1998	5.25	1.82	1.60	1.19	0.96	2.80	4.36	4.13	7.10	9.91	10.57	7.51	57.20	56.83	84%
1999	4.51	1.63	1.41	1.32	1.58	2.93	5.25	7.04	8.70	10.51	8.58	7.53	60.99	62.36	90%
2000	6.86	2.73	2.51	1.57	1.55	3.91	5.48	7.16	9.66	9.23	9.82	7.86	68.35	68.06	101%
2001	3.84	1.84	1.68	1.45	2.20	4.14	4.86	10.05	10.92	9.78	9.75	7.98	68.49	67.89	101%
2002	6.56	2.56	1.47	1.97	2.56	4.63	5.65	7.82	9.87	11.08	9.87	9.13	73.17	70.60	108%
2003	5.64	3.23	1.73	1.26	2.31	4.04	4.05	7.62	9.78	12.14	9.23	8.84	69.87	69.74	103%
2004	6.71	1.72	1.12	1.08	2.22	4.99	7.38	8.66	9.46	10.16	9.88	8.76	72.14	73.55	106%
2005	4.86	2.21	1.54	1.14	1.54	3.20	4.93	6.60	8.37	11.13	10.65	7.41	63.58	63.19	94%
2006	5.19	2.50	1.50	1.52	2.47	3.04	3.81	8.54	9.82	12.43	9.37	8.42	68.61	67.58	101%
2007	5.27	2.09	2.22	1.98	1.71	4.34	5.86	8.58	9.59	9.814	10.45	7	68.90	71.86	102%
2008	4.45	3.25	1.68	1.37	2.14	4.60	6.65	8.66	10.37	10.54	10.54	8.42	72.67	70.43	107%
2009	6.27	2.40	1.35	2.04	1.95	3.90	6.24	8.52	9.09	11.053	10.12	8.63	71.566	71.26	106%
2010	4.84	3.00	1.28	1.20	1.61	3.91	4.65	6.40	9.52	10.2	9.08	8.26	63.95	66.21	94%
2011	4.98	2.43	1.13	1.53	2.46	2.64	5.64	7.13	8.22	10.25	9.62	8.46	64.49	63.70	95%
2012	4.73	2.30	2.93	2.49	2.84	3.46	5.52	8.84	10.19	11.27	10.58	8.08	73.23	71.63	108%
2013	5.28	2.55	1.89	1.48	2.51	4.74	7.61	9.09	10.20	11.78	9.35	7.45	73.93	75.28	109%
2014	6.04	3.41	2.59	3.43	2.43	4.66	6.23	10.51	10.77	11.05	9.56	7.6	78.28	78.65	115%
2015	6.26	2.73	1.16	1.79	2.65	4.96	6.62	7.31	10.01	10.73	10	9.37	73.59	71.70	108%
2016	5.81	2.19	1.20	0.75	2.80	3.30	5.70	7.92	11.87	12.29	9.71	9.06	72.6	71.64	107%
2017	4.74	2.32	1.56	1.16	1.49	3.78	5.18	8.93	9.78	12.02	10.04	8.34	69.34	70.00	102%
2018	6.53	2.15	2.60	1.51	3.33	3.46	5.30	7.95	10.43	12.22	9.84	8.11	73.43	73.66	108%
2019	5.88	4.07	1.70	1.93	1.57	3.22	5.99	6.27	10.99	11.55	11.25	8.36	72.78	71.79	107%
2020	6.99	4.01	1.20	1.27	3.82	3.29	5.64	9.41	10.80	11.26	11	7.68	76.37	77.59	113%
2021	7.73	3.33	2.16	2.56	2.45	4.58	7.24	9.69	10.66	11.12	10.06	8.64	80.22	80.34	118%
2022	5.89	2.29	1.05	1.71	3.02	4.83	6.37	9.48	10.94	10.67	9.81	8.82	74.88	75.40	110%
Maximum	**7.73**	**4.07**	**2.93**	**3.43**	**3.82**	**5.17**	**7.61**	**10.51**	**11.87**	**12.43**	**11.77**	**9.47**	**80.22**	**80.34**	**118%**
Minimum	**3.20**	**1.30**	**0.76**	**0.66**	**0.96**	**2.17**	**3.64**	**4.13**	**7.10**	**8.46**	**7.05**	**6.10**	**57.20**	**56.83**	**84%**
Mean	**5.25**	**2.49**	**1.52**	**1.47**	**2.04**	**3.64**	**5.53**	**7.89**	**9.53**	**10.76**	**9.79**	**7.92**	**67.83**	**67.85**	**100%**

ETo can be approximated using: ETo= Pan Evaporation x 0.6402

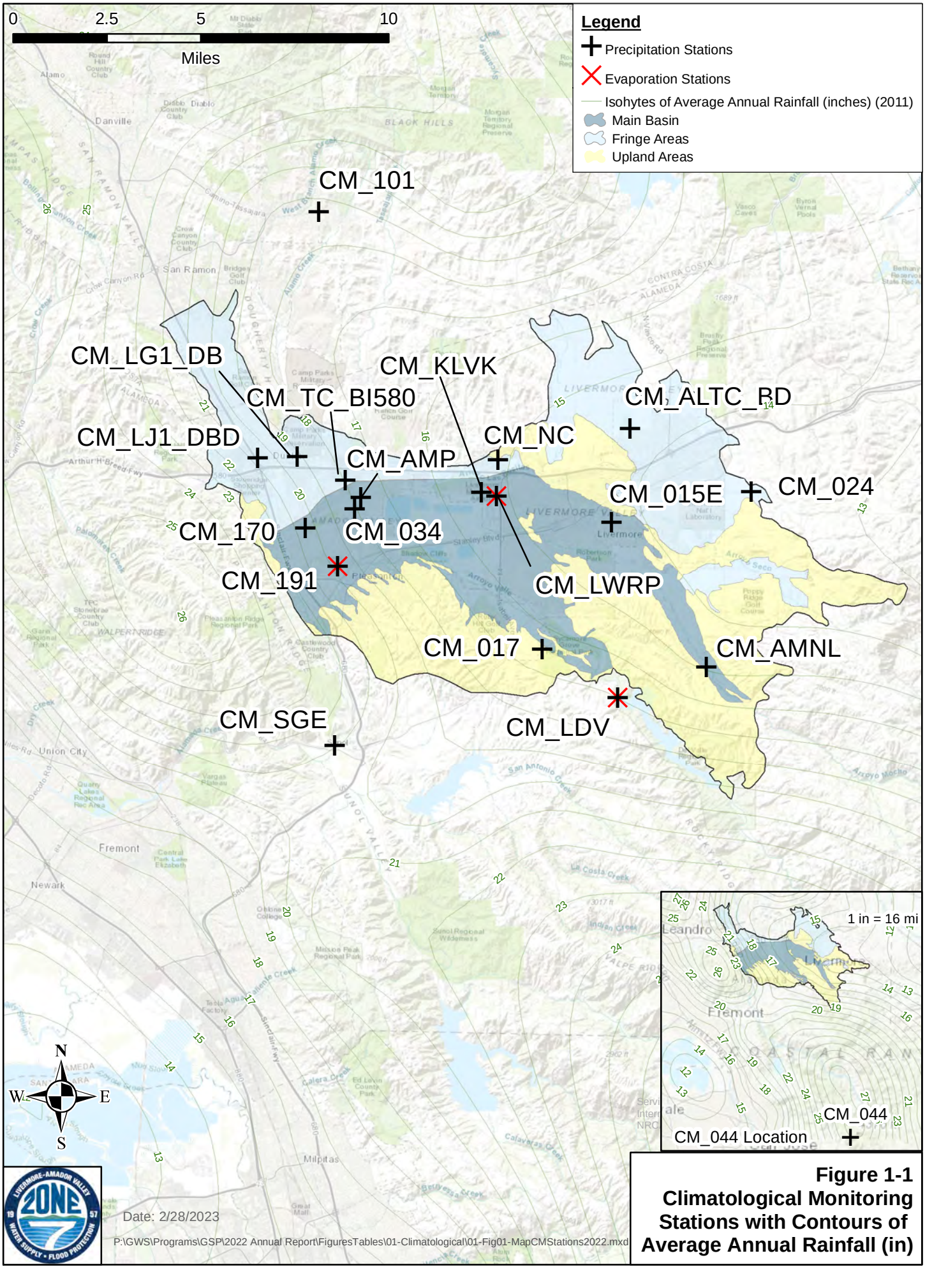
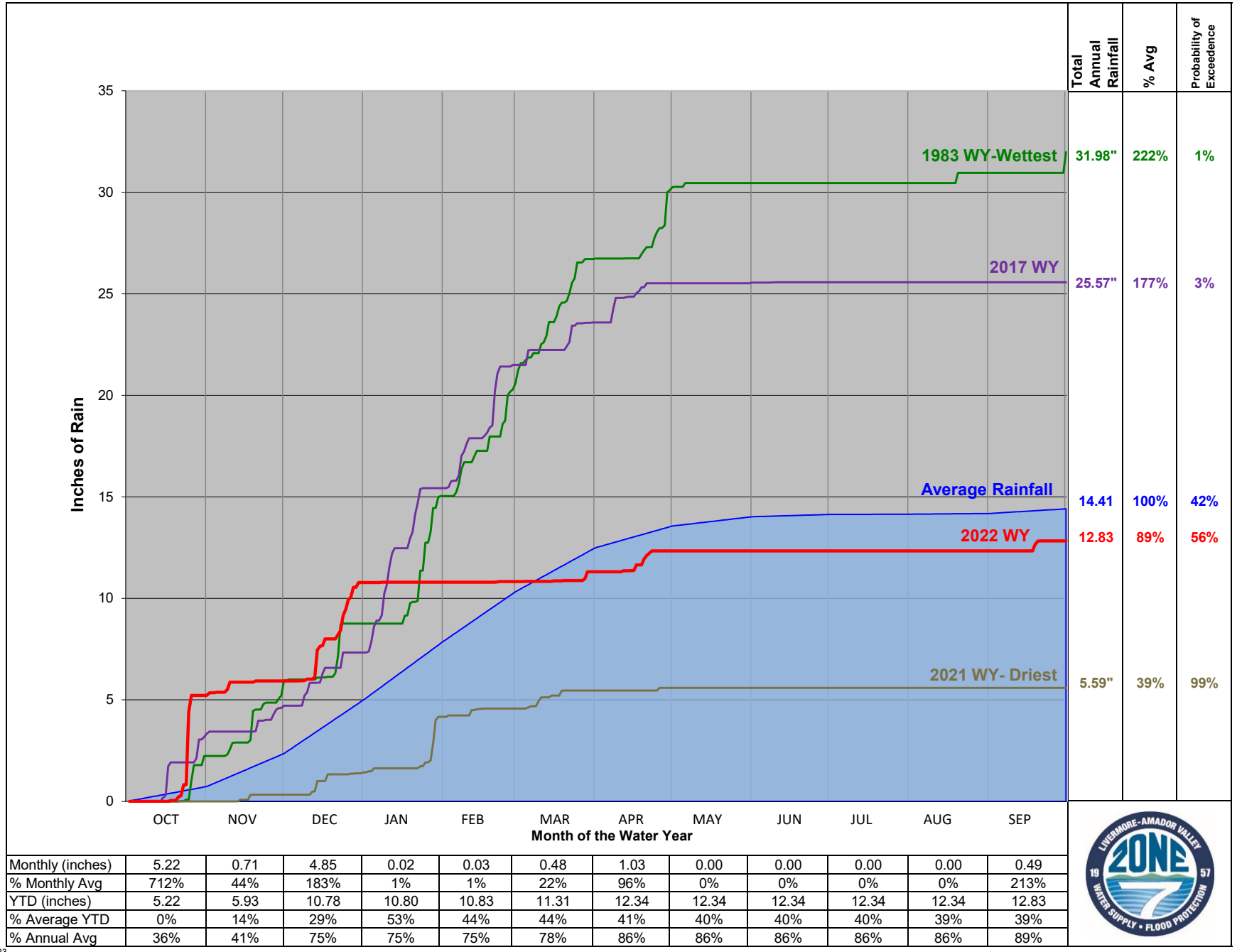


Figure 1-1
Climatological Monitoring Stations with Contours of Average Annual Rainfall (in)

FIGURE 1-2
Graph of Livermore Rainfall Index (in inches)
(Station CM_015E to 2020, Station CM_KLVK after 2020)



Monthly (inches)	5.22	0.71	4.85	0.02	0.03	0.48	1.03	0.00	0.00	0.00	0.00	0.49
% Monthly Avg	712%	44%	183%	1%	1%	22%	96%	0%	0%	0%	0%	213%
YTD (inches)	5.22	5.93	10.78	10.80	10.83	11.31	12.34	12.34	12.34	12.34	12.34	12.83
% Average YTD	0%	14%	29%	53%	44%	44%	41%	40%	40%	40%	39%	39%
% Annual Avg	36%	41%	75%	75%	75%	78%	86%	86%	86%	86%	86%	89%

2/28/2023
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2 Surface Water Monitoring

2.1 Program Changes

There were no changes to the Surface Water Monitoring Program during the 2022 WY. For more information on the Surface Water Monitoring Program, see the following sections of the 2022 Alternative GSP:

- **Section 5.2.1:** Existing Monitoring and Management Programs
- **Section 14.2.7.2:** Other Monitoring Networks – Surface Water Monitoring Program

2.2 Results for the 2022 Water Year

All the surface water stations monitored for the 2022 WY are mapped on ***Figure 2-1*** and listed in ***Table 2-1***. ***Table 2-2*** tabulates monthly flows during the 2022 WY at 20 stations along the main streams over the Basin. ***Table 2-3*** presents the water quality results from all stations sampled during the 2022 WY to identify the quality of water recharging and discharging from the Basin.

Table 2-A below summarizes the natural flows that flowed from the upper watershed into the three recharging stream reaches for the 2022 WY:

Table 2-A: Natural Flows from Upper Watershed, 2022 WY

Station	Stream	Natural Flow (AF)	Percent of Average
AVBLC*	Arroyo Valle	11,866	49%
AMNL	Arroyo Mocho	1,156	34%
ALPL	Arroyo Las Positas	3,880	73%
TOTAL Natural Inflow		**16,902**	52%

* Natural flow into Lake del Valle

Table 2-B below summarizes the South Bay Aqueduct (SBA) releases to the recharging streams for “artificial” (or “conservation”) recharge during the 2022 WY:

Table 2-B: South Bay Aqueduct Releases, 2022 WY

Station	Stream	Released (AF)	Percent of Average
SBA_TO2_AV	Arroyo Valle	1,776	60%
SBA_AM	Arroyo Mocho	0	0%
SBA_ALTC	Arroyo Las Positas	0	0%
TOTAL SBA Releases		**1,776**	**27%**

- In December 2021, DWR released 3,896 AF from Lake del Valle into Arroyo Valle to prevent flooding in the lake (a.k.a. flood release).

- "Live stream" conditions were maintained in the Arroyo Valle with natural and artificial flows from October 26, 2021 to November 16, 2021 and for most of the period between December 15, 2021 to April 07, 2022.

- Due to another dry year, Zone 7 was again unable to provide any water to East Bay Regional Parks District (EBRPD) for Shadow Cliffs Lake recharge. For comparison, during the 2020 WY, EBRPD was able to divert 444 acre-feet (AF) from the Arroyo Valle for Shadow Cliffs recharge.

- Peak flows and average flows are shown in ***Table 2-C*** below:

Table 2-C: Peak and Annual Mean Flows, 2022 WY

Stream	Station	Peak (cfs)	Annual Mean (cfs)
Arroyo Valle	AVNL	700	8.3
Arroyo Mocho	AMNL	534	1.6
Arroyo Las Positas	ALPL	1,138	5.4
Arroyo de la Laguna	ADLLV	5,390	36.1

- A total of 26,128 AF of water flowed out of the Valley past Station Arroyo de la Laguna at Verona (ADLLV); 51% of average.

2.3 Attached Tables and Figures

Table 2-1: *Table of Surface Water Monitoring Stations and Monitoring Frequencies, 2022 WY*
Table 2-2: *Monthly Flows, 2022 WY*
Table 2-3: *Table of Surface Water Quality Results, 2022 WY*

Figure 2-1: *Map of Surface Water Monitoring Sites, 2022 WY*

TABLE 2-1
TABLE OF SURFACE WATER MONITORING STATIONS
AND MONITORING INFORMATION
2022 WATER YEAR

Station ID	Station Name	Station Type	Flow Range	Flow Freq	Gauge Height	Flow (Q)	Water Temp	Other Parameters	WQ Freq	Primary Operator
ALAMO CANAL - LINE F										
ACNP	Alamo Canal near Pleasanton	Gauge Height	Entire	15 Min	x	x	15 Min	SSD	-	USGS
AC_WCD	Alamo Creek at Willow Creek Dr near Dublin	Gauge Height	Entire	15 Min	x	x	15 Min	-	-	Balance
ALTAMONT CREEK - LINE R										
ALTC_BD	Altamont Creek at Bluebell Drive	Gauge Height	High	15 Min	x	x	15 Min	-	-	Zone 7
SBA_ALTC	SBA Turnout to Altamont Creek	Flow Meter	Entire	15 Min	-	x	-	-	-	DWR
ARROYO DE LA LAGUNA - LINE B										
ADLL_HWY84	Arroyo De La Laguna at Highway 84 in Sunol	Gauge Height	Entire	15 Min	x	x	15 Min	-	-	Balance
ADLLV	Arroyo De La Laguna at Verona	Gauge Height	Entire	15 Min	x	x	15 Min	pH, SC	Annual	USGS
ARROYO LAS POSITAS - LINE H										
ALP_ELCH	Arroyo Las Positas above El Charro Road	Gauge Height	Entire	15 Min	x	x	15 Min	-	Annual	Zone 7
ALPL	Arroyo Las Positas at Livermore	Gauge Height	Entire	15 Min	x	x	15 Min	SSD	Annual	Zone 7
LLNL_ALP	LLNL Treated Groundwater Discharge to ALP	Estimated	Entire	Daily	-	x	-	-	-	LLNL
ARROYO MOCHO - LINE G										
AMHAG	Arroyo Mocho at Livermore	Gauge Height	Entire	15 Min	x	x	-	SSD	Annual	Zone 7
AM_KB	Arroyo Mocho at Kaiser Bridge	Gauge Height	Entire	15 Min	x	x	15 Min	-	Annual	Zone 7
AMNL	Arroyo Mocho near Livermore	Gauge Height	Entire	15 Min	x	x	15 Min	-	Annual	Zone 7
AMP	Arroyo Mocho near Pleasanton	Gauge Height	Entire	15 Min	x	x	15 Min	SSD	Annual	Zone 7
MA_COPE_I	Cope Lake to Lake I	Gauge Height	Entire	Hourly	x	x	-	-	-	Zone 7
MA_VUL_COPE	Vulcan Discharge to Cope Lake	Flow Meter	Entire	Daily	-	x	-	-	-	Vulcan
SBA_AM	SBA Turnout to Arroyo Mocho	Flow Meter	Entire	15 Min	-	x	-	-	-	DWR
ARROYO SECO - LINE P										
AS_SFR	Arroyo Seco at Southfront Rd	Gauge Height	Entire	15 Min	x	x	15 Min	-	-	Balance
ARROYO VALLE - LINE E										
ADVP	Arroyo Valle at Pleasanton	Gauge Height	Entire	15 Min	x	x	15 Min	-	Quarterly	Zone 7
AVADLL	Arroyo Valle above Arroyo De La Laguna	Water Temp	-	-	-	-	15 Min	-	-	Zone 7
AVBLC	Arroyo Valle below Lang Canyon	Gauge Height	Entire	15 Min	x	x	15 Min	-	Annual	USGS
AVCAT	Arroyo Valle along Camp Arroyo Trail	Water Temp	-	-	-	-	15 Min	-	-	Zone 7
AVDCC	Arroyo Valle at Dry Creek Confluence	Water Temp	-	-	-	-	15 Min	-	-	Zone 7
AV_DIV_SC	Arroyo Valle Diversion to Shadow Cliffs	Flow Meter	Entire	Daily	-	x	-	-	-	EBRPD
AV_ISABEL	Arroyo Valle at Isabel	Water Temp	-	-	-	-	15 Min	-	-	Zone 7
AVNL	Arroyo Valle near Livermore	Gauge Height	Entire	15 Min	x	x	15 Min	-	Quarterly	USGS
AVSCPK18	Arroyo Valle at Shadow Cliffs Pond K18	Water Temp	-	-	-	-	15 Min	-	-	Zone 7
AVSGP	Arroyo Valle at Sycamore Grove Park	Water Temp	-	-	-	-	15 Min	-	-	Zone 7
LDV_FLD_GATE	Lake Del Valle Flood Gate	Calculated	Entire	15 Min	-	x	-	-	-	DWR
SBA_TO1_AV	SBA Turnout 1 to Arroyo Valle	Estimated	Entire	Daily	-	x	-	-	-	DWR
SBA_TO2_AV	SBA Turnout 2 to Arroyo Valle	Flow Meter	Entire	15 Min	-	x	15 Min	-	-	DWR
CHABOT CANAL - LINE G-1										
CC_BSRD	Chabot Canal below Stoneridge Drive nr Pleasanton	Gauge Height	Entire	15 Min	x	x	15 Min	-	-	Balance
LG1_DB	Line G1 at Dublin Blvd	Gauge Height	Entire	15 Min	x	x	15 Min	-	-	Balance
SOUTH SAN RAMON CREEK - LINE J										
LJ1_BDB	Line J1 Below Dublin Blvd	Gauge Height	Entire	15 Min	x	x	15 Min	-	-	Balance
SSRC_AAVBLVD	South San Ramon Creek above Amador Valley Blvd	Gauge Height	Entire	15 Min	x	x	15 Min	-	-	Zone 7
TASSAJARA CREEK - LINE K										
TC_BI580	Tassajara Creek below Interstate 580	Gauge Height	High	15 Min	x	x	15 Min	-	-	Balance

Quarterly Water Quality satisfies water rights requirements. SSD = Suspended Sediment Discharge. SC = Specific Conductance.

TABLE 2-2
MONTHLY FLOWS (Acre-Feet)
2022 WATER YEAR

Station	Abbrev	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Arroyo Valle														
below Lang Canyon	AVBLC	262.8	58.3	9756.8	1080.5	328.2	223.8	117	38.3	0	0	0	0	11865.7
SBA Releases	SBA_TO2_AV	128.7	442.9	122.5	303.8	437.5	276.6	37.6	4.6	5.2	6	5.7	4.8	1775.9
Lake Flood Gate	LDV_FLD_GATE	0	0	3895.5	0	0	0	0	0	0	0	0	0	3895.5
Near Livermore	AVNL	147.7	449.6	4153.4	336.6	471.4	317	76.3	21.5	6.7	7.2	10.9	11.6	6009.9
Diversion to Shadow Cliffs	AV_DIV_SC	0	0	0	0	0	0	0	0	0	0	0	0	0
Recharged Artificial	*AV_RC*	*122*	*429*	*91*	*260*	*392*	*265*	*32*	*0*	*0*	*0*	*0*	*0*	*1591*
Recharged Natural	*AV_RN*	*141*	*21*	*1695*	*-23*	*30*	*56*	*128*	*22*	*7*	*7*	*11*	*41*	*2136*
at Pleasanton	ADVP	119.5	0.1	4251.4	99.1	49.5	13.2	0.1	0	0	0	0	0	4532.9
Arroyo Mocho														
Near Livermore	AMNL	0.4	5.3	1080.4	44.9	7.9	9.5	4.8	2.5	0.4	0	0	0	1156.1
SBA Releases	SBA_AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Recharged Artificial	*AM_RC*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Recharged Natural	*AM_RN*	*339*	*17*	*857*	*46*	*8*	*18*	*22*	*2*	*0*	*0*	*0*	*9*	*1318*
at Livermore	AMHAG	220.3	8	884.6	0	0	0	0	0	0	0	0	1.4	1114.3
at Kaiser Bridge	AM_KB	187.3	6.8	723.5	0	0	0	0	0	0	0	0	0	917.6
Near Pleasanton*	AMP	1669.5	249.1	2567.2	195.5	136.2	200.5	342.6	114.1	76.8	61.8	66.8	133.5	5813.6
Arroyo Las Positas														
SBA Releases	SBA_ALTC	0	0	0	0	0	0	0	0	0	0	0	0	0
at Livermore	ALPL	1145.2	242.9	909	216.7	167.7	189.6	260.8	162.6	147.6	139.9	131	167.1	3880.1
Recharged Artificial	*ALP_RC*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Recharged Natural	*ALP_RN*	*383*	*60*	*73*	*17*	*41*	*48*	*63*	*71*	*91*	*101*	*88*	*91*	*1127*
above El Charro	ALP_ELCH	787.4	200.5	1151.8	210.3	132.6	159.6	244.3	98.2	63.6	46	49.6	97.6	3241.5
Alamo Canal/Arroyo de la Laguna														
Near Pleasanton	ACNP	4078.4	311.4	3729.4	456.8	231.2	328.4	1027.3	135	77.2	67.3	55.6	174.4	10672.4
at Verona	ADLLV	7610.6	799.8	12870.6	937.4	528.8	684.7	1595.8	348.1	173	116.2	84.2	378.4	26127.6

SBA Releases = Zone 7 releases from the South Bay Aqueduct to streams ("artificial")
Recharged Natural = stream recharge from rainfall runoff ("natural").
Recharged Artificial = recharge from South Bay Aqueduct Releases
* Below confluence with Arroyo Las Positas

TABLE 2-3
SURFACE WATER QUALITY RESULTS
2022 WATER YEAR

SITE ID	Date	Time	FLOW (cfs)	TEMP. °C	SC mS/cm	pH	Mineral Constituents (mg/L)									Select Metals (ug/L)				TDS	Hard
							Ca	Mg	Na	K	HCO3	SO4	Cl	NO3N	SiO2	B	As	Fe	Cr	mg/L	mg/L
ADLLV	9/22/2022	16:40	14.2*	21.3	985	7.8	51	30	123	6.9	240	89	149	0.56	16.1	1480	4	115	< 1	587	252
ADVP	2/15/2022	14:53	1.1	11	600	7.7	41	20	56	2.7	172	53	76	< 0.01	3	280	1	< 100	< 1	337	185
ALP_ELCH	9/22/2022	14:54	1.8	19.8	1050	7.6	35	20	143	6.1	180	49	207	0.55	12.2	2620	6.8	< 200	< 2	564	170
ALPL	9/22/2022	13:58	2.3	18.8	1330	7.8	60	38	178	4.4	316	69	239	1.92	23.5	3320	3.4	< 100	1.4	777	307
AMNL	3/23/2022	16:12	0.2	14.9	1094	7.7	42	83	55	2.6	518	90	51	< 0.1	10.7	1040	< 1	< 100	< 1	592	447
AMP	9/22/2022	15:34	2.4	23.4	1418	7.8	52	28	184	7.2	236	80	299	0.92	14.8	3050	7.4	< 200	< 2	786	245
AVBLC	3/23/2022	15:10	3.1*	20.6	626	8.2	53	35	28	1.7	281	70	13	< 0.1	11.1	570	< 1	< 100	< 1	357	276
AVNL	12/1/2021	14:15	0.8	10.7	897	7.5	57	32	84	3.2	235	102	92	< 0.1	19	850	1.7	< 100	< 1	506	274
AVNL	2/15/2022	15:54	9.0	11.4	459	8	26	17	47	2.9	117	45	57	0.6	14.8	250	1.7	< 100	< 1	271	135
AVNL	6/2/2022	13:20	0.1	18.9	931	7.6	61	35	92	3.1	260	134	96	< 0.1	18	890	1.9	< 100	< 1	568	296
AVNL	9/22/2022	17:24	0.3	17.2	957	7.8	67	39	98	3.7	286	144	91	< 0.1	23.5	1050	1.4	< 100	< 1	608	329

* Daily mean flow

SSRC_AAVBLVD
AC_WCD
LJ1_BDB
LG1_DB
TC_BI580
ACNP
CC_BSRD
AMP
AM_KB
MA_VUL_COPE
MA_COPE_I
ADVP
AVSCPK18
AMHAG
AVADLL
AV_DIV_SC
AV_ISABEL
AVSGP
AVDCC
SBA_TO1_AV
AVCAT
AVNL
SBA_TO2_AV
LDV_FLD_GATE
ADLLV
ADLL_HWY84
ALTC_BD
ALPL
ALP_ELCH
AS_SFR
LLNL_ALP
SBA_ALTC
SBA_AM
AMNL
AVBLC

Alamo Crk West Branch
South San Ramon Crk
Alamo Crk
Alamo Canal
Line G-1
Line G-2
Tassajara Crk
Tassajara Tributary
Cottonwood Crk
Line G-3
Collier Crk
Collier Tributary
Isabel Crk
Cayetano Crk
Cayetano Tributary 1
Cayetano Tributary 2
Line R-1
Line S
Line W
Altamont Crk
Arroyo Las Positas
Relocated Positas
Relocated Positas Tributary
Patterson Ru
Line J-1
Line J-2
Line J-3
Line J-4
Line F-4
Dublin Crk
Devaney Crk
Gold Creek
Chabot Canal
Pleasanton Canal
Line G-1-1
Line G-2-1
Line G-2-2
Line G-3-1
Line G-3-2
Line G-3-3
Line G-3-4
Line G-3-5
Line G-3-6
Line G-3-7
Line G-3-8
Line G-3
Line B-2-1
Line B-2-2
Line B-2-3
Line B-1
Line B-1-1
Arroyo Mocho
Line G-4
Line G-4 Tributary
Arroyo Seco
Line E-2
Vineyard Crk
SOUTH BAY AQUEDUCT
Arroyo de la Laguna
Arroyo del Valle
Stoneybrook Crk
Sinbad Crk
Alameda Creek
Vallecitos Crk
San Antonio Crk
San Antonio Creek
Coral Hollow Creek
Mountain House Creek
Grant Line Rd
Patterson Pass Rd
Mascot Blvd
W Grant Line Rd
Livermore
LIVERMORE VALLEY
AMADOR VALLEY
PLEASANTON RIDGE
ROCK SPRINGS
DOUGHERTY HILLS
CONTRA COSTA
ALAMEDA

N
W
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S

0 2 4
Miles

LEGEND

- Water Quality-Discrete
- Water Temp-Recorder
- Flow-Daily
- Flow-Recorder
- Water Quality-Water Rights
- Streams
- Lakes and Ponds
- South Bay Aqueduct
- Groundwater Basin (DWR 2016)
- Main Basin Subarea Boundary
- Main Basin
- Fringe Areas
- Upland Areas

DATE: Mar 24, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\02-SurfaceWater\02-Fig01-MapSWStations22.mxd

Figure 2-1
Map of Surface Water Monitoring Sites
2022 Water Year
Livermore Valley Groundwater Basin

3 Mining Area Monitoring

3.1 Program Changes

Presently, two mining companies, CEMEX and Vulcan Materials, have on-going surface mining operations for the extraction and sale of sands and gravels in the central portion of the Main Basin Management Area (Main Basin). The Mining Area Monitoring Program includes water level measurements and water quality analysis for many of the mining area ponds or quarry lakes within the mined area. No changes were made to the program in the 2022 WY. For more information on the Mining Area Program, see the following sections of the 2021 Alternative GSP:

- **Section 5.2.1:** Existing Monitoring and Management Programs
- **Section 14.2.7.3:** Other Monitoring Networks – Chain of Lakes/Mining Area Monitoring Program

3.2 Results for the 2022 Water Year

Figure 3-1 shows a map of the gravel mining pits and ponds that includes Fall 2022 WY groundwater elevation contours for the Upper Aquifer. ***Figure 3-2*** shows the planned locations of the future Chain of Lakes following mining activities (planned completion in 2058). ***Table 3-1*** summarizes the water levels observed in the mining area ponds for the 2022 WY. ***Table 3-2*** shows water quality results from grab samples of mining ponds for the 2022 WY. Per- and polyfluoroalkyl substances (PFAS) results from the mining ponds are shown in ***Table 3-3***. Water quality results from the mining ponds are discussed in ***Section 6: Groundwater Quality***.

The following ponds were actively mined during the 2022 WY:

Table 3-A: Ponds Actively Mined during 2022 WY

Pond	Chain of Lake	Mining Company
MA-R028	Lake D	Vulcan Materials (formerly Calmat)
MA-P046	Lake J	CEMEX (formerly RMC Lonestar)
MA-P042	Lake B	CEMEX (formerly RMC Lonestar).

- Mining Ponds MA-R028 (Lake D) and MA-P042 (Lake B) have been mined to depths such that the ponds appear to be in contact with both the Upper and Lower Aquifers. These two pond elevations are included in both the Upper and Lower Aquifer groundwater elevation contour maps presented in ***Section 5: Groundwater Elevations***.

- Pond MA-R024 was mined deeper than the depth shown on the reclamation plan. The footprint of the excavation includes a portion of Lake E and former Pond 7 to the west. The pond is temporarily being used as a silt pond. Once the silt fills in the bottom of the excavation to the final reclamation depth, a berm will be placed between Lake E and former Pond 7.

- Vulcan Materials Company (Vulcan) continues to transfer its pumped groundwater into various ponds and eventually discharges any excess water into Cope Lake. Vulcan did not discharge into Cope Lake in the 2022 WY due to a combination of a below-normal WY type and the addition of MA-R024A as a silt pond with a large storage capacity.

- CEMEX transferred its pumped groundwater into other onsite ponds and used some water as a gravel wash water source.

- Estimated groundwater transfers and losses associated with the mining area are shown in ***Table 3-B*** below.

Table 3-B: Estimated Groundwater Transfer and Losses in Mining Area, 2022 WY (AF)

Activity	2022 WY	Typical/ Average (AF)
Mining Area Transfers*		
Vulcan to Cope Lake	0	8,700
Cope Lake to Lake I	0	7,000
Diverted to Shadow Cliffs	0	600
Mining Area Losses		
Processing Losses**	700	700
Net Pond Precip/Evaporation	3,798	2,400
Pumped GW Exported from Valley	0	0

* Transfers made to locations outside of the quarries.

** Estimated

- Due to the critically dry year, Zone 7 was unable to provide any water to EBRPD for Shadow Cliffs Lake recharge.

3.3 Attached Tables and Figures

***Table 3-1**: Semiannual Water Levels in Mining Area Ponds, 2022 WY*
***Table 3-2**: Water Quality Results for Mining Area Water Samples, 2022 WY*
***Table 3-3**: PFAS Water Quality Results from Mining Area Ponds, 2022 WY*

***Figure 3-1**: Gravel Mining Pits with Groundwater Elevation Contours (Fall 2022)*
***Figure 3-2**: Future Chain of Lakes*

TABLE 3-1
SEMIANNUAL WATER LEVELS IN MINING AREA PONDS
2022 WATER YEAR

POND				CURRENT POND STATUS				POND ELEVATION (ft)				EXCAVATION					CURRENT EXCAVATION STATUS		
Pond Name	Description	Chain of Lake	Map Name	Pond Area (acre)	Contact with Aquifer	Mining Activity	Mining Use	Fall 21	Spring 22	Fall 22	WY Diff	Excavation Name	Current Owner	Deepest Depth (ft)	Permit Number	Permit Status	Current Status	Current Depth	Excavated Area (acre)
MA-C001	Lake C - southeast	C	C1	4.9	No	Static	Unused	355.82	356.48	352.54	-3.28	MA-C001	Vulcan	360	SMP 16	Active	Excavated	360	32.2
MA-R003	R3		R3	3.3	No	Pumped Into	Settling Pond	344.54	344.76	343.82	-0.72	MA-R003	Vulcan	240	SMP 16	Active	Excavated	240	14.8
MA-R004	R4		R4	10.9	Yes	In Flux	Water Storage	312.97	313.9	315.55	2.58	MA-R004	Vulcan	240	SMP 16	Active	Excavated	240	16.5
MA-R008	Lake G	G	R8	2.4	No	Pumped From	Settling Pond	NM	NM	NM		MA-R008	Vulcan	260	SMP 16	Active	Excavated	260	46
MA-R021	R21		R21	26.9	No	Static	Unused	NM	NM	NM		MA-R021	Vulcan	280	SMP 16	Active	Excavated	280	44.2
MA-R022	Lake F	F	R22	60	No	Pumped From	Settling Pond	362.58	362.92	362.32	-0.26	MA-R022	Vulcan	290	SMP 16	Active	Excavated	290	79.3
MA-R023	Vulcan Pond 5		R23	21.6	No	Pumped Into	Water Storage	360.27	360.5	361.23	0.96	MA-R023	Vulcan	270	SMP 16	Active	Excavated	270	27.5
MA-R024A	Lake E - southeast	E	R24A	58.1	Yes	Pumped Into	Settling Pond	NM	NM	249.76		MA-R024	Vulcan	200	SMP 16	Active	Excavated	200	86.9
MA-R027	Vulcan Pond 4		R27	15.7	No	In Flux	Water Storage	NM	NM	NM		MA-R027	Vulcan	300	SMP 16	Active	Excavated	300	59.5
MA-R028	Lake D - northwest	D	R28	0.6	Yes	Pumped From	Active Mining	166.36	169.71	169.04	2.68	MA-R028	Vulcan	165	SMP 16	Active	Active Mining	165	62.9
MA-K015	Shadow Cliffs	Sh.Cliff	ShCliffs	77.6	Yes	Static	Unused	320.13	318.98	315.47	-4.66	MA-K015	EBRP	265	closed	Reclaimed	Excavated	265	142.3
MA-K018	Lake Boris		K18	8.6	Yes	Static	Unused	345.88	349.71	345.94	0.06	MA-K018	EBRP	330	closed	Reclaimed	Excavated	330	24.5
MA-K019A	BMX Park Pond		K19A	2.1	Yes	Static	Unused	NM	NM	NM		MA-K019	EBRP	335	closed	Reclaimed	Backfilled		11.1
MA-K028	Lake H	H	LkH	62.1	Yes	Static	Unused	293.25	289.97	285.19	-8.06	MA-K028	Hansen	220	SMP 31/36	Reclaiming	Reclaiming	220	89.6
MA-K030	Cope Lake	Cope	Cope	174.1	No	Static	Unused	326.97	326.2	323.18	-3.79	MA-K030	Zone 7	240	SMP 31/36	Reclaimed	Reclaimed	240	233.9
MA-K037	Lake I	I	LkI	235.3	Yes	Static	Unused	285.75	282.13	275.67	-10.08	MA-K037	Zone 7	220	SMP 31/36	Active	Reclaimed	220	300.8
MA-P010	P10		P10	1	Yes	Static	Unused	353.79	363.64	356.07	2.28	MA-P010	Cemex	340	SMP 23	Active	Excavated	340	34
MA-P010A	Top Con Middle	B	P10A	15	Yes	Static	Unused	362.683	NM	NM		MA-P010	Cemex	340	SMP 23	Active	Excavated	340	34
MA-P012	Island Pond		P12	12.7	Yes	Static	Unused	346.65	350.98	347.27	0.62	MA-P012	EBRP	330	SMP 23	Reclaimed	Excavated	330	29.5
MA-P027	Lake D - southwest	D	P27	9.2	Yes	Static	Unused	270.94		NM		MA-P027	Cemex	250	SMP 23	Active	Excavated	250	31
MA-P028	Lake A - west	A	P28	7.1	Yes	Static	Unused	402.2	403.89	401.85	-0.35	MA-P028	Cemex	360	SMP 23	Active	Reclaiming	360	24.6
MA-P041	Lake A - east	A	P41	55.2	Yes	Static	Unused	409.24	412.03	409.44	0.2	MA-P041	Cemex	370	SMP 23	Active	Reclaiming	370	91.3
MA-P042	Lake B - west	B	P42	8.5	Yes	In Flux	Active Mining	256.17	262.13	NM		MA-P042	Cemex	255	SMP 23	Active	Active Mining	255	101.8
MA-P042A	Lake B - east	B	P42A	8.4	Yes	Pumped From	Active Mining	NM	NM	256.25		MA-P042	Cemex	255	SMP 23	Active	Active Mining	255	101.8
MA-P042B	Lake B - middle	B	P42B	0.1	Yes	In Flux	Active Mining	NM	NM	NM		MA-P042	Cemex	255	SMP 23	Active	Active Mining	255	101.8
MA-P043	P43		P43	80.5	No	In Flux	Settling Pond	NM	NM	NM		MA-P043	Cemex	240	SMP 23	Active	Excavated	240	130.9
MA-P044	P44		P44	13.1	Yes	In Flux	Water Storage	327.99	334.44	319.29	-8.7	MA-P044	Cemex	250	SMP 23	Active	Excavated	250	20
MA-P045	P45		P45	16.2	Yes	In Flux	Water Storage	NM	NM	NM		MA-P045	Cemex	310	SMP 23	Active	Excavated	310	25
MA-P046	Lake J	J	P46	5.2	Yes	Pumped From	Active Mining	264.13	267.98	262.96	-1.17	MA-P046	Cemex	250	SMP 23	Active	Active Mining	250	23.8

NM = Not Measured
WY Diff = Water Year Difference (Fall to Fall)

TABLE 3-2
WATER QUALITY RESULTS FOR SELECT METALS AND MINERALS
2022 WATER YEAR

			TEMP	EC		Mineral Constituents (mg/L)									Select Metals (ug/L)				TDS	Hard
SITE ID	DATE	By	°C	umhos/cm	pH	Ca	Mg	Na	K	HCO3	SO4	Cl	NO3N	SiO2	B	As	Fe	Cr	mg/L	mg/L
MA-C001	4/21/21	ZONE7	19.8	981	8.5	34	56	79	3.4	275	41	178	< 0.1	0.9	460	3	< 100	< 1	540	316
MA-K015	4/22/21	ZONE7	21.7	766	8.6	29	34	79	4.1	222	59	109	< 0.1	1.3	490	2.5	< 100	< 1	435	212
MA-K018	4/22/21	ZONE7	21.1	681	8.2	46	25	56	2.9	160	78	97	< 0.1	3.6	270	1	< 100	< 1	390	218
MA-K028	4/21/21	ZONE7	20.9	892	8.8	32	57	81	2.5	305	55	127	< 0.1	1.4	700	3.1	< 100	< 1	524	315
MA-K030	4/21/21	ZONE7	19.6	758	8.6	40	51	52	2.5	263	53	103	< 0.1	9	400	3.4	< 100	< 1	450	310
MA-K037	4/21/21	ZONE7	20	764	8.7	28	51	50	2.5	246	52	105	< 0.1	3.6	450	3.4	< 100	< 1	425	280
MA-P010	4/22/21	ZONE7	23.1	515	9.5	19	28	50	2.4	105	46	68	< 0.1	0.2	290	2.7	< 100	< 1	304	163
MA-P012	4/22/21	ZONE7	17.9	695	7.9	49	25	56	2.8	165	77	99	< 0.1	7.3	260	< 1	< 100	< 1	398	225
MA-P027	4/22/21	ZONE7	19.1	682	8.3	45	28	60	1.8	202	51	98	< 0.1	9	430	1.3	< 100	< 1	397	227
MA-P042	4/22/21	ZONE7	20.2	635	8.4	45	27	52	1.5	188	55	85	< 0.1	14.6	300	< 1	< 100	< 1	381	223
MA-P044	4/22/21	ZONE7	20	663	8.5	39	30	62	2.2	181	54	98	< 0.1	8.3	420	1.4	< 100	< 1	391	222
MA-P046	4/22/21	ZONE7	21.6	796	8	60	33	58	2.2	278	51	98	1.36	16.9	410	< 1	< 100	< 1	464	286
MA-R004	4/21/21	ZONE7	19.2	749	8.3	51	44	44	2.6	259	46	92	0.57	15.8	330	< 1	< 100	1.3	430	309
MA-R022	4/21/21	ZONE7	20.4	660	8.4	39	39	39	2.1	223	46	89	0.22	10.7	320	< 1	< 100	1.4	382	259
MA-R023	4/21/21	ZONE7	19.2	681	8.4	41	42	40	2.4	233	46	91	0.12	8.6	320	< 1	< 100	1.1	395	275
MA-R024A	4/21/21	ZONE7	18.8	762	8.3	55	46	40	2.6	289	46	92	0.88	17.5	330	< 1	< 100	1.7	452	328
MA-R028	4/21/21	ZONE7	18.2	653	7.9	55	32	35	1.6	240	43	79	1.08	19.5	280	< 1	< 100	2.8	390	270

TABLE 3-3
PFAS WATER QUALITY RESULTS FROM MINING AREA PONDS
2022 WATER YEAR
(Only PFAS Compounds with detected concentrations shown)

Well	Chain of Lake	Label	Sampled	Units	PFAS COMPOUNDS (with Response Level)					
					PFBS	PFHpA	PFHxA	PFHxS	PFOA	PFOS
					5000	-	-	20	10	40
MA-K028	H	LkH	5/3/22	ng/L	11	3.7	11	39	9.7	44
MA-K028	H	LkH	5/4/22	ng/L	5.5	2.3	5.3	14	5.9	24
MA-K030	Cope	Cope	10/13/21	ng/L	5.4	2.4	4.6	15	5.4	10
MA-K030	Cope	Cope	5/3/22	ng/L	5.5	2.3	5.3	14	5.9	24
MA-K030	Cope	Cope	5/4/22	ng/L	11	3.7	11	39	9.7	44
MA-K037	I	LkI	10/13/21	ng/L	5.4	2.6	5.3	18	6	31
MA-K037	I	LkI	5/3/22	ng/L	5.8	2.2	5.9	19	5.6	39
MA-K037	I	LkI	5/4/22	ng/L	5.8	2.2	5.9	19	5.6	39
MA-P042	B	P42	10/14/21	ng/L	< 2.0	< 2.0	< 2.0	< 2.0	2.2	2.4
MA-R028	D	R28	10/13/21	ng/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Red Text = Concentration above Response Level

LEGEND

2022 Program Wells (Upper Aquifer)

- Supply
- Monitor
- Nested
- Mining Pond
- SGMA Representative Wells

Mining Pond Areas 2022

- Static (= groundwater elevation); In Flux
- Pumped From
- Pumped Into
- Clay-lined
- Contours (Interval = 10')
- Hatch pattern towards lower elevation
- Rivers
- Township-Range Line
- Main Basin
- Fringe Areas
- Upland Areas
- Future Chain of Lakes (revised 2018)

10D7 275.99
10A2 297.9
11B1 334.35
11C3 331.91
11G1
12A2 357.35
7C2 390.8
9H13 271.5
9H10 272.79
9J7 271.06
10N2 272.53
LkH 285.19
Lki 275.67
H
I
G
F
E
12G1 339.47
R24A 249.76
9P5 268.48
Cope
R4 315.55
16E4 255.53
18E1 323.86
R28 169.04
D
ShCliffs 315.47
P46 262.96
13P5 276.15
K18 345.94
P44 319.29
19D7 258.42
16P5 307.11
22D2 304.91
P12 347.27
C
B
P10 356.07
P42A 256.25
19N3 371.78
P28 401.85
P41 409.44
A
25C3 353.88
30D2 403.8
20R2 444.3
29F4
3S/1E
3S/2E
Asco
East Pleasanton
Radum
Pleasanton
Livermore
Stanley Blvd
W Jack London Blvd
Busch Rd
Cameron Ave
Mohr Ave
Boulder St
Vineyard Ave
Ruby Hill Golf Club

N
W E
S

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Feet

DATE: Mar 24, 2022
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Figure 3-1
Gravel Mining Pits with Groundwater Elevation Contours (Fall 2022)
Livermore Valley Groundwater Basin

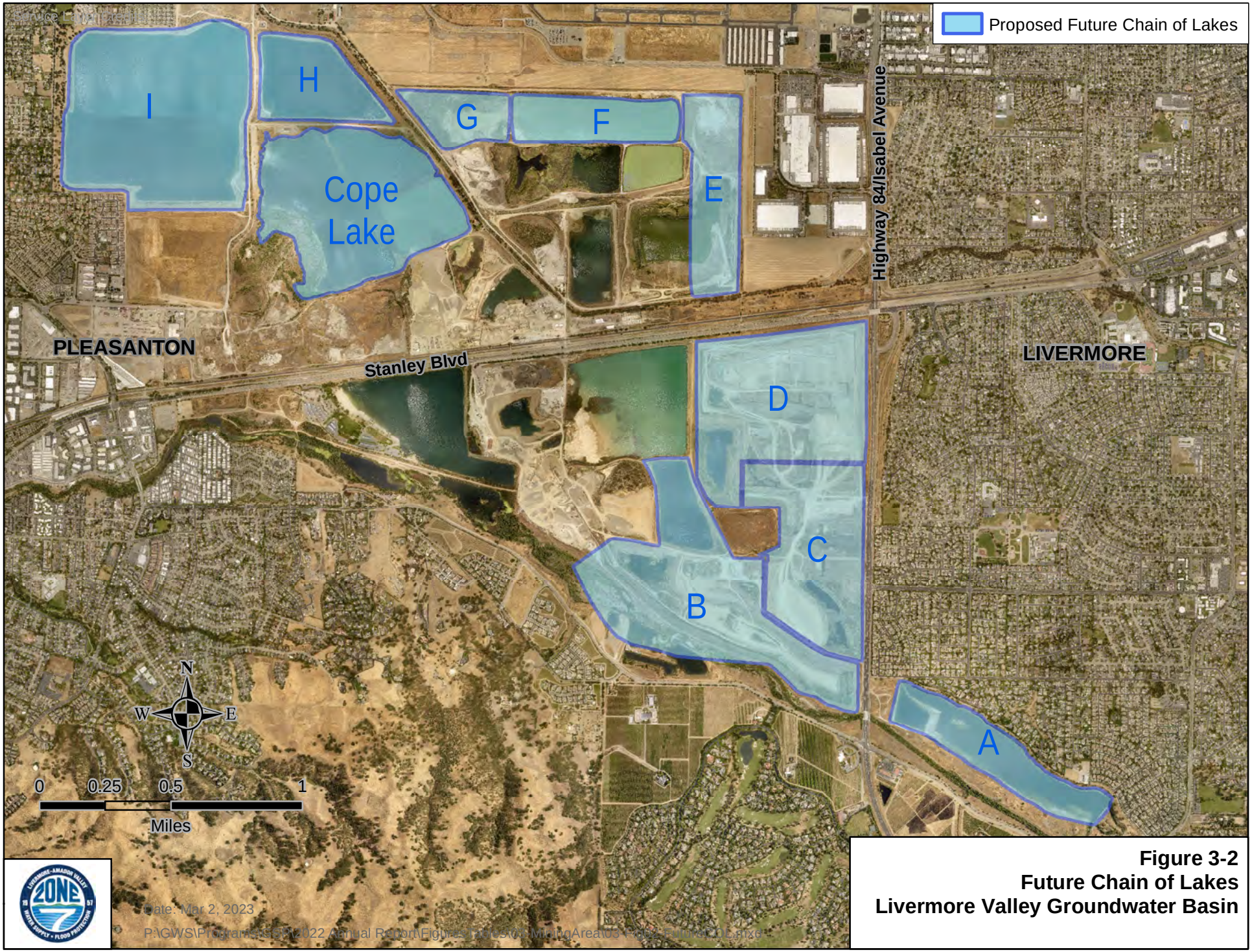

Figure 3-2
Future Chain of Lakes
Livermore Valley Groundwater Basin

Date: Mar 2, 2023

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4 Interconnected Surface Water-Groundwater Monitoring

4.1 Program Changes

As part of the 2021 Alternative GSP, Zone 7 made significant changes to the Interconnected Surface Water-Groundwater Monitoring Program including:

- Identifying potential Interconnected Surface Water (ICSW) and or Groundwater Dependent Ecosystems (GDE) areas that were not recognized in the 2016 Alternative GSP.
- Identifying 14 wells as Representative Monitoring Sites for Interconnected Surface Water (RMS-ICSW).
- Creating Sustainability Management Criteria (SMCs) for these RMS-ICSW (see ***Table 4-A*** below).

Table 4-A: SMCs for Depletions of Interconnected Surface Water

Undesirable Results Definition	Undesirable Results Criteria	Minimum Threshold (MT)	Measurable Objective (MO)
When groundwater extractions in the Basin cause significant and unreasonable depletions of hydrologically connected surface water, such that beneficial uses and users of the surface water (including the likely GDEs and protected species) are significantly and unreasonably harmed. Specifically, a significant and unreasonable negative effect would be experienced if the health of the GDE areas in the Basin are adversely impacted by mechanisms that can be directly attributed to pumping-related lowering of groundwater levels over time, rather than effects of natural or climactic processes and/or unfavorable hydrologic conditions or land use changes.	If and when Depletions of Interconnected Surface Water occur as a result of unsustainable groundwater extraction such that groundwater levels decline below their MTs in greater than 40% of the RMS-ICSW for more than two consecutive years.	Historic low water levels measured at each RMS-ICSW, or when unavailable, estimated from Zone 7 groundwater elevation rasters.	Minimum water levels measured between 2014 and 2020 at each RMS-ICSW, or when unavailable, estimated from Zone 7 groundwater elevation rasters.

GDE = Groundwater Dependent Ecosystems
RMS-ICSW = Representative Monitoring Sites for Interconnected Surface Water

More detail is available in the following sections of the 2021 Alternative GSP:

- **Section 1.2.5:** Surface Water-Groundwater Interaction/Groundwater Dependent Ecosystems Program Update

- **Section 8.8:** Current and Historical Groundwater Conditions - Groundwater Dependent Ecosystems
- **Section 13.6:** Sustainability Indicators – Depletions of Interconnected Surface Water
- **Section 14.2.6:** Monitoring Network for Depletions of Interconnected Surface Water
- **Section 14.4:** Representative Monitoring

4.2 Results for the 2022 Water Year

Figure 4-1 shows the hydrographs for the two RMS-ICSW in the vicinity of the Springtown Alkali Sink. ***Figure 4-2*** shows hydrographs for all the RMS-ICSW wells. ***Table 4-1*** compares water level measurements from the seasonal high and seasonal low 2022 WY monitoring events to the Minimum Thresholds (MTs) and Measurable Objectives (MOs) defined at RMS-ICSW wells in the 2022 Alternative GSP. The table also shows the change in elevation from the previous year's seasonal low to this year's seasonal low. Groundwater levels dropped below MTs at one RMS-ICSW (3S2E23E001 [23E1]) and below MOs at four additional RMS-ICSW (Wells 3S2E30D002 [30D2], 3S2E29F004 [29F4], 3S2E33C001 [33C1], and 3S2E16E004 [16E4]) during the seasonal low (i.e., Fall) 2022 WY monitoring event; however, all RMS-ICSW wells were measured above their MTs and MOs during the seasonal high (i.e., spring) monitoring event. The MT exceedance observed at 23E1 does not currently constitute an Undesirable Result (UR) per the definition shown in ***Table 4-A***.

4.3 Attached Tables and Figures

Table 4-1*: 2022 Groundwater Elevations at Representative Monitoring Sites for ICSW*

Figure 4-1*: Hydrographs in the Vicinity of the Alkali Sink & Springtown Springs*
Figure 4-2*: Spider Map of Representative Monitoring Sites for Interconnected Surface Water*

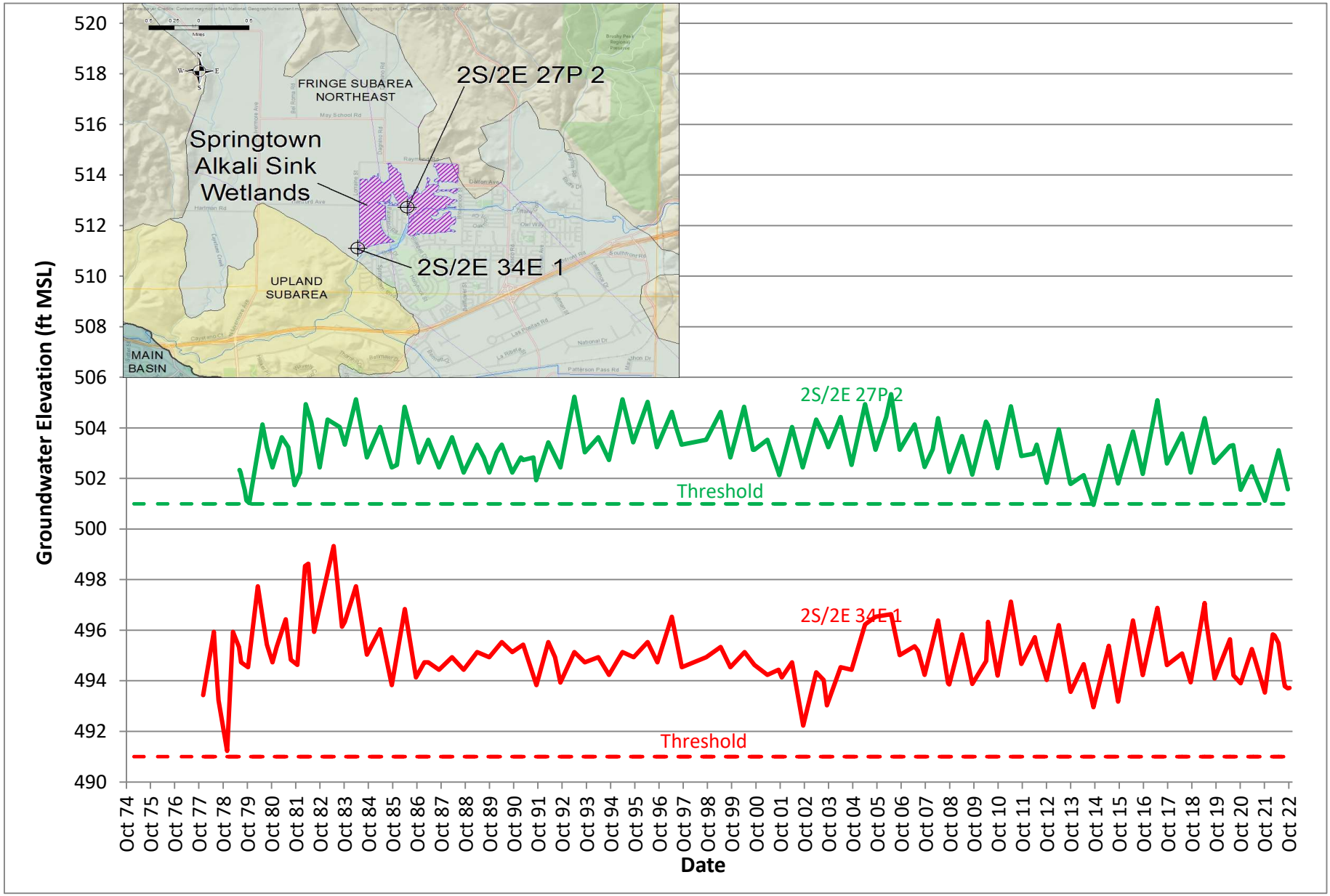
TABLE 4-1
GROUNDWATER ELEVATIONS AT REPRESENTATIVE MONITORING SITES FOR INTERCONNECTED SURFACE WATER
2022 WATER YEAR
LIVERMORE VALLEY GROUNDWATER BASIN

RMS Well		Management Area/Unit			2022 Water Year (in ft)					SMCs for ICSW (ft above MSL)				
Well Name	Map	Area	Subarea	Aquifer	Season High GWE	Season Low GWE	Change from 2021*	Height above MT	Height above MO	MT	IM-5	IM-10	IM-15	MO
3S2E30D002	30D2	Main	Amador	Upper	410	403.8	-1.83	2.8	-2.7	401	403.8	404.7	405.6	407
3S1E16P005	16P5	Main	Amador	Upper	315.31	307.11	22.22	21.91	21.91	285	285.2	285.2	285.2	285
3S2E33G001	33G1	Main	Amador	Upper	502.47	502.16	-0.16	1.16	0.86	501	501.1	501.2	501.2	501
3S2E29F004	29F4	Main	Amador	Upper	446.16	444.55	0	6.75	-0.05	438	441.2	442.3	443.5	445
3S2E33C001	33C1	Main	Amador	Upper	487.9	485.26	-0.07	3.16	-0.94	482	484.2	484.8	485.5	486
3S1E02N006	2N6	Main	Camp	Upper	337.92	336.94	0.22	5.44	3.04	332	333.9	333.9	333.9	334
3S2E16E004	16E4	Main	Mocho II	Upper	481.96	466.92	-0.09	0.02	-0.08	467	466.9	466.9	466.9	467
3S2E23E001	23E1	Main	Mocho II	Upper	596.88	594.37	0	-1.03	-1.03	595	595.4	595.4	595.4	595
4S2E01A001	1A1	Main	Mocho II	Upper	800.81	793.06	-2.9	11.86	11.86	781	781.2	781.2	781.2	781
2S2E27P002	27P2	Fringe	Spring	Upper	503.11	501.57	0.45	0.57	0.57	501	501	501	501	501
2S2E34E001	34E1	Fringe	May	Upper	495.48	493.7	0.17	2.5	0.7	491	492.1	492.4	492.7	493
3S1E05K006	5K6	Fringe	Camp	Upper	330.87	328.94	-0.76	2.94	0.74	326	328.2	328.2	328.2	328
3S1E02R001	2R1	Fringe	Camp	Upper	357.29	356.89	2.92	11.59	3.29	345	349.4	350.8	352.2	354
3S2E32E007	32E7	Upland	Upland	Upper	592.62	592.14	-0.4	0.74	0.74	591	591.4	591.4	591.4	591

RMS = Representative Monitoring Site
GWE = Groundwater Elevation (in ft above Mean Sea Level)
SMC = Sustainable Management Criteria
ICSW = Interconnected Surface Water
MSL = Mean Sea Level
IM = Interim Milestone
MO = Measurable Objective
MT = Minimum Threshold
* = 2022 Seasonal Low minus 2021 Seasonal Low

Main
Fringe
Upland

FIGURE 4-1
HYDROGRAPHS IN THE VICINITY OF THE ALKALI SINK AND SPRINGTOWN SPRINGS
LIVERMORE VALLEY GROUNDWATER BASIN



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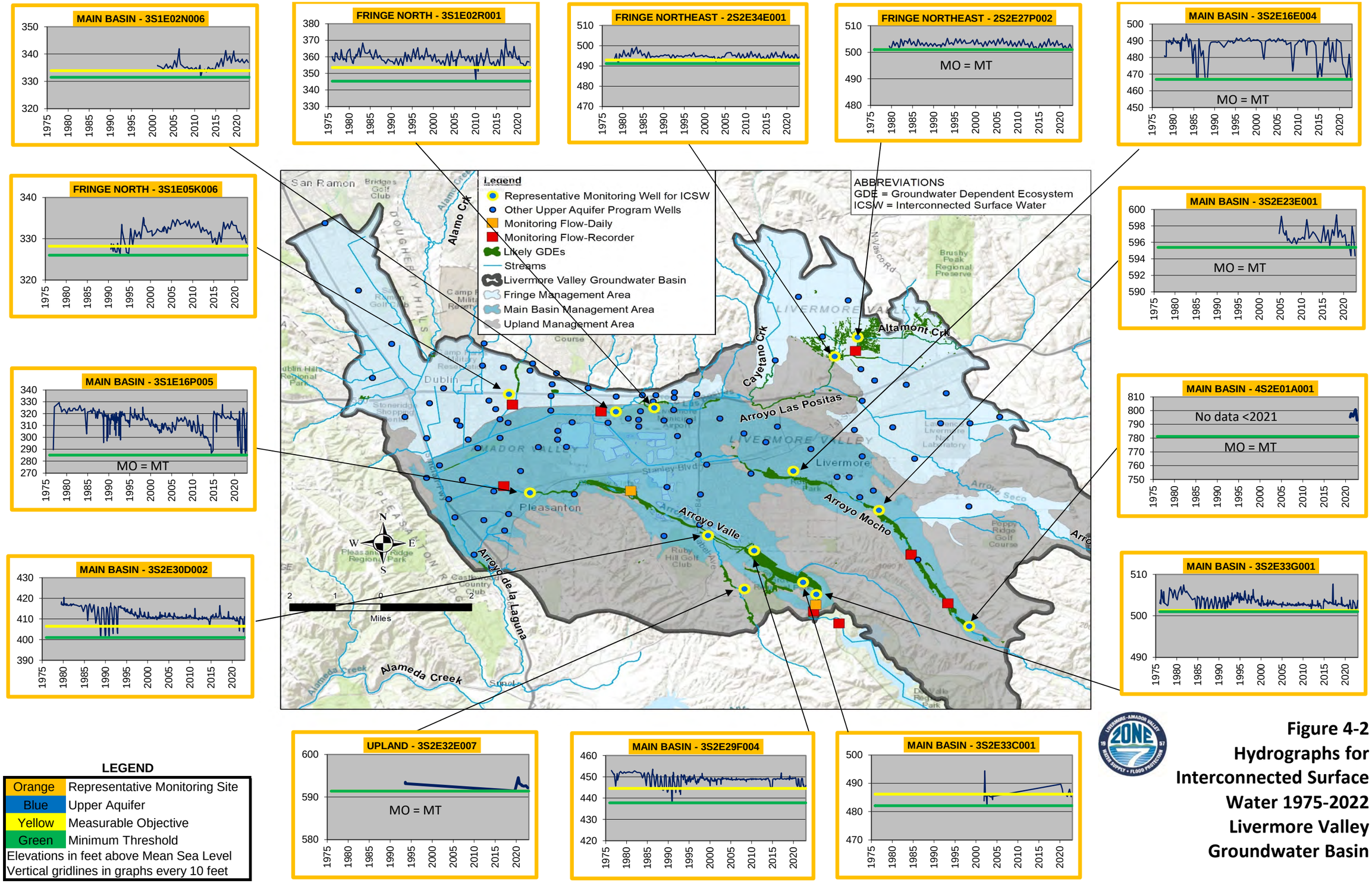
11/21/2022



LEGEND

Orange	Representative Monitoring Site
Blue	Upper Aquifer
Yellow	Measurable Objective
Green	Minimum Threshold

Elevations in feet above Mean Sea Level
Vertical gridlines in graphs every 10 feet

Figure 4-2
Hydrographs for Interconnected Surface Water 1975-2022
Livermore Valley Groundwater Basin

5 Groundwater Elevation Monitoring

5.1 Program Changes

The Groundwater Elevation Monitoring Program was unchanged for the 2022 WY.

In 2022 WY, Zone 7 began researching and pilot-testing probe/telemetry options that will allow staff to observe water levels in real time. Over the next few years, Zone 7 is planning to install several of these probe/telemetry devices in various wells, including all the Representative Monitoring Sites for Water Level (RMS-WL).

Zone 7's 2021 Alternative GSP established SMCs for Chronic Lowering of Groundwater Levels as shown in ***Table 5-A*** below.

Table 5-A: SMCs for Chronic Lowering of Groundwater Levels

Undesirable Results Definition	Undesirable Results Criteria	Minimum Threshold (MT)	Measurable Objective (MO)
If and when a chronic decline in groundwater levels over the course of the planning and implementation horizon significantly and unreasonably impairs the reasonable and beneficial use of, and access to, groundwater for beneficial uses and users within the Basin.	Water levels in greater than 25% of the RMS-WLs decline below their respective MTs for two consecutive years.	Difference between the historic low water level and maximum annual rate of groundwater change for each RMS-WL, or the historic low if annual groundwater level change data are unavailable.	Historic low water level for each RMS-WL.

RMS-WL = Representative Monitoring Sites for Water Levels

For more information on general groundwater gradients, water level trends, and the groundwater elevation program; see the following sections of the 2021 Alternative GSP:

- **Section 1.2.1:** Groundwater Level Program Updates
- **Section 8.3:** Current and Historical Groundwater Conditions - Groundwater Elevations and Flow Directions
- **Section 13.1:** Sustainability Indicators – Chronic Lowering of Groundwater Levels
- **Section 14.2.1:** Monitoring Network for Chronic Lowering of Groundwater Levels
- **Section 14.4:** Representative Monitoring

5.2 Results for the 2022 Water Year

5.2.1 General

Figure 5-1 and ***Table 5-1*** show all 236 wells in the 2022 WY Groundwater Elevation Program. ***Table 5-2*** shows wells construction information for each of the wells. ***Table 5-3*** shows water level measurements from all wells in the program for the 2022 WY. ***Table 5-4*** shows water level measurements in Representative Monitoring Sites for Water Level (RMS-WL) and their groundwater elevations relative to the MOs and MTs established in the 2021 Alternative GSP.

In general, groundwater levels for the 2022 WY followed a typical seasonal pattern observed from the historical data:

- rising in the beginning of the year with rainfall recharge and minimal pumping occurring,
- levelling off in late spring, and
- dropping during the second half of the WY as rainfall ceased and pumping demands increased.

The groundwater gradients in both the Upper and Lower Aquifers were generally from east to west and ranged from 0.005 to 0.025 feet/feet (ft/ft), except across the major groundwater barriers between the basin (e.g., the Main and Fringe – especially across the northwestern portion of the Main Basin) and across the Livermore Fault that represents the boundary between the Mocho 2 and Amador Subareas. In general, the groundwater gradient runs toward the center of the Basin where there are piezometric depressions created around several municipal wellfields and actively dewatered quarry excavations that extend into the Lower Aquifer.

Most of the groundwater elevation declines in the Basin (the steepest groundwater gradient) occur in the central area of the Main Basin, where the mining pits (MA-R028, MA-P042, and MA-P046) are being excavated. These quarry dewatering operations create groundwater depressions in pits where water is pumped and mounds in unlined pits where excess water is stored. In fact, the lowest groundwater elevation in the Basin corresponded to the pond in mining pit MA-R028 (future Lake D) at 169 feet above mean sea level (ft msl). The water from the dewatering of MA-P042 and MA-P046 (future Lakes B and J, respectively) was discharged into other adjacent clay-lined mining pits. The water from pit MA-R028 (future Lake D) was discharged into MA-R024, where it likely recharged back into the Basin.

As is usually the case, water levels in the Fringe Management Area (Fringe Area) and Upland Management Area (Upland Area) stayed relatively constant throughout the 2022 WY. Wells located in the Fringe and Upland Areas rely mainly on natural recharge to maintain water supply. During below normal, dry, and critically dry hydrologic years, natural recharge may not be sufficient to maintain the groundwater levels in these wells and lack of sufficient natural recharge

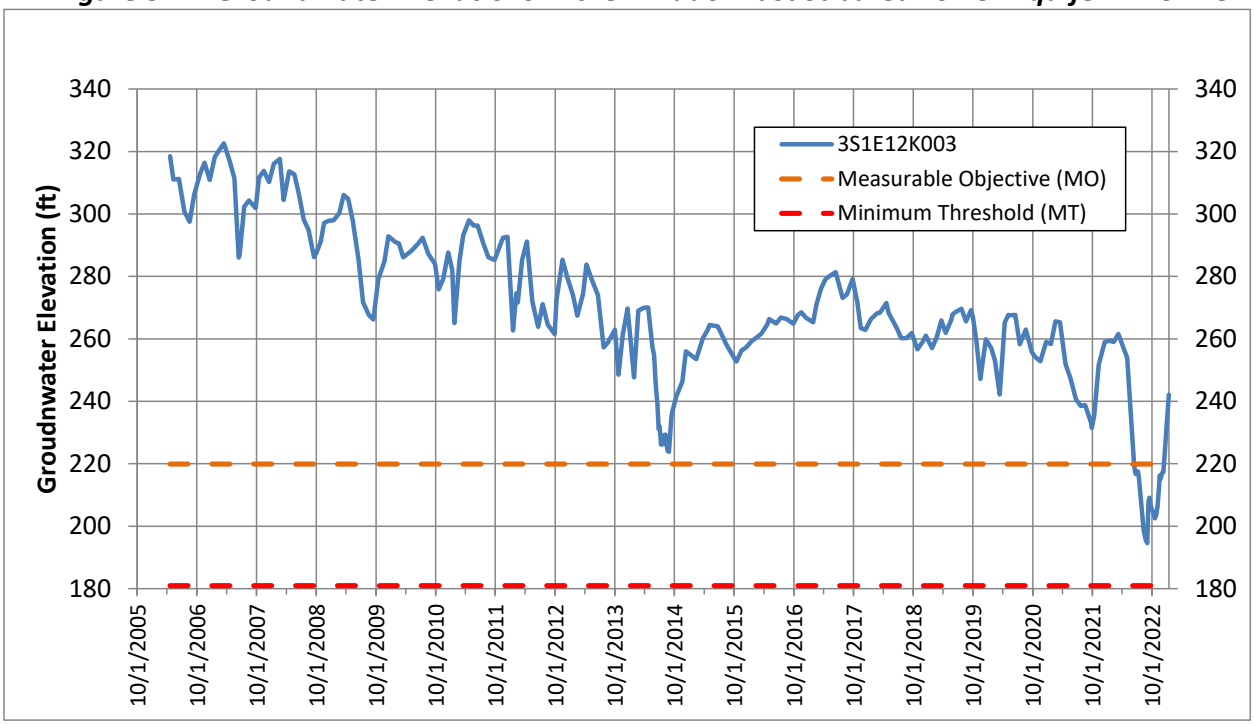
can potentially cause loss of production in these wells. In order to sustainably manage these Management Areas, groundwater pumping must be limited to available supply from natural recharge.

5.2.2 Representative Monitoring Sites for Water Levels (RMS-WL)

Figure 5-2 shows locations of all RMS-WL for the 2022 WY. ***Figure 5-3*** shows hydrographs of historical and recent groundwater elevations at all RMS-WL, respectively. These hydrographs further demonstrate the seasonal trends observed in both the Upper/Fringe Aquifers and the Lower Aquifer. The seasonal fluctuations are greater in the Lower Aquifer where more pumping occurs to meet seasonal demands in the warmer months, and when surface water treatment plant outages occur.

Table 5-4 compares water level measurements from the seasonal high (Spring) and seasonal low (Fall) 2022 WY monitoring events to the MTs and MOs defined at RMS-WL wells in the 2022 Alternative GSP. The table also shows the change in elevation from the previous year's seasonal low to this year's seasonal low. Groundwater elevations in all Main Basin RMS-WL wells in the Upper Aquifer dropped relative to 2021 WY conditions, especially in the Lower Aquifer (up to 26.2 feet [ft]). Water levels at all RMS-WL wells continued to remain above their respective MTs. Water levels remained above the MOs except for 3S1E12K003 (RMS-WL for the Amador East Subarea Lower Aquifer) which dropped below the MO in June 2022 and had a seasonal low at 25.3 ft below the MO on September 2, 2022 (but was still 13.6 ft above the MT, see ***Figure 5-A*** below).

Figure 5-A: Groundwater Elevations in the Amador East Subarea Lower Aquifer RMS-Well



Zone 7 closely monitored the decreasing water level in this RMS-WL well as it approached and exceeded the MO threshold. In response, Zone 7 performed several management actions described in ***Section 11.3***. As a result of these management actions (and assisted by rainfall later in the month), the water level in this RMS-WL began increasing after September 2, 2022, and recovered above the MO in December 2022.

In the Fringe Aquifer, water elevations in the RMS-WL wells stayed relatively constant throughout the 2022 WY, generally varying by less than 3.0 ft compared to groundwater levels in 2021 WY. The RMS-WL in the Upland Area (Well 3S2E21K009 [21K9]) could not be accessed for the Spring measurement; however, the water level was over 6.0 ft above the MO and MT for the Fall measurement.

5.2.3 Upper and Fringe Aquifers

Figure 5-4 and ***Figure 5-5*** show 2022 WY groundwater elevation contours in the Upper and Fringe Aquifers during seasonal high (Spring) and seasonal low (Fall) conditions, respectively. ***Figure 5-6*** shows the difference in water elevations from Fall 2021 to Fall 2022. ***Figure 5-7*** shows the depth to water using Fall 2022 water levels.

Upper Aquifer water levels generally fluctuated by less than 5.0 ft except in the western portion of the Main Basin where the water level dropped more than 15 ft. This is likely because of below average groundwater recharge (from rainfall and stream sources) and above average municipal pumping in this portion of the Basin.

Water levels in wells in the southwestern portion of the Basin near the Arroyo de la Laguna (as indicated primarily by the RMS-WL for the Bernal Subarea Upper Aquifer 3S1E20C007 [20C7] and Well 3S1E29M004 [29M4]) were below the upper threshold groundwater elevation at which Basin overflow occurs (i.e., about 295 ft msl). Consequently, no water overflowed from the Upper Aquifer into the Arroyo de la Laguna and exited the Basin during the 2022 WY.

5.2.4 Lower Aquifer

Figure 5-8 and ***Figure 5-9*** show 2022 WY groundwater elevation contours in the Lower Aquifer during seasonal high (Spring) and seasonal low (Fall) conditions, respectively. ***Figure 5-10*** shows the difference in groundwater elevations from Fall 2021 to Fall 2022***. Figure 5-11*** shows the height of water levels above historic lows, which was used to create the Measurable Objectives for the Main Basin.

For the third consecutive year, seasonal low groundwater elevations in the Lower Aquifer continued to decline from the previous year because of below average groundwater recharge (from rainfall and stream sources), above-average municipal pumping, and additional dewatering from deeper mining excavations. Lower Aquifer water levels dropped significantly (up to about 45 ft) in portions of the Basin from Fall 2021 to Fall 2022. In general, groundwater elevations in the western (Bernal Subarea) and eastern (Mocho II Subarea) portions of the Main Basin remained well above historic lows (up to about 140 ft). However, there were three main areas in the Amador Subarea with significant drawdown as indicated in orange and red areas in ***Figure 5-11***:

- In the southwestern portion of the Amador Subarea - this drawdown was likely caused by pumping from the Pleasanton municipal wells (P5, P6, and P8) and/or a Shadow Cliffs Park pumping well (15J3). This area was up to 27 ft below the historic low.

- In the northeastern portion of the Amador Subarea - this was likely caused by municipal pumping from California Water Service (CWS 20 and CWS 24 Wells) and Zone 7 (Stoneridge and COL Wells), lower than normal recharge along the Arroyo Mocho, and boundary effects from the northern portion of the basin. Portions of this area appeared to be up to about 20 ft below historic low. Note that fall low water levels were not provided by CWS for this report – water levels shown on the figures are estimated based on historical values and nearby water levels.

- The mining area in the central and southern portion of the Amador Subarea - the two current mining excavations (MA-R028 by Vulcan and MA-P042 by CEMEX, see ***Section 3***) have extended down into the lower aquifer and gone below the historic low. Mining Area Pond MA-R-028 appears to be about 45 ft below the historic low.

5.3 Attached Tables and Figures

***Table 5-1**: Groundwater Elevation Program Wells and Respective Monitoring Frequency*
***Table 5-2**: Well Construction Details*
***Table 5-3**: Table of Semiannual Groundwater Levels, Fall 2021 To Fall 2022*
***Table 5-4**: Table of Semiannual Groundwater Levels in Representative Monitoring Sites, Fall 2021 To Fall 2022*

***Figure 5-1**: Map of Wells in Water Level Monitoring Network*
***Figure 5-2**: Representative Monitoring Sites*
***Figure 5-3**: Hydrographs, 1975 to 2022 WYs*
***Figure 5-4**: Groundwater Gradient Map, Upper Aquifer, Spring 2022 WY*
***Figure 5-5**: Groundwater Gradient Map, Upper Aquifer, Fall 2022 WY*
***Figure 5-6**: Change in Groundwater Elevation, Upper Aquifer, Fall 2021 WY to Fall 2022 WY*
***Figure 5-7**: Depth to Groundwater, Upper Aquifer, Fall 2022 WY*
***Figure 5-8**: Groundwater Gradient Map, Lower Aquifer, Spring 2022 WY*
***Figure 5-9**: Groundwater Gradient Map, Lower Aquifer, Fall 2022 WY*
***Figure 5-10**: Change in Groundwater Elevation, Lower Aquifer, Fall 2021 WY to Fall 2022 WY*
***Figure 5-11**: Map of Groundwater Levels Above Historical Lows, Lower Aquifer, Fall 2022 WY*

TABLE 5-1
MONITORING WELLS IN 2022 GROUNDWATER LEVELS PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Meas By	Frequency (per year)	Recorder (min)	RMS-WL	RMS-ICSW	Key	Water Rights	Other
1S4E31P005	31P5	CASGEM Tracy WAPA	Tracy	U	monitor	unknown	Zone 7	2						
2S1E32E001	32E1	End of Arnold Rd	None	U	monitor	active	Zone 7	2						
2S1E32N001	32N1	Camp Parks	Camp	U	monitor	active	Zone 7	2						
2S1E32Q001	32Q1	Summer Glen Dr	Camp	U	monitor	active	Zone 7	2						
2S1E33L001	33L1	Gleason Dr @ Tassajara	None	U	monitor	active	Zone 7	2						
2S1E33P002	33P2	Central Pkwy at Emerald Glen Pk	Camp	U	monitor	active	Zone 7	2						
2S1E33R001	33R1	Central Pkwy @ Grafton	None	U	monitor	active	Zone 7	2						
2S1W15F001	15F1	BOLLINGER	Bishop	U	monitor	active	Zone 7	2						
2S1W26C002	26C2	PINE VALLEY	Dublin	U	monitor	active	Zone 7	2						
2S1W36E003	36E3	Kolb Park	Dublin	U	monitor	active	Zone 7	2						
2S1W36F001	36F1	Dublin High shallow	Dublin	L	nested	active	Zone 7	2						
2S1W36F002	36F2	Dublin High mid	Dublin	L	nested	active	Zone 7	2						
2S1W36F003	36F3	Dublin High deep	Dublin	L	nested	damaged	Zone 7	2						
2S2E21L001	21L1	Merlin	May	U	domestic	active	Zone 7	2						
2S2E27C002	27C2	Dagnino Rd	Spring	U	domestic	active	Zone 7	2						
2S2E27K001	27K1	Model Airport	Spring	U	livestock	inactive	Zone 7	2						
2S2E27M002	27M2	Kwan	May	U	domestic	active	Zone 7	2						
2S2E27P002	27P2	hartford ave east	Spring	U	monitor	active	Zone 7	2			X			
2S2E28D002	28D2	May School	May	U	monitor	active	Zone 7	2						
2S2E28J002	28J2	FCC Well	May	L	industrial	active	Zone 7	2						
2S2E28Q001	28Q1	hartford ave	May	U	monitor	active	Zone 7	2						
2S2E32K002	32K2	jenson's N liv. Ave	Cayetano	U	monitor	active	Zone 7	2						
2S2E34E001	34E1	Mud City	May	U	monitor	active	Zone 7	12		X	X			
2S2E34Q002	34Q2	Hollyhock & Crocus	Spring	U	monitor	active	Zone 7	2						
2S3E01D001	1D1	CASGEM Tracy PGE	Tracy	U	irrigation	unknown	Zone 7	2						
3S1E01F002	1F2	Constitution Dr	Camp	U	monitor	active	Zone 7	2						
3S1E01H003	1H3	Collier Canyon g1	Camp	U	monitor	active	LWRP	2						
3S1E01J004	1J04	Collier Vineyards	Camp	L	irrigation	active	Zone 7	2						
3S1E01L001	1L1	Kitty Hawk	Camp	U	monitor	active	Zone 7	2						
3S1E01P002	1P2	Airport gas g5	Amador	U	monitor	active	LWRP	2						
3S1E01P003	1P3	New airport well	Amador	L	supply	inactive	Zone 7	2						
3S1E02J002	2J2	Maint. Bldg	Camp	U	monitor	active	Zone 7	2						
3S1E02J003	2J3	Doolan Rd East	Camp	U	monitor	active	Zone 7	2						
3S1E02K002	2K2	Doolan Rd West	Camp	U	monitor	active	Zone 7	2						
3S1E02M003	2M3	Friesman Rd North	Camp	U	monitor	active	Zone 7	2						
3S1E02N006	2N6	Friesman Rd South	Amador	U	monitor	active	Zone 7	2			X			
3S1E02P003	2P3	Crosswinds Church	Camp	L	domestic	active	Zone 7	2						
3S1E02Q001	2Q1	LPGC #1	Amador	U	monitor	active	Zone 7	2						
3S1E02R001	2R1	Beebs	Amador	U	monitor	active	LWRP	2			X			

TABLE 5-1
MONITORING WELLS IN 2022 GROUNDWATER LEVELS PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Meas By	Frequency (per year)	Recorder (min)	RMS-WL	RMS-ICSW	Key	Water Rights	Other
3S1E03G002	3G2	fallon rd	Camp	U	monitor	active	Zone 7	2						
3S1E04A001	4A1	SMP-DUB-2	Camp	U	monitor	active	Zone 7	2						
3S1E04J005	4J5	Pimlico shallow	Camp	U	monitor	active	Zone 7	2						
3S1E04J006	4J6	Pimlico deep	Camp	U	monitor	active	Zone 7	2						
3S1E04Q002	4Q2	gulfstream	Amador	U	monitor	active	Zone 7	2						
3S1E05K006	5K6	Rosewood shallow	Camp	U	monitor	active	Zone 7	2			X			
3S1E05K007	5K7	Rosewood deep	Camp	L	monitor	active	Zone 7	2						
3S1E05L003	5L3	Oracle	Camp	U	monitor	active	Zone 7	2						
3S1E05P006	5P6	Owens Park	Camp	U	monitor	active	Zone 7	2						
3S1E06F003	6F3	Dublin Ct	Dublin	U	monitor	active	Zone 7	12		X				
3S1E06G005	6G5	Nissan Repair	Dublin	L	industrial	GPO Intent to use	Zone 7	2						
3S1E06N002	6N2	DSRSD MW-3	Dublin	U	monitor	active	Zone 7	2						
3S1E07B002	7B2	Hopyard rd	Dublin	L	monitor	active	Zone 7	2						
3S1E07B012	7B12	Hacienda Arch	Dublin	U	monitor	active	Zone 7	2						
3S1E07G007	7G7	Chabot Well	Dublin	U	monitor	active	Zone 7	2						
3S1E07J005	7J5	Thomas Hart School	Dublin	U	monitor	active	Zone 7	2						
3S1E08B001	8B1	Lizard Well	Amador	U	monitor	active	Zone 7	2						
3S1E08G004	8G4	Apache	Amador	U	monitor	active	Zone 7	2						
3S1E08H009	8H9	Mocho 4 Nested Shallow	Amador	L	nested	active	Zone 7	2						
3S1E08H010	8H10	Mocho 4 Nested Middle	Amador	L	nested	active	Zone 7	2						
3S1E08H011	8H11	Mocho 4 Nested deep	Amador	D	nested	active	Zone 7	2						
3S1E08H013	8H13	Mocho 3 mon	Amador	D	monitor	active	Zone 7	2						
3S1E08H018	M4	Mocho 4	Amador	L	muni	active	Zone 7	2						
3S1E08K001	8K1	Cockroach well	Amador	U	monitor	active	Zone 7	2						
3S1E08N001	8N1	sports park	Bernal	U	monitor	active	Zone 7	2						
3S1E09H010	9H10	NW Lake I Shallow	Amador	U	nested	active	Zone 7	2						
3S1E09H011	9H11	NW Lake I Deep	Amador	L	nested	active	Zone 7	2						
3S1E09H013	9H13	Lister	Amador	U	domestic	active	Zone 7	2						
3S1E09J007	9J7	SW Lake I Shallow	Amador	U	nested	active	Zone 7	2						
3S1E09J008	9J8	SW Lake I Middle	Amador	L	nested	active	Zone 7	2						
3S1E09J009	9J9	SW Lake I Deep	Amador	L	nested	active	Zone 7	2						
3S1E09M002	M1	Mocho 1	Amador	L	muni	active	Zone 7	2						
3S1E09M003	M2	Mocho 2	Amador	L	muni	active	Zone 7	2						
3S1E09M004	M3	Mocho 3	Amador	L	muni	active	Zone 7	2						
3S1E09P005	9P5	Key_AmW_U (Mohr Key)	Amador	U	monitor	active	Zone 7	12		X		X		
3S1E09P009	9P9	Mohr Ave Shallow	Amador	L	nested	active	Zone 7	12	15					X
3S1E09P010	9P10	Key_AmW_L	Amador	L	nested	active	Zone 7	12		X		X		
3S1E09P011	9P11	Mohr Ave Deep	Amador	L	nested	active	Zone 7	12						X
3S1E10A002	10A2	El Charro Rd	Amador	U	monitor	active	Zone 7	2						

TABLE 5-1
MONITORING WELLS IN 2022 GROUNDWATER LEVELS PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Meas By	Frequency (per year)	Recorder (min)	RMS-WL	RMS-ICSW	Key	Water Rights	Other
3S1E10B008	10B8	Kaiser Rd Shallow	Amador	L	nested	active	Zone 7	2						
3S1E10B009	10B9	Kaiser Rd Middle 1	Amador	L	nested	active	Zone 7	2						
3S1E10B010	10B10	Kaiser Rd Middle 2	Amador	L	nested	unknown	Zone 7	2						
3S1E10B011	10B11	Kaiser Rd Deep	Amador	D	nested	active	Zone 7	2						
3S1E10B014	COL5 Mon	COL 5 Monitoring	Amador	L	monitor	unknown	Zone 7	2						
3S1E10D002	10D2	Stoneridge Shallow	Amador	L	nested	active	Zone 7	2						
3S1E10D003	10D3	Stoneridge Middle 1	Amador	L	nested	active	Zone 7	2						
3S1E10D004	10D4	Stoneridge Middle 2	Amador	L	nested	active	Zone 7	2						
3S1E10D005	10D5	Stoneridge Deep	Amador	D	nested	active	Zone 7	2						
3S1E10D007	10D7	North Lake I Shallow	Amador	U	nested	active	Zone 7	2						
3S1E10D008	10D8	North Lake I Cluster 2	Amador	L	nested	active	Zone 7	2						
3S1E10K002	COL1 Mon	COL 1 Monitoring	Amador	L	monitor	active	Zone 7	2						
3S1E10N002	10N2	South Lake I Shallow	Amador	U	nested	active	Zone 7	2						
3S1E10N003	10N3	South Lake I Deep	Amador	L	nested	active	Zone 7	2						
3S1E11B001	11B1	Airport West	Amador	U	monitor	active	LWRP	2						
3S1E11C003	11C3	LAVWMA ROW	Amador	U	monitor	active	Zone 7	2						
3S1E11G001	KeyAmEU	Key_AmE_U	Amador	U	nested	active	Zone 7	12		X		X		
3S1E11G002	11G2	Rancho Charro Middle 1	Amador	L	nested	active	Zone 7	12						X
3S1E11G003	11G3	Rancho Charro Middle 2	Amador	L	nested	active	Zone 7	12						X
3S1E11G004	11G4	Rancho Charro Deep	Amador	D	nested	active	Zone 7	12						X
3S1E11M002	COL2 Mon	COL 2 Monitoring	Amador	L	monitor	active	Zone 7	2						
3S1E11P006	11P6	New Jamieson Residence	Amador	L	domestic	active	Zone 7	2						
3S1E12A002	12A2	Airport South	Amador	U	monitor	active	LWRP	2						
3S1E12D002	12D2	LWRP G6	Amador	U	monitor	active	LWRP	2						
3S1E12G001	12G1	Oaks Park Shallow	Amador	U	monitor	active	LWRP	2						
3S1E12H004	12H4	LWRP Shallow	Amador	L	nested	active	Zone 7	2						
3S1E12H005	12H5	LWRP Middle 1	Amador	L	nested	active	Zone 7	2						
3S1E12H006	12H6	LWRP Middle 2	Amador	L	nested	active	Zone 7	2						
3S1E12H007	12H7	LWRP Deep	Amador	D	nested	active	Zone 7	2						
3S1E12K002	12K2	Oaks Park Mid	Amador	L	nested	active	Zone 7	12						X
3S1E12K003	KeyAmELow	Key_AmE_L	Amador	L	nested	active	Zone 7	12		X		X		
3S1E12K004	12K4	Oaks Park Deep	Amador	D	nested	active	Zone 7	12						X
3S1E13P005	13P5	LGA Grant Nested 1	Amador	U	nested	active	Zone 7	2						
3S1E13P006	13P6	LGA Grant Nested 2	Amador	L	nested	active	Zone 7	2						
3S1E13P007	13P7	LGA Grant Nested 3	Amador	L	nested	active	Zone 7	2						
3S1E13P008	13P8	LGA Grant Nested 4	Amador	L	nested	active	Zone 7	2						
3S1E14B001	14B1	Industrial Asphalt	Amador	L	industrial	active	Zone 7	2						
3S1E14D002	14D2	South Cope Lake	Amador	L	monitor	active	Zone 7	2						
3S1E15F003	15F3	Kaiser #8	Amador	L	supply	inactive	Zone 7	2						

TABLE 5-1
MONITORING WELLS IN 2022 GROUNDWATER LEVELS PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Meas By	Frequency (per year)	Recorder (min)	RMS-WL	RMS-ICSW	Key	Water Rights	Other
3S1E15J003	15J3	shadow cliff	Amador	L	supply	unknown	Zone 7	2						
3S1E15M003	15M3	Bush/Valley South	Amador	L	monitor	active	Zone 7	2						
3S1E16A004	16A4	Bush/Valley Mid	Amador	L	monitor	active	Zone 7	2						
3S1E16B001	16B1	Bush/Valley North	Amador	D	monitor	active	Zone 7	2						
3S1E16C002	16C2	Santa Rita Valley Shallow	Amador	L	nested	active	Zone 7	2						
3S1E16C003	16C3	Santa Rita Valley Middle	Amador	L	nested	active	Zone 7	2						
3S1E16C004	16C4	Santa Rita Valley Deep	Amador	L	nested	active	Zone 7	2						
3S1E16E004	16E4	black ave - cultural	Amador	U	monitor	active	Zone 7	2						
3S1E16L002	P4	Pleas 4	Amador	L	muni	inactive	Pleas	2						
3S1E16P005	16P5	Vervais Monitor	Amador	U	monitor	active	Zone 7	12			X		X	
3S1E16R001	16R1	Stanley Berry Farm	Amador	L	supply	unknown	Zone 7	2						
3S1E17B004	17B4	Casterson	Amador	L	supply	unknown	Zone 7	2						
3S1E17D003	17D3	Hopyard Nested Shallow	Bernal	L	nested	active	Zone 7	2						
3S1E17D004	17D4	Hopyard Nested Middle 1	Bernal	L	nested	active	Zone 7	2						
3S1E17D005	17D5	Hopyard Nested Middle 2	Bernal	L	nested	active	Zone 7	2						
3S1E17D006	17D6	Hopyard Nested Middle 3	Bernal	L	nested	active	Zone 7	2						
3S1E17D007	17D7	Hopyard Nested Deep	Bernal	D	nested	active	Zone 7	2						
3S1E17D010	H7	Hopyard 7	Bernal	L	monitor	active	Zone 7	2						
3S1E17D011	17D11	Hopyard 9 Monitoring Well	Bernal	L	monitor	active	Zone 7	2						
3S1E18A005	P7	Pleas 7	Bernal	L	muni	inactive	Pleas	2						
3S1E18E004	18E4	Valley Trails II	Bernal	U	monitor	active	Zone 7	2						
3S1E18J002	18J2	camino segura	Bernal	U	monitor	active	Zone 7	2						
3S1E18N001	18N1	merritt	Bernal	L	irrigation	unknown	Zone 7	2						
3S1E19A010	SF-B	SFWD South (B)	Bernal	L	muni	active	Zone 7	2						
3S1E19A011	SF-A	SFWD North (A)	Bernal	L	muni	active	Zone 7	2						
3S1E19C004	19C4	del valle & laguna	Bernal	U	monitor	active	Zone 7	2						
3S1E19K001	19K1	680/bernal	Bernal	U	monitor	active	Zone 7	2						
3S1E20C003	20C3	Fairgrounds Potable Backup	Bernal	L	supply	active	Zone 7	2						
3S1E20C007	20C7	Key_Bern_U	Bernal	U	monitor	active	Zone 7	12		X		X	X	
3S1E20C008	20C8	Key_Bern_L	Bernal	L	nested	active	Zone 7	12		X		X		
3S1E20C009	20C9	Fair Nested Deep	Bernal	L	nested	active	Zone 7	12						X
3S1E20J004	20J4	civic center	Bernal	U	monitor	active	Zone 7	2						
3S1E20M011	20M11	S.F "M"LINE	Bernal	U	monitor	active	Zone 7	2						
3S1E20Q002	20Q2	20Q2	Bernal	U	monitor	active	Zone 7	2						
3S1E22D002	22D2	vineyard trailer	Amador	U	monitor	active	Zone 7	2						
3S1E23J001	23J1	1627 vineyard trailer	Amador	L	domestic	unknown	Zone 7	2						
3S1E24Q001	24Q1	Ruby Hills	Amador	L	irrigation	unknown	Zone 7	2						
3S1E25C003	25C3	Katz Winery Mansion	Amador	U	monitor	unknown	Zone 7	2						
3S1E28M002	28M2	Bargar	Upland	U	supply	active	Zone 7	2						

TABLE 5-1
MONITORING WELLS IN 2022 GROUNDWATER LEVELS PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Meas By	Frequency (per year)	Recorder (min)	RMS-WL	RMS-ICSW	Key	Water Rights	Other
3S1E29M004	29M4	f.c. channel	Castle	U	monitor	active	Zone 7	12					X	
3S1E29P002	29P2	castlewood dr	Bernal	U	monitor	active	Zone 7	2						
3S1E33G005	33G5	Pleasanton Calippe 33G5	Upland	U	monitor	unknown	Zone 7	2						
3S1W01B009	1B9	DSRSD Shallow	Dublin	L	nested	unknown	Zone 7	2						
3S1W01B010	1B10	DSRSD Middle	Dublin	L	nested	unknown	Zone 7	2						
3S1W01B011	1B11	DSRSD Deep	Dublin	L	nested	unknown	Zone 7	2						
3S1W02A002	2A2	McNamara's	Dublin	U	monitor	active	Zone 7	2						
3S1W12B002	12B2	Stoneridge Mall Rd	Dublin	U	monitor	active	Zone 7	2						
3S1W12J001	12J1	DSRSD South	Dublin	U	monitor	active	Zone 7	2						
3S1W13J001	13J1	muirwood dr	Castle	U	monitor	active	Zone 7	2						
3S2E01F002	1F2	Brisa at Circuit City	Spring	U	monitor	active	Zone 7	2						
3S2E02B002	2B2	south front rd	Spring	U	monitor	active	Zone 7	2						
3S2E03A001	3A1	Bluebell	Spring	U	monitor	active	Zone 7	2						
3S2E03K003	3K3	first & S. front rd	Mocho I	U	monitor	active	Zone 7	2						
3S2E05N001	5N1	Spider Well	Mocho II	M	supply	inactive	Zone 7	2						
3S2E07C002	7C2	jaws - york way - G4	Mocho II	U	monitor	active	LWRP	2						
3S2E07H002	7H2	dakota	Mocho II	U	monitor	active	Zone 7	2						
3S2E07N002	7N2	Isabel & Arroyo Mocho	Amador	U	monitor	active	Zone 7	2						
3S2E07P003	CWS24	CWS 24	Amador	L	muni	active	CWS	2						
3S2E07R002	7R2	CWS 31 Monitoring	Mocho II	D	monitor	active	CWS	2						
3S2E07R003	CWS31	CWS 31	Upland	L	muni	active	CWS	2						
3S2E08H002	8H2	North k	Mocho II	U	monitor	active	Zone 7	2						
3S2E08H003	8H3	Key_Mo2_L	Mocho II	L	nested	active	Zone 7	12		X		X		
3S2E08H004	8H4	N Liv Ave Deep	Mocho II	L	nested	active	Zone 7	12						X
3S2E08K002	8K2	Key_Mo2_U (Livermore Key)	Mocho II	U	monitor	active	Zone 7	12	15	X		X		
3S2E08N002	CWS14	CWS 14	Mocho II	L	muni	active	CWS	2						
3S2E08P001	CWS8	CWS 8	Mocho II	L	muni	active	CWS	2						
3S2E08Q009	8Q9	D-2	Mocho II	L	monitor	active	Zone 7	2						
3S2E09Q004	9Q4	school st	Mocho II	U	monitor	active	Zone 7	2						
3S2E10F003	10F3	hexcel	Mocho I	U	monitor	active	Zone 7	2						
3S2E10Q001	10Q1	almond	Mocho II	U	monitor	active	Zone 7	2						
3S2E10Q002	10Q2	LLNL W-703	Mocho II	L	monitor	unknown	LLNL	2						
3S2E11C001	11C1	joan way	Mocho I	U	monitor	active	Zone 7	2						
3S2E12C004	12C4	LLNL W-486	Spring	U	monitor	unknown	LLNL	2						
3S2E12J003	12J3	LLNL W-017A	Spring	L	monitor	unknown	LLNL	2						
3S2E14A003	14A3	S. vasco @east ave	Mocho I	U	monitor	active	LLNL	2						
3S2E14B001	14B1	5763 east ave	Mocho I	L	domestic	unknown	Zone 7	2						
3S2E15E002	15E2	Retzlaff Winery	Mocho II	L	irrigation	active	Zone 7	2						
3S2E15L001	15L1	Concannon 2	Mocho II	U	monitor	active	Other	2						

TABLE 5-1
MONITORING WELLS IN 2022 GROUNDWATER LEVELS PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Meas By	Frequency (per year)	Recorder (min)	RMS-WL	RMS-ICSW	Key	Water Rights	Other
3S2E15L002	15L2	Concannon 6D	Mocho II	U	monitor	active	Other	2						
3S2E15M002	15M2	Concannon 1	Mocho II	U	monitor	active	Other	2						
3S2E15M003	15M3	Concannon 5D	Mocho II	U	monitor	active	Other	2						
3S2E15Q006	15Q6	Concannon Old Pumping	Mocho II	L	irrigation	abandoned	Zone 7	2						
3S2E15Q008	15Q 8	Concannon 4	Mocho II	U	monitor	active	Other	2						
3S2E15R017	15R17	Buena Vista Shallow	Mocho II	U	nested	active	Zone 7	2						
3S2E15R018	15R18	Buena Vista Deep	Mocho II	L	nested	active	Zone 7	2						
3S2E15R020	15R20	Concannon 3	Mocho II	U	monitor	active	Other	2						
3S2E16A003	16A3	Memory Gardens	Mocho II	L	irrigation	active	Zone 7	2						
3S2E16C001	CWS15	CWS 15	Mocho II	L	muni	active	CWS	2						
3S2E16E004	16E4	pepper tree	Mocho II	U	monitor	active	Zone 7	2			X			
3S2E18B001	CWS20	CWS 20	Amador	L	muni	active	CWS	2						
3S2E18E001	18E1	Stanley East of Isabel	Amador	U	monitor	active	Zone 7	2						
3S2E19D007	19D7	Isabel Shallow	Amador	U	nested	active	Zone 7	2						
3S2E19D008	19D8	Isabel Middle 1	Amador	L	nested	active	Zone 7	2						
3S2E19D009	19D9	Isabel Middle 2	Amador	L	nested	active	Zone 7	2						
3S2E19D010	19D10	Isabel Deep	Amador	L	nested	active	Zone 7	2						
3S2E19N003	19N3	Shallow Cemex Nested	Amador	U	nested	active	Zone 7	2						
3S2E19N004	19N4	Deep Cemex Nested	Amador	L	nested	active	Zone 7	2						
3S2E20M001	20M1	Alden Lane	Amador	L	supply	active	Zone 7	2						
3S2E20R002	20R2	Ravenswood South Well	Upland	U	irrigation	active	Zone 7	2						
3S2E21K009	21K9	Marina Ave	Upland	U	domestic	active	Zone 7	2		X				
3S2E22B001	22B1	grapes	Mocho II	U	monitor	active	Zone 7	2						
3S2E23E001	23E1	Murrieta Nested Shallow	Mocho II	U	nested	active	Zone 7	2			X			
3S2E23E002	23E2	Murrieta Nested Deep	Mocho II	L	nested	active	Zone 7	2						
3S2E24A001	24A1	S. greenville	Mocho I	U	monitor	active	Zone 7	12		X				
3S2E26J002	26J2	mines rd	Mocho II	U	monitor	active	Zone 7	2						
3S2E29F004	29F4	Wetmore	Amador	U	monitor	active	Zone 7	12			X		X	
3S2E29L001	29L1 (P3)	Sycamore Grove P3	Amador	U	monitor	active	Zone 7	2						
3S2E30C001	30C1	Vineyard 30C 1	Amador	L	supply	active	Zone 7	2						
3S2E30D002	30D2	vineyard	Amador	U	monitor	active	Zone 7	12	15		X		X	
3S2E32E007	32E7	DVWTP 32E7	Upland	U	monitor	active	Zone 7	2			X			
3S2E33C001	33C1 (P1)	Sycamore Grove P1	Amador	U	monitor	inactive	Zone 7	2			X			
3S2E33G001	33G1	Crohare	Amador	U	monitor	active	Zone 7	12			X		X	
3S3E06Q003	6Q3	PPWTP South Monitoring	Altamont	U	monitor	active	Zone 7	2						
3S3E07D002	7D2	7D 2	Spring	U	monitor	active	LLNL	2						
3S3E20L004	20L4	Vail on Tesla	Mocho I	U	domestic	active	Zone 7	2						
3S3E20R004	20R4	Buonanno on Tesla	Mocho I	U	domestic	active	Zone 7	2						
3S3E21C001	21C1	Russell on Reuss	Upland	U	domestic	active	Zone 7	2						

TABLE 5-1
MONITORING WELLS IN 2022 GROUNDWATER LEVELS PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Meas By	Frequency (per year)	Recorder (min)	RMS-WL	RMS-ICSW	Key	Water Rights	Other
4S2E01A001	1A1	Gallagher Ag	Mocho II	U	irrigation	active	Zone 7	2			X			
4S3E06E004	6E4	Gallagher Domestic	Mocho II	U	domestic	active	Zone 7	2						
WELLS IN THE GROUNDWATER LEVELS PROGRAM = 236														

RMS = Representative Monitoring Site
ICSW = Interconnected Surface Water
WL = Water Levels
WR = Water Rights

TABLE 5-2
GROUNDWATER PROGRAM
WELL CONSTRUCTION DETAILS
2022 WATER YEAR

Site	Map	Type	Other Name	Completed	Basin	Aquifer	RP	TD	Dia	Perf
2S1E32E001	32E1	monitor	End of Arnold Rd	12/28/2000	None	U	392.56	70	2	55 - 70
2S1E32N001	32N1	monitor	Camp Parks	7/1/1976	Camp	U	360.79	44	2.5	34 - 39
2S1E32Q001	32Q1	monitor	Summer Glen Dr	12/29/2000	Camp	U	367.55	45	2	30 - 45
2S1E33L001	33L1	monitor	Gleason Dr @ Tassajara	12/27/2000	None	U	389.46	80	2	65 - 80
2S1E33P002	33P2	monitor	Central Pkwy at Emerald Glen P	12/20/2000	Camp	U	370.05	55	2	45 - 55
2S1E33R001	33R1	monitor	Central Pkwy @ Grafton	10/23/2001	None	U	358.5	60	2	40 - 60
2S1W15F001	15F1	monitor	BOLLINGER	9/28/1976	Bishop	U	439.44	60	2.5	50.3 - 55.3
2S1W26C00	26C2	monitor	PINE VALLEY	9/28/1976	Dublin	U	406.53	50	2.5	40 - 45
2S1W36E00	36E3	monitor	Kolb Park	9/13/1977	Dublin	U	346.51	60	2.5	50 - 55
2S1W36F001	36F1	nested	Dublin High shallow	5/8/1996	Dublin	L	342.71	190	2	140 - 180
2S1W36F002	36F2	nested	Dublin High mid	5/8/1996	Dublin	L	342.71	320	2	270 - 310
2S2E21L001	21L1	domestic	Merlin	5/1/1973	May	U	563	168	10	49 - 168
2S2E27M002	27M2	domestic	Kwan	7/16/1975	May	U	521	112	6	0 - 0
2S2E27P002	27P2	monitor	hartford ave east	6/18/1979	Spring	U	505.43	68	4	35 - 63
2S2E28D002	28D2	monitor	May School	11/2/1976	May	U	555.15	55	2.5	44 - 49
2S2E28J002	28J2	industrial	FCC Well	7/26/1984	May	L	522.292	230	6	50 - 230
2S2E28Q001	28Q1	monitor	hartford ave	11/2/1976	May	U	513.04	28	2.5	17.6 - 22.6
2S2E32K002	32K2	monitor	jenson's N liv. Ave	12/20/1977	Cayetano	U	507.43	43	2.5	33 - 38
2S2E34E001	34E1	monitor	Mud City	12/21/1977	May	U	499.73	49	2.5	40 - 45
2S2E34Q002	34Q2	monitor	Hollyhock & Crocus	12/12/2001	Spring	U	507.24	50	2	25 - 50
3S1E01F002	1F2	monitor	Constitution Dr	12/18/2000	Camp	U	428.44	40	2	25 - 40
3S1E01H003	1H3	monitor	Collier Canyon g1	12/20/1977	Camp	U	422.8	80	2.5	70 - 75
3S1E01J004	1J04	irrigation	Collier Vineyards	2/6/2018	Camp	L		300	12	260 - 280
3S1E01L001	1L1	monitor	Kitty Hawk	12/19/2000	Camp	U	403.04	70	2	60 - 70
3S1E01P002	1P2	monitor	Airport gas g5	12/11/1975	Amador	U	389.64	50	2.5	40 - 45
3S1E01P003	1P3	supply	New airport well	7/28/1988	Amador	L	394.44	480	12	245 - 460
3S1E02J002	2J2	monitor	Maint. Bldg	7/16/2003	Camp	U	380.89	41	2	31 - 41
3S1E02J003	2J3	monitor	Doolan Rd East	7/16/2003	Camp	U	406.35	65	2	55 - 65
3S1E02K002	2K2	monitor	Doolan Rd West	12/10/1975	Camp	U	397.04	46	2.5	36.5 - 41.5
3S1E02M003	2M3	monitor	Friesman Rd North	11/13/2000	Camp	U	365.04	50	2	35 - 50
3S1E02N006	2N6	monitor	Friesman Rd South	11/13/2000	Amador	U	366.14	55	2	40 - 55
3S1E02P003	2P3	domestic	Crosswinds Church	9/26/1977	Camp	L	371.73	380	10	340 - 372
3S1E02Q001	2Q1	monitor	LPGC #1	7/16/2003	Amador	U	369.92	45	2	35 - 45
3S1E02R001	2R1	monitor	Beebs	11/1/1975	Amador	U	376.29	33	2.5	21 - 26
3S1E03G002	3G2	monitor	fallon rd	1/18/1978	Camp	U	354.24	50	2.5	40 - 45
3S1E04A001	4A1	monitor	SMP-DUB-2	10/23/2001	Camp	U	350.67	49.5	2	29.5 - 49.5
3S1E04J005	4J5	monitor	Pimlico shallow	10/25/2001	Camp	U	345.2	47	2	22 - 47
3S1E04J006	4J6	monitor	Pimlico deep	10/24/2001	Camp	U	345.55	110	2	65 - 110
3S1E04Q002	4Q2	monitor	gulfstream	12/13/1977	Amador	U	345.42	90	2.5	80 - 85
3S1E05K006	5K6	monitor	Rosewood shallow	6/7/1990	Camp	U	346.05	75	4	40 - 70
3S1E05K007	5K7	monitor	Rosewood deep	6/8/1990	Camp	L	346.19	150	4	134 - 144
3S1E05L003	5L3	monitor	Oracle	12/11/2001	Camp	U	339.43	40	2	15 - 40
3S1E05P006	5P6	monitor	Owens Park	12/19/2000	Camp	U	336.65	35	2	25 - 35
3S1E06F003	6F3	monitor	Dublin Ct	9/29/1976	Dublin	U	329.82	36	2.5	27 - 32

RP = Reference Point Elevation (in feet above MSL) TD = Total Depth of well (in feet below ground surface)
Dia = Diameter of well casing (in inches) Perf = Preferated interval (in feet below ground surface), uppermost - lowermost

Site	Map	Type	Other Name	Completed	Basin	Aquifer	RP	TD	Dia	Perf
3S1E06N002	6N2	monitor	DSRSD MW-3	3/20/1985	Dublin	U	335.2	67	4	47 - 67
3S1E06N003	6N3	monitor	DSRSD MW-4	12/4/1984	Dublin	U	340.74	72		52 - 72
3S1E06N006	6N6	monitor	DSRSD NE-76	11/9/2007	Dublin	U	333.58	75	2	50 - 70
3S1E07B002	7B2	monitor	Hopyard rd	5/17/1979	Dublin	L	327.77	152	4	143 - 149
3S1E07B012	7B12	monitor	Hacienda Arch	7/31/2002	Dublin	U	327.82	70	2	50 - 70
3S1E07D001	7D1	monitor	DSRSD SW-75	11/6/2007	Dublin	U	330.09	75	2	54 - 74
3S1E07D003	7D3	monitor	DSRSD SE-70	11/2/2007	Dublin	U	332.28	70	2	45 - 65
3S1E07G007	7G7	monitor	Chabot Well	1/22/2002	Dublin	U	327.33	55	2	35 - 55
3S1E07J005	7J5	monitor	Thomas Hart School	7/10/2002	Dublin	U	326.78	50	2	30 - 50
3S1E08B001	8B1	monitor	Lizard Well	5/31/1979	Amador	U	338.28	148	4	55 - 82
3S1E08G004	8G4	monitor	Apache	12/19/2001	Amador	U	341.47	85	2	60 - 85
3S1E08H009	8H9	nested	Mocho 4 Nested Shallow	12/12/1996	Amador	L	338.53	240	2	210 - 230
3S1E08H010	8H10	nested	Mocho 4 Nested Middle	12/12/1996	Amador	L	339.26	440	2	290 - 430
3S1E08H011	8H11	nested	Mocho 4 Nested deep	12/21/1996	Amador	D	339.26	720	2	520 - 720
3S1E08H013	8H13	monitor	Mocho 3 mon	12/11/1998	Amador	D	338.96	800	2	570 - 790
3S1E08H018	M4	muni	Mocho 4	11/1/2000	Amador	L	341.94	745	20	515 - 730
3S1E08K001	8K1	monitor	Cockroach well	1/23/1978	Amador	U	332.37	99	2.5	89 - 94
3S1E08N001	8N1	monitor	sports park	8/27/1976	Bernal	U	323.68	72	2.5	62 - 67
3S1E09B001	St1	muni	Stoneridge	1/28/1992	Amador	L	349.23	810	20	250 - 800
3S1E09H013	9H13	domestic	Lister		Amador	U		145	8	-
3S1E09J007	9J7	nested	SW Lake I Shallow	11/23/2004	Amador	U	357.36	145	2	120 - 140
3S1E09J008	9J8	nested	SW Lake I Middle	11/23/2004	Amador	L	357.55	305	2	280 - 300
3S1E09J009	9J9	nested	SW Lake I Deep	11/23/2004	Amador	L	357.68	505	2	480 - 500
3S1E09M002	M1	muni	Mocho 1	4/6/1964	Amador	L	343.95	530	16	150 - 510
3S1E09M003	M2	muni	Mocho 2	5/4/1967	Amador	L	347.47	575	18	250 - 570
3S1E09M004	M3	muni	Mocho 3	11/1/2000	Amador	L	342.89	498	20	315 - 493
3S1E09P005	9P5	monitor	Key_AmW_U (Mohr Key)	12/6/1977	Amador	U	349.4	105	2.5	95 - 100
3S1E09P009	9P9	nested	Mohr Ave Shallow	3/23/2005	Amador	L	349.59	210	2	185 - 205
3S1E09P010	9P10	nested	Key_AmW_L	3/23/2005	Amador	L	349.51	310	2	285 - 305
3S1E09P011	9P11	nested	Mohr Ave Deep	3/23/2005	Amador	L	349.44	425	2	405 - 420
3S1E10A002	10A2	monitor	El Charro Rd	5/10/1979	Amador	U	367.35	88	4	70 - 80
3S1E10B008	10B8	nested	Kaiser Rd Shallow	6/18/1997	Amador	L	353.6	200	2	100 - 190
3S1E10B009	10B9	nested	Kaiser Rd Middle 1	6/18/1997	Amador	L	353.49	294	2	244 - 284
3S1E10B010	10B10	nested	Kaiser Rd Middle 2	6/18/1997	Amador	L	353.52	600	2	400 - 590
3S1E10B011	10B11	nested	Kaiser Rd Deep	6/18/1997	Amador	D	353.52	810	2	660 - 800
3S1E10B014	COL5 M	monitor	COL 5 Monitoring	2/26/2014	Amador	L	355.591	690	2	390 - 690
3S1E10B016	COL5	muni	COL 5	7/19/2014	Amador	L	357.584	690	18	390 - 690
3S1E10D002	10D2	nested	Stoneridge Shallow	9/10/1998	Amador	L	349.32	212	2	182 - 212
3S1E10D003	10D3	nested	Stoneridge Middle 1	9/10/1998	Amador	L	349.28	322	2	262 - 312
3S1E10D004	10D4	nested	Stoneridge Middle 2	9/10/1998	Amador	L	349.3	616	2	366 - 606
3S1E10D005	10D5	nested	Stoneridge Deep	9/10/1998	Amador	D	349.32	790	2	720 - 780
3S1E10K002	COL1 M	monitor	COL 1 Monitoring	1/17/2007	Amador	L	358.68	590.6	4	195.5 - 585.6
3S1E10K003	COL1	muni	COL 1	2/27/2008	Amador	L	363.79	530	18	205 - 530
3S1E11B001	11B1	monitor	Airport West	12/11/1975	Amador	U	369.35	43	2.5	33 - 38
3S1E11C003	11C3	monitor	LAVWMA ROW	12/22/2003	Amador	U	364.82	55	2	35 - 55
3S1E11G001	KeyAmE	nested	Key_AmE_U	4/8/1997	Amador	U	371.62	120	2	100 - 110
3S1E11G002	11G2	nested	Rancho Charro Middle 1	4/8/1997	Amador	L	371.61	350	2	230 - 340
3S1E11G003	11G3	nested	Rancho Charro Middle 2	4/8/1997	Amador	L	371.64	590	2	380 - 580
3S1E11G004	11G4	nested	Rancho Charro Deep	4/8/1997	Amador	D	371.68	790	2	620 - 780
3S1E11M002	COL2 M	monitor	COL 2 Monitoring	9/25/2007	Amador	L	365.96	700	4.5	199 - 699
3S1E11M003	COL2	muni	COL 2	2/14/2008	Amador	L	369.24	684	18	345 - 684

RP = Reference Point Elevation (in feet above MSL) TD = Total Depth of well (in feet below ground surface)
Dia = Diameter of well casing (in inches) Perf = Preferated interval (in feet below ground surface), uppermost - lowermost

Site	Map	Type	Other Name	Completed	Basin	Aquifer	RP	TD	Dia	Perf
3S1E11P006	11P6	domestic	New Jamieson Residence	3/10/2000	Amador	L	376.67	400	5	240 - 380
3S1E12A002	12A2	monitor	Airport South	12/11/1975	Amador	U	401.35	69	2.5	63.7 - 68.7
3S1E12D002	12D2	monitor	LWRP G6		Amador	U	384.45	44.6		36 - 41
3S1E12G001	12G1	monitor	Oaks Park Shallow	12/12/1975	Amador	U	404.47	73	2.5	63 - 68
3S1E12H004	12H4	nested	LWRP Shallow	1/8/1998	Amador	L	407.75	270	2	185 - 260
3S1E12H005	12H5	nested	LWRP Middle 1	1/8/1998	Amador	L	407.78	400	2	360 - 390
3S1E12H006	12H6	nested	LWRP Middle 2	1/8/1998	Amador	L	407.75	480	2	410 - 468
3S1E12H007	12H7	nested	LWRP Deep	1/8/1998	Amador	D	407.67	684	2	609 - 674
3S1E12K002	12K2	nested	Oaks Park Mid	11/1/2005	Amador	L	406.29	300	2	210 - 295
3S1E12K003	KeyAmE	nested	Key_AmE_L	11/1/2005	Amador	L	406.83	475	2	355 - 470
3S1E12K004	12K4	nested	Oaks Park Deep	11/1/2005	Amador	D	406.71	575	2	550 - 570
3S1E13P005	13P5	nested	LGA Grant Nested 1	11/2/2010	Amador	U	399.97	135	2	110 - 130
3S1E13P006	13P6	nested	LGA Grant Nested 2	11/2/2010	Amador	L	399.93	255	2	230 - 250
3S1E13P007	13P7	nested	LGA Grant Nested 3	11/2/2010	Amador	L	399.97	375	2	350 - 370
3S1E13P008	13P8	nested	LGA Grant Nested 4	11/2/2010	Amador	L	399.94	605	2	580 - 600
3S1E14B001	14B1	industrial	Industrial Asphalt		Amador	L	384.2	435	8	200 - 410
3S1E14D002	14D2	monitor	South Cope Lake	8/30/2006	Amador	L	371.83	740	14.5	170 - 740
3S1E15J003	15J3	supply	shadow cliff	12/2/1980	Amador	L	344.59	196	8	154 - 184
3S1E15M003	15M3	monitor	Bush/Valley South	12/15/1998	Amador	L	362.88	600	2	280 - 590
3S1E16A002	P8	muni	Pleas 8	3/27/1992	Amador	L	358.2	500	20	200 - 495
3S1E16A004	16A4	monitor	Bush/Valley Mid	12/3/1998	Amador	L	359.36	603	2	280 - 580
3S1E16B001	16B1	monitor	Bush/Valley North	12/18/1998	Amador	D	355.81	805	2	605 - 800
3S1E16C002	16C2	nested	Santa Rita Valley Shallow	4/14/2005	Amador	L	344.38	190	2	165 - 185
3S1E16C003	16C3	nested	Santa Rita Valley Middle	4/14/2005	Amador	L	344.27	305	2	280 - 300
3S1E16C004	16C4	nested	Santa Rita Valley Deep	4/14/2005	Amador	L	344.16	375	2	355 - 370
3S1E16E004	16E4	monitor	black ave - cultural	12/15/1977	Amador	U	351.69	105	2.5	95 - 100
3S1E16L005	P5	muni	Pleas 5	4/4/1962	Amador	L	358.05	685	18	149 - 650
3S1E16L007	P6	muni	Pleas 6	6/1/1966	Amador	L	354.47	647	18	165 - 647
3S1E16P005	16P5	monitor	Vervais Monitor	10/8/1976	Amador	U	354.51	75	2.5	64 - 69
3S1E17B004	17B4	supply	Casterson	1/1/1950	Amador	L	337.69	248	8	0 - 248
3S1E17D003	17D3	nested	Hopyard Nested Shallow	8/6/1996	Bernal	L	325.13	108	4	92 - 98
3S1E17D004	17D4	nested	Hopyard Nested Middle 1	8/6/1996	Bernal	L	325.14	236	4	206 - 226
3S1E17D005	17D5	nested	Hopyard Nested Middle 2	8/6/1996	Bernal	L	325.13	308	4	266 - 286
3S1E17D006	17D6	nested	Hopyard Nested Middle 3	8/6/1996	Bernal	L	325.12	408	4	378 - 398
3S1E17D007	17D7	nested	Hopyard Nested Deep	8/6/1996	Bernal	D	325.13	684	4	654 - 674
3S1E17D011	17D11	monitor	Hopyard 9 Monitoring Well	12/16/1998	Bernal	L	324.84	603	2	340 - 505
3S1E17D012	H9	muni	Hopyard 9	11/5/1999	Bernal	L	327.9	315	18	235 - 310
3S1E18A006	H6	muni	Hopyard 6	2/1/1987	Bernal	L	326.74	500	18	158 - 490
3S1E18E004	18E4	monitor	Valley Trails II	5/31/1979	Bernal	U	320.21	83	4	69 - 79
3S1E18J002	18J2	monitor	camino segura	10/20/1977	Bernal	U	323.02	71	2.5	61 - 66
3S1E19A010	SF-B	muni	SFWD South (B)		Bernal	L	337.02	331		189 - 327
3S1E19A011	SF-A	muni	SFWD North (A)	10/9/2001	Bernal	L	334.27	330	18	196 - 320
3S1E19C004	19C4	monitor	del valle & laguna	6/11/1979	Bernal	U	322.23	78	4	68 - 73
3S1E19K001	19K1	monitor	680/bernal	12/8/1975	Bernal	U	321.54	57.6	2.5	47.6 - 52.6
3S1E20B002	20B2	supply	Fairgrounds Potable	12/27/1961	Bernal	L	344.03	500	12	218 - 500
3S1E20C007	20C7	monitor	Key_Bern_U	6/15/2000	Bernal	U	338.66	153	2	65 - 145
3S1E20C008	20C8	nested	Key_Bern_L	10/20/2008	Bernal	L	338.67	315	2	295 - 315
3S1E20C009	20C9	nested	Fair Nested Deep	10/20/2008	Bernal	L	338.78	515	2	495 - 515
3S1E20J004	20J4	monitor	civic center	12/5/1975	Bernal	U	331.62	72	2.5	62 - 67
3S1E20M011	20M11	monitor	S.F "M"LINE	10/12/1977	Bernal	U	325.73	71	2.5	61 - 66
3S1E20Q002	20Q2	monitor	20Q2	2/17/1976	Bernal	U	325.82	65	10	45 - 53

RP = Reference Point Elevation (in feet above MSL) TD = Total Depth of well (in feet below ground surface)
Dia = Diameter of well casing (in inches) Perf = Preferated interval (in feet below ground surface), uppermost - lowermost

Site	Map	Type	Other Name	Completed	Basin	Aquifer	RP	TD	Dia	Perf
3S1E22D002	22D2	monitor	vineyard trailer	10/28/1976	Amador	U	368.05	72	2.5	62 - 67
3S1E23J001	23J1	domestic	1627 vineyard trailer	3/4/1958	Amador	L	428.2	120	8	0 - 120
3S1E25C003	25C3	monitor	Katz Winery Mansion	11/28/1990	Amador	U	454.16	146	2	70 - 140
3S1E28M002	28M2	supply	Bargar	2/8/1962	Upland	U	0	141	5	80 - 141
3S1E29M004	29M4	monitor	f.c. channel	12/4/1975	Castle	U	310.94	57	2.5	47 - 52
3S1E29P002	29P2	monitor	castlewood dr	12/9/1975	Bernal	U	302.82	42	2.5	32 - 37
3S1E33G005	33G5	monitor	Pleasanton Calippe 33G5	7/21/2006	Upland	U	0	35	2	11 - 35
3S1W01B00	1B9	nested	DSRSD Shallow	2/15/1996	Dublin	L	333.56	162	2	122 - 152
3S1W01B01	1B10	nested	DSRSD Middle	2/15/1996	Dublin	L	333.57	414	2	274 - 404
3S1W01B01	1B11	nested	DSRSD Deep	2/15/1996	Dublin	L	333.74	560	2	480 - 550
3S1W01J001	1J1	monitor	DSRSD MW-1	12/4/1984	Dublin	U	334.36	70		47 - 64
3S1W02A00	2A2	monitor	McNamara's	10/7/1976	Dublin	U	369.4	47	2.5	37 - 42
3S1W12B00	12B2	monitor	Stoneridge Mall Rd	6/21/1996	Dublin	U	342.89	39.5	4	20 - 50
3S1W12J001	12J1	monitor	DSRSD South	12/9/1975	Dublin	U	329.31	62	2.5	52 - 57
3S1W13J001	13J1	monitor	muirwood dr	10/7/1976	Castle	U	343.94	48	2.5	39 - 44
3S2E01F002	1F2	monitor	Brisa at Circuit City	12/22/1977	Spring	U	572.99	68.6	2.5	59 - 64
3S2E02B002	2B2	monitor	south front rd	6/7/1976	Spring	U	539.45	46	2.5	36.9 - 41.9
3S2E03A001	3A1	monitor	Bluebell	12/21/1977	Spring	U	517.63	54	2.5	44 - 49
3S2E03K003	3K3	monitor	first & S. front rd	12/12/1977	Mocho I	U	522.83	60	2.5	50 - 55
3S2E05N001	5N1	supply	Spider Well	10/5/1977	Mocho II	M	444	210	10	0 - 210
3S2E07C002	7C2	monitor	jaws - york way - G4	4/6/1978	Mocho II	U	420.84	49	2.5	39 - 44
3S2E07H002	7H2	monitor	dakota	7/29/1989	Mocho II	U	442.85	54	2	44 - 54
3S2E07N002	7N2	monitor	Isabel & Arroyo Mocho	12/20/2012	Amador	U	422	162	2	132 - 152
3S2E07P003	CWS24	muni	CWS 24	4/4/1972	Amador	L	431.46	510	16	300 - 490
3S2E07R003	CWS31	muni	CWS 31	9/20/2002	Upland	L	446	583	16	410 - 528
3S2E08F001	CWS10	muni	CWS 10	5/15/1954	Mocho II	L	456.24	470	16	143 - 433
3S2E08H002	8H2	monitor	North k	6/14/1976	Mocho II	U	469.61	46	2.5	36 - 41
3S2E08H003	8H3	nested	Key_Mo2_L	7/10/2009	Mocho II	L	477.25	195	2	170 - 190
3S2E08H004	8H4	nested	N Liv Ave Deep	7/10/2009	Mocho II	L	476.97	385	2	360 - 380
3S2E08K002	8K2	monitor	Key_Mo2_U (Livermore Key)	12/13/1977	Mocho II	U	464.78	74	2.5	64 - 69
3S2E08N002	CWS14	muni	CWS 14	1/16/1958	Mocho II	L	453.64	526	10	140 - 515
3S2E08Q009	8Q9	monitor	D-2	6/15/1999	Mocho II	L	464.7	114	2	99 - 114
3S2E09Q001	CWS9	muni	CWS 9	2/18/1952	Mocho II	L	518.15	572	14	180 - 492
3S2E09Q004	9Q4	monitor	school st	11/1/1977	Mocho II	U	505.425	80	2.5	70 - 75
3S2E10F003	10F3	monitor	hexcel	12/12/1977	Mocho I	U	534.84	45	2.5	35 - 40
3S2E10Q001	10Q1	monitor	almond	11/1/1976	Mocho II	U	555.36	43.5	2.5	33.5 - 39
3S2E10Q002	10Q2	monitor	LLNL W-703	12/3/1990	Mocho II	L	549.569	325	4.5	298 - 325
3S2E11C001	11C1	monitor	joan way	11/1/1976	Mocho I	U	556.347	66.2	2.5	56.2 - 61.2
3S2E12C004	12C4	monitor	LLNL W-486	3/11/1988	Spring	U	591.46	108	4.5	100 - 108
3S2E12J003	12J3	monitor	LLNL W-017A	5/20/1981	Spring	L	631.05	160	5	127 - 157
3S2E14A003	14A3	monitor	S. vasco @east ave	12/13/1977	Mocho I	U	602.24	110	2.5	100 - 105
3S2E14B001	14B1	domestic	5763 east ave	5/26/1983	Mocho I	L	593.36	300	9	146 - 234
3S2E15E002	15E2	irrigation	Retzlaff Winery	11/14/1983	Mocho II	L	549.69	192	8	104 - 189
3S2E15L001	15L1	monitor	Concannon 2	10/10/2013	Mocho II	U	561.5	40.5	2	20 - 40.5
3S2E15L002	15L2	monitor	Concannon 6D	1/14/2015	Mocho II	U		70.5	2	40 - 70
3S2E15M002	15M2	monitor	Concannon 1	10/10/2013	Mocho II	U	549.46	45	2	25 - 45
3S2E15M003	15M3	monitor	Concannon 5D	1/13/2015	Mocho II	U		75.8	2	45.3 - 75.3
3S2E15Q008	15Q 8	monitor	Concannon 4	1/14/2015	Mocho II	U		41	2	10.5 - 40.5
3S2E15R017	15R17	nested	Buena Vista Shallow	12/14/2006	Mocho II	U	592.41	63	2	38 - 58
3S2E15R018	15R18	nested	Buena Vista Deep	12/15/2007	Mocho II	L	592.47	138	2	113 - 133
3S2E15R020	15R20	monitor	Concannon 3	1/14/2015	Mocho II	U		51	2	20.5 - 50.5

RP = Reference Point Elevation (in feet above MSL) TD = Total Depth of well (in feet below ground surface)
Dia = Diameter of well casing (in inches) Perf = Preferated interval (in feet below ground surface), uppermost - lowermost

Site	Map	Type	Other Name	Completed	Basin	Aquifer	RP	TD	Dia	Perf
3S2E16A003	16A3	irrigation	Memory Gardens	5/1/1972	Mocho II	L	527.06	240	10	91 - 240
3S2E16C001	CWS15	muni	CWS 15	2/18/1958	Mocho II	L	510.97	584	16	150 - 523
3S2E16E004	16E4	monitor	pepper tree	12/15/1977	Mocho II	U	506.26	45	2.5	35 - 40
3S2E18B001	CWS20	muni	CWS 20	1/30/1961	Amador	L	438.56	497	16	190 - 465
3S2E18E001	18E1	monitor	Stanley East of Isabel	4/22/1977	Amador	U	423.86	133.8	2.5	123.8 - 128.8
3S2E19D007	19D7	nested	Isabel Shallow	1/29/1999	Amador	U	415.07	180	2	100 - 180
3S2E19D008	19D8	nested	Isabel Middle 1	1/29/1999	Amador	L	415.04	260	2	210 - 260
3S2E19D009	19D9	nested	Isabel Middle 2	1/29/1999	Amador	L	414.98	390	2	280 - 390
3S2E19D010	19D10	nested	Isabel Deep	1/29/1999	Amador	L	414.89	470	2	420 - 470
3S2E19N003	19N3	nested	Shallow Cemex Nested	7/27/2018	Amador	U	418.45	120	2	105 - 115
3S2E19N004	19N4	nested	Deep Cemex Nested	7/27/2018	Amador	L	417.96	203	2	188 - 198
3S2E20M001	20M1	supply	Alden Lane	9/15/1928	Amador	L	478.79	184	12	0 - 184
3S2E20R002	20R2	irrigation	Ravenswood South Well	5/1/1985	Upland	U	522	257	9	107 - 252
3S2E21K009	21K9	domestic	Marina Ave		Upland	U	0	0	6	0 - 0
3S2E22B001	22B1	monitor	grapes	7/8/1976	Mocho II	U	585.88	31.9	2.5	21.9 - 26.9
3S2E23E001	23E1	nested	Murrieta Nested Shallow	9/2/2004	Mocho II	U	613.36	40	2	20 - 35
3S2E23E002	23E2	nested	Murrieta Nested Deep	9/2/2004	Mocho II	L	613.23	110	2	95 - 105
3S2E24A001	24A1	monitor	S. greenville	11/1/1976	Mocho I	U	717.7	46.3	2.5	36.3 - 41.3
3S2E26J002	26J2	monitor	mines rd	12/27/1977	Mocho II	U	689.92	44	2.5	34 - 39
3S2E29F004	29F4	monitor	Wetmore	10/28/1976	Amador	U	457.5	36	2.5	26 - 31
3S2E30C001	30C1	supply	Vineyard 30C 1	3/16/1995	Amador	L	439.41	150	6	125 - 145
3S2E30D002	30D2	monitor	vineyard	6/18/1979	Amador	U	431.6	44	4	24 - 39
3S2E32E007	32E7	monitor	DVWTP 32E7	7/16/1991	Upland	U	610.94	37	6	19 - 34
3S2E33C001	33C1 (P	monitor	Sycamore Grove P1	11/29/2001	Amador	U	493.23	20	2	5 - 20
3S2E33G001	33G1	monitor	Crohare	12/12/1975	Amador	U	511.52	17	2.5	9 - 14
3S2E33K001	33K1	monitor	VA		Amador	U	546.83	15	2.5	7 - 12
3S2E33L001	33L1	monitor	VA/CROHARE FENCE		Amador	U	557.63	16	2.5	11 - 16
3S3E06Q003	6Q3	monitor	PPWTP South Monitoring	8/29/2016	Altamont	U	681.07	30	2	20 - 30
3S3E07D002	7D2	monitor	7D 2	11/1/1976	Spring	U	621.94	72	2.5	64 - 69
3S3E19C002	19C2	domestic	Wilker well 2		Mocho I	U	740.7	66	8	0 - 66
3S3E20L004	20L4	domestic	Vail on Tesla	8/15/2005	Mocho I	U	0	340	5	0 - 0
3S3E20R004	20R4	domestic	Buonanno on Tesla		Mocho I	U	0	0	6	0 - 0
3S3E21C001	21C1	domestic	Russell on Reuss	1/1/1977	Upland	U	0	128	12	60 - 124
4S2E01A001	1A1	irrigation	Gallagher Ag	2/6/2015	Mocho II	U		130	6	45 - 130
4S3E06E004	6E4	domestic	Gallagher Domestic	5/28/1976	Mocho II	U		220	10	184 - 212

RP = Reference Point Elevation (in feet above MSL) TD = Total Depth of well (in feet below ground surface)
Dia = Diameter of well casing (in inches) Perf = Preferated interval (in feet below ground surface), uppermost - lowermost

TABLE 5-3
SEMIANNUAL GROUNDWATER LEVELS
(Feet above Mean Sea Level, NAVD88)
FALL 2021 TO FALL 2022

					Fall 2021		Spring 2022		Fall 2022		Change in Elevation (ft)		
											Seasonal		Annual
Well Number	Display Name	Well Depth	Aquifer	Subarea	Depth to Water	GW Elev	Depth to Water (ft)	GW Elev	Depth to Water (ft)	GW Elev	Fall 21 to Spring 22	Spring 22 to Fall 22	Fall 21 to Fall 22
1S4E31P005	31P5	24	U	Tracy	18.5	41.5	18.9	41.1	NA	NA	-0.5	-	-
2S1E32E001	32E1	70	U	None	40.6	352.0	40.9	351.7	42.5	350.1	-0.3	-1.6	-1.9
2S1E32N001	32N1	44	U	Camp	20.2	340.6	20.0	340.8	20.6	340.2	0.2	-0.6	-0.4
2S1E32Q001	32Q1	45	U	Camp	29.9	337.7	29.6	337.9	30.8	336.7	0.2	-1.2	-1.0
2S1E33L001	33L1	80	U	None	55.1	334.4	55.7	333.8	56.7	332.8	-0.6	-1.0	-1.6
2S1E33P002	33P2	55	U	Camp	35.7	334.4	36.2	333.9	37.3	332.8	-0.5	-1.1	-1.6
2S1E33R001	33R1	60	U	None	22.7	335.9	22.9	335.6	23.6	334.9	-0.2	-0.7	-0.9
2S1W15F001	15F1	60	U	Bishop	12.1	427.3	9.8	429.6	11.5	427.9	2.3	-1.7	0.6
2S1W26C002	26C2	50	U	Dublin	27.9	378.6	24.7	381.9	27.2	379.4	3.2	-2.5	0.7
2S1W36E003	36E3	60	U	Dublin	5.4	341.2	3.8	342.7	5.1	341.4	1.6	-1.4	0.2
2S1W36F001	36F1	190	L	Dublin	14.7	328.1	14.4	328.3	16.0	326.7	0.3	-1.6	-1.3
2S1W36F002	36F2	320	L	Dublin	9.5	333.2	9.6	333.1	10.6	332.2	-0.1	-0.9	-1.0
2S1W36F003	36F3	520	L	Dublin	24.7	318.0	23.8	318.9	29.6	313.2	0.9	-5.7	-4.8
2S2E21L001	21L1	168	U	May	37.3	525.7	36.8	526.3	37.5	525.5	0.6	-0.8	-0.2
2S2E27C002	27C2	108	U	Spring	15.8	526.4	16.2	526.0	16.4	525.7	-0.4	-0.2	-0.7
2S2E27K001	27K1	96	U	Spring	10.4	514.1	9.5	515.0	10.6	513.9	0.9	-1.1	-0.2
2S2E27M002	27M2	112	U	May	9.6	514.9	8.5	516.1	9.7	514.8	1.2	-1.2	-0.1
2S2E27P002	27P2	68	U	Spring	4.3	501.1	2.3	503.1	3.9	501.6	2.0	-1.5	0.4
2S2E28D002	28D2	55	U	May	31.0	524.2	30.8	524.4	31.2	524.0	0.2	-0.4	-0.3
2S2E28J002	28J2	230	L	May	7.7	514.6	6.8	515.5	8.0	514.3	0.9	-1.2	-0.3
2S2E28Q001	28Q1	28	U	May	7.3	505.8	5.5	507.5	8.6	504.4	1.8	-3.1	-1.4
2S2E32K002	32K2	43	U	Cayetano	9.2	498.2	9.2	498.3	10.3	497.2	0.1	-1.1	-1.0
2S2E34E001	34E1	49	U	May	6.2	493.5	4.3	495.5	6.0	493.7	1.9	-1.8	0.2
2S2E34Q002	34Q2	50	U	Spring	4.1	503.1	2.8	504.4	4.0	503.2	1.3	-1.2	0.1
2S3E01D001	1D1	80	U	Tracy	12.9	77.1	12.2	77.8	NA	NA	0.7	-	-
3S1E01F002	1F2	40	U	Camp	21.9	406.5	21.2	407.2	21.8	406.7	0.7	-0.5	0.2
3S1E01H003	1H3	80	U	Camp	30.0	392.8	28.4	394.4	31.0	391.8	1.6	-2.6	-1.0
3S1E01J004	1J04	300	L	Camp	NA	NA	NA	NA	NA	NA	-	-	-
3S1E01L001	1L1	70	U	Camp	62.0	341.1	60.0	343.1	62.2	340.8	2.0	-2.2	-0.3
3S1E01P002	1P2	50	U	Amador	26.7	363.0	27.0	362.6	29.0	360.6	-0.3	-2.0	-2.3
3S1E01P003	1P3	480	L	Amador	150.3	244.1	136.1	258.3	171.8	222.6	14.2	-35.7	-21.5
3S1E02J002	2J2	41	U	Camp	18.3	362.6	13.9	367.0	17.8	363.1	4.5	-4.0	0.5
3S1E02J003	2J3	65	U	Camp	28.3	378.1	28.1	378.3	29.6	376.8	0.1	-1.5	-1.4
3S1E02K002	2K2	46	U	Camp	27.5	369.6	27.0	370.0	28.1	369.0	0.4	-1.1	-0.6
3S1E02M003	2M3	50	U	Camp	15.2	349.8	14.8	350.3	16.1	349.0	0.5	-1.3	-0.9
3S1E02N006	2N6	55	U	Amador	29.4	336.7	28.2	337.9	29.2	336.9	1.2	-1.0	0.2
3S1E02P003	2P3	380	L	Camp	128.8	242.9	117.0	254.8	152.2	219.5	11.9	-35.3	-23.4
3S1E02Q001	2Q1	45	U	Amador	23.2	346.7	20.7	349.2	23.1	346.9	2.5	-2.4	0.1
3S1E02R001	2R1	33	U	Amador	22.3	354.0	19.0	357.3	19.4	356.9	3.3	-0.4	2.9
3S1E03G002	3G2	50	U	Camp	11.7	342.6	9.9	344.3	12.1	342.1	1.8	-2.2	-0.4
3S1E04A001	4A1	50	U	Camp	19.6	331.1	19.8	330.9	20.6	330.1	-0.2	-0.8	-1.0
3S1E04J005	4J5	47	U	Camp	18.1	327.1	17.5	327.7	19.0	326.2	0.7	-1.5	-0.8
3S1E04J006	4J6	110	U	Camp	21.5	324.1	21.8	323.8	23.2	322.4	-0.3	-1.4	-1.7
3S1E04Q002	4Q2	90	U	Amador	58.5	287.0	61.3	284.1	67.4	278.0	-2.9	-6.1	-9.0
3S1E05K006	5K6	75	U	Camp	16.4	329.7	15.2	330.9	17.1	328.9	1.2	-1.9	-0.8
3S1E05K007	5K7	150	L	Camp	24.8	321.4	24.0	322.2	27.2	319.0	0.8	-3.2	-2.4
3S1E05L003	5L3	40	U	Camp	13.7	325.8	12.9	326.6	14.0	325.4	0.8	-1.1	-0.4
3S1E05P006	5P6	35	U	Camp	13.6	323.1	12.4	324.3	14.8	321.8	1.2	-2.4	-1.2
3S1E06F003	6F3	36	U	Dublin	6.0	323.8	5.0	324.9	6.3	323.5	1.1	-1.3	-0.3
3S1E06G005	6G5	200	L	Dublin	10.8	321.4	10.5	321.7	11.8	320.4	0.3	-1.3	-1.0
3S1E06N002	6N2	67	U	Dublin	14.7	320.5	13.8	322.5	15.0	320.2	2.0	-2.4	-0.3
3S1E07B002	7B2	152	L	Dublin	11.9	315.9	11.6	316.2	12.9	314.8	0.3	-1.4	-1.1
3S1E07B012	7B12	70	U	Dublin	14.5	313.3	14.1	313.7	15.1	312.8	0.4	-0.9	-0.5
3S1E07G007	7G7	55	U	Dublin	17.2	310.2	16.7	310.7	17.8	309.6	0.5	-1.1	-0.6
3S1E07J005	7J5	50	U	Dublin	29.1	297.7	16.8	310.0	28.7	298.1	12.3	-11.9	0.4
3S1E08B001	8B1	148	U	Amador	52.7	285.6	52.8	285.5	53.6	284.7	-0.1	-0.8	-0.9
3S1E08G004	8G4	85	U	Amador	59.6	281.9	61.7	279.8	68.4	273.1	-2.1	-6.7	-8.8
3S1E08H009	8H9	240	L	Amador	87.1	251.5	83.1	255.5	100.4	238.1	4.0	-17.4	-13.4
3S1E08H010	8H10	440	L	Amador	110.6	228.7	93.3	246.0	135.3	204.0	17.3	-42.0	-24.7
3S1E08H011	8H11	720	D	Amador	142.9	196.3	131.9	207.4	177.3	162.0	11.0	-45.4	-34.4
3S1E08H013	8H13	800	D	Amador	137.4	201.6	126.4	212.6	173.2	165.8	10.9	-46.8	-35.8
3S1E08H018	M4	745	L	Amador	NM	NM	NM	NM	NA	NA	-	-	-
3S1E08K001	8K1	99	U	Amador	71.0	261.4	67.7	264.7	80.1	252.3	3.3	-12.3	-9.0
3S1E08N001	8N1	72	U	Bernal	62.7	261.0	57.6	266.1	66.4	257.3	5.0	-8.8	-3.7
3S1E09H010	9H10	145	U	Amador	70.1	282.8	72.8	280.1	80.1	272.8	-2.7	-7.3	-10.0
3S1E09H011	9H11	190	L	Amador	85.1	268.0	81.5	271.5	95.6	257.5	3.5	-14.0	-10.5
3S1E09H013	9H13	145	U	Amador	72.6	281.4	75.2	278.9	82.5	271.5	-2.5	-7.4	-9.9

U = Upper; L = Lower; NM = Not Measured; NA = Not Available; OBS = Obstructed; - = Not Applicable
Highlighted = Representative Monitoring Site
P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Tbl03-TblSAWaterLevels22.xlsx

TABLE 5-3
SEMIANNUAL GROUNDWATER LEVELS
(Feet above Mean Sea Level, NAVD88)
FALL 2021 TO FALL 2022

					Fall 2021		Spring 2022		Fall 2022		Change in Elevation (ft)		
											Seasonal		Annual
Well Number	Display Name	Well Depth	Aquifer	Subarea	Depth to Water	GW Elev	Depth to Water (ft)	GW Elev	Depth to Water (ft)	GW Elev	Fall 21 to Spring 22	Spring 22 to Fall 22	Fall 21 to Fall 22
1S4E31P005	31P5	24	U	Tracy	18.5	41.5	18.9	41.1	NA	NA	-0.5	-	-
2S1E32E001	32E1	70	U	None	40.6	352.0	40.9	351.7	42.5	350.1	-0.3	-1.6	-1.9
2S1E32N001	32N1	44	U	Camp	20.2	340.6	20.0	340.8	20.6	340.2	0.2	-0.6	-0.4
2S1E32Q001	32Q1	45	U	Camp	29.9	337.7	29.6	337.9	30.8	336.7	0.2	-1.2	-1.0
2S1E33L001	33L1	80	U	None	55.1	334.4	55.7	333.8	56.7	332.8	-0.6	-1.0	-1.6
2S1E33P002	33P2	55	U	Camp	35.7	334.4	36.2	333.9	37.3	332.8	-0.5	-1.1	-1.6
3S1E09J007	9J7	145	U	Amador	75.7	281.7	78.4	279.0	86.3	271.1	-2.7	-7.9	-10.6
3S1E09J008	9J8	305	L	Amador	100.9	256.7	93.2	264.3	112.9	244.6	7.6	-19.7	-12.1
3S1E09J009	9J9	505	L	Amador	126.4	231.3	110.5	247.2	144.8	212.9	15.9	-34.3	-18.4
3S1E09M002	M1	530	L	Amador	NM	NM	NM	NM	NA	NA	-	-	-
3S1E09M003	M2	575	L	Amador	100.5	247.0	NM	NM	117.4	230.0	-	-	-16.9
3S1E09M004	M3	498	L	Amador	NA	NA	36.3	306.6	NA	NA	-	-	-
3S1E09P005	9P5	105	U	Amador	71.2	278.2	72.3	277.1	80.9	268.5	-1.1	-8.6	-9.7
3S1E09P009	9P9	210	L	Amador	82.3	267.3	79.3	270.3	93.0	256.6	3.0	-13.7	-10.7
3S1E09P010	9P10	310	L	Amador	95.2	254.3	87.7	261.8	108.4	241.1	7.5	-20.6	-13.2
3S1E09P011	9P11	425	L	Amador	118.0	231.4	100.2	249.3	136.0	213.4	17.9	-35.9	-18.0
3S1E10A002	10A2	88	U	Amador	65.4	302.0	65.4	302.0	69.5	297.9	0.0	-4.1	-4.1
3S1E10B008	10B8	200	L	Amador	78.1	275.5	76.6	277.0	88.7	264.9	1.5	-12.1	-10.7
3S1E10B009	10B9	294	L	Amador	94.2	259.3	81.2	272.3	105.8	247.7	13.0	-24.6	-11.6
3S1E10B010	10B10	600	L	Amador	119.3	234.3	106.6	246.9	136.6	217.0	12.7	-30.0	-17.3
3S1E10B011	10B11	810	D	Amador	134.4	219.2	118.6	234.9	156.8	196.8	15.8	-38.2	-22.4
3S1E10B014	COL5 Mon	690	L	Amador	125.7	229.9	112.7	242.9	146.4	209.2	13.0	-33.8	-20.8
3S1E10D002	10D2	212	L	Amador	82.0	267.4	77.9	271.4	92.5	256.8	4.0	-14.6	-10.6
3S1E10D003	10D3	322	L	Amador	92.4	256.9	100.6	248.7	104.1	245.2	-8.3	-3.5	-11.8
3S1E10D004	10D4	616	L	Amador	114.9	234.4	100.6	248.7	129.9	219.4	14.3	-29.3	-15.1
3S1E10D005	10D5	790	D	Amador	NM	NM	120.0	229.3	155.1	194.2	-	-35.1	-
3S1E10D007	10D7	145	U	Amador	74.7	286.3	78.7	282.3	85.1	276.0	-4.0	-6.3	-10.3
3S1E10D008	10D8	215	L	Amador	93.2	267.8	88.9	272.1	103.5	257.6	4.3	-14.5	-10.2
3S1E10K002	COL1 Mon	591	L	Amador	100.9	257.8	93.3	265.4	112.4	246.3	7.5	-19.1	-11.6
3S1E10N002	10N2	195	U	Amador	74.9	283.0	77.9	280.0	85.4	272.5	-3.0	-7.4	-10.5
3S1E10N003	10N3	195	L	Amador	89.6	268.4	85.7	272.4	99.4	258.6	3.9	-13.7	-9.8
3S1E11B001	11B1	43	U	Amador	35.7	333.6	34.0	335.4	35.0	334.4	1.7	-1.0	0.7
3S1E11C003	11C3	55	U	Amador	33.2	331.6	31.7	333.1	32.9	331.9	1.5	-1.2	0.3
3S1E11G001	11G1	120	U	Amador	77.8	293.8	74.0	297.6	85.7	285.9	3.8	-11.7	-7.9
3S1E11G002	11G2	350	L	Amador	122.1	249.5	107.9	263.7	137.6	234.0	14.1	-29.7	-15.6
3S1E11G003	11G3	590	L	Amador	135.7	235.9	120.6	251.1	157.8	213.8	15.1	-37.2	-22.1
3S1E11G004	11G4	790	D	Amador	151.5	220.2	132.4	239.3	184.5	187.2	19.1	-52.1	-33.0
3S1E11M002	COL2 Mon	700	L	Amador	110.4	255.5	107.9	258.1	125.0	241.0	2.6	-17.1	-14.5
3S1E11P006	11P6	400	L	Amador	127.7	249.0	120.1	256.6	Dry	Dry	7.6	-	-
3S1E12A002	12A2	69	U	Amador	45.4	356.0	43.0	358.4	44.0	357.4	2.4	-1.0	1.4
3S1E12D002	12D2	45	U	Amador	39.0	345.5	41.0	343.5	Dry	Dry	-2.0	-	-
3S1E12G001	12G1	73	U	Amador	65.6	338.8	65.0	339.5	65.0	339.5	0.6	0.0	0.6
3S1E12H004	12H4	270	L	Amador	157.3	250.4	141.8	266.0	175.4	232.4	15.6	-33.6	-18.1
3S1E12H005	12H5	400	L	Amador	179.0	228.8	162.4	245.4	209.2	198.6	16.6	-46.8	-30.2
3S1E12H006	12H6	480	L	Amador	181.7	226.0	163.3	244.4	212.4	195.4	18.4	-49.1	-30.7
3S1E12H007	12H7	684	D	Amador	191.9	215.8	168.9	238.8	215.0	192.7	23.0	-46.1	-23.1
3S1E12K002	12K2	300	L	Amador	153.1	253.2	137.5	268.8	168.3	238.0	15.6	-30.7	-15.1
3S1E12K003	12K3	475	L	Amador	171.4	235.4	152.9	253.9	199.6	207.2	18.5	-46.7	-28.2
3S1E12K004	12K4	575	D	Amador	180.2	226.5	156.1	250.6	205.5	201.2	24.1	-49.3	-25.3
3S1E13P005	13P5	135	U	Amador	110.7	283.0	109.1	284.6	117.6	276.2	1.6	-8.4	-6.9
3S1E13P006	13P6	255	L	Amador	150.4	243.3	139.9	253.8	170.2	223.5	10.5	-30.3	-19.8
3S1E13P007	13P7	375	L	Amador	152.8	240.7	133.0	260.4	178.0	215.5	19.7	-45.0	-25.2
3S1E13P008	13P8	605	L	Amador	166.6	227.0	142.3	251.3	190.1	203.5	24.3	-47.7	-23.5
3S1E14B001	14B1	435	L	Amador	140.0	244.2	126.4	257.8	159.1	225.1	13.6	-32.7	-19.1
3S1E14D002	14D2	740	L	Amador	112.1	259.7	103.4	268.4	127.5	244.4	8.7	-24.1	-15.4
3S1E15F003	15F3	625	L	Amador	136.4	232.6	110.7	258.3	158.7	210.3	25.8	-48.1	-22.3
3S1E15J003	15J3	196	L	Amador	113.5	231.1	89.3	255.3	139.3	205.3	24.2	-50.0	-25.7
3S1E15M003	15M3	600	L	Amador	NA	NA	111.4	251.5	164.8	198.1	-	-53.4	-
3S1E16A004	16A4	603	L	Amador	127.5	231.9	109.4	249.9	153.3	206.1	18.1	-43.9	-25.8
3S1E16B001	16B1	805	D	Amador	137.9	217.9	119.5	236.4	170.2	185.6	18.5	-50.8	-32.3
3S1E16C002	16C2	190	L	Amador	91.8	252.6	82.7	261.7	109.9	234.4	9.1	-27.2	-18.1
3S1E16C003	16C3	305	L	Amador	113.3	231.0	95.5	248.8	143.2	201.1	17.8	-47.8	-29.9
3S1E16C004	16C4	375	L	Amador	123.9	220.3	104.1	240.0	156.7	187.5	19.8	-52.6	-32.8
3S1E16E004	16E4	105	U	Amador	84.0	267.7	74.1	277.6	96.2	255.5	10.0	-22.1	-12.1
3S1E16L002	P4	151	L	Amador	89.7	256.6	78.0	268.3	109.5	236.8	11.7	-31.5	-19.8
3S1E16P005	16P5	75	U	Amador	69.6	284.9	39.2	315.3	47.4	307.1	30.4	-8.2	22.2
3S1E16R001	16R1	239	L	Amador	125.6	236.9	94.4	268.1	144.5	218.0	31.2	-50.1	-18.9

U = Upper; L = Lower; NM = Not Measured; NA = Not Available; OBS = Obstructed; - = Not Applicable
Highlighted = Representative Monitoring Site
P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Tbl03-TblSAWaterLevels22.xlsx

TABLE 5-3
SEMIANNUAL GROUNDWATER LEVELS
(Feet above Mean Sea Level, NAVD88)
FALL 2021 TO FALL 2022

					Fall 2021		Spring 2022		Fall 2022		Change in Elevation (ft)		
											Seasonal		Annual
Well Number	Display Name	Well Depth	Aquifer	Subarea	Depth to Water	GW Elev	Depth to Water (ft)	GW Elev	Depth to Water (ft)	GW Elev	Fall 21 to Spring 22	Spring 22 to Fall 22	Fall 21 to Fall 22
1S4E31P005	31P5	24	U	Tracy	18.5	41.5	18.9	41.1	NA	NA	-0.5	-	-
2S1E32E001	32E1	70	U	None	40.6	352.0	40.9	351.7	42.5	350.1	-0.3	-1.6	-1.9
2S1E32N001	32N1	44	U	Camp	20.2	340.6	20.0	340.8	20.6	340.2	0.2	-0.6	-0.4
2S1E32Q001	32Q1	45	U	Camp	29.9	337.7	29.6	337.9	30.8	336.7	0.2	-1.2	-1.0
2S1E33L001	33L1	80	U	None	55.1	334.4	55.7	333.8	56.7	332.8	-0.6	-1.0	-1.6
2S1E33P002	33P2	55	U	Camp	35.7	334.4	36.2	333.9	37.3	332.8	-0.5	-1.1	-1.6
3S1E17B004	17B4	248	L	Amador	86.2	251.5	74.3	263.4	99.2	238.5	11.9	-25.0	-13.1
3S1E17D003	17D3	108	L	Bernal	72.9	252.2	64.4	260.7	86.9	238.3	8.5	-22.5	-14.0
3S1E17D004	17D4	236	L	Bernal	78.6	246.5	69.7	255.4	87.0	238.2	8.9	-17.3	-8.4
3S1E17D005	17D5	308	L	Bernal	75.5	249.6	66.6	258.5	87.0	238.1	8.9	-20.4	-11.5
3S1E17D006	17D6	408	L	Bernal	66.2	259.0	59.2	266.0	73.7	251.5	7.0	-14.5	-7.5
3S1E17D007	17D7	684	D	Bernal	21.1	304.1	19.6	305.5	21.3	303.8	1.4	-1.7	-0.3
3S1E17D010	H7	425	L	Bernal	77.2	251.0	68.8	259.3	86.5	241.7	8.4	-17.7	-9.3
3S1E17D011	17D11	603	L	Bernal	63.5	261.4	57.3	267.5	71.5	253.4	6.2	-14.2	-8.0
3S1E18A005	P7	454	L	Bernal	76.9	250.4	64.3	263.0	96.1	231.2	12.6	-31.8	-19.2
3S1E18E004	18E4	83	U	Bernal	52.8	267.4	50.9	269.3	57.1	263.1	1.9	-6.2	-4.3
3S1E18J002	18J2	71	U	Bernal	57.4	265.7	54.4	268.7	62.6	260.4	3.0	-8.2	-5.2
3S1E19A010	SF-B	331	L	Bernal	80.9	256.1	73.0	264.0	95.4	241.7	7.9	-22.4	-14.5
3S1E19A011	SF-A	330	L	Bernal	NM	NM	67.1	267.2	89.7	244.5	-	-22.7	-
3S1E19C004	19C4	78	U	Bernal	56.6	265.7	52.9	269.4	62.0	260.3	3.7	-9.1	-5.4
3S1E19K001	19K1	58	U	Bernal	Dry	Dry	55.2	266.4	Dry	Dry	-	-	-
3S1E20C003	20C3	110	L	Bernal	74.9	263.7	71.0	267.7	83.1	255.5	3.9	-12.2	-8.2
3S1E20C007	20C7	153	U	Bernal	74.1	264.6	70.4	268.3	81.4	257.3	3.7	-11.0	-7.3
3S1E20C008	20C8	315	L	Bernal	88.1	250.5	76.8	261.9	105.1	233.6	11.3	-28.3	-17.0
3S1E20C009	20C9	515	L	Bernal	82.8	256.0	74.5	264.3	97.9	240.9	8.3	-23.4	-15.2
3S1E20J004	20J4	72	U	Bernal	64.7	266.9	58.7	272.9	68.7	262.9	6.0	-9.9	-4.0
3S1E20M011	20M11	71	U	Bernal	58.7	267.0	53.9	271.9	64.6	261.1	4.8	-10.7	-5.9
3S1E20Q002	20Q2	65	U	Bernal	24.6	301.2	23.0	302.8	24.9	300.9	1.6	-1.9	-0.3
3S1E22D002	22D2	72	U	Amador	63.9	304.2	58.7	309.3	63.1	304.9	5.2	-4.4	0.8
3S1E23J001	23J1	120	L	Amador	83.9	344.3	91.0	337.2	Dry	Dry	-7.1	-	-
3S1E24Q001	24Q1	440	L	Amador	120.9	306.6	109.7	317.8	126.1	301.4	11.2	-16.4	-5.2
3S1E25C003	25C3	146	U	Amador	99.5	354.7	98.2	356.0	100.3	353.9	1.3	-2.1	-0.8
3S1E28M002	28M2	141	U	Upland	30.3	359.7	14.2	375.8	26.9	363.1	16.1	-12.7	3.4
3S1E29M004	29M4	57	U	Castle	41.5	269.5	40.4	270.5	44.0	266.9	1.0	-3.6	-2.6
3S1E29P002	29P2	42	U	Bernal	30.4	272.4	29.3	273.5	30.8	272.1	1.1	-1.4	-0.3
3S1E33G005	33G5	35	U	Upland	13.7	394.9	11.4	397.1	17.2	391.3	2.2	-5.8	-3.6
3S1W01B009	1B9	162	L	Dublin	11.1	322.5	10.5	323.1	11.9	321.7	0.6	-1.4	-0.8
3S1W01B010	1B10	414	L	Dublin	7.1	326.5	8.2	325.4	23.3	310.3	-1.2	-15.1	-16.3
3S1W01B011	1B11	560	L	Dublin	18.2	315.5	19.0	314.8	9.8	323.9	-0.7	9.1	8.4
3S1W02A002	2A2	47	U	Dublin	28.2	341.2	25.0	344.4	27.9	341.5	3.2	-2.9	0.3
3S1W12B002	12B2	40	U	Dublin	22.2	320.7	20.2	322.7	21.9	321.0	2.0	-1.7	0.3
3S1W12J001	12J1	62	U	Dublin	23.9	305.4	23.7	305.6	24.8	304.5	0.2	-1.1	-0.9
3S1W13J001	13J1	48	U	Castle	30.7	313.2	28.6	315.3	30.7	313.3	2.1	-2.1	0.0
3S2E01F002	1F2	69	U	Spring	24.8	548.2	24.5	548.5	25.2	547.8	0.3	-0.7	-0.4
3S2E02B002	2B2	46	U	Spring	11.0	528.5	9.8	529.7	10.5	529.0	1.2	-0.7	0.5
3S2E03A001	3A1	54	U	Spring	6.3	511.3	4.9	512.7	6.3	511.4	1.4	-1.4	0.1
3S2E03K003	3K3	60	U	Mocho I	14.3	508.6	13.9	509.0	14.3	508.6	0.4	-0.4	0.0
3S2E05N001	5N1	210	M	Mocho II	37.2	406.9	33.3	410.7	43.0	401.0	3.8	-9.6	-5.8
3S2E07C002	7C2	49	U	Mocho II	30.1	390.7	28.0	392.8	30.0	390.8	2.1	-2.0	0.1
3S2E07H002	7H2	54	U	Mocho II	36.8	406.1	31.4	411.5	38.5	404.4	5.4	-7.1	-1.7
3S2E07N002	7N2	162	U	Amador	148.8	273.3	135.1	286.9	150.5	271.5	13.6	-15.4	-1.8
3S2E07P003	CWS24	510	L	Amador	NA	NA	42.0	389.5	NA	NA	-	-	-
3S2E07R002	7R2	805	D	Mocho II	4.4	441.6	4.0	442.0	NA	NA	0.4	-	-
3S2E07R003	CWS31	583	L	Upland	36.6	409.4	35.0	411.0	NA	NA	1.6	-	-
3S2E08H002	8H2	46	U	Mocho II	41.1	428.5	40.3	429.3	41.2	428.4	0.8	-0.8	-0.1
3S2E08H003	8H3	195	L	Mocho II	60.9	416.3	54.4	422.9	70.5	406.8	6.6	-16.1	-9.6
3S2E08H004	8H4	385	L	Mocho II	61.0	416.0	54.9	422.1	123.4	353.6	6.0	-68.4	-62.4
3S2E08K002	8K2	74	U	Mocho II	47.4	417.4	39.9	424.9	50.0	414.8	7.4	-10.1	-2.6
3S2E08N002	CWS14	526	L	Mocho II	NA	NA	42.0	411.6	NA	NA	-	-	-
3S2E08P001	CWS8	273	L	Mocho II	54.5	413.7	47.0	421.2	NA	NA	7.5	-	-
3S2E08Q009	8Q9	114	L	Mocho II	42.5	422.2	34.3	430.4	46.0	418.7	8.2	-11.7	-3.5
3S2E09Q004	9Q4	80	U	Mocho II	44.5	460.1	31.8	472.8	45.1	459.4	12.7	-13.3	-0.6
3S2E10F003	10F3	45	U	Mocho I	15.6	519.2	13.6	521.2	15.4	519.5	2.0	-1.8	0.2
3S2E10Q001	10Q1	44	U	Mocho II	29.9	525.5	23.6	531.8	29.4	526.0	6.3	-5.8	0.5
3S2E10Q002	10Q2	325	L	Mocho II	NA	NA	NA	NA	NA	NA	-	-	-
3S2E11C001	11C1	66	U	Mocho I	29.7	527.4	29.2	527.9	30.3	526.8	0.5	-1.0	-0.6
3S2E12C004	12C4	108	U	Spring	56.0	535.5	55.8	535.7	NA	NA	0.2	-	-

U = Upper; L = Lower; NM = Not Measured; NA = Not Available; OBS = Obstructed; - = Not Applicable
Highlighted = Representative Monitoring Site
P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Tbl03-TblSAWaterLevels22.xlsx

TABLE 5-3
SEMIANNUAL GROUNDWATER LEVELS
(Feet above Mean Sea Level, NAVD88)
FALL 2021 TO FALL 2022

					Fall 2021		Spring 2022		Fall 2022		Change in Elevation (ft)		
											Seasonal		Annual
Well Number	Display Name	Well Depth	Aquifer	Subarea	Depth to Water	GW Elev	Depth to Water (ft)	GW Elev	Depth to Water (ft)	GW Elev	Fall 21 to Spring 22	Spring 22 to Fall 22	Fall 21 to Fall 22
1S4E31P005	31P5	24	U	Tracy	18.5	41.5	18.9	41.1	NA	NA	-0.5	-	-
2S1E32E001	32E1	70	U	None	40.6	352.0	40.9	351.7	42.5	350.1	-0.3	-1.6	-1.9
2S1E32N001	32N1	44	U	Camp	20.2	340.6	20.0	340.8	20.6	340.2	0.2	-0.6	-0.4
2S1E32Q001	32Q1	45	U	Camp	29.9	337.7	29.6	337.9	30.8	336.7	0.2	-1.2	-1.0
2S1E33L001	33L1	80	U	None	55.1	334.4	55.7	333.8	56.7	332.8	-0.6	-1.0	-1.6
2S1E33P002	33P2	55	U	Camp	35.7	334.4	36.2	333.9	37.3	332.8	-0.5	-1.1	-1.6
3S2E12J003	12J3	160	L	Spring	84.0	547.1	NA	NA	NA	NA	-	-	-
3S2E14A003	14A3	110	U	Mocho I	73.7	528.5	NA	NA	NA	NA	-	-	-
3S2E14B001	14B1	300	L	Mocho I	66.6	526.8	66.1	527.3	67.3	526.1	0.5	-1.2	-0.7
3S2E15E002	15E2	192	L	Mocho II	61.8	487.9	43.0	506.7	61.9	487.8	18.8	-18.8	-0.1
3S2E15L001	15L1	41	U	Mocho II	NA	NA	NA	NA	Dry	Dry	-	-	-
3S2E15L002	15L2	71	U	Mocho II	47.5	513.3	NA	NA	47.2	513.6	-	-	0.2
3S2E15M002	15M2	45	U	Mocho II	NA	NA	NA	NA	Dry	Dry	-	-	-
3S2E15M003	15M3	76	U	Mocho II	55.5	492.9	NA	NA	57.0	491.4	-	-	-1.5
3S2E15Q006	15Q6	301	L	Mocho II	64.4	513.2	51.1	526.5	61.9	515.7	13.3	-10.8	2.5
3S2E15Q008	15Q 8	41	U	Mocho II	33.8	550.6	NA	NA	32.7	551.7	-	-	1.1
3S2E15R017	15R17	63	U	Mocho II	13.2	579.3	10.1	582.3	12.4	580.0	3.1	-2.3	0.7
3S2E15R018	15R18	138	L	Mocho II	26.4	566.1	16.6	575.9	23.1	569.4	9.8	-6.5	3.3
3S2E15R020	15R20	51	U	Mocho II	19.1	570.3	NA	NA	16.5	572.9	-	-	2.6
3S2E16A003	16A3	240	L	Mocho II	55.3	471.8	39.9	487.2	54.8	472.2	15.4	-15.0	0.5
3S2E16C001	CWS15	584	L	Mocho II	NA	NA	NA	NA	NA	NA	-	-	-
3S2E16E004	16E4	45	U	Mocho II	39.3	467.0	24.3	482.0	39.3	466.9	15.0	-15.0	-0.1
3S2E18B001	CWS20	497	L	Amador	207.0	231.6	48.0	390.6	NA	NA	159.0	-	-
3S2E18E001	18E1	134	U	Amador	100.9	323.0	92.2	331.6	100.0	323.9	8.6	-7.8	0.9
3S2E19D007	19D7	180	U	Amador	135.1	280.0	122.8	292.3	156.7	258.4	12.3	-33.9	-21.6
3S2E19D008	19D8	260	L	Amador	135.4	279.6	123.1	291.9	157.0	258.1	12.3	-33.9	-21.6
3S2E19D009	19D9	390	L	Amador	180.0	235.0	159.6	255.4	206.1	208.9	20.4	-46.5	-26.2
3S2E19D010	19D10	470	L	Amador	157.0	257.9	144.8	270.1	180.0	234.9	12.2	-35.2	-23.0
3S2E19N003	19N3	120	U	Amador	47.5	371.0	42.0	376.5	46.7	371.8	5.5	-4.7	0.8
3S2E19N004	19N4	203	L	Amador	36.7	381.2	29.5	388.5	29.6	388.3	7.3	-0.1	7.1
3S2E20M001	20M1	184	L	Amador	59.7	419.1	53.3	425.5	59.8	419.0	6.4	-6.6	-0.1
3S2E20R002	20R2	257	U	Upland	79.8	443.4	75.9	447.3	78.9	444.3	3.9	-3.0	0.9
3S2E21K009	21K9	0	U	Upland	90.9	476.2	NM	NM	90.4	476.7	-	-	0.5
3S2E22B001	22B1	32	U	Mocho II	Dry	Dry	18.1	567.8	Dry	Dry	-	-	-
3S2E23E001	23E1	40	U	Mocho II	19.0	594.4	16.5	596.9	19.0	594.4	2.5	-2.5	0.0
3S2E23E002	23E2	110	L	Mocho II	16.9	596.3	14.3	598.9	16.6	596.6	2.6	-2.3	0.3
3S2E24A001	24A1	46	U	Mocho I	18.1	699.6	20.4	697.3	20.9	696.8	-2.3	-0.5	-2.8
3S2E26J002	26J2	44	U	Mocho II	13.4	676.6	8.6	681.4	12.3	677.7	4.8	-3.7	1.1
3S2E29F004	29F4	36	U	Amador	13.0	444.6	11.3	446.2	13.0	444.6	1.6	-1.6	0.0
3S2E29L001	29L1 (P3)	23	U	Amador	13.5	450.1	10.5	453.2	13.5	450.1	3.0	-3.0	0.0
3S2E30C001	30C1	150	L	Amador	36.5	402.9	31.7	407.7	34.3	405.1	4.8	-2.6	2.2
3S2E30D002	30D2	44	U	Amador	26.0	405.6	21.6	410.0	27.8	403.8	4.4	-6.2	-1.8
3S2E32E007	32E7	37	U	Upland	18.4	592.5	18.3	592.6	18.8	592.1	0.1	-0.5	-0.4
3S2E33C001	33C1 (P1)	20	U	Amador	12.3	485.3	9.7	487.9	12.4	485.3	2.6	-2.6	-0.1
3S2E33G001	33G1	17	U	Amador	9.2	502.3	9.1	502.5	9.4	502.2	0.1	-0.3	-0.2
3S3E06Q003	6Q3	30	U	Altamont	8.1	673.0	8.2	672.8	13.4	667.7	-0.1	-5.2	-5.3
3S3E07D002	7D2	72	U	Spring	47.9	574.0	NA	NA	NA	NA	-	-	-
3S3E20L004	20L4	340	U	Mocho I	101.3	761.1	OBS	OBS	82.4	780.0	-	-	18.9
3S3E20R004	20R4	0	U	Mocho I	51.2	872.6	46.5	877.2	54.3	869.5	4.7	-7.7	-3.0
3S3E21C001	21C1	128	U	Upland	34.1	1033.1	34.3	1032.9	34.5	1032.7	-0.2	-0.2	-0.4
4S2E01A001	1A1	130	U	Mocho II	23.8	796.0	19.0	800.8	26.7	793.1	4.8	-7.8	-2.9
4S3E06E004	6E4	220	U	Mocho II	6.7	801.0	2.2	805.5	10.5	797.2	4.5	-8.3	-3.9

U = Upper; L = Lower; NM = Not Measured; NA = Not Available; OBS = Obstructed; - = Not Applicable
Highlighted = Representative Monitoring Site
P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Tbl03-TblSAWaterLevels22.xlsx

TABLE 5-4
GROUNDWATER ELEVATIONS AT REPRESENTATIVE MONITORING SITES
FOR CHRONIC LOWERING OF GROUNDWATER ELEVATIONS
2022 WATER YEAR
LIVERMORE VALLEY GROUNDWATER BASIN

RMS Well		*Management Area/Unit*			*2022 Water Year (in ft)*					*SMCs for GWE (ft above Mean Sea Level)*				
Well Name	*Map*	*Area*	*Subarea*	*Aquifer*	*Season High GWE*	*Season Low GWE*	*Change from 2021**	*Height above MT*	*Height above MO*	*MT*	*IM-5*	*IM-10*	*IM-15*	*MO*
3S1E20C007	20C7	Main	Bernal	Upper	268.4	257.3	-7.3	112.5	77.8	144.8	153.4	162.1	170.8	179.5
3S1E20C008	20C8	Main	Bernal	Lower	266.7	233.6	-17.0	88.8	54.1	144.8	153.4	162.1	170.8	179.5
3S1E09P005	9P5	Main	Amador West	Upper	279.3	268.5	-9.7	88.7	61.8	179.8	186.5	193.2	199.9	206.7
3S1E09P010	9P10	Main	Amador West	Lower	270.5	241.1	-13.2	61.4	34.5	179.8	186.5	193.2	199.9	206.7
3S1E11G001	11G1	Main	Amador East	Upper	298.7	285.9	-7.9	104.9	66.0	181.0	190.7	200.4	210.2	219.9
3S1E12K003	12K3	Main	Amador East	Lower	261.6	207.2	-28.2	26.2	-12.7	181.0	190.7	200.4	210.2	219.9
3S2E08K002	8K2	Main	Mocho II	Upper	425.9	414.8	-2.6	159.7	121.7	255.1	264.6	274.1	283.6	293.1
3S2E08H003	8H3	Main	Mocho II	Lower	423.8	406.8	-9.6	151.6	113.6	255.1	264.6	274.1	283.6	293.1
3S1E06F003	6F3	Fringe	Northwest	Upper	324.9	323.5	-0.3	18.6	8.9	305.0	307.4	309.8	312.2	314.6
2S2E34E001	34E1	Fringe	Northeast	Upper	495.8	493.7	0.2	5.5	2.5	488.2	489.0	489.7	490.5	491.2
3S2E24A001	24A1	Fringe	East	Upper	697.9	696.8	-2.8	21.3	18.5	675.5	676.2	676.9	677.6	678.3
3S2E21K009	21K9	Upland	Upland	Upper	476.7	476.7	NA	6.6	6.6	470.1	470.1	470.1	470.1	470.1

RMS = Representative Monitoring Site
GWE = Groundwater Elevation (in ft above Mean Sea Level)
SMC = Sustainable Management Criteria
IM = Interim Milestone
MO = Measurable Objective
MT = Minimum Threshold
NA = Not Available
* = 2022 Seasonal Low minus 2021 Seasonal Low

Main
Fringe
Upland

ABBREVIATIONS FOR MUNI WELLS
CWS= California Water Service
M = Mocho (Zone 7)
H = Hopyard (Zone 7)
St = Stoneridge (Zone 7)
P = Pleasanton
SF = San Francisco Public Utilities Commision

LEGEND

Wells in 2022 GW Elevation Program

- Supply, Lower
- Supply, Upper
- Monitoring, Deep
- Monitoring, Lower
- Monitoring, Upper
- Municipal, Lower
- Nested, Deep
- Nested, Lower
- Nested, Upper
- Representative Monitoring Sites
- Main Basin
- Fringe Areas
- Upland Areas
- Mining Pond
- Streams
- Township-Range Line

2S/1W 2S/1E 2S/2E 2S/3E
3S/1W 3S/1E 3S/2E 3S/3E
4S/1W 4S/1E 4S/2E 4S/3E

N W E S

0 2 4
Miles

DATE: Mar 6, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Fig01-MapAllWellsGM22.mxd

Figure 5-1
Map of Wells in
Water Level Monitoring Network
Livermore Valley Groundwater Basin

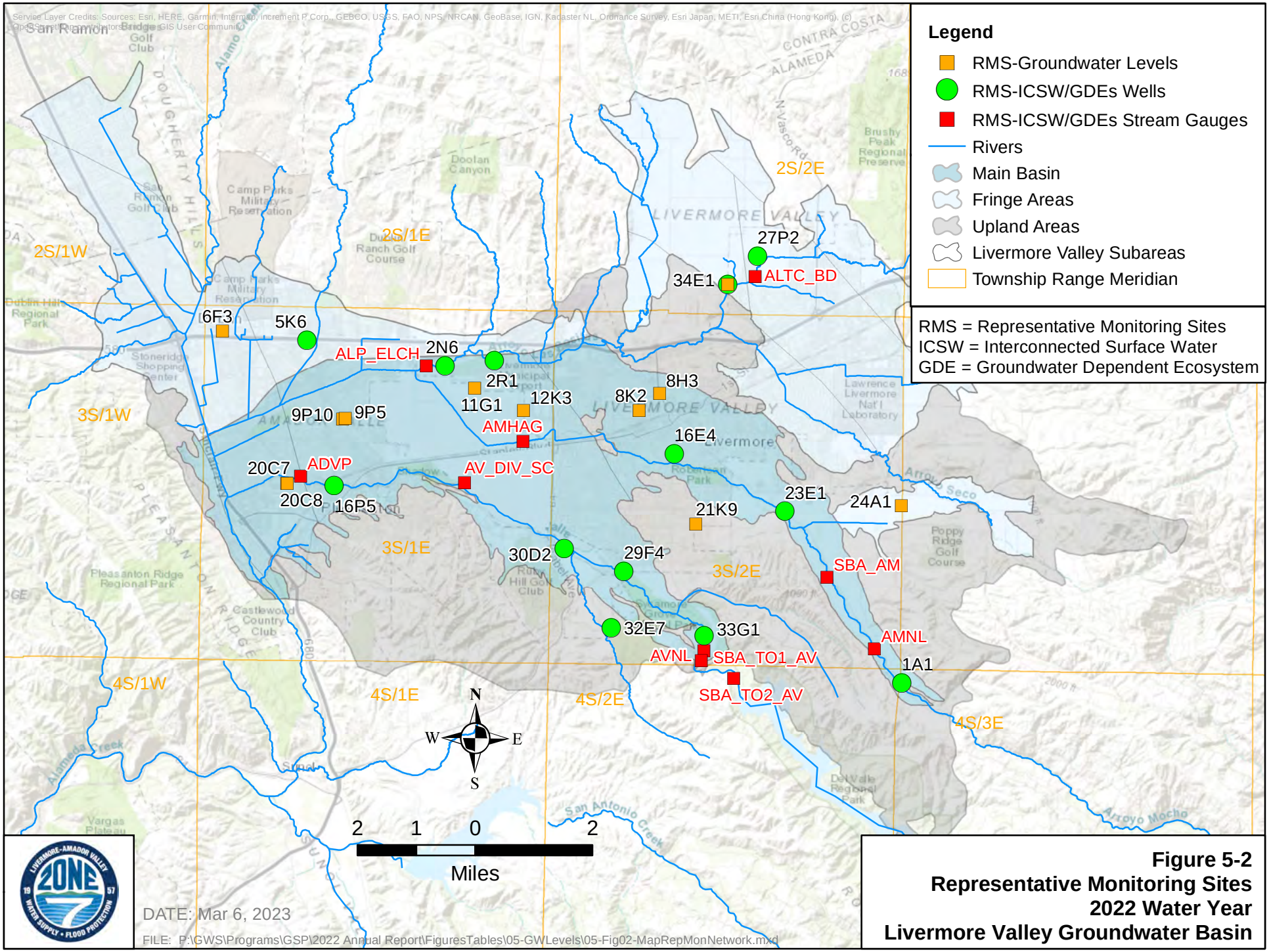


Figure 5-2
Representative Monitoring Sites
2022 Water Year
Livermore Valley Groundwater Basin

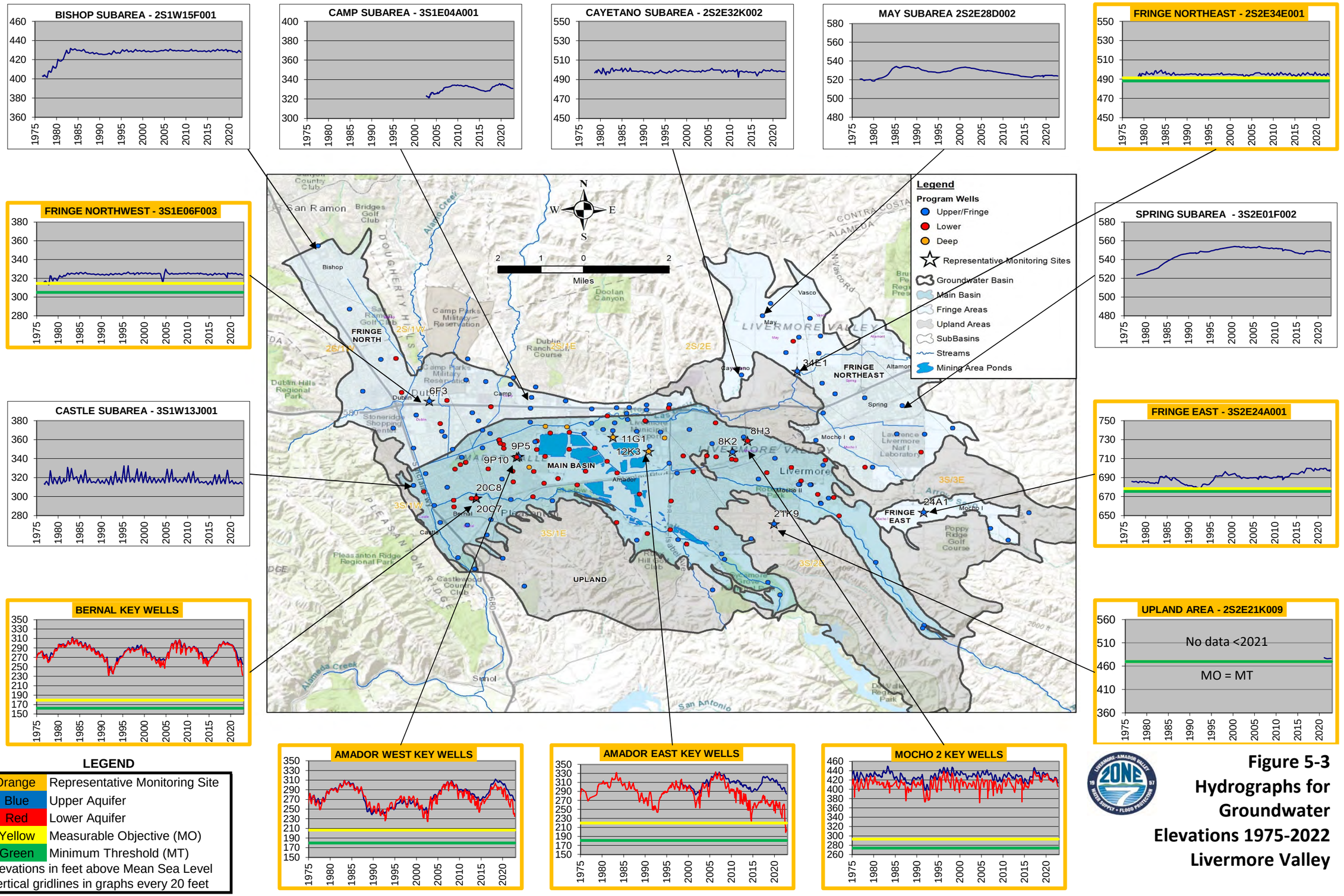


Figure 5-3
Hydrographs for Groundwater Elevations 1975-2022
Livermore Valley

LEGEND

2022 Program Wells (Upper Aquifer)

- Supply; irrigation; livestock
- Monitor
- Nested
- Mining Pond
- SGMA Representative Wells

Mining Pond Areas 2022

- Static (= groundwater elevation)
- Pumped From
- Pumped Into
- Clay-lined
- Contours (Interval = 10')
- Hatch pattern towards lower elevation
- Main Basin
- Fringe Area
- Upland Area

2S/1W 2S/1E 2S/2E 2S/3

3S/1W 3S/1E 3S/2E 3S/3E

4S/1W 4S/1E 4S/2E 4S/3E

N W E S

0 2 4

Miles

DATE: Mar 6, 2023

FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Fig04-GradientUpperSpring22.mxd

Figure 5-4
Groundwater Gradient Map
Upper Aquifer, Seasonal High, Spring 2022
Livermore Valley Groundwater Basin

LEGEND

2022 Program Wells - Upper Aquifer

- Supply
- Monitor
- Nested
- Mining Pond
- SGMA Representative Wells

Mining Pond Areas 2022

- Static (= groundwater elevation)
- Pumped From
- Pumped Into
- Clay-lined
- Contours (Interval = 10')
- Hatch pattern towards lower elevation
- Main Basin
- Fringe Area
- Upland Area

N
W E
S

0 2 4
Miles

DATE: Mar 6, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Fig05-GradientUpperFall22.mxd

Figure 5-5
Groundwater Gradient Map
Upper Aquifer; Seasonal Low, Fall 2022
Livermore Valley Groundwater Basin

LEGEND

Elevation Difference* (ft)

- < -45
- -45 to -35
- -35 to -25
- -25 to -15
- -15 to -5
- -5 to 5
- 5 to 15
- 15 to 25
- 25 to 35
- 35 to 45
- 45 to 55
- Mining Ponds
- Main Basin
- Fringe Area
- Upland Area

* Fall 2022 Minus Fall 2021 so negative numbers represent a drop from 2021WY to 2022WY.

FRINGE SUBAREA - NORTH

UPLAND SUBAREA

FRINGE SUBAREA - NORTHEAST

MAIN BASIN

UPLAND SUBAREA

FRINGE SUBAREA - EAST

UPLAND SUBAREA

UPLAND SUBAREA

UPLAND SUBAREA

N

W E

S

0 2 4

Miles

DATE: Mar 20, 2023

FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Fig06-ChangeGradientUpper22.mxd

Figure 5-6
Change in Groundwater Elevation
Upper Aquifer; Fall 2021 to Fall 2022
Livermore Valley Groundwater Basin

LEGEND

Depth to Groundwater (ft)

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100
- 100 - 110
- 110 - 120
- 120 - 130
- 130 - 140
- 140 - 150
- Streams
- Mining Ponds

FRINGE SUBAREA - NORTH

UPLAND SUBAREA

MAIN BASIN

UPLAND SUBAREA

UPLAND SUBAREA

FRINGE SUBAREA - NORTHEAST

FRINGE SUBAREA - EAST

UPLAND SUBAREA

N

W E

S

0 2 4

Miles

DATE: Jan 10, 2023

FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Fig07-DepthToUpperGWTable22.mxd

Figure 5-7
Depth to Groundwater
Upper Aquifer; Season Low, Fall 2022
Livermore Valley Groundwater Basin

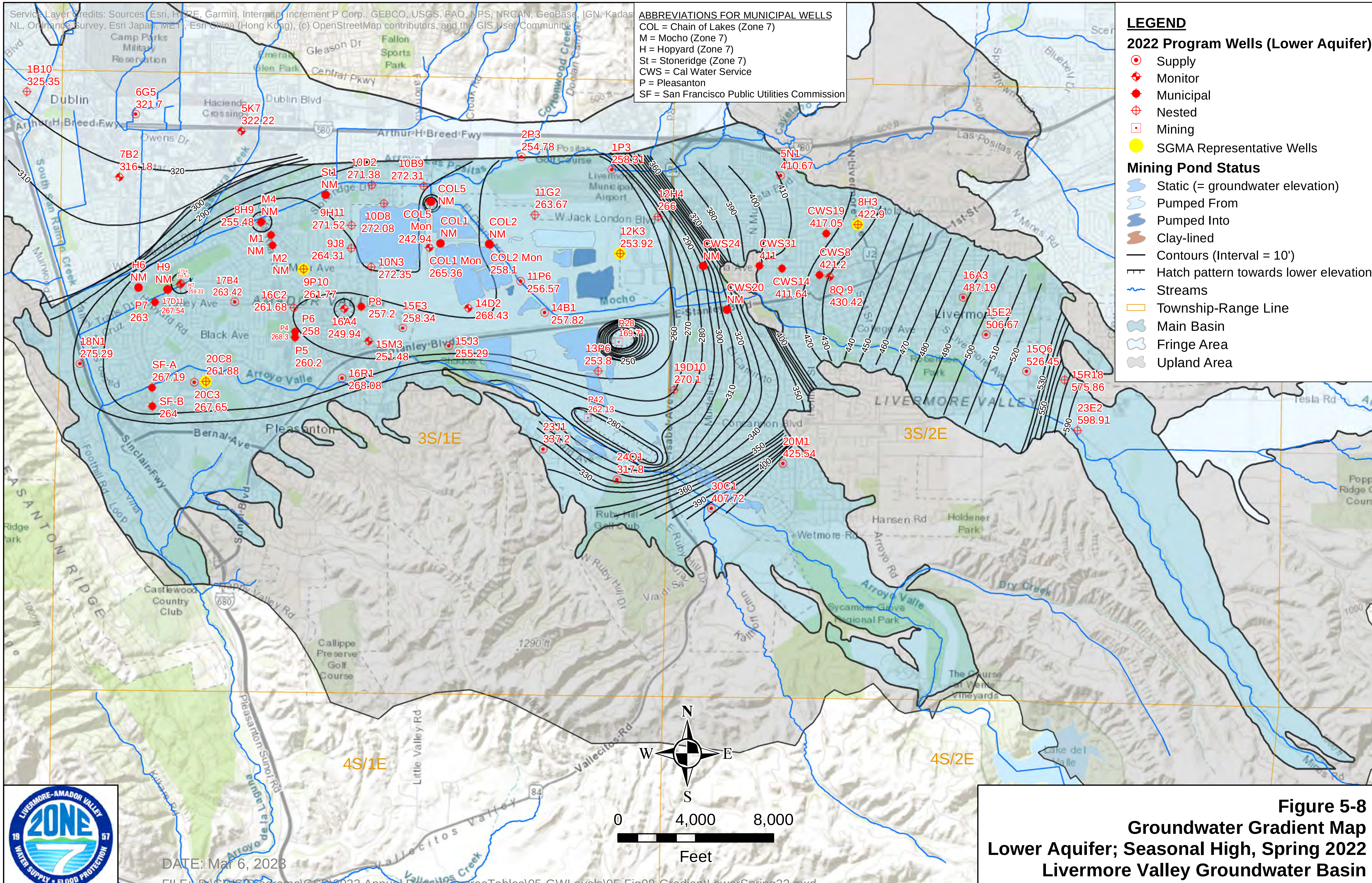


Figure 5-8
Groundwater Gradient Map
Lower Aquifer; Seasonal High, Spring 2022
Livermore Valley Groundwater Basin

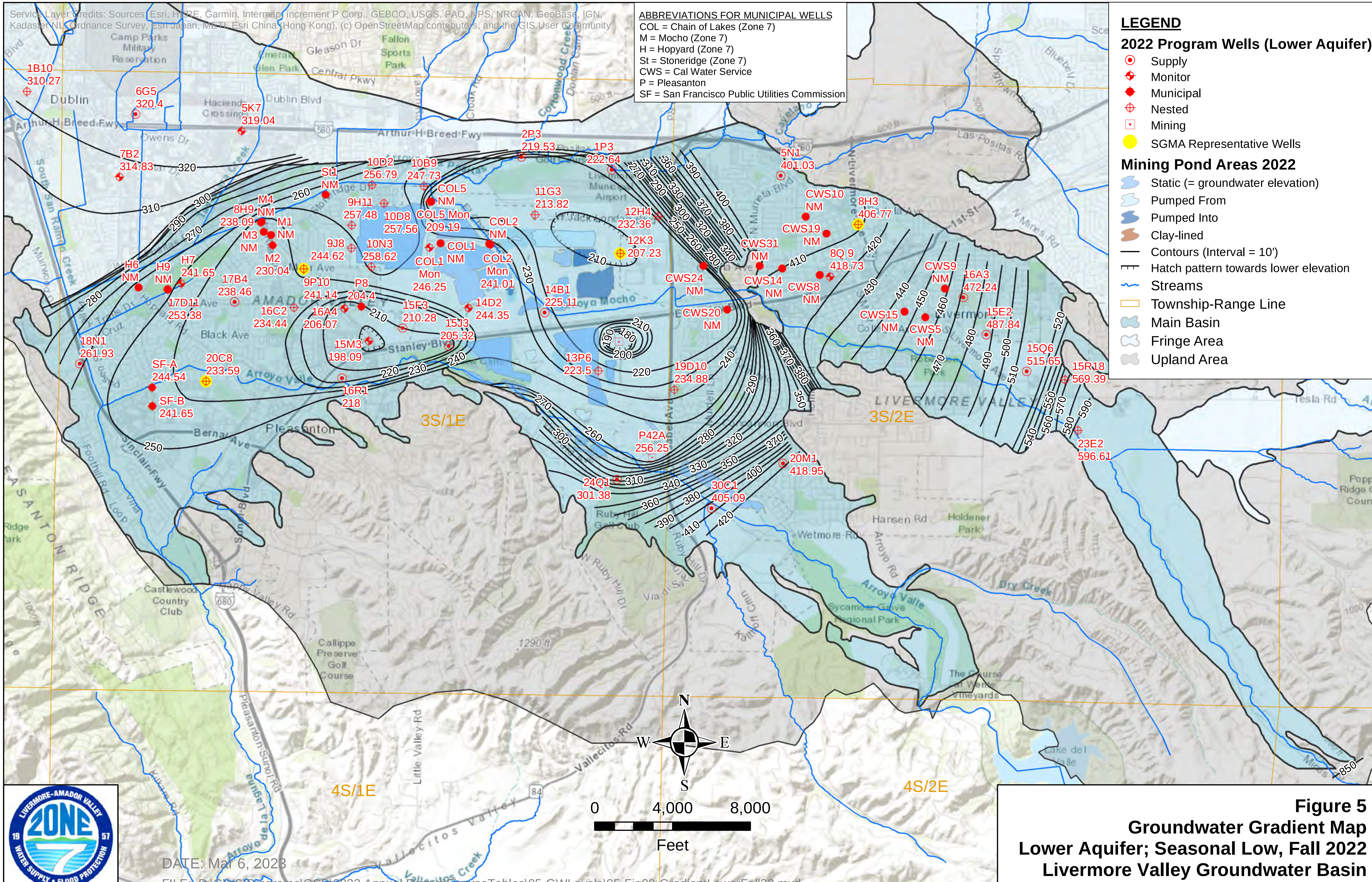


Figure 5
Groundwater Gradient Map
Lower Aquifer; Seasonal Low, Fall 2022
Livermore Valley Groundwater Basin

LEGEND

Elevation Difference* (ft)

- < -45
- -45 to -35
- -35 to -25
- -25 to -15
- -15 to -5
- -5 to 5
- 5 to 15
- 15 to 25
- 25 to 35
- 35 to 45
- 45 to 55
- Streams
- Municipal Supply Wells

* Fall 2022 Minus Fall 2021 so negative numbers represent a drop from 2021WY to 2022WY.

FRINGE SUBAREA - NORTH

UPLAND SUBAREA

MAIN BASIN

FRINGE SUBAREA - NORTHEA

FRINGE SUBAREA - EAST

UPLAND SUBAREA

UPLAND SUBAREA

UPLAND SUBAREA

Stoneridge 1
COL 5
Mocho 4
Mocho 3
Mocho 2
Mocho 1
COL 1
COL 2
Hop 6
Hop 9
Pleas 8
Pleas 6
Pleas 5
SF-A
SF-B
Fair C3
Fair B2
CWS 10
CWS 19
CWS 24
CWS 31
CWS 14
CWS 8
CWS 20
CWS 17
CWS 12
CWS 9
CWS 15
CWS 5
R28
P42

3S/1E
3S/2E
3S/3E
4S/1E
4S/2E

N
W
E
S

0 4,000 8,000
Feet

DATE: Mar 20, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\05-GWLevels\05-Fig10-ChangeGradientLower22.mxd

Figure 5-10
Change in Groundwater Elevation
Lower Aquifer; Fall 2021 to Fall 2022
Livermore Valley Groundwater Basin

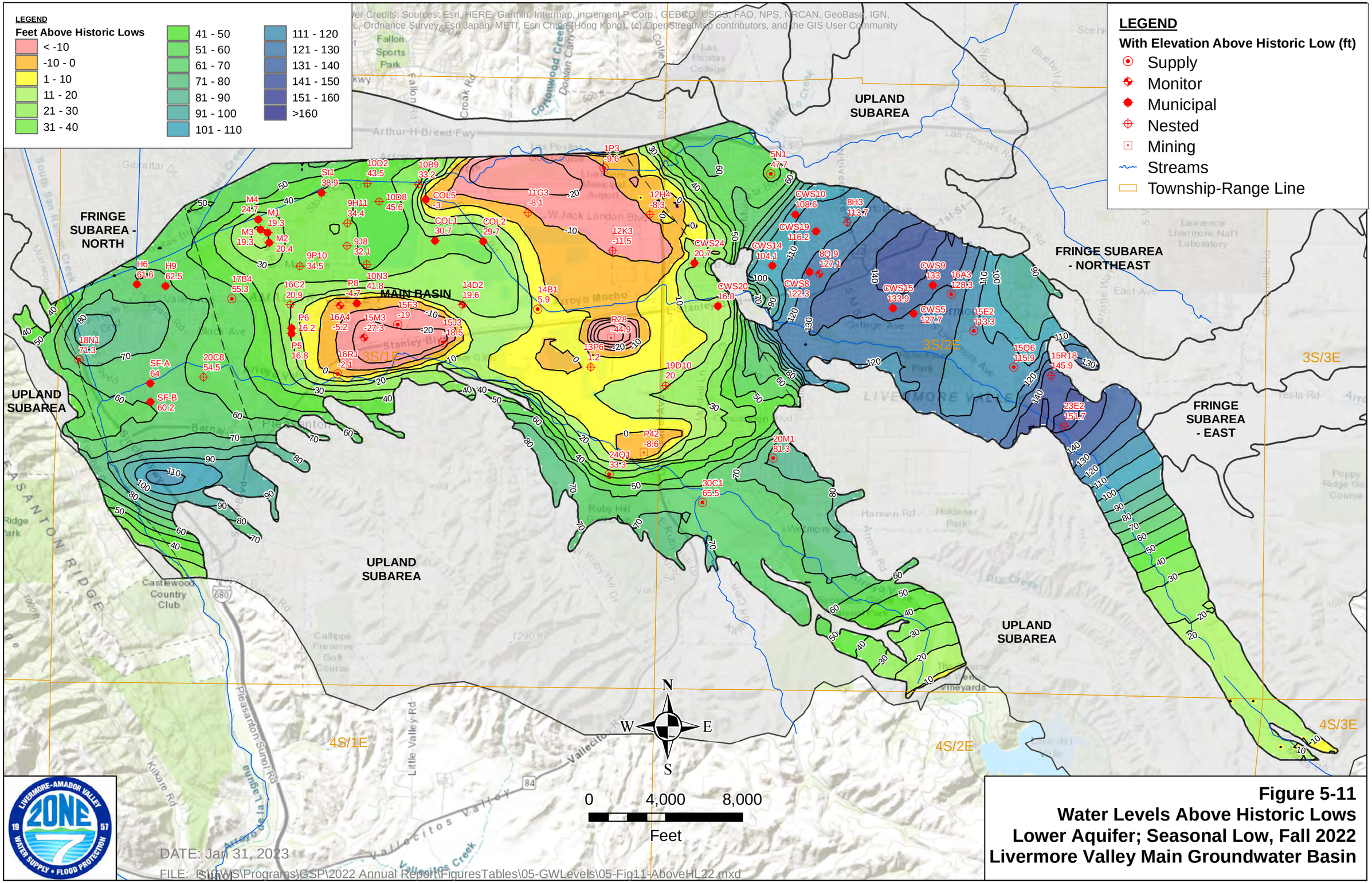


Figure 5-11
Water Levels Above Historic Lows
Lower Aquifer; Seasonal Low, Fall 2022
Livermore Valley Main Groundwater Basin

6 Groundwater Quality Monitoring

6.1 Program Changes

Table 6-A below lists the changes that were made to the Groundwater Quality Monitoring Program for the 2022 WY.

Table 6-A: Program Wells Changes during the 2022 WY

Action	Reason	Note
2S2E27K001 Removed from program	No sample port	Still measured for water levels.

Zone 7's 2021 Alternative GSP also established the SMCs for Degraded Water Quality as shown in ***Table 6-B*** below.

Table 6-B: SMCs for Degraded Water Quality

Undesirable Results Definition	Undesirable Results Criteria	Minimum Threshold	Measurable Objective
If groundwater recharge or extraction causes significant and unreasonable degradation of water quality in the Basin, such that these changes impact the long-term viability of domestic, agricultural, municipal, environmental, or other beneficial uses over the planning and implementation horizon of this Alternative GSP. Significant and unreasonable changes to water quality associated with Undesirable Results would include a significant increase, on a regional basis, in concentrations of identified COCs above applicable state and federal regulatory thresholds, as a result of groundwater recharge or extraction.	If and when MTs are exceeded for any of the identified COCs in greater than 25% the RMS-WQs at least two consecutive years as a result of groundwater recharge or extraction, such that they cannot be managed to provide drinking water supply (i.e., that treatment or blending is not possible or practicable).	Greater of MCL (or other appropriate regulatory criteria) or the SGMA baseline concentration plus maximum historical annual range.	TDS: Recommended Secondary MCL (500 mg/L) in the Main Basin, Upper Secondary MCL (1,000 mg/L) or 2015 concentrations (whichever is greater) in the Fringe and Upland Areas. Nitrate: Primary MCL (10 mg/L) Boron: Health Risk Limit (HRL; 1,400 µg/L) Hexavalent Chromium: Primary MCL (50 µg/L)

SMC = Sustainable Management Criteria
COCs = Constituents of Concern
RMS-WQ = Representative Monitoring Sites for Water Quality
MCL = Maximum Contaminant Level
SGMA = Sustainable Groundwater Management Act
MT = Minimum Threshold
GSP = Groundwater Sustainability Plan
TDS = Total Dissolved Solids

For more information on general groundwater quality and the groundwater quality program, see the following sections of the 2021 Alternative GSP:

- **Section 1.2.3:** Groundwater Quality Program Updates
- **Section 8.6:** Current and Historical Groundwater Conditions - Groundwater Quality
- **Section 13.4:** Sustainability Indicators – Degraded Water Quality
- **Section 14.2.4:** Monitoring Network for Degraded Water Quality
- **Section 14.4:** Representative Monitoring

6.2 Results for the 2022 Water Year

6.2.1 General

Figure 6-1 and ***Table 6-1*** show all 230 wells in the 2022 WY Groundwater Quality Program. ***Table 5-2*** from ***Section 5: Groundwater Elevation Monitoring*** shows well construction information for each of the wells. ***Table 6-2*** shows metal and mineral results from all wells in the program for the 2022 Water Year. In general, concentrations of the constituents of concern (TDS, nitrate, boron, chromium, and PFAS) remain relatively unchanged over the last several years.

6.2.2 Total Dissolved Solids (TDS)

Table 6-3 shows TDS results for the 2022 WY in Representative Monitoring Sites for Degraded Water Quality (RMS-WQ) and their relative to the MOs and MTs defined in the 2021 Alternative GSP. Concentrations were below the MTs in all wells except for one well in the Mocho II Subarea Lower Aquifer (3S2E08H003 [8H3]) which had detections of TDS at 742 milligrams per Liter (mg/L) (24 mg/L above the MT, 5 mg/L greater than in the 2021 WY). Four additional wells had concentrations above the MOs including two wells in the Main Basin Upper Aquifer (3S1E11G001 [11G1] and 3S2E08K002 [8K2]), one in the Main Basin Lower Aquifer (3S1E20C008 [20C8]), and one in the Fringe Area (3S2E24A001 [24A1]). As stated in the 2021 Alternative GSP, a UR for Degraded Water Quality occurs if and when:

MTs are exceeded for any of the identified constituents of concern in greater than 25% of the RMS-WQs at least two (2) consecutive years as a result of SGMA-related groundwater management activities such that they cannot be managed to provide drinking water supply (i.e., that treatment or blending is not possible or practicable).

Therefore, since only one RMS-WQ had a concentration above the MT during the 2022 WY, this MT exceedance does not constitute a UR for Degraded Water Quality for TDS.

Figure 6-2 shows graphs of TDS concentrations from 1975 to 2022 in various wells including the RMS-WQ. ***Figure 6-3*** and ***Figure 6-4*** show TDS concentrations for the 2022 WY in the Upper and Lower Aquifers, respectively.

- During the 2022 WY, the TDS concentrations in groundwater continued to be lowest in areas adjacent to the Arroyo Valle and the Arroyo Mocho, where they were generally less than 500 mg/L in both the Upper and Lower Aquifers.

- There continues to be two main areas of the Basin where TDS concentrations exceed 1,000 mg/L in the Upper Aquifer:

    - In the northwestern Fringe Area and extending south into the Main Basin. This high TDS area is most likely due to the combination of the concentrating effects of urban irrigation, leaching of buried lacustrine and marine sediments, recharge of poorer quality water from Arroyo Las Positas, and legacy wastewater and sludge disposal practices in the Pleasanton and Dublin areas.

    - In the northeastern Fringe Area. This high-TDS area is likely due to poorer quality water that runs off marine sediments on the east and north of the Basin and recharges the Basin along the hill-fronts.

- Many of the supply wells in the Pleasanton area produced water with TDS concentrations greater than the basin objective of 500 mg/L (also used as the MO for the RMS-WQ wells) during the 2022 WY. The highest concentrations were detected as follows:

    - The highest concentration detected in a Zone 7 municipal well was in the Mocho 4 Well (M4) at 674 mg/L.

    - One of the San Francisco Public Utilities Commission (SFPUC) wells in the Bernal wellfield (SF-B) detected TDS at 721 mg/L.

    - A private irrigation well (3S1E17B004 [17B4]) located central to four active wellfields (Mocho, Hopyard, Bernal, and Busch Valley) had TDS at 740 mg/L.

6.2.3 Nitrates

Table 6-4 shows nitrate (as nitrogen, NO_3-N) results for the 2022 WY in RMS-WQ and their relative to the MOs and MTs defined in the 2021 Alternative GSP. Concentrations were below the MTs in all wells and above the MOs in two wells, one in the Main Basin Lower Aquifer (3S2E08H001 [8H3]) and one in the Fringe Area (3S2E24A001 [24A1]). Since no RMS-WQ had a concentration above the MT, there were no UR occurrences for nitrate.

Figure 6-5 shows graphs of NO_3-N concentrations from 1975 to 2022 in various wells including the RMS-WQ. ***Figure 6-6*** and ***Figure 6-7*** show NO_3-N concentrations for the 2022 WY in the Upper and Lower Aquifers, respectively.

The Nutrient Management Plan (NMP) (*Zone 7, 2015b*) identified ten local high nitrate Areas of Concern (AOC) where nitrate concentrations persist above the Basin Objective (which is the

Maximum Contaminant Level [MCL], 10 mg/L NO_{3}-N). Overall, these AOCs have been decreasing in size and/or concentration or have been relatively stable over the last five years:

- **Happy Valley**—Two wells are near this area; however, only 3S1E28M002 (28M2) was sampled and analyzed for nitrate (at 6.4 mg/L) in the 2022 WY.

- **Bernal**—The long-term trend of concentrations in 3S1E22D002 (22D2) continues to decline slowly. In the 2022 WY, the concentration was at 8.29 mg/L compared to 8.38 mg/L for the 2021 WY.

- **Staples Ranch**—For the past few years, nitrate concentrations in this AOC have hovered around the Basin Objective. The highest concentration during the 2022 WY was detected in 3S1E05K006 (5K6) at 10.3 mg/L.

- **Constitution**—Nitrate concentrations in 3S1E01H003 (1H3) remain slightly above the above the Basin Objective at 16.7 mg/L during the 2022 WY compared to 13.3 mg/L in 2021 WY.

- **Jack London**—The highest nitrate concentration detected in this AOC was in 3S1E12D002 (12D2) at 12 mg/L during the 2022 WY (not sampled in 2021 WY).

- **May School**—Historically, the nitrate concentration in this AOC has been characterized annually by the results of a single monitoring well (2S2E28D002 [28D2]), which have varied over the last 7 years between 16.7 mg/L and 42.8 mg/L. Well 2S2E21L001 (21L1), which was added to the program in 2021, had a nitrate concentration of 19.1 mg/L (19.8 mg/L in 2021 WY).

- **Charlotte Way**— In the 2022 WY, only one well in this area exceeded the MCL: 12.9 mg/L in 3S2E03K003 (3K3, 14.1 mg/L in the 2021 WY). The concentration in 3S2E14A003 (14A3) has been hovering near the basin objective for the last few years; this year the concentration was below the basin objective at 9.85 mg/L, but last year it was above at 10.2 mg/L.

- **Buena Vista**—During the 2022 WY, one of the highest concentrations was again detected in the northeastern portion of the plume at 13.2 mg/L in 3S2E10Q001 (10Q1, 14.6 mg/L in the 2021 WY). Just to the southwest of that well, the concentration in 3S2E15M002 (15M2) was just above that at 14 mg/L (not measured in the 2021 WY). Overall, this nitrate plume, which also extends into the Lower Aquifer, has been relatively stable over the last five years.

- **Greenville**—Historically, this AOC was characterized by the results of a single monitoring well (3S2E24A001, 24A1); however, nearby well 3S2E19C002 (19C2) was added to the program in the 2021 WY. For the 2022 WY, 24A1 had a concentration of 26.1 mg/L (1.5 mg/L in the 2021 WY) and 19C2 had 17 mg/L (18.9 mg/L in the 2021 WY). Two wells southeast of this AOC that were also added to the program in the 2021 WY also had

concentrations near the Basin Objective: 3S3E20L004 (20L4) at 14.9 mg/L (18.6 mg/L in the 2021 WY) and 3S3E20R004 (20R4) at 9.42 mg/L (12.7 mg/L in the 2021 WY).

- **Mines Road**—For the 2022 WY, the nitrate concentration in 3S2E26J002 (26J2) was again below the Basin Objective at 0.7 mg/L (1.94 mg/L in 2021 WY). Two wells southeast of this AOC that were added to the program in the 2021 WY were both non-detect for nitrate.

6.2.4 Boron

Table 6-5 shows boron results for the 2022 WY in RMS-WQ relative to the MOs and MTs defined in the 2021 Alternative GSP. Concentrations were below the MTs in all wells but were above the MOs in one well in the Fringe Area (3S1E06F003 [6F3]). Since no RMS-WQ had a concentration above the MT, there were no UR occurrences for boron.

Figure 6-8 shows graphs of boron concentrations from 1975 to 2022 in various wells including the RMS-WQ. ***Figure 6-9*** and ***Figure 6-10*** show boron concentrations for the 2022 WY in the Upper and Lower Aquifers, respectively. Boron exists at elevated concentrations in the areas of the Basin listed below. These localized concentrations of boron have been relatively stable for many years.

- Along the boundary between the northwestern Fringe Area and the Main Basin. The highest concentration was detected near the center of this area in 3S1E04J005 (4J5) at 9,400 micrograms per Liter (µg/L) the 2022 WY (11,600 µg/L in 2021 WY). It appears that a small portion of this plume extends into the Lower Aquifer just north of Lake I.

- In portions of the northeastern Fringe Area. The highest concentration detected in these areas in the 2022 WY was detected at 32,800 µg/L in 2S2E27P002 (27P2), compared to 27,000 µg/L in the 2021 WY.

- In the eastern Fringe Area. The highest concentration was detected in 3S2E21C001 (21C1, in the Upland Area) at 3,600 µg/L (4,040 ug/L in the 2021 WY).

6.2.5 Chromium

Table 6-6 shows total Chromium (Cr) results for the 2022 WY in RMS-WQ relative to the MOs and MTs defined in the 2021 Alternative GSP. Concentrations were below the MTs and MOs in all wells. Since no RMS-WQ had a concentration above the MT, there were no UR occurrences for chromium.

Figure 6-11 shows graphs of Cr concentrations from 1975 to 2022 in various wells including the RMS-WQ. ***Figure 6-12*** and ***Figure 6-13*** show Cr concentrations for the 2022 WY in the Upper and Lower Aquifers, respectively.

Cr concentrations did not exceed the 50 µg/L threshold in any wells for the 2022 WY, however there are two areas that historically have had concentrations above the 50 µg/L threshold.

- While samples from monitoring well 3S2E12C004 (12C4) in the northeastern Fringe Area have typically exhibited high Cr values in the past (94µg/L in the 2020 WY), the concentration was only 7.3 µg/L in the 2022 WY.

- In the 2020 WY Cr was detected at 108 µg/L in monitoring well 3S1E07G007 (7G7) in the northwestern Fringe Area just north of the Main Basin, however in both the 2021 and 2022 WYs the concentration was below the detection limit.

6.2.6 PFAS

Table 6-7 shows 2022 WY PFAS results from the wells. ***Table 3-3*** in ***Section 3*** (Mining Area Monitoring) shows 2022 WY PFAS concentrations in the mining area ponds. The PFAS compound with the highest concentrations in the Basin has been perfluorooctane sulfonic acid (PFOS). PFOS concentrations in the Upper and Lower Aquifers are shown on ***Figure 6-15*** and ***Figure 6-16***, respectively.

PFOS

- The majority of wells with PFOS concentrations that were above the Department of Drinking Water's (DDW) 40 parts per trillion (ppt) response level (RL) appear to be within an area in both the Upper and Lower Aquifers that stretches from the southwestern edge of the airport (north of the mining area) to Pleasanton's Wellfield (west of the mining area) and to Zone 7's Mocho Wellfield (northwest of the mining area).

- The highest PFOS concentration detected has been in well 3S1E10B008 (10B8, north of Lake I) at 790 ppt in the 2022 WY (not sampled in the 2021 WY).

- Eight of Zone 7's ten municipal wells have tested above the Notification Level (NL) for PFOS (6.1 ppt), and four of the municipal wells have had PFOS concentrations that exceeded DDW's recommended RL of 40 ppt. The highest concentration detected in a Zone 7 municipal supply well was in Mocho 1 (3S1E09M002 or M1) at 110 ppt in 2020 WY. Mocho 1 was not pumping, and therefore not sampled, during the 2022 WY.

- Pleasanton's three municipal wells all had concentration of PFOS above the NL, but below the RL for PFOS, the highest of which was at Well 8 (Pleas 8 or P8) at 23.8 ppt in the 2022 WY (75 ppt in the 2021 WY).

- PFOS was detected in the three California Water Service (CWS) wells sampled in the 2022 WY; however, none of the wells had concentrations above the NL (6.1 ppt).

PFOA

- Two of Zone 7's municipal wells have also tested above the NL for perfluorooctanoic acid (PFOA) (5.1 ppt) in the 2022 WY: Mocho 3 at up to 5.9 ppt and COL 1 up to 6.3 ppt.

PFHxS

- In 2022, DDW established a RL (20 ppt) and NL (3 ppt) for Perfluorohexane Sulfonate (PFHxS).

- Areas of elevated PFHxS concentrations in the basin appear to reflect those of PFOS.

- Of the eight Zone 7 municipal wells sampled in 2022 WY, five had concentrations above the PFHxS RL, the highest of which was measured in Mocho 3 (up to 45 ppt). One of the four samples from COL 2 was also equal to the RL at 20 ppt. To meet the new guidelines, the Mocho wells are being treated by the existing Mocho Groundwater Demineralization Plant (MGDP); and Zone 7 has stopped pumping from the Stoneridge and COL wells until PFAS treatment systems can be installed at these wells The PFAS treatment system for the Stoneridge Well is currently under construction and scheduled to be operational in summer 2023, and the design of PFAS treatment system for COL well has been completed and construction is estimated to be completed sometime in late 2023 or 2024.

Other PFAS Compounds

- Although additional PFAS compounds have also been detected in Zone 7's water supplies, the results were either below the NL (e.g., Perfluorobutanesulfonic acid [PFBS] at 500 ppt) or at present there are no regulatory guidelines for these contaminants.

6.3 Attached Tables and Figures

***Table 6-1**: Monitoring Wells in 2021 Groundwater Quality Program Wells*
***Table 6-2**: Water Quality Results for Metals and Minerals, 2022 WY*
***Table 6-3**: Total Dissolved Solids at Representative Monitoring Sites, 2022 WY*
***Table 6-4**: Nitrate at Representative Monitoring Sites, 2022 WY*
***Table 6-5**: Boron at Representative Monitoring Sites, 2022 WY*
***Table 6-6**: Chromium at Representative Monitoring Sites, 2022 WY*
***Table 6-7**: PFAS Water Quality Results from Wells, 2022 WY*

***Figure 6-1**: Map of Wells in the Water Quality Program, 2022 WY*
***Figure 6-2**: TDS Chemographs, 1975 to 2022 WYs*
***Figure 6-3**: TDS Concentrations; Upper Aquifer, 2022 WY*
***Figure 6-4**: TDS Concentrations; Lower Aquifer, 2022 WY*
***Figure 6-5**: Nitrate Chemographs, 1975 to 2022 WYs*

***Figure 6-6**: Nitrate as N Concentrations; Upper Aquifer, 2022 WY*
***Figure 6-7**: Nitrate as N Concentrations; Lower Aquifer, 2022 WY*
***Figure 6-8**: Boron Chemographs, 1975 to 2022 WYs*
***Figure 6-9**: Boron Concentrations; Upper Aquifer, 2022 WY*
***Figure 6-10**: Boron Concentrations; Lower Aquifer, 2022 WY*
***Figure 6-11**: Chromium Chemographs, 1975 to 2022 WYs*
***Figure 6-12**: Total Chromium Concentrations; Upper Aquifer, 2022 WY*
***Figure 6-13**: Total Chromium Concentrations; Lower Aquifer, 2022 WY*
***Figure 6-14**: PFOS Chemographs, 1975 to 2022 WYs*
***Figure 6-15**: PFOS Concentrations; Upper Aquifer, 2022 WY*
***Figure 6-16**: PFOS Concentrations; Lower Aquifer, 2022 WY*

TABLE 6-1
MONITORING WELLS IN 2022 GROUNDWATER QUALITY PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Sampled By	Frequency (per year)	RMS-WQ	Key	WR	Muni
2S1E32E001	32E1	End of Arnold Rd	None	U	monitor	active	Zone 7	1				
2S1E32N001	32N1	Camp Parks	Camp	U	monitor	active	Zone 7	1				
2S1E32Q001	32Q1	Summer Glen Dr	Camp	U	monitor	active	Zone 7	1				
2S1E33L001	33L1	Gleason Dr @ Tassajara	None	U	monitor	active	Zone 7	1				
2S1E33P002	33P2	Central Pkwy at Emerald Glen Pk	Camp	U	monitor	active	Zone 7	1				
2S1E33R001	33R1	Central Pkwy @ Grafton	None	U	monitor	active	Zone 7	1				
2S1W15F001	15F1	BOLLINGER	Bishop	U	monitor	active	Zone 7	1				
2S1W26C002	26C2	PINE VALLEY	Dublin	U	monitor	active	Zone 7	1				
2S1W36E003	36E3	Kolb Park	Dublin	U	monitor	active	Zone 7	1				
2S1W36F001	36F1	Dublin High shallow	Dublin	L	nested	active	Zone 7	1				
2S1W36F002	36F2	Dublin High mid	Dublin	L	nested	active	Zone 7	1				
2S2E21L001	21L1	Merlin	May	U	domestic	active	Zone 7	1				
2S2E27M002	27M2	Kwan	May	U	domestic	active	Zone 7	1				
2S2E27P002	27P2	hartford ave east	Spring	U	monitor	active	Zone 7	1				
2S2E28D002	28D2	May School	May	U	monitor	active	Zone 7	1				
2S2E28J002	28J2	FCC Well	May	L	industrial	active	Zone 7	1				
2S2E28Q001	28Q1	hartford ave	May	U	monitor	active	Zone 7	1				
2S2E32K002	32K2	jenson's N liv. Ave	Cayetano	U	monitor	active	Zone 7	1				
2S2E34E001	34E1	Mud City	May	U	monitor	active	Zone 7	1	X			
2S2E34Q002	34Q2	Hollyhock & Crocus	Spring	U	monitor	active	Zone 7	1				
3S1E01F002	1F2	Constitution Dr	Camp	U	monitor	active	Zone 7	1				
3S1E01H003	1H3	Collier Canyon g1	Camp	U	monitor	active	Zone 7	4				
3S1E01J004	1J04	Collier Vineyards	Camp	L	irrigation	active	Zone 7	1				
3S1E01L001	1L1	Kitty Hawk	Camp	U	monitor	active	Zone 7	1				
3S1E01P002	1P2	Airport gas g5	Amador	U	monitor	active	Zone 7	1				
3S1E01P003	1P3	New airport well	Amador	L	supply	inactive	Zone 7	4				
3S1E02J002	2J2	Maint. Bldg	Camp	U	monitor	active	Zone 7	1				
3S1E02J003	2J3	Doolan Rd East	Camp	U	monitor	active	Zone 7	1				
3S1E02K002	2K2	Doolan Rd West	Camp	U	monitor	active	Zone 7	1				
3S1E02M003	2M3	Friesman Rd North	Camp	U	monitor	active	Zone 7	1				
3S1E02N006	2N6	Friesman Rd South	Amador	U	monitor	active	Zone 7	1				
3S1E02P003	2P3	Crosswinds Church	Camp	L	domestic	active	Zone 7	1				
3S1E02Q001	2Q1	LPGC #1	Amador	U	monitor	active	Zone 7	1				
3S1E02R001	2R1	Beebs	Amador	U	monitor	active	Zone 7	4				
3S1E03G002	3G2	fallon rd	Camp	U	monitor	active	Zone 7	1				

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LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Sampled By	Frequency (per year)	RMS-WQ	Key	WR	Muni
3S1E04A001	4A1	SMP-DUB-2	Camp	U	monitor	active	Zone 7	1				
3S1E04J005	4J5	Pimlico shallow	Camp	U	monitor	active	Zone 7	1				
3S1E04J006	4J6	Pimlico deep	Camp	U	monitor	active	Zone 7	1				
3S1E04Q002	4Q2	gulfstream	Amador	U	monitor	active	Zone 7	1				
3S1E05K006	5K6	Rosewood shallow	Camp	U	monitor	active	Zone 7	1				
3S1E05K007	5K7	Rosewood deep	Camp	L	monitor	active	Zone 7	1				
3S1E05L003	5L3	Oracle	Camp	U	monitor	active	Zone 7	1				
3S1E05P006	5P6	Owens Park	Camp	U	monitor	active	Zone 7	1				
3S1E06F003	6F3	Dublin Ct	Dublin	U	monitor	active	Zone 7	1	X			
3S1E06N002	6N2	DSRSD MW-3	Dublin	U	monitor	active	Zone 7	1				
3S1E06N003	6N3	DSRSD MW-4	Dublin	U	monitor	active	Other	1				
3S1E06N006	6N6	DSRSD NE-76	Dublin	U	monitor	active	Other	1				
3S1E07B002	7B2	Hopyard rd	Dublin	L	monitor	active	Zone 7	1				
3S1E07B012	7B12	Hacienda Arch	Dublin	U	monitor	active	Zone 7	1				
3S1E07D001	7D1	DSRSD SW-75	Dublin	U	monitor	unknown	Other	1				
3S1E07D003	7D3	DSRSD SE-70	Dublin	U	monitor	unknown	Other	1				
3S1E07G007	7G7	Chabot Well	Dublin	U	monitor	active	Zone 7	1				
3S1E07J005	7J5	Thomas Hart School	Dublin	U	monitor	active	Zone 7	1				
3S1E08B001	8B1	Lizard Well	Amador	U	monitor	active	Zone 7	1				
3S1E08G004	8G4	Apache	Amador	U	monitor	active	Zone 7	1				
3S1E08H009	8H9	Mocho 4 Nested Shallow	Amador	L	nested	active	Zone 7	1				
3S1E08H010	8H10	Mocho 4 Nested Middle	Amador	L	nested	active	Zone 7	1				
3S1E08H011	8H11	Mocho 4 Nested deep	Amador	D	nested	active	Zone 7	1				
3S1E08H013	8H13	Mocho 3 mon	Amador	D	monitor	active	Zone 7	1				
3S1E08H018	M4	Mocho 4	Amador	L	muni	active	Zone 7	4				X
3S1E08K001	8K1	Cockroach well	Amador	U	monitor	active	Zone 7	1				
3S1E08N001	8N1	sports park	Bernal	U	monitor	active	Zone 7	1				
3S1E09B001	St1	Stoneridge	Amador	L	muni	active	Zone 7	4				X
3S1E09H013	9H13	Lister	Amador	U	domestic	active	Zone 7	1				
3S1E09J007	9J7	SW Lake I Shallow	Amador	U	nested	active	Zone 7	1				
3S1E09J008	9J8	SW Lake I Middle	Amador	L	nested	active	Zone 7	1				
3S1E09J009	9J9	SW Lake I Deep	Amador	L	nested	active	Zone 7	1				
3S1E09M002	M1	Mocho 1	Amador	L	muni	active	Zone 7	4				X
3S1E09M003	M2	Mocho 2	Amador	L	muni	active	Zone 7	4				X
3S1E09M004	M3	Mocho 3	Amador	L	muni	active	Zone 7	4				X

TABLE 6-1
MONITORING WELLS IN 2022 GROUNDWATER QUALITY PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Sampled By	Frequency (per year)	RMS-WQ	Key	WR	Muni
3S1E09P005	9P5	Key_AmW_U (Mohr Key)	Amador	U	monitor	active	Zone 7	1	X	X		
3S1E09P009	9P9	Mohr Ave Shallow	Amador	L	nested	active	Zone 7	1				
3S1E09P010	9P10	Key_AmW_L	Amador	L	nested	active	Zone 7	1	X	X		
3S1E09P011	9P11	Mohr Ave Deep	Amador	L	nested	active	Zone 7	1				
3S1E10A002	10A2	El Charro Rd	Amador	U	monitor	active	Zone 7	1				
3S1E10B008	10B8	Kaiser Rd Shallow	Amador	L	nested	active	Zone 7	1				
3S1E10B009	10B9	Kaiser Rd Middle 1	Amador	L	nested	active	Zone 7	1				
3S1E10B010	10B10	Kaiser Rd Middle 2	Amador	L	nested	unknown	Zone 7	1				
3S1E10B011	10B11	Kaiser Rd Deep	Amador	D	nested	active	Zone 7	1				
3S1E10B014	10B14	COL 5 Monitoring	Amador	L	monitor	unknown	Zone 7	1				
3S1E10B016	COL5	COL 5	Amador	L	muni	active	Zone 7	4				
3S1E10D002	10D2	Stoneridge Shallow	Amador	L	nested	active	Zone 7	1				
3S1E10D003	10D3	Stoneridge Middle 1	Amador	L	nested	active	Zone 7	1				
3S1E10D004	10D4	Stoneridge Middle 2	Amador	L	nested	active	Zone 7	1				
3S1E10D005	10D5	Stoneridge Deep	Amador	D	nested	active	Zone 7	1				
3S1E10K002	10K2	COL 1 Monitoring	Amador	L	monitor	active	Zone 7	1				
3S1E10K003	COL1	COL 1	Amador	L	muni	active	Zone 7	4				X
3S1E11B001	11B1	Airport West	Amador	U	monitor	active	Zone 7	4				
3S1E11C003	11C3	LAVWMA ROW	Amador	U	monitor	active	Zone 7	1				
3S1E11G001	11G1	Key_AmE_U	Amador	U	nested	active	Zone 7	1	X	X		
3S1E11G002	11G2	Rancho Charro Middle 1	Amador	L	nested	active	Zone 7	1				
3S1E11G003	11G3	Rancho Charro Middle 2	Amador	L	nested	active	Zone 7	1				
3S1E11G004	11G4	Rancho Charro Deep	Amador	D	nested	active	Zone 7	1				
3S1E11M002	11M2	COL 2 Monitoring	Amador	L	monitor	active	Zone 7	1				
3S1E11M003	COL2	COL 2	Amador	L	muni	active	Zone 7	4				X
3S1E11P006	11P6	New Jamieson Residence	Amador	L	domestic	unknown	Zone 7	1				
3S1E12A002	12A2	Airport South	Amador	U	monitor	active	Zone 7	4				
3S1E12D002	12D2	LWRP G6	Amador	U	monitor	active	LWRP	4				
3S1E12G001	12G1	Oaks Park Shallow	Amador	U	monitor	active	Zone 7	4				
3S1E12H004	12H4	LWRP Shallow	Amador	L	nested	active	Zone 7	1				
3S1E12H005	12H5	LWRP Middle 1	Amador	L	nested	active	Zone 7	1				
3S1E12H006	12H6	LWRP Middle 2	Amador	L	nested	active	Zone 7	1				
3S1E12H007	12H7	LWRP Deep	Amador	D	nested	active	Zone 7	1				
3S1E12K002	12K2	Oaks Park Mid	Amador	L	nested	active	Zone 7	1				
3S1E12K003	12K3	Key_AmE_L	Amador	L	nested	active	Zone 7	1	X	X		

TABLE 6-1
MONITORING WELLS IN 2022 GROUNDWATER QUALITY PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Sampled By	Frequency (per year)	RMS-WQ	Key	WR	Muni
3S1E12K004	12K4	Oaks Park Deep	Amador	D	nested	active	Zone 7	1				
3S1E13P005	13P5	LGA Grant Nested 1	Amador	U	nested	active	Zone 7	1				
3S1E13P006	13P6	LGA Grant Nested 2	Amador	L	nested	active	Zone 7	1				
3S1E13P007	13P7	LGA Grant Nested 3	Amador	L	nested	active	Zone 7	1				
3S1E13P008	13P8	LGA Grant Nested 4	Amador	L	nested	active	Zone 7	1				
3S1E14B001	14B1	Industrial Asphalt	Amador	L	industrial	unknown	Zone 7	1				
3S1E14D002	14D2	South Cope Lake	Amador	L	monitor	active	Zone 7	1				
3S1E15J003	15J3	shadow cliff	Amador	L	supply	unknown	Zone 7	1				
3S1E15M003	15M3	Bush/Valley South	Amador	L	monitor	active	Zone 7	1				
3S1E16A002	P8	Pleas 8	Amador	L	muni	active	Pleas	1				
3S1E16A004	16A4	Bush/Valley Mid	Amador	L	monitor	active	Zone 7	1				
3S1E16B001	16B1	Bush/Valley North	Amador	D	monitor	active	Zone 7	1				
3S1E16C002	16C2	Santa Rita Valley Shallow	Amador	L	nested	active	Zone 7	1				
3S1E16C003	16C3	Santa Rita Valley Middle	Amador	L	nested	active	Zone 7	1				
3S1E16C004	16C4	Santa Rita Valley Deep	Amador	L	nested	active	Zone 7	1				
3S1E16E004	16E4	black ave - cultural	Amador	U	monitor	active	Zone 7	1				
3S1E16L005	P5	Pleas 5	Amador	L	muni	active	Pleas	1				
3S1E16L007	P6	Pleas 6	Amador	L	muni	active	Pleas	1				
3S1E16P005	16P5	Vervais Monitor	Amador	U	monitor	active	Zone 7	2			X	
3S1E17B004	17B4	Casterson	Amador	L	supply	unknown	Zone 7	1				
3S1E17D003	17D3	Hopyard Nested Shallow	Bernal	L	nested	active	Zone 7	1				
3S1E17D004	17D4	Hopyard Nested Middle 1	Bernal	L	nested	active	Zone 7	1				
3S1E17D005	17D5	Hopyard Nested Middle 2	Bernal	L	nested	active	Zone 7	1				
3S1E17D006	17D6	Hopyard Nested Middle 3	Bernal	L	nested	active	Zone 7	1				
3S1E17D007	17D7	Hopyard Nested Deep	Bernal	D	nested	active	Zone 7	1				
3S1E17D011	17D11	Hopyard 9 Monitoring Well	Bernal	L	monitor	active	Zone 7	1				
3S1E17D012	H9	Hopyard 9	Bernal	L	muni	active	Zone 7	4				X
3S1E18A006	H6	Hopyard 6	Bernal	L	muni	active	Zone 7	4				X
3S1E18E004	18E4	Valley Trails II	Bernal	U	monitor	active	Zone 7	1				
3S1E18J002	18J2	camino segura	Bernal	U	monitor	active	Zone 7	1				
3S1E19A010	SF-B	SFWD South (B)	Bernal	L	muni	active	Zone 7	1				
3S1E19A011	SF-A	SFWD North (A)	Bernal	L	muni	active	Zone 7	1				
3S1E19C004	19C4	del valle & laguna	Bernal	U	monitor	active	Zone 7	1				
3S1E19K001	19K1	680/bernal	Bernal	U	monitor	active	Zone 7	1				
3S1E20B002	20B2	Fairgrounds Potable	Bernal	L	supply	active	Zone 7	1				

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MONITORING WELLS IN 2022 GROUNDWATER QUALITY PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Sampled By	Frequency (per year)	RMS-WQ	Key	WR	Muni
3S1E20C007	20C7	Key_Bern_U	Bernal	U	monitor	active	Zone 7	2	X	X	X	
3S1E20C008	20C8	Key_Bern_L	Bernal	L	nested	active	Zone 7	1	X	X		
3S1E20C009	20C9	Fair Nested Deep	Bernal	L	nested	active	Zone 7	1				
3S1E20J004	20J4	civic center	Bernal	U	monitor	active	Zone 7	1				
3S1E20M011	20M11	S.F "M"LINE	Bernal	U	monitor	active	Zone 7	1				
3S1E20Q002	20Q2	20Q2	Bernal	U	monitor	active	Zone 7	1				
3S1E22D002	22D2	vineyard trailer	Amador	U	monitor	active	Zone 7	1				
3S1E23J001	23J1	1627 vineyard trailer	Amador	L	domestic	unknown	Zone 7	1				
3S1E25C003	25C3	Katz Winery Mansion	Amador	U	monitor	unknown	Zone 7	1				
3S1E28M002	28M2	Bargar	Upland	U	supply	active	Zone 7	1				
3S1E29M004	29M4	f.c. channel	Castle	U	monitor	active	Zone 7	1				
3S1E29P002	29P2	castlewood dr	Bernal	U	monitor	active	Zone 7	1				
3S1E33G005	33G5	Pleasanton Calippe 33G5	Upland	U	monitor	unknown	Zone 7	1				
3S1W01B009	1B9	DSRSD Shallow	Dublin	L	nested	unknown	Zone 7	1				
3S1W01B010	1B10	DSRSD Middle	Dublin	L	nested	unknown	Zone 7	1				
3S1W01B011	1B11	DSRSD Deep	Dublin	L	nested	unknown	Zone 7	1				
3S1W01J001	1J1	DSRSD MW-1	Dublin	U	monitor	unknown	Other	1				
3S1W02A002	2A2	McNamara's	Dublin	U	monitor	active	Zone 7	1				
3S1W12B002	12B2	Stoneridge Mall Rd	Dublin	U	monitor	active	Zone 7	1				
3S1W12J001	12J1	DSRSD South	Dublin	U	monitor	active	Zone 7	1				
3S1W13J001	13J1	muirwood dr	Castle	U	monitor	active	Zone 7	1				
3S2E01F002	1F2	Brisa at Circuit City	Spring	U	monitor	active	Zone 7	1				
3S2E02B002	2B2	south front rd	Spring	U	monitor	active	Zone 7	1				
3S2E03A001	3A1	Bluebell	Spring	U	monitor	active	Zone 7	1				
3S2E03K003	3K3	first & S. front rd	Mocho I	U	monitor	active	Zone 7	1				
3S2E05N001	5N1	Spider Well	Mocho II	M	supply	inactive	Zone 7	1				
3S2E07C002	7C2	jaws - york way - G4	Mocho II	U	monitor	active	Zone 7	4				
3S2E07H002	7H2	dakota	Mocho II	U	monitor	active	Zone 7	1				
3S2E07N002	7N2	Isabel & Arroyo Mocho	Amador	U	monitor	active	Zone 7	1				
3S2E07P003	CWS24	CWS 24	Amador	L	muni	active	Zone 7	1				
3S2E07R003	CWS31	CWS 31	Upland	L	muni	active	Zone 7	1				
3S2E08F001	CWS10	CWS 10	Mocho II	L	muni	active	CWS	1				
3S2E08H002	8H2	North k	Mocho II	U	monitor	active	Zone 7	1				
3S2E08H003	8H3	Key_Mo2_L	Mocho II	L	nested	active	Zone 7	1	X	X		
3S2E08H004	8H4	N Liv Ave Deep	Mocho II	L	nested	active	Zone 7	1				

TABLE 6-1
MONITORING WELLS IN 2022 GROUNDWATER QUALITY PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Sampled By	Frequency (per year)	RMS-WQ	Key	WR	Muni
3S2E08K002	8K2	Key_Mo2_U (Livermore Key)	Mocho II	U	monitor	active	Zone 7	1	X	X		
3S2E08N002	CWS14	CWS 14	Mocho II	L	muni	active	Zone 7	1				
3S2E08Q009	8Q 9	D-2	Mocho II	L	monitor	active	Zone 7	1				
3S2E09Q001	CWS9	CWS 9	Mocho II	L	muni	active	CWS	1				
3S2E09Q004	9Q4	school st	Mocho II	U	monitor	active	Zone 7	1				
3S2E10F003	10F3	hexcel	Mocho I	U	monitor	active	Zone 7	1				
3S2E10Q001	10Q1	almond	Mocho II	U	monitor	active	Zone 7	1				
3S2E10Q002	10Q2	LLNL W-703	Mocho II	L	monitor	unknown	LLNL	1				
3S2E11C001	11C1	joan way	Mocho I	U	monitor	active	Zone 7	1				
3S2E12C004	12C4	LLNL W-486	Spring	U	monitor	unknown	LLNL	1				
3S2E12J003	12J3	LLNL W-017A	Spring	L	monitor	unknown	LLNL	1				
3S2E14A003	14A3	S. vasco @east ave	Mocho I	U	monitor	active	LLNL	1				
3S2E14B001	14B1	5763 east ave	Mocho I	L	domestic	unknown	Zone 7	1				
3S2E15E002	15E2	Retzlaff Winery	Mocho II	L	irrigation	active	Zone 7	1				
3S2E15L001	15L1	Concannon 2	Mocho II	U	monitor	active	Other	1				
3S2E15L002	15L2	Concannon 6D	Mocho II	U	monitor	active	Other	1				
3S2E15M002	15M2	Concannon 1	Mocho II	U	monitor	active	Other	1				
3S2E15M003	15M3	Concannon 5D	Mocho II	U	monitor	active	Other	1				
3S2E15Q008	15Q 8	Concannon 4	Mocho II	U	monitor	active	Other	1				
3S2E15R017	15R17	Buena Vista Shallow	Mocho II	U	nested	active	Zone 7	1				
3S2E15R018	15R18	Buena Vista Deep	Mocho II	L	monitor	active	Zone 7	1				
3S2E15R020	15R20	Concannon 3	Mocho II	U	monitor	active	Other	1				
3S2E16A003	16A3	Memory Gardens	Mocho II	L	irrigation	active	Zone 7	1				
3S2E16C001	CWS15	CWS 15	Mocho II	L	muni	active	Zone 7	1				
3S2E16E004	16E4	pepper tree	Mocho II	U	monitor	active	Zone 7	1				
3S2E18B001	CWS20	CWS 20	Amador	L	muni	active	Zone 7	1				
3S2E18E001	18E1	Stanley East of Isabel	Amador	U	monitor	active	Zone 7	1				
3S2E19D007	19D7	Isabel Shallow	Amador	U	nested	active	Zone 7	1				
3S2E19D008	19D8	Isabel Middle 1	Amador	L	nested	active	Zone 7	1				
3S2E19D009	19D9	Isabel Middle 2	Amador	L	nested	active	Zone 7	1				
3S2E19D010	19D10	Isabel Deep	Amador	L	nested	active	Zone 7	1				
3S2E19N003	19N3	Shallow Cemex Nested	Amador	U	nested	active	Zone 7	1				
3S2E19N004	19N4	Deep Cemex Nested	Amador	L	nested	active	Zone 7	1				
3S2E20M001	20M1	Alden Lane	Amador	L	supply	unknown	Zone 7	1				
3S2E20R002	20R2	Ravenswood South Well	Upland	U	irrigation	active	Zone 7	1				

TABLE 6-1
MONITORING WELLS IN 2022 GROUNDWATER QUALITY PROGRAM
LIVERMORE VALLEY GROUNDWATER BASIN

Well	Map	Alias	Basin	Aquifer	Type	Status	Sampled By	Frequency (per year)	RMS-WQ	Key	WR	Muni
3S2E21K009	21K9	Hughey Marina Ave	Upland	U	domestic	active	Zone 7	1				
3S2E22B001	22B1	grapes	Mocho II	U	monitor	active	Zone 7	1				
3S2E23E001	23E1	Murrieta Nested Shallow	Mocho II	U	nested	active	Zone 7	1				
3S2E23E002	23E2	Murrieta Nested Deep	Mocho II	L	nested	active	Zone 7	1				
3S2E24A001	24A1	S. greenville	Mocho I	U	monitor	active	Zone 7	1	X			
3S2E26J002	26J2	mines rd	Mocho II	U	monitor	active	Zone 7	1				
3S2E29F004	29F4	Wetmore	Amador	U	monitor	active	Zone 7	2			X	
3S2E30C001	30C1	Vineyard 30C 1	Amador	L	supply	active	Zone 7	1				
3S2E30D002	30D2	vineyard	Amador	U	monitor	active	Zone 7	1				
3S2E32E007	32E7	DVWTP 32E7	Upland	U	monitor	active	Zone 7	1				
3S2E33C001	33C1 (P1)	Sycamore Grove P1	Amador	U	monitor	inactive	Zone 7	1				
3S2E33G001	33G1	Crohare	Amador	U	monitor	active	Zone 7	2			X	
3S3E06Q003	6Q3	PPWTP South Monitoring	Altamont	U	monitor	active	Zone 7	1				
3S3E07D002	7D2	7D 2	Spring	U	monitor	active	LLNL	1				
3S3E19C002	19C2	Wilker well 2	Mocho I	U	domestic	active	Zone 7	1				
3S3E20L004	20L 4	Vail on Tesla	Mocho I	U	domestic	active	Zone 7	1				
3S3E20R004	20R 4	Buonanno on Tesla	Mocho I	U	domestic	active	Zone 7	1				
3S3E21C001	21C1	Russell on Reuss	Upland	U	domestic	active	Zone 7	1				
4S2E01A001	1A1	Gallagher Ag	Mocho II	U	irrigation	active	Zone 7	1				
4S3E06E004	6E4	Gallagher Domestic	Mocho II	U	domestic	active	Zone 7	1				
WELLS IN GROUNDWATER QUALITY PROGRAM = 230												

RMS = Representative Monitoring Sites
WQ-Water Quality
WR = Water Rights
Muni = Municipal

TABLE 6-2
WATER QUALITY RESULTS FOR SELECT METALS AND MINERALS
2022 WATER YEAR

			TEMP	EC		Mineral Constituents (mg/L)									Select Metals (ug/L)				TDS	Hard
SITE ID	DATE	By	°C	umhos/cm	pH	Ca	Mg	Na	K	HCO3	SO4	Cl	NO3N	SiO2	B	As	Fe	Cr	mg/L	mg/L
2S1E32E001	4/20/22	ZONE7	18.7	1334	7	152	15	135	1.5	565	30	141	7.56	47.1	< 200	6.4	735	< 2	833	441
2S1E32N001	4/20/22	ZONE7	16.3	842	7.2	75	8	104	1.7	265	37	123	2.12	30	480	1.7	< 100	3.5	519	221
2S1E32Q001	4/21/22	ZONE7	19.5	2162	7	172	68	205	2.3	625	97	342	6.35	32.1	680	6	340	2.8	1254	710
2S1E33L001	4/21/22	ZONE7	15.1	1604	7.2	112	23	187	7.6	361	94	239	9.34	27.8	560	7.8	1130	5	909	373
2S1E33P002	4/21/22	ZONE7	16.3	2136	7.3	172	61	244	3.5	732	59	349	6.88	36.4	860	5.4	2640	16	1316	681
2S1E33R001	4/21/22	ZONE7	19.9	668	7.5	57	14	73	0.9	236	24	74	3.61	27.8	110	2	< 100	18	403	200
2S1W15F001	4/20/22	ZONE7	20.2	1530	6.8	164	68	92	1.1	683	38	164	< 0.1	21.4	210	2.2	< 100	< 1	885	690
2S1W26C002	4/21/22	ZONE7	15.3	687	7	95	18	42	0.8	354	35	24	3.33	30	140	2.6	< 100	< 1	434	312
2S1W36E003	4/20/22	ZONE7	19.4	928	7	126	25	62	0.6	378	90	70	3.41	38.5	130	3.9	< 100	< 1	613	418
2S1W36F001	4/20/22	ZONE7	21.6	307	7.4	51	< 0	12	6	164	2	21	< 0.1	7.9	< 200	5.7	< 200	6	181	128
2S1W36F002	4/20/22	ZONE7	21.7	117	7.1	18	< 0	3	2.2	58	< 1	2	< 0.1	3	< 200	5.4	< 200	< 2	57	43
2S2E21L001	5/9/22	ZONE7	18.2	1300	7.7	59	34	185	1.3	369	33	185	19.1	36.4	450	6	< 100	2.9	801	288
2S2E27M002	5/9/22	ZONE7	16.2	1898	7.9	52	57	306	0.5	551	139	290	7.27	34.2	2350	5.5	< 100	3.3	1185	365
2S2E27P002	2/14/22	ZONE7	16.5	4605	7.7	75	49	835	2.1	208	< 1	1419	0.39	25.7	32800	< 5	562	< 5	2511	390
2S2E28J002	3/23/22	ZONE7	17.7	1021	8.3	5	4	215	0.5	385	59	84	< 0.1	19.5	1630	< 1	< 100	< 1	578	28
2S2E28Q001	2/14/22	ZONE7	14.5	909	7.6	30	28	155	0.9	282	71	115	1.08	34.2	720	13	432	< 2	579	190
2S2E32K002	5/25/22	ZONE7	20.2	961	7.7	36	29	119	1.5	317	55	114	2.19	34.2	450	5.1	< 100	8.9	556	209
2S2E34E001	8/9/22	ZONE7	20.5	751	7.6	14	5	116	1.6	331	41	87	< 0.1	20.1	520	9.2	308	< 2	448	56
2S2E34Q002	2/14/22	ZONE7	17.3	1767	7.7	67	70	217	1.2	255	134	377	0.91	32.1	3900	3.9	< 200	< 2	1029	456
3S1E01F002	8/23/22	ZONE7	19.6	1233	7	123	41	118	0.6	566	31	139	2.37	47.1	250	3.8	< 100	1.3	789	477
3S1E01H003	4/21/22	LWRP	-	1930	-	73	44	280	1.4	-	70	320	16.6	32	1400.	-	-	-	1130	-
3S1E01H003	9/14/22	LWRP	-	1900	-	79	45	288	1.6	-	72	302	16.7	32	1400.	-	-	-	1130	-
3S1E01L001	8/23/22	ZONE7	29.1	1964	7.3	106	52	309	1.4	612	65	280	21.4	32.1	4280	6.7	< 200	10	1242	479
3S1E01P002	4/21/22	LWRP	-	1420	-	66	45	180	1.7	-	80	274	0.6	23	3300.	-	-	-	820	-
3S1E01P002	9/14/22	LWRP	-	1430	-	70	47	194	2	-	74	306	0.6	22	3100.	-	-	-	810	-
3S1E02J002	8/25/22	ZONE7	17.9	4073	7	240	124	557	1.8	619	272	957	10.1	27.8	5800	< 5	< 500	< 5	2529	1111
3S1E02J003	5/25/22	ZONE7	28	730	7.1	30	18	89	5.3	210	21	120	< 0.1	10.7	370	1.9	669	< 1	398	149
3S1E02K002	8/23/22	ZONE7	33.4	939	7.7	22	19	207	1.9	384	33	95	5.91	21.4	860	7.4	515	9.3	615	133
3S1E02M003	5/25/22	ZONE7	25	1742	7.5	56	32	288	2.7	647	63	204	10.2	40.7	2160	6.3	3560	20	1051	272
3S1E02N006	8/24/22	ZONE7	17.9	1585	7.3	84	53	221	1.5	501	82	243	0.16	23.5	3600	6.5	287	2.4	956	426
3S1E02P003	6/29/22	ZONE7	21.1	754	7.8	41	32	68	1.7	268	41	71	4.39	23.5	490	2.2	< 100	5.9	431	234
3S1E02Q001	8/25/22	ZONE7	18.6	851	7.1	46	24	139	12.4	276	15	128	< 0.1	23.5	1400	5.5	1050	< 2	524	214
3S1E02R001	4/21/22	LWRP	-	1540	-	75	57	170	1.4	-	63	257	4.1	30	3100.	-	-	-	930	-
3S1E02R001	9/14/22	LWRP	-	1530	-	75	58	187	1.5	-	60	231	5.5	27	3200.	-	-	-	900	-
3S1E03G002	5/25/22	ZONE7	19.7	1605	7.6	62	33	227	1.8	667	25	179	< 0.1	19.7	1100	4.3	< 100	< 1	877	291
3S1E04A001	5/25/22	ZONE7	23.5	1418	7.6	118	26	174	4.2	416	30	246	2.39	141.2	440	8	35700	34	956	400
3S1E04J005	8/24/22	ZONE7	17.9	2550	8	38	39	584	1.8	890	167	343	2.62	49.2	9410	13	7810E	14	1673	256
3S1E04J006	8/24/22	ZONE7	17.7	185	7.3	22	6	14	2.8	67	7	15	1.09	21.4	160	5	3970	9.4	126	80
3S1E04Q002	5/25/22	ZONE7	25.2	1589	7.4	73	42	216	1.6	402	85	285	0.4	19.5	1350	3.6	< 100	< 1	922	355
3S1E05K006	4/19/22	ZONE7	22.2	1981	7.3	146	58	262	1.5	615	230	220	10.3	23.5	1900	2.2	< 100	< 1	1289	604
3S1E05K007	4/19/22	ZONE7	24.9	1146	8	61	25	149	1.5	283	123	118	1.08	23.5	920	7.1	< 100	< 1	646	255
3S1E05L003	9/12/22	ZONE7	25.7	1089	7.5	55	31	146	1.1	422	137	79	< 0.1	27.8	880	6.5	1100	2	685	266
3S1E05P006	8/24/22	ZONE7	26	3594	7.3	243	149	546	1.4	577	996	490	4.64	34.2	1960	7.1	< 500	< 5	2764	1219
3S1E06F003	9/12/22	ZONE7	25.5	4246	7	333	128	453	2.9	552	671	917	< 0.1	21.4	2500	7.4	< 500	< 5	2798	1359
3S1E06M002	11/16/21	DSRSD	17.9	8084	7.15	-	-	-	-	-	2850	379	< 5	-	-	-	-	-	9760	-
3S1E06M002	11/30/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	4.9J	-	< 5	-	-
3S1E06M002	5/3/22	DSRSD	18.7	8218	6.91	-	-	-	-	-	3030	359	< 5	-	-	-	-	-	7040	-
3S1E06M002	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	-	< 5	-	-
3S1E06N002	11/17/21	DSRSD	17.1	24650	6.98	-	-	-	-	-	1260	9620	< 5	-	-	-	-	-	32400	-
3S1E06N002	12/3/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	< 5	-	-

- = Not Analyzed

Highlighted = Representative Monitoring Site

TABLE 6-2
WATER QUALITY RESULTS FOR SELECT METALS AND MINERALS
2022 WATER YEAR

			TEMP	EC		Mineral Constituents (mg/L)									Select Metals (ug/L)				TDS	Hard
SITE ID	DATE	By	°C	umhos/cm	pH	Ca	Mg	Na	K	HCO3	SO4	Cl	NO3N	SiO2	B	As	Fe	Cr	mg/L	mg/L
3S1E06N002	5/2/22	DSRSD	18.6	23710	7.24	-	-	-	-	-	1250	8940	0.45	-	-	-	-	-	17500	-
3S1E06N002	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	< 5	-	-
3S1E06N003	11/16/21	DSRSD	18.5	10880	7.31	-	-	-	-	-	195.36	4160	< 5	-	-	-	-	-	10200	-
3S1E06N003	11/30/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	7.7	-	< 5	-	-
3S1E06N003	5/3/22	DSRSD	21.6	11460	7.24	-	-	-	-	-	216	3750	0.64	-	-	-	-	-	8700	-
3S1E06N003	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	6.7	-	< 5	-	-
3S1E06N004	11/16/21	DSRSD	18.5	2912	7.36	-	-	-	-	-	856.6	118.7	0.4346	-	-	-	-	-	2720	-
3S1E06N004	11/30/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	< 5	-	-
3S1E06N004	5/2/22	DSRSD	18.4	2810	7.57	-	-	-	-	-	758	112	0.11	-	-	-	-	-	2080	-
3S1E06N004	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3	-	< 5	-	-
3S1E06N005	11/17/21	DSRSD	16.3	29180	7.42	-	-	-	-	-	6690	9560	< 5	-	-	-	-	-	45500	-
3S1E06N005	11/30/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	8.7	-	< 5	-	-
3S1E06N005	5/3/22	DSRSD	20.7	27180	6.99	-	-	-	-	-	5610	7390	< 5	-	-	-	-	-	23100	-
3S1E06N005	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	< 5	-	-
3S1E06N006	11/17/21	DSRSD	17.4	26000	7.11	-	-	-	-	-	1890	12200	< 5	-	-	-	-	-	37200	-
3S1E06N006	12/3/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	8J	-	< 5	-	-
3S1E06N006	5/3/22	DSRSD	21.3	25510	6.8	-	-	-	-	-	1460	9090	< 5	-	-	-	-	-	19000	-
3S1E06N006	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8	-	< 5	-	-
3S1E07B002	6/28/22	ZONE7	21.3	620	8.5	20	9	107	4.8	205	33	72	0.36	8.6	470	2.3	< 100	< 1	366	87
3S1E07B012	6/28/22	ZONE7	21.2	11890	7.3	416	301	1900	2.7	297	372	3549	0.16	42.8	1770	< 10	< 1000	< 10	6731	2280
3S1E07D001	11/17/21	DSRSD	19.1	5049	7.31	-	-	-	-	-	136.55	1420	< 5	-	-	-	-	-	3090	-
3S1E07D001	12/1/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	0.26J	-	-
3S1E07D001	5/2/22	DSRSD	20.7	4978	7.16	-	-	-	-	-	125	1380	< 5	-	-	-	-	-	2900	-
3S1E07D001	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	16	-	< 5	-	-
3S1E07D002	11/17/21	DSRSD	19.1	24040	7.09	-	-	-	-	-	16800	4310	< 5	-	-	-	-	-	24400	-
3S1E07D002	11/30/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	37	-	< 5	-	-
3S1E07D002	5/2/22	DSRSD	21.2	24230	6.88	-	-	-	-	-	10300	4140	< 5	-	-	-	-	-	23300	-
3S1E07D002	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	38	-	< 5	-	-
3S1E07D003	11/17/21	DSRSD	18.5	19610	7	-	-	-	-	-	228.66	8040	< 5	-	-	-	-	-	24200	-
3S1E07D003	11/30/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	72	-	< 5	-	-
3S1E07D003	5/2/22	DSRSD	19.6	19940	6.8	-	-	-	-	-	301	7230	< 5	-	-	-	-	-	12860	-
3S1E07D003	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	70	-	< 5	-	-
3S1E07D004	11/17/21	DSRSD	18.1	39270	7.05	-	-	-	-	-	12100	19100	< 5	-	-	-	-	-	34300	-
3S1E07D004	11/30/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	-	< 5	-	-
3S1E07D004	5/3/22	DSRSD	18.7	18740	6.98	-	-	-	-	-	6140	3830	< 5	-	-	-	-	-	16100	-
3S1E07D004	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	7.6	-	150	-	-
3S1E07G007	9/12/22	ZONE7	25.1	18300	7.1	395	483	3870	4	478	3056	5307	< 0.1	19.7	4430	< 20	< 2000	< 20	13370	2974
3S1E07J005	6/28/22	ZONE7	23.6	2200	7.5	95	79	314	1.6	794	279	194	< 0.1	25.7	4700	2.8	< 200	< 2	1380	563
3S1E08B001	11/30/21	ZONE7	20.5	1568	7.6	51	45	195	1.2	298	187	258	< 0.1	12.4	2370	1.9	271	< 1	898	313
3S1E08B001	9/20/22	ZONE7	18.5	1423	8.3	42	37	226	1.4	334	140	249	< 0.1	15.4	2030	10	5190	5.4	879	257
3S1E08G004	8/24/22	ZONE7	30.3	2390	7.5	113	93	390	2.5	740	397	246	1.53	36.4	4670	4.8	1700	4.6	1649	665
3S1E08H009	8/22/22	ZONE7	22.7	928	7.5	62	50	78	2	373	50	86	5.09	27.8	760	1.7	< 100	8.3	562	361
3S1E08H010	8/22/22	ZONE7	27.6	1116	7.6	55	41	145	2.2	410	81	110	4.25	32.1	1470	1.5	< 100	6.7	687	307
3S1E08H011	8/22/22	ZONE7	26.2	1020	7.4	62	45	116	2.6	359	78	115	1.81	30	1250	3.7	82	5	633	341
3S1E08H013	8/22/22	ZONE7	35.5	411	9.9	11	3	79	2.7	46	48	59	0.54	11.8	500	3.4	288	< 2	240	40
3S1E08H018	10/4/21	ZONE7	19.9	1052	7.5	69	46	95	2.5	386	74	120	2.53	27.8	1030	1.1	< 100	5.1	636	362
3S1E08H018	1/10/22	ZONE7	20.2	1028	7.6	75	48	105	2.6	424	76	119	2.09	30	1060	1.1	< 100	3.7	674	386
3S1E08H018	4/11/22	ZONE7	18.5	1010	7.5	70	45	101	2.4	372	74	112	2.19	30	980	1.2	< 100	4.1	628	360
3S1E08H018	7/11/22	ZONE7	20.2	968	7.5	59	38	87	2.4	356	64	98	2.31	25.7	800	1.2	< 100	5	560	305
3S1E08K001	9/13/22	ZONE7	20.1	1981	7.2	153	103	135	3.6	701	239	223	2.93	30	2070	1.2	< 100	5.7	1245	806

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TABLE 6-2
WATER QUALITY RESULTS FOR SELECT METALS AND MINERALS
2022 WATER YEAR

			TEMP	EC		Mineral Constituents (mg/L)									Select Metals (ug/L)				TDS	Hard
SITE ID	DATE	By	°C	umhos/cm	pH	Ca	Mg	Na	K	HCO3	SO4	Cl	NO3N	SiO2	B	As	Fe	Cr	mg/L	mg/L
3S1E09B001	10/4/21	ZONE7	19.3	992	7.5	66	57	65	2.1	395	60	117	3.28	27.8	640	1.5	< 100	6.1	604	400
3S1E09B001	1/10/22	ZONE7	18.6	1080	7.6	77	57	74	2.4	416	67	132	2.66	30	810	1.5	< 100	4.3	657	427
3S1E09B001	4/11/22	ZONE7	18.3	1090	7.6	77	65	78	2.3	414	67	131	2.9	27.8	730	1.6	< 100	4.9	666	460
3S1E09H010	11/30/21	ZONE7	17.5	830	7.4	39	38	65	1.4	274	41	108	< 0.1	20.5	630	1.1	< 100	< 1	449	255
3S1E09H010	5/24/22	ZONE7	22.4	785	7.6	41	39	64	1.4	263	47	97	< 0.1	16.5	500	< 1	< 100	< 1	436	263
3S1E09H011	11/30/21	ZONE7	18.2	871	7.4	43	46	65	1.5	325	29	114	< 0.1	25.7	820	< 1	< 100	< 1	485	298
3S1E09H011	5/24/22	ZONE7	21.4	843	7.5	40	42	65	1.5	318	30	97	< 0.1	21.4	690	< 1	< 100	< 1	455	273
3S1E09H013	5/3/22	ZONE7	16.7	801	7.7	45	40	63	1.5	243	50	108	< 0.1	16.9	510	< 1	< 100	< 1	445	277
3S1E09J007	9/26/22	ZONE7	34.6	722	7.3	47	32	61	2.6	250	26	96	< 0.1	13.9	560	< 1	< 100	< 1	402	250
3S1E09J008	9/27/22	ZONE7	19.8	832	7.5	75	36	49	1.9	285	50	105	< 0.1	20.1	660	< 1	< 100	< 1	478	336
3S1E09J009	9/27/22	ZONE7	22.9	710	7.5	52	48	26	1.8	303	41	57	3.5	27.8	250	< 1	< 100	8.5	419	328
3S1E09M003	10/7/21	ZONE7	17.7	858	7.3	65	40	61	1.8	300	59	103	1.07	23.5	660	< 1	< 100	3.8	506	327
3S1E09M003	1/10/22	ZONE7	17.2	837	7.5	71	41	64	1.9	301	58	105	0.94	23.5	660	< 1	< 100	3.4	517	347
3S1E09M003	4/11/22	ZONE7	17.1	860	7.5	70	43	68	1.9	297	60	106	0.94	25.7	690	< 1	< 100	3.1	525	352
3S1E09M003	7/11/22	ZONE7	18.5	886	7.4	64	40	65	2	292	57	108	0.87	23.5	600	< 1	< 100	3.4	507	325
3S1E09M004	10/4/21	ZONE7	19.1	996	7.5	53	41	106	2.1	356	74	120	1.71	27.8	1220	1	< 100	5.2	607	301
3S1E09M004	1/11/22	ZONE7	17.2	944	7.5	53	42	109	2.1	341	67	118	1.5	27.8	1200	1.1	< 100	3.5	594	305
3S1E09M004	4/11/22	ZONE7	17.4	1002	7.7	58	44	118	2.1	342	75	121	1.79	30	1240	1.1	< 100	4	625	326
3S1E09M004	7/11/22	ZONE7	20.4	1018	7.4	55	42	109	2.3	340	70	118	1.93	27.8	1110	1.1	< 100	4.7	600	311
3S1E09P005	5/24/22	ZONE7	34.8	743	7.3	56	29	56	1.9	220	49	103	< 0.1	15.6	400	< 1	< 100	< 1	419	259
3S1E09P009	5/24/22	ZONE7	22.8	761	7.1	47	29	69	1.8	231	52	92	0.23	21.4	530	3.6	< 200	2.7	427	237
3S1E09P010	5/24/22	ZONE7	20.2	763	7.4	50	32	65	1.8	240	52	89	0.14	21.2	600	< 1	< 100	< 1	430	257
3S1E09P011	5/24/22	ZONE7	21.6	446	7.4	30	13	59	1.4	218	35	19	0.08	23.5	500	10	744	3.5	289	129
3S1E10A002	8/23/22	ZONE7	35	1892	7.3	90	86	251	2.4	565	121	307	8.09	34.2	2970	4.9	584	5.5	1206	579
3S1E10B008	9/29/22	ZONE7	27.1	1370	7.4	68	64	132	2.1	538	76	158	8.88	25.7	2060	2	< 100	13	831	434
3S1E10B009	9/28/22	ZONE7	20.6	1072	7.6	60	55	82	2.2	384	57	124	5.74	25.7	1140	1.8	< 100	6.4	622	377
3S1E10B010	9/28/22	ZONE7	21	721	7.5	46	44	46	1.7	297	40	67	3.4	25.7	430	1.3	< 100	8.1	432	296
3S1E10B011	9/28/22	ZONE7	18.4	667	7.3	46	41	32	2.1	279	35	54	5.79	30	220	4	815	8.6	404	284
3S1E10B014	6/29/22	ZONE7	17.4	695	7.4	37	35	33	1.5	256	35	65	3.86	25.7	210	< 1	< 100	8.6	376	236
3S1E10B016	10/4/21	ZONE7	19.1	653	7.5	46	43	35	1.7	307	34	47	1.78	27.8	350	< 1	< 100	11	394	292
3S1E10B016	1/10/22	ZONE7	18.3	641	7.5	50	36	37	1.7	290	38	49	3.1	30	350	< 1	< 100	9.3	399	274
3S1E10B016	4/5/22	ZONE7	18.1	696	7.5	56	32	42	1.8	303	32	55	3.28	32.1	400	1	< 100	11	415	270
3S1E10B016	7/11/22	ZONE7	20.8	676	7.5	47	42	36	1.8	287	35	50	3.58	27.8	310	< 1	< 100	11	397	291
3S1E10K002	9/29/22	ZONE7	24.3	899	7.4	71	41	48	1.8	332	42	104	2.75	19.3	450	< 1	< 100	3.3	503	347
3S1E10K003	10/4/21	ZONE7	18.1	853	7.5	61	54	42	1.8	337	43	101	2.28	23.5	430	< 1	< 100	5.9	503	374
3S1E10K003	1/10/22	ZONE7	16.5	843	7.4	62	51	44	1.7	325	49	93	2.82	25.7	430	< 1	< 100	5.2	499	365
3S1E10K003	4/5/22	ZONE7	17	889	7.6	72	44	48	1.9	328	40	112	2.71	27.8	500	< 1	< 100	5.8	520	363
3S1E10K003	7/11/22	ZONE7	20	873	7.4	59	54	43	1.8	330	45	89	3.31	23.5	410	< 1	< 100	7.1	493	370
3S1E11C003	8/25/22	ZONE7	30.7	1615	7.2	79	64	218	1.6	534	87	216	7.48	25.7	2700	6.4	238	4.9	987	462
3S1E11G001	8/11/22	ZONE7	27	1175	7.3	70	79	79	2.9	446	65	117	9.4	36.4	750	1.5	< 100	5	711	500
3S1E11G002	8/11/22	ZONE7	23.9	1083	7.7	69	63	71	2.1	400	54	90	5.66	25.7	830	3.6	< 200	9.1	598	432
3S1E11G003	8/11/22	ZONE7	27.4	705	7.5	46	46	32	1.8	287	38	44	3.78	30	270	< 1	< 100	11	397	305
3S1E11G004	8/11/22	ZONE7	22.1	662	7.6	43	26	57	2.6	206	49	76	0.81	13.7	370	< 1	< 100	3.1	374	213
3S1E11M002	6/29/22	ZONE7	20.8	1008	7.5	36	39	62	2.9	290	52	128	4.94	12.2	520	< 1	< 100	12	551	251
3S1E11M003	10/4/21	ZONE7	18.6	780	7.4	52	52	34	1.6	319	43	75	2.75	25.7	380	< 1	< 100	7.2	453	344
3S1E11M003	1/10/22	ZONE7	17.3	705	7.4	56	49	35	1.7	300	43	67	3.55	27.8	340	< 1	< 100	6.5	443	342
3S1E11M003	4/5/22	ZONE7	17.1	795	7.4	64	42	40	1.8	316	39	81	4.14	27.8	400	< 1	< 100	7.2	470	334
3S1E11M003	7/11/22	ZONE7	20.7	771	7.4	51	48	34	1.7	297	40	74	4.09	25.7	340	< 1	< 100	8.4	439	326
3S1E11P006	8/10/22	ZONE7	24.6	744	7.6	65	31	48	1.6	242	46	85	0.6	18.6	370	< 1	< 100	1.9	418	290
3S1E12A002	4/21/22	LWRP	-	1160	-	64	92	54	2.3	-	60	139	12	33	600.	-	-	-	680	-

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TABLE 6-2
WATER QUALITY RESULTS FOR SELECT METALS AND MINERALS
2022 WATER YEAR

			TEMP	EC		Mineral Constituents (mg/L)									Select Metals (ug/L)				TDS	Hard
SITE ID	DATE	By	°C	umhos/cm	pH	Ca	Mg	Na	K	HCO3	SO4	Cl	NO3N	SiO2	B	As	Fe	Cr	mg/L	mg/L
3S1E12A002	9/14/22	LWRP	-	1170	-	64	91	55	2.4	-	57	153	10.9	33	600.	-	-	-	670	-
3S1E12H004	3/24/22	ZONE7	22	813	7.2	53	61	35	1.7	347	49	68	4.52	30	330	< 1	< 100	7.1	489	383
3S1E12H005	3/24/22	ZONE7	23.2	768	7.3	47	44	33	1.8	303	42	58	2.65	34.2	330	4.1	< 200	12	422	298
3S1E12H006	4/21/22	ZONE7	19.8	638	7.7	42	42	36	2.4	296	41	30	2.11	44.9	240	5.3	4170	23	394	278
3S1E12H007	4/21/22	ZONE7	18.1	509	8	23	21	65	1.1	216	21	35	1.42	27.8	370	13	< 100	6.9	307	144
3S1E12K002	9/19/22	ZONE7	20.6	609	7.4	36	43	32	1.4	225	38	66	1.96	25.7	270	< 1	< 100	3.3	362	267
3S1E12K003	9/19/22	ZONE7	20.9	794	7.4	50	57	38	1.7	298	50	78	4.31	30	390	< 1	< 100	4.1	471	360
3S1E12K004	9/19/22	ZONE7	21.8	313	7.7	16	17	29	1.3	147	7	19	1.55	21.4	140	< 1	< 100	2.4	191	110
3S1E13P005	8/10/22	ZONE7	25.5	761	7.4	51	30	64	1.9	202	56	104	< 0.1	12.4	440	< 1	< 100	< 1	419	252
3S1E14B001	8/10/22	ZONE7	21.6	800	7.3	80	27	48	1.9	255	50	95	0.75	19.5	400	< 1	< 100	1.8	451	312
3S1E15M003	9/20/22	ZONE7	21.4	709	7.4	46	22	75	1.7	245	38	75	1.31	25.7	270	< 1	< 100	< 1	410	206
3S1E16A004	9/20/22	ZONE7	18.2	853	7.4	97	36	41	2	332	50	91	1.13	23.5	400	< 1	< 100	2.2	509	390
3S1E16B001	11/29/21	ZONE7	24	600	7.5	56	21	34	1.6	249	30	41	2.89	25.7	270	< 1	< 100	8.9	345	227
3S1E16B001	6/28/22	ZONE7	21.3	561	7.4	53	19	33	1.6	237	31	37	2.37	21	220	< 1	< 100	11	323	210
3S1E16P005	11/22/21	ZONE7	17.2	638	6.7	45	29	44	2.6	134	67	94	0.54	12.4	280	< 1	< 100	< 1	362	231
3S1E17B004	9/21/22	ZONE7	20.6	1289	7.7	114	61	72	2.5	513	72	121	5.1	21.4	790	< 1	< 100	2.9	740	536
3S1E17D010	6/28/22	ZONE7	20.9	1226	8.4	15	4	224	0.8	253	15	247	< 0.1	19.3	2150	14	< 100	< 1	659	54
3S1E17D011	6/28/22	ZONE7	20.5	400	6.8	13	3	57	4.3	69	4	67	7.01	5.6	480	2.6	< 100	< 1	219	44
3S1E17D012	10/4/21	ZONE7	18.7	884	7.5	70	44	54	1.8	367	48	85	3.16	23.5	630	< 1	< 100	6.1	521	356
3S1E18A006	10/4/21	ZONE7	19.2	1047	7.5	83	55	73	1.8	443	91	90	3.28	25.7	610	1.3	< 100	5.1	653	435
3S1E18A006	1/11/22	ZONE7	16.7	1012	7.6	88	56	78	1.8	436	89	89	2.62	25.7	620	1.4	< 100	5.9	654	451
3S1E18E004	4/18/22	ZONE7	16	725	7.5	68	13	85	0.9	308	68	55	< 0.1	30	580	< 1	< 100	< 1	472	225
3S1E18J002	4/18/22	ZONE7	17.6	3493	7.5	153	240	411	1.8	1050	717	396	< 0.1	23.5	1890	26	< 200	< 2	2461	1371
3S1E19A010	6/14/22	EUROFINS	-	1310	7.3	129	66.7	58.2	2.77	-	104	118	-	-	-	< 2	< 100	< 10	721	592
3S1E19A011	6/14/22	EUROFINS	-	1750	7.22	180	90.8	62.2	2.93	-	104	241	-	-	-	< 2	< 100	< 10	978	799
3S1E19C004	4/18/22	ZONE7	18	612	8	40	30	53	2.9	323	3	43	0.11	12.2	430	< 1	< 100	< 1	345	224
3S1E20B002	10/14/21	ZONE7	-	853	7.3	73	39	53	1.6	363	57	71	3.56	25.7	410	< 1	< 100	2.5	515	343
3S1E20B002	7/25/22	ALPHA UKI	-	-	-	-	-	-	-	-	-	-	-	-	-	< 2	-	< 10	-	-
3S1E20C007	11/29/21	ZONE7	17.7	679	7.1	52	27	48	1.9	263	41	64	1.57	18.8	360	< 1	< 100	1.7	389	241
3S1E20C007	9/26/22	ZONE7	18.1	684	7.1	58	29	53	2.1	274	45	67	1.71	18.4	380	< 1	< 100	1.7	415	264
3S1E20C008	9/27/22	ZONE7	22.4	986	7.4	97	50	45	2.2	429	47	80	5.21	21.4	250	< 1	< 100	3.6	578	448
3S1E20J004	3/23/22	ZONE7	17.1	1111	7	58	43	133	1.1	417	62	111	5.71	34.2	570	4.1	789	< 2	673	322
3S1E20M011	3/24/22	ZONE7	22.1	840	7.3	76	44	57	2.3	356	50	72	1.95	23.5	380	3.4	< 200	< 2	509	371
3S1E20Q002	3/23/22	ZONE7	17.2	2037	6.9	119	124	166	1.3	1031	108	113	< 0.1	25.7	1070	< 2	6680	< 2	1165	809
3S1E22D002	3/24/22	ZONE7	20	931	6.9	42	42	114	0.6	304	53	114	8.29	42.8	100	< 1	< 100	2	595	278
3S1E23J001	3/22/22	ZONE7	16.7	515	8.2	25	15	69	3.2	119	61	70	0.25	9.8	210	< 1	< 100	< 1	314	124
3S1E25C003	3/22/22	ZONE7	24.8	781	7.2	54	34	76	1.5	251	31	116	3.34	27.8	380	3.3	484	2.8	479	275
3S1E28M002	5/3/22	ZONE7	18.9	1216	7.2	66	42	159	0.6	464	48	146	6.41	25.7	560	1.1	< 100	1.2	744	338
3S1E29M004	4/18/22	ZONE7	17.6	877	6.6	68	32	68	2.7	232	120	92	< 0.1	25.7	420	14	12000	< 1	523	302
3S1E29P002	4/18/22	ZONE7	18.2	1048	7.4	67	49	110	1.7	519	6	109	< 0.1	23.5	1190	< 1	114	< 1	622	371
3S1E33G005	4/19/22	ZONE7	16	1504	6.5	112	64	116	0.4	227	130	328	< 0.1	27.8	200	2.6	198	< 1	890	544
3S1W01B009	4/19/22	ZONE7	15.5	982	7.5	65	27	157	1.4	379	83	119	2.24	23.5	580	5.1	< 100	< 1	672	273
3S1W01B010	4/19/22	ZONE7	17.6	761	7.6	43	15	131	0.6	361	< 1	87	< 0.1	27.8	550	199	313	< 1	482	170
3S1W01B011	4/19/22	ZONE7	15.1	888	7.7	26	9	160	0.8	266	< 1	163	< 0.1	25.7	700	19	< 100	< 1	516	102
3S1W01J001	11/16/21	DSRSD	19.4	2857	7.35	-	-	-	-	-	533.34	245	< 5	-	-	-	-	-	2170	-
3S1W01J001	11/30/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	48	-	< 5	-	-
3S1W01J001	5/3/22	DSRSD	20.1	2890	6.97	-	-	-	-	-	515	232	< 5	-	-	-	-	-	2050	-
3S1W01J001	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	46	-	< 5	-	-
3S1W01J002	11/16/21	DSRSD	18.9	2766	7.52	-	-	-	-	-	519.9	271.5	6.1871	-	-	-	-	-	2140	-
3S1W01J002	11/30/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	< 5	-	-

- = Not Analyzed

Highlighted = Representative Monitoring Site

TABLE 6-2
WATER QUALITY RESULTS FOR SELECT METALS AND MINERALS
2022 WATER YEAR

			TEMP	EC		Mineral Constituents (mg/L)									Select Metals (ug/L)				TDS	Hard
SITE ID	DATE	By	°C	umhos/cm	pH	Ca	Mg	Na	K	HCO3	SO4	Cl	NO3N	SiO2	B	As	Fe	Cr	mg/L	mg/L
3S1W01J002	5/3/22	DSRSD	19.9	2284	7.02	-	-	-	-	-	369	167	15	-	-	-	-	-	1610	-
3S1W01J002	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3	-	< 5	-	-
3S1W02A002	4/19/22	ZONE7	19.3	1728	6.7	188	40	104	0.6	573	85	183	7.45	23.5	420	1.6	< 100	1	939	635
3S1W12A009	11/18/21	DSRSD	20.2	6860	7.15	-	-	-	-	-	116.14	2260	< 5	-	-	-	-	-	4530	-
3S1W12A009	12/3/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	4.7	-	< 5	-	-
3S1W12A009	5/2/22	DSRSD	21.2	6326	7.4	-	-	-	-	-	115	2100	< 5	-	-	-	-	-	4550	-
3S1W12A009	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	-	< 5	-	-
3S1W12A010	11/18/21	DSRSD	20	2060	7.61	-	-	-	-	-	254.33	222	4.8042	-	-	-	-	-	1380	-
3S1W12A010	12/3/21	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	7.6	-	< 5	-	-
3S1W12A010	5/3/22	DSRSD	23.5	2207	7.15	-	-	-	-	-	367	205	3.21	-	-	-	-	-	1490	-
3S1W12A010	6/6/22	DSRSD	-	-	-	-	-	-	-	-	-	-	-	-	-	6.1	-	< 5	-	-
3S1W12B002	9/12/22	ZONE7	25.8	967	6.9	91	33	65	0.5	306	143	52	1.52	30	200	< 1	< 100	< 1	572	364
3S1W12J001	9/13/22	ZONE7	19.6	1262	7.5	82	29	162	1.1	415	176	135	0.2	30	630	5.8	1580	4.1	821	324
3S1W13J001	4/18/22	ZONE7	17.6	925	6.6	97	43	47	0.6	296	100	88	3.87	27.8	190	< 1	< 100	< 1	566	419
3S2E01F002	2/15/22	ZONE7	13.9	1737	7.4	135	53	172	5.3	455	67	316	1.25	40.7	2160	2.3	< 100	1.3	1020	556
3S2E02B002	2/15/22	ZONE7	20.2	272	6.8	28	5	15	2.1	116	< 1	25	< 0.01	13.1	150	3.4	3190	< 2	145	91
3S2E03A001	2/15/22	ZONE7	18.3	1088	7.5	60	39	125	1.1	295	69	150	5.26	38.5	1570	3.2	< 100	13	652	311
3S2E03K003	2/15/22	ZONE7	20.2	1129	7.5	60	47	120	1.9	329	84	118	12.9	30	1410	1.8	< 100	9.9	681	344
3S2E05N001	11/22/21	ZONE7	18.7	830	7.5	54	60	40	1.9	312	45	81	12	30	480	< 1	121	6.3	519	382
3S2E05N001	3/21/22	ZONE7	26	889	7.6	53	58	41	1.8	333	45	83	9.62	27.8	440	< 1	< 100	6.7	517	371
3S2E07C002	4/21/22	LWRP	-	1170	-	54	87	56	3	-	63	142	11.8	35	600.	-	-	-	700	-
3S2E07C002	9/14/22	LWRP	-	1180	-	57	93	63	3.4	-	63	129	11.3	36	600.	-	-	-	680	-
3S2E07H002	3/21/22	ZONE7	20.7	1208	7.1	56	70	118	3	424	124	84	10.8	32.1	720	< 1	< 100	< 1	744	428
3S2E07N002	9/13/22	ZONE7	26.2	515	8.1	30	33	32	1.7	191	35	51	1.41	25.7	220	1.3	< 100	3.3	310	211
3S2E07P003	5/10/22	BSK	-	440	8.1	18	13	51	< 2	-	16	34	-	-	-	< 2	< 100	< 10	310	97
3S2E08H003	3/21/22	ZONE7	25.8	1405	7.2	82	89	67	1.7	437	74	135	10.3	32.1	480	3.9	< 200	5.8	7420	572
3S2E08H004	3/21/22	ZONE7	24.5	1052	7.5	48	49	123	2	355	24	166	4.45	27.8	600	2	< 100	7.4	635	322
3S2E08K002	2/17/22	ZONE7	22.6	1059	7.4	55	79	54	1.9	372	70	129	7.9	30	460	1	< 100	2.9	638	464
3S2E08Q009	3/21/22	ZONE7	19.5	1023	7.5	50	67	46	2.1	332	54	98	5.39	25.7	400	< 1	< 100	3.3	531	401
3S2E09Q001	2/7/22	BSK	-	980	-	57	64	48	< 2	-	58	89	-	-	-	< 2	58	< 10	560	410
3S2E09Q004	2/16/22	ZONE7	17.4	1221	7.3	46	93	81	1.3	380	100	158	8.36	36.4	980	< 1	< 100	2.7	740	498
3S2E10F003	2/16/22	ZONE7	17	1302	7.1	66	86	95	2.2	444	88	161	7.32	30	1280	1.3	< 100	3.2	780	519
3S2E10Q001	2/16/22	ZONE7	18.5	1606	7.2	74	111	116	1.2	497	109	208	13.2	34.2	1810	< 1	< 100	2.1	957	642
3S2E10Q002	3/22/22	ZONE7	-	762	7.9	50	40	56	1.9	203	81	88	6.17	25.7	760	1	< 100	5.5	471	290
3S2E11C001	2/15/22	ZONE7	17	861	7.5	58	28	87	2	303	37	101	2.63	32.1	420	< 1	< 100	3.6	507	260
3S2E12C004	3/22/22	ZONE7	-	1119	8	51	12	162	1.8	153	116	195	3.28	32.1	3680	2.5	< 100	73	661	177
3S2E12J003	3/22/22	ZONE7	-	685	8.1	41	16	75	3.1	65	61	153	0.37	25.7	420	1.7	< 100	< 1	409	168
3S2E14A003	3/24/22	ZONE7	18.2	1129	7.1	100	44	79	2.5	510	31	79	9.85	30	570	< 1	< 100	4	660	431
3S2E14B001	3/23/22	ZONE7	20.5	1028	7.4	76	44	79	2	341	48	108	9.35	30	700	< 1	< 100	9.3	598	371
3S2E15E002	11/29/21	ZONE7	15.4	548	7.2	18	13	61	4.2	90	20	95	1.11	14.3	150	1.8	< 100	< 1	275	99
3S2E15E002	3/22/22	ZONE7	18.8	458	7.8	26	16	53	3.1	109	45	67	0.21	9	220	1.3	< 100	< 1	274	131
3S2E15L001	11/22/21	ZONE7	20.7	1150	7.2	47	101	67	1.5	380	108	145	12.5	34.2	610	1.1	< 100	1	746	534
3S2E15L001	12/21/21	UNKN	18.4	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	750	-
3S2E15L001	2/16/22	ZONE7	20.3	1198	7.5	46	98	70	1.5	381	103	138	9.19	32.1	650	1	< 100	1.2	718	519
3S2E15L001	3/14/22	UNKN	20.9	-	7.2	-	-	-	-	-	-	-	11	-	-	-	-	-	740	-
3S2E15L001	6/13/22	UNKN	21.1	-	7.2	46	95	69	1.4	-	120	150	11	-	-	-	-	-	800	-
3S2E15L002	12/21/21	UNKN	19.8	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	790	-
3S2E15L002	3/14/22	UNKN	22.1	-	7.24	-	-	-	-	-	-	-	3	-	-	-	-	-	560	-
3S2E15L002	6/13/22	UNKN	20.6	-	6.73	49	93	68	1.4	-	110	160	10	-	-	-	-	-	800	-
3S2E15L002	9/28/22	UNKN	19.6	-	7.42	-	-	-	-	-	-	-	11	-	-	-	-	-	850	-

- = Not Analyzed

Highlighted = Representative Monitoring Site

TABLE 6-2
WATER QUALITY RESULTS FOR SELECT METALS AND MINERALS
2022 WATER YEAR

			TEMP	EC		Mineral Constituents (mg/L)									Select Metals (ug/L)				TDS	Hard
SITE ID	DATE	By	°C	umhos/cm	pH	Ca	Mg	Na	K	HCO3	SO4	Cl	NO3N	SiO2	B	As	Fe	Cr	mg/L	mg/L
3S2E15M002	2/16/22	ZONE7	19.9	824	7.5	53	65	26	2	306	47	79	7.61	25.7	240	2	< 100	7.3	483	400
3S2E15M002	3/14/22	UNKN	21	-	7.15	-	-	-	-	-	-	-	12	-	-	-	-	-	560	-
3S2E15M002	6/13/22	UNKN	20.9	-	7.21	63	73	27	2.4	-	66	97	14	-	-	-	-	-	630	-
3S2E15M003	12/21/21	UNKN	19.4	-	-	-	-	-	-	-	-	-	7.1	-	-	-	-	-	730	-
3S2E15M003	3/14/22	UNKN	21.5	-	7.46	-	-	-	-	-	-	-	1.2	-	-	-	-	-	180	-
3S2E15M003	6/13/22	UNKN	21.5	-	6.97	59	88	57	1.5	-	83	120	7.6	-	-	-	-	-	780	-
3S2E15M003	9/28/22	UNKN	19.5	-	7.49	-	-	-	-	-	-	-	6.7	-	-	-	-	-	720	-
3S2E15Q008	12/21/21	UNKN	18.2	-	-	-	-	-	-	-	-	-	6.3	-	-	-	-	-	700	-
3S2E15Q008	3/14/22	UNKN	20.6	-	6.86	-	-	-	-	-	-	-	7.6	-	-	-	-	-	680	-
3S2E15Q008	6/13/22	UNKN	21.6	-	6.98	55	92	58	1.5	-	110	110	6.6	-	-	-	-	-	780	-
3S2E15Q008	9/28/22	UNKN	19.9	-	7.45	-	-	-	-	-	-	-	6.7	-	-	-	-	-	800	-
3S2E15R017	2/17/22	ZONE7	19.6	985	7.5	44	83	46	1.5	351	65	109	10.8	32.1	700	4.6	< 200	7.7	602	451
3S2E15R018	2/17/22	ZONE7	24.3	646	7.6	51	39	34	1.5	305	43	46	0.93	30	250	1.1	< 100	< 1	399	290
3S2E15R020	12/21/21	UNKN	20.6	-	-	-	-	-	-	-	-	-	8.3	-	-	-	-	-	700	-
3S2E15R020	3/14/22	UNKN	19.8	-	7.05	-	-	-	-	-	-	-	9.2	-	-	-	-	-	760	-
3S2E15R020	6/13/22	UNKN	20.3	-	6.76	45	85	56	1.6	-	80	130	8.6	-	-	-	-	-	740	-
3S2E15R020	9/28/22	UNKN	20.4	-	7.37	-	-	-	-	-	-	-	8.3	-	-	-	-	-	790	-
3S2E16A003	3/21/22	ZONE7	14.8	1127	7.4	52	89	52	1.5	368	86	115	10.7	30	500	< 1	< 100	2.6	655	497
3S2E16E004	3/21/22	ZONE7	17	782	7.1	34	50	55	2.4	273	44	73	2.44	20.1	300	< 1	< 100	1	424	291
3S2E18E001	3/23/22	ZONE7	17.1	521	7.4	33	36	22	1.7	199	33	45	1.8	25.7	230	3.5	< 200	2.5	303	230
3S2E19D007	8/9/22	ZONE7	25.8	400	7.5	40	13	35	1.5	127	4	42	6.06	32.1	< 200	2.4	1570	11	257	154
3S2E19D008	8/9/22	ZONE7	20.8	410	8.1	36	19	23	1.3	137	6	42	6.02	25.7	< 100	< 1	< 100	7.2	248	168
3S2E19D009	8/11/22	ZONE7	18.7	371	7.2	36	14	25	1.3	146	5	30	6.96	27.8	< 100	< 1	< 100	4.2	242	148
3S2E19D010	8/11/22	ZONE7	20.2	777	7.1	66	35	48	1.9	219	31	98	10.2	30	< 100	< 1	< 100	1.1	463	309
3S2E19N003	8/10/22	ZONE7	21.1	540	7.5	40	21	53	1.6	242	26	39	0.23	27.8	250	4.2	223	< 2	329	187
3S2E19N004	8/10/22	ZONE7	23.6	622	7.7	26	13	100	1.8	240	21	66	< 0.1	17.3	350	23	< 100	< 1	364	119
3S2E20M001	3/22/22	ZONE7	19.9	899	7.3	68	43	74	1.7	339	57	103	2.24	21.4	320	1.1	< 100	< 1	546	347
3S2E21N001	9/21/22	ZONE7	-	1165	7.5	60	56	99	1.8	254	25	228	3.38	40.7	170	< 1	< 100	< 1	651	381
3S2E22B001	2/16/22	ZONE7	19.1	1204	7.4	54	90	64	1.3	358	131	141	8.11	32.1	580	< 1	< 100	1.3	727	506
3S2E23E001	2/17/22	ZONE7	18.9	733	7.5	37	52	47	1.6	333	38	60	2.67	23.5	500	< 1	< 100	3	436	306
3S2E23E002	2/17/22	ZONE7	19.3	1082	7.6	44	59	109	2.4	378	46	164	0.11	25.7	2870	2.6	< 100	< 1	638	352
3S2E24A001	8/9/22	ZONE7	19.2	1646	6.9	139	64	146	2	551	71	190	26.1	34.2	1100	< 1	< 100	2.8	1033	612
3S2E26J002	2/17/22	ZONE7	14.6	1054	7.3	53	86	66	2.4	517	70	74	0.7	16.1	810	< 1	< 100	< 1	626	486
3S2E29F004	3/22/22	ZONE7	16.9	653	7.8	64	30	40	1.7	304	57	39	< 0.1	21.2	330	9.2	< 200	< 2	403	284
3S2E29F004	6/29/22	ZONE7	22.4	640	7.7	67	28	41	1.6	284	57	36	< 0.1	20.3	290	6.2	128	< 1	392	283
3S2E30C001	3/22/22	ZONE7	18.9	733	7.9	56	35	68	1.8	280	43	77	4.95	27.8	430	12	4240	8.7	469	284
3S2E30D002	3/22/22	ZONE7	20.9	623	7.5	47	19	57	2.2	171	62	82	0.18	12.4	270	< 1	< 100	< 1	367	198
3S2E32E007	4/18/22	ZONE7	22.6	587	7.1	36	24	50	1.4	110	47	102	3.38	23.5	110	< 1	< 100	< 1	353	189
3S2E33C001	6/29/22	ZONE7	21.8	940	7.2	68	31	76	2.7	257	83	133	0.13	13.5	500	1.2	< 100	< 1	535	298
3S2E33G001	5/25/22	ZONE7	27.8	913	7.2	54	29	78	3.4	249	121	100	< 0.1	12	780	1.1	< 100	< 1	520	254
3S2E33G001	6/29/22	ZONE7	25.5	954	7.5	63	30	109	3.6	263	112	107	0.14	21.4	1100	4.8	573	2.1	577	280
3S3E06Q003	3/23/22	ZONE7	19.2	2067	7.4	106	43	280	3.1	313	321	264	8.09	81.3	5150	5.6	5840	9.7	1289	442
3S3E07D002	2/15/22	ZONE7	14.7	2295	7.3	106	61	312	2.1	264	296	409	5.3	47.1	6970	2.6	< 200	2.8	1387	516
3S3E19C002	5/9/22	ZONE7	18	1641	7.4	119	61	138	2.1	284	40	361	17	27.8	1230	< 1	< 100	1.6	964	549
3S3E20L004	5/2/22	ZONE7	19.6	1628	7.4	109	56	165	2	275	178	269	14.9	25.7	1500	< 1	< 100	1.5	1006	503
3S3E20R004	5/2/22	ZONE7	19.9	2229	7.5	124	79	270	5.3	397	404	326	9.42	23.5	1100	< 2	< 200	< 2	1469	635
3S3E21C001	5/2/22	ZONE7	19.9	2653	7.5	95	88	434	12.4	626	449	308	< 0.1	59.9	3600	8.2	< 200	< 2	1756	601
4S2E01A001	5/2/22	ZONE7	19.3	1707	8.1	12	53	278	1.6	433	159	220	< 0.1	13.5	13000	1	< 100	< 1	957	248
4S3E06E004	5/2/22	ZONE7	18.2	1854	7.7	37	69	248	3.8	456	62	321	0.22	15.4	2680	1.2	118	< 1	983	376

- = Not Analyzed
Highlighted = Representative Monitoring Site

TABLE 6-3
TOTAL DISSOLVED SOLIDS (TDS) AT REPRESENTATIVE MONITORING SITES
2022 WATER YEAR
LIVERMORE VALLEY GROUNDWATER BASIN

RMS Well		Management Area/Unit			TDS (mg/L)			SMCs for TDS (mg/L)				
Well Name	Map	Area	Subarea	Aquifer	2022 WY	Below MT	Below MO	MT	IM-5	IM-10	IM-15	MO
3S1E20C007	20C7	Main	Bernal	Upper	402	398	98	800	725	650	575	500
3S1E20C008	20C8	Main	Bernal	Lower	578	176	-78	754	691	627	564	500
3S1E09P005	9P5	Main	Amador West	Upper	419	889	81	1,308	1,106	904	702	500
3S1E09P010	9P10	Main	Amador West	Lower	430	187	70	617	588	559	529	500
3S1E11G001	11G1	Main	Amador East	Upper	711	251	-211	962	847	731	616	500
3S1E12K003	12K3	Main	Amador East	Lower	471	125	29	596	572	548	524	500
3S2E08K002	8K2	Main	Mocho II	Upper	638	58	-138	696	647	598	549	500
3S2E08H003	8H3	Main	Mocho II	Lower	742	-24	-242	718	664	609	555	500
3S1E06F003	6F3	Fringe	Northwest	Upper	2,798	857	47	3,655	3,453	3,250	3,048	2,845
2S2E34E001	34E1	Fringe	Northeast	Upper	448	552	552	1,000	1,000	1,000	1,000	1,000
3S2E24A001	24A1	Fringe	East	Upper	1,033	146	-9	1,179	1,140	1,102	1,063	1,024
3S2E21K009	21K9	Upland	Upland	Upper	651*	349	349	1,000	1,000	1,000	1,000	1,000

*	Sample not available. Result from nearby Well 3S1E21N001.
RMS	Representative Monitoring Sites
TDS	Total Dissolved Solids
mg/L	milligrams per liter
MT	Minimum Threshold
IM-#	Interim Milestone at # years
MO	Measurable Objective
SMC	Sustainable Management Criteria

TABLE 6-4
NITRATE (as NO_3N) AT REPRESENTATIVE MONITORING SITES
2022 WATER YEAR
LIVERMORE VALLEY GROUNDWATER BASIN

RMS Well		Management Area/Unit			Nitrate as Nitrogen (mg/L)			SMCs Nitrate (mg/L)				
Well Name	Map	Area	Subarea	Aquifer	2022 WY	Below MT	Below MO	MT	IM-5	IM-10	IM-15	MO
3S1E20C007	20C7	Main	Bernal	Upper	1.64	8.4	8.4	10	10	10	10	10
3S1E20C008	20C8	Main	Bernal	Lower	5.21	4.8	4.8	10	10	10	10	10
3S1E09P005	9P5	Main	Amador West	Upper	ND	10.0	10.0	10	10	10	10	10
3S1E09P010	9P10	Main	Amador West	Lower	0.14	9.9	9.9	10	10	10	10	10
3S1E11G001	11G1	Main	Amador East	Upper	9.4	9.9	0.6	19	17	15	12	10
3S1E12K003	12K3	Main	Amador East	Lower	4.31	5.7	5.7	10	10	10	10	10
3S2E08K002	8K2	Main	Mocho II	Upper	7.9	8.3	2.1	16	15	13	12	10
3S2E08H003	8H3	Main	Mocho II	Lower	10.3	4.4	-0.3	15	14	12	11	10
3S1E06F003	6F3	Fringe	Northwest	Upper	ND	10.0	10.0	10	10	10	10	10
2S2E34E001	34E1	Fringe	Northeast	Upper	ND	10.0	10.0	10	10	10	10	10
3S2E24A001	24A1	Fringe	East	Upper	26.1	11.4	-16.1	38	31	24	17	10
3S2E21K009	21K9	Upland	Upland	Upper	3.38*	6.6	6.6	10	10	10	10	10

*	Sample not available. Result from nearby Well 3S1E21N001.
RMS	Representative Monitoring Sites
TDS	Total Dissolved Solids
mg/L	milligrams per liter
MT	Minimum Threshold
IM-#	Interim Milestone at # years
MO	Measurable Objective
SMC	Sustainable Management Criteria
ND	Not Detected (i.e., below lab detection limits). Assumed 0 for calculations.

TABLE 6-5
BORON (B) AT REPRESENTATIVE MONITORING SITES
2022 WATER YEAR
LIVERMORE VALLEY GROUNDWATER BASIN

RMS Well		Management Area/Unit			Boron (ug/L)			SMCs Boron (ug/L)				
Well Name	Map	Area	Subarea	Aquifer	2022 WY	Below MT	Below MO	MT	IM-5	IM-10	IM-15	MO
3S1E20C007	20C7	Main	Bernal	Upper	380	1,020	1,020	1,400	1,400	1,400	1,400	1,400
3S1E20C008	20C8	Main	Bernal	Lower	250	1,150	1,150	1,400	1,400	1,400	1,400	1,400
3S1E09P005	9P5	Main	Amador West	Upper	400	1,000	1,000	1,400	1,400	1,400	1,400	1,400
3S1E09P010	9P10	Main	Amador West	Lower	600	800	800	1,400	1,400	1,400	1,400	1,400
3S1E11G001	11G1	Main	Amador East	Upper	750	650	650	1,400	1,400	1,400	1,400	1,400
3S1E12K003	12K3	Main	Amador East	Lower	390	1,010	1,010	1,400	1,400	1,400	1,400	1,400
3S2E08K002	8K2	Main	Mocho II	Upper	460	940	940	1,400	1,400	1,400	1,400	1,400
3S2E08H003	8H3	Main	Mocho II	Lower	480	920	920	1,400	1,400	1,400	1,400	1,400
3S1E06F003	6F3	Fringe	Northwest	Upper	2,500	2,090	-1,100	4,590	3,793	2,995	2,198	1,400
2S2E34E001	34E1	Fringe	Northeast	Upper	520	4,200	880	4,720	3,890	3,060	2,230	1,400
3S2E24A001	24A1	Fringe	East	Upper	1,100	1,300	300	2,400	2,150	1,900	1,650	1,400
3S2E21K009	21K9	Upland	Upland	Upper	170*	1,230	1,230	1,400	1,400	1,400	1,400	1,400

*	Sample not available. Result from nearby Well 3S1E21N001.
RMS	Representative Monitoring Sites
TDS	Total Dissolved Solids
ug/L	micrograms per liter
MT	Minimum Threshold
IM-#	Interim Milestone at # years
MO	Measurable Objective
SMC	Sustainable Management Criteria

TABLE 6-6
CHROMIUM (Cr) AT REPRESENTATIVE MONITORING SITES
2022 WATER YEAR
LIVERMORE VALLEY GROUNDWATER BASIN

RMS Well		Management Area/Unit			Chromium (ug/L)			SMCs Chromium (ug/L)				
Well Name	Map	Area	Subarea	Aquifer	2022 WY	Below MT	Below MO	MT	IM-5	IM-10	IM-15	MO
3S1E20C007	20C7	Main	Bernal	Upper	1.7	48	48	50	50	50	50	50
3S1E20C008	20C8	Main	Bernal	Lower	3.6	46	46	50	50	50	50	50
3S1E09P005	9P5	Main	Amador West	Upper	ND	50	50	50	50	50	50	50
3S1E09P010	9P10	Main	Amador West	Lower	ND	50	50	50	50	50	50	50
3S1E11G001	11G1	Main	Amador East	Upper	5	45	45	50	50	50	50	50
3S1E12K003	12K3	Main	Amador East	Lower	4.1	46	46	50	50	50	50	50
3S2E08K002	8K2	Main	Mocho II	Upper	2.9	47	47	50	50	50	50	50
3S2E08H003	8H3	Main	Mocho II	Lower	5.8	44	44	50	50	50	50	50
3S1E06F003	6F3	Fringe	Northwest	Upper	ND	50	50	50	50	50	50	50
2S2E34E001	34E1	Fringe	Northeast	Upper	ND	50	50	50	50	50	50	50
3S2E24A001	24A1	Fringe	East	Upper	2.8	47	47	50	50	50	50	50
3S2E21K009	21K9	Upland	Upland	Upper	ND*	50	50	50	50	50	50	50

*	Sample not available. Result from nearby Well 3S1E21N001.
RMS	Representative Monitoring Sites
TDS	Total Dissolved Solids
ug/L	micrograms per liter
MT	Minimum Threshold
IM-#	Interim Milestone at # years
MO	Measurable Objective
SMC	Sustainable Management Criteria
ND	Not Detected (i.e., below lab detection limits). Assumed 0 for calculations.

TABLE 6-7
PFAS WATER QUALITY RESULTS FROM WELLS
2022 WATER YEAR
(Only PFAS Compounds with detected concentrations shown)

							PFAS COMPOUNDS (with Response Level)							
							PFBS	PFDA	PFHpA	PFHxA	PFHxS	PFNA	PFOA	PFOS
Well	WellName	Type	Category	Aquifer	Sampled	Units	5000	-	-	-	20	-	10	40
2S2E34E001	Mud City	well-static	monitor	U	8/9/22	ng/L	< 1.7	< 1.7	< 1.7	< 1.7	4.5	< 1.7	< 1.7	< 1.7
3S1E01F002	Constitution Dr	well-static	monitor	U	8/23/22	ng/L	26	< 1.8	5.6	13	10	< 1.8	8.7	17
3S1E01L001	Kitty Hawk	well-static	monitor	U	8/23/22	ng/L	14	< 1.7	< 1.7	1.8	40	< 1.7	2.9	29
3S1E02J002	Maint. Bldg	well-static	monitor	U	8/25/22	ng/L	39	< 1.8	< 1.8	< 1.8	41	< 1.8	< 1.8	34
3S1E02K002	Doolan Rd West	well-static	monitor	U	8/23/22	ng/L	12	< 1.7	8.3	27	320	< 1.7	39	210
3S1E02N006	Friesman Rd South	well-static	monitor	U	8/24/22	ng/L	13	< 1.7	< 1.7	< 1.7	13	3.6	5.5	47
3S1E02Q001	LPGC #1	well-static	monitor	U	8/25/22	ng/L	4.8	< 1.7	4.3	18	3.9	1.7	6.2	8.4
3S1E04J005	Pimlico shallow	well-static	monitor	U	8/24/22	ng/L	23	< 1.7	< 1.7	< 1.7	18	2.5	< 1.7	41
3S1E04J006	Pimlico deep	well-static	monitor	U	8/24/22	ng/L	7.7	3.2	< 1.7	2.1	24	2.6	5.3	18
3S1E05L003	Oracle	well-static	monitor	U	9/12/22	ng/L	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
3S1E05P006	Owens Park	well-static	monitor	U	8/24/22	ng/L	8.7	< 1.8	< 1.8	< 1.8	4.2	< 1.8	< 1.8	4
3S1E06F003	Dublin Ct	well-static	monitor	U	9/12/22	ng/L	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
3S1E07G007	Chabot Well	well-static	monitor	U	9/12/22	ng/L	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
3S1E08B001	Lizard Well	well-static	monitor	U	11/30/21	ng/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
3S1E08B001	Lizard Well	well-static	monitor	U	9/20/22	ng/L	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
3S1E08G004	Apache	well-static	monitor	U	8/24/22	ng/L	4.8	< 1.7	2.6	6.7	11	< 1.7	9.4	7
3S1E08H009	Mocho 4 Nested Shallow	well-static	nested	L	8/22/22	ng/L	3.6	< 1.7	< 1.7	2.4	16	< 1.7	1.9	9.2
3S1E08H010	Mocho 4 Nested Middle	well-static	nested	L	8/22/22	ng/L	6	< 1.7	< 1.7	4.1	25	< 1.7	3.7	22
3S1E08H011	Mocho 4 Nested deep	well-static	nested	D	8/22/22	ng/L	5.8	< 1.7	< 1.7	3.9	14	< 1.7	3.5	18
3S1E08H013	Mocho 3 mon	well-static	monitor	D	8/22/22	ng/L	4.9	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	2	6.7
3S1E08H018	**Mocho 4**	**well-supply**	**muni**	**L**	**10/4/21**	**ng/L**	**3.7**	**< 2.0**	**< 2.0**	**2.5**	**13**	**< 2.0**	**2.3**	**12**
3S1E08H018	**Mocho 4**	**well-supply**	**muni**	**L**	**1/10/22**	**ng/L**	**3.8**	**< 2.0**	**< 2.0**	**2.9**	**13**	**< 2.0**	**2.5**	**13**
3S1E08H018	**Mocho 4**	**well-supply**	**muni**	**L**	**4/11/22**	**ng/L**	**3.6**	**< 2.0**	**< 2.0**	**2.4**	**11**	**< 2.0**	**2.1**	**10**
3S1E08H018	**Mocho 4**	**well-supply**	**muni**	**L**	**7/11/22**	**ng/L**	**3.1**	**< 2.0**	**< 2.0**	**2.1**	**10**	**< 2.0**	**2**	**9.9**
3S1E08K001	Cockroach well	well-static	monitor	U	9/13/22	ng/L	3.6	< 1.6	< 1.6	< 1.6	4.1	2.1	3	4.3

Municipal Wells are Bold

Aquifer: U=Upper; L=Lower; D=Deep

Red Text = Concentration is above Response Level

TABLE 6-7
PFAS WATER QUALITY RESULTS FROM WELLS
2022 WATER YEAR
(Only PFAS Compounds with detected concentrations shown)

							PFAS COMPOUNDS (with Response Level)							
							PFBS	PFDA	PFHpA	PFHxA	PFHxS	PFNA	PFOA	PFOS
Well	WellName	Type	Category	Aquifer	Sampled	Units	5000	-	-	-	20	-	10	40
3S1E09B001	**Stoneridge**	**well-supply**	**muni**	**L**	**10/4/21**	**ng/L**	**4.5**	**< 2.0**	**< 2.0**	**3.4**	**19**	**< 2.0**	**2.7**	**18**
3S1E09B001	**Stoneridge**	**well-supply**	**muni**	**L**	**1/10/22**	**ng/L**	**5.8**	**< 2.0**	**< 2.0**	**4.5**	**23**	**< 2.0**	**3.1**	**22**
3S1E09B001	**Stoneridge**	**well-supply**	**muni**	**L**	**4/11/22**	**ng/L**	**5.9**	**< 2.0**	**< 2.0**	**4.3**	**24**	**< 2.0**	**3.2**	**23**
3S1E09B001	**Stoneridge**	**well-supply**	**muni**	**L**	**9/13/22**	**ng/L**	**6.6**	**< 1.7**	**< 1.7**	**4.7**	**26**	**< 1.7**	**3**	**30**
3S1E09H010	NW Lake I Shallow	well-static	nested	U	11/30/21	ng/L	4.8	< 2.0	< 2.0	< 2.0	18	< 2.0	4.3	27
3S1E09H010	NW Lake I Shallow	well-static	nested	U	5/24/22	ng/L	5.3	< 2.0	< 2.0	< 2.0	16	< 2.0	3.8	16
3S1E09H011	NW Lake I Deep	well-static	nested	L	5/24/22	ng/L	5.9	< 2.0	< 2.0	3.7	25	< 2.0	6	39
3S1E09J007	SW Lake I Shallow	well-static	nested	U	9/26/22	ng/L	5.1	2.4	7.2	23	18	1.9	21	19
3S1E09J008	SW Lake I Middle	well-static	nested	L	9/27/22	ng/L	5.2	< 1.7	< 1.7	3.3	24	< 1.7	5.8	44
3S1E09M003	**Mocho 2**	**well-supply**	**muni**	**L**	**10/7/21**	**ng/L**	**6.2**	**< 2.0**	**< 2.0**	**4.8**	**29**	**< 2.0**	**4.3**	**32**
3S1E09M003	**Mocho 2**	**well-supply**	**muni**	**L**	**4/11/22**	**ng/L**	**6.3**	**< 2.0**	**< 2.0**	**4**	**27**	**< 2.0**	**4.1**	**30**
3S1E09M003	**Mocho 2**	**well-supply**	**muni**	**L**	**7/11/22**	**ng/L**	**6.7**	**< 2.0**	**2.1**	**5**	**29**	**< 2.0**	**4.7**	**36**
3S1E09M004	**Mocho 3**	**well-supply**	**muni**	**L**	**10/4/21**	**ng/L**	**7.5**	**< 2.0**	**2.2**	**5.9**	**34**	**< 2.0**	**5.1**	**45**
3S1E09M004	**Mocho 3**	**well-supply**	**muni**	**L**	**1/11/22**	**ng/L**	**8.7**	**< 2.0**	**2.6**	**7.6**	**45**	**< 2.0**	**5.9**	**62**
3S1E09M004	**Mocho 3**	**well-supply**	**muni**	**L**	**4/11/22**	**ng/L**	**7.8**	**< 2.0**	**2.2**	**6.5**	**38**	**< 2.0**	**5.6**	**51**
3S1E09M004	**Mocho 3**	**well-supply**	**muni**	**L**	**7/11/22**	**ng/L**	**7.3**	**< 2.0**	**2.2**	**5.9**	**33**	**< 2.0**	**4.8**	**45**
3S1E09P009	Mohr Ave Shallow	well-static	nested	L	5/24/22	ng/L	5.5	< 2.0	2.4	4.9	16	< 2.0	5.9	30
3S1E09P010	Key_AmW_L	well-static	nested	L	5/24/22	ng/L	5.3	< 2.0	< 2.0	3.6	16	< 2.0	4.7	24
3S1E09P011	Mohr Ave Deep	well-static	nested	L	5/24/22	ng/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.3	< 2.0
3S1E10A002	El Charro Rd	well-static	monitor	U	8/23/22	ng/L	22	< 1.7	2.9	11	84	< 1.7	9.8	210
3S1E10B008	Kaiser Rd Shallow	well-static	nested	L	9/29/22	ng/L	68	< 1.6	17	60	410	< 1.6	36	790
3S1E10B009	Kaiser Rd Middle 1	well-static	nested	L	9/28/22	ng/L	2.4	< 2.0	< 2.0	< 2.0	10	< 2.0	2.3	9
3S1E10B010	Kaiser Rd Middle 2	well-static	nested	L	9/28/22	ng/L	3.5	< 2.0	< 2.0	3.4	23	< 2.0	< 2.0	180
3S1E10B011	Kaiser Rd Deep	well-static	nested	D	9/28/22	ng/L	< 2.0	< 2.0	< 2.0	< 2.0	3.3	< 2.0	< 2.0	4
3S1E10B016	**COL 5**	**well-supply**	**muni**	**L**	**10/4/21**	**ng/L**	**2.7**	**< 2.0**	**< 2.0**	**2.2**	**14**	**< 2.0**	**< 2.0**	**20**

Municipal Wells are Bold
Aquifer: U=Upper; L=Lower; D=Deep
Red Text = Concentration is above Response Level

TABLE 6-7
PFAS WATER QUALITY RESULTS FROM WELLS
2022 WATER YEAR
(Only PFAS Compounds with detected concentrations shown)

							PFAS COMPOUNDS (with Response Level)							
							PFBS	PFDA	PFHpA	PFHxA	PFHxS	PFNA	PFOA	PFOS
Well	WellName	Type	Category	Aquifer	Sampled	Units	5000	-	-	-	20	-	10	40
3S1E10B016	**COL 5**	**well-supply**	**muni**	**L**	**1/10/22**	**ng/L**	**2.4**	**< 2.0**	**< 2.0**	**2**	**13**	**< 2.0**	**< 2.0**	**17**
3S1E10B016	**COL 5**	**well-supply**	**muni**	**L**	**4/5/22**	**ng/L**	**3.9**	**< 2.0**	**< 2.0**	**2.7**	**17**	**< 2.0**	**< 2.0**	**22**
3S1E10B016	**COL 5**	**well-supply**	**muni**	**L**	**9/20/22**	**ng/L**	**6**	**< 1.7**	**< 1.7**	**4.3**	**25**	**< 1.7**	**1.8**	**32**
3S1E10D002	Stoneridge Shallow	well-static	nested	L	10/13/22	ng/L	23	< 1.6	4.9	18	72	< 1.6	8.1	82
3S1E10D003	Stoneridge Middle 1	well-static	nested	L	10/13/22	ng/L	8	< 1.6	< 1.6	7.2	57	< 1.6	2.8	85
3S1E10D004	Stoneridge Middle 2	well-static	nested	L	10/13/22	ng/L	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
3S1E10D005	Stoneridge Deep	well-static	nested	D	10/13/22	ng/L	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
3S1E10K002	COL 1 Monitoring	well-static	monitor	L	9/29/22	ng/L	12	< 1.7	3.6	10	58	< 1.7	9.3	63
3S1E10K003	**COL 1**	**well-supply**	**muni**	**L**	**10/4/21**	**ng/L**	**7.6**	**< 2.0**	**2.4**	**6.6**	**39**	**< 2.0**	**5.9**	**46**
3S1E10K003	**COL 1**	**well-supply**	**muni**	**L**	**1/10/22**	**ng/L**	**8.4**	**< 2.0**	**2.6**	**7.5**	**38**	**< 2.0**	**5.3**	**42**
3S1E10K003	**COL 1**	**well-supply**	**muni**	**L**	**4/5/22**	**ng/L**	**8.3**	**< 2.0**	**2.6**	**7.2**	**40**	**< 2.0**	**6.3**	**45**
3S1E10K003	**COL 1**	**well-supply**	**muni**	**L**	**7/11/22**	**ng/L**	**9.4**	**< 2.0**	**2.6**	**6.7**	**40**	**< 2.0**	**5.9**	**45**
3S1E11C003	LAVWMA ROW	well-static	monitor	U	8/25/22	ng/L	48	< 1.7	3.7	13	160	< 1.7	11	230
3S1E11G001	Key_AmE_U	well-static	nested	U	8/11/22	ng/L	15	< 1.6	6.7	14	57	< 1.6	14	82
3S1E11G002	Rancho Charro Middle 1	well-static	nested	L	8/11/22	ng/L	10	< 1.8	2	6.5	32	< 1.8	4.5	36
3S1E11G003	Rancho Charro Middle 2	well-static	nested	L	8/11/22	ng/L	< 1.8	< 1.8	< 1.8	< 1.8	2.5	< 1.8	< 1.8	9.2
3S1E11G004	Rancho Charro Deep	well-static	nested	D	8/11/22	ng/L	4.4	< 1.7	1.7	3.1	6.7	< 1.7	5.3	21
3S1E11M003	**COL 2**	**well-supply**	**muni**	**L**	**10/4/21**	**ng/L**	**5.4**	**< 2.0**	**< 2.0**	**4.6**	**20**	**< 2.0**	**3.6**	**22**
3S1E11M003	**COL 2**	**well-supply**	**muni**	**L**	**1/10/22**	**ng/L**	**4**	**< 2.0**	**< 2.0**	**3.4**	**17**	**< 2.0**	**2.5**	**18**
3S1E11M003	**COL 2**	**well-supply**	**muni**	**L**	**4/5/22**	**ng/L**	**5.4**	**< 2.0**	**< 2.0**	**4.6**	**19**	**< 2.0**	**3.6**	**21**
3S1E11M003	**COL 2**	**well-supply**	**muni**	**L**	**7/11/22**	**ng/L**	**4.5**	**< 2.0**	**< 2.0**	**3.7**	**17**	**< 2.0**	**3**	**19**
3S1E11P006	New Jamieson Residence	well-supply	domestic	L	8/10/22	ng/L	4.4	< 1.8	1.8	3.9	11	< 1.8	4.6	10
3S1E13P005	LGA Grant Nested 1	well-static	nested	U	8/10/22	ng/L	3.6	< 1.8	< 1.8	< 1.8	3.1	< 1.8	3.1	3
3S1E14B001	Industrial Asphalt	well-supply	industrial	L	8/10/22	ng/L	4.1	< 1.7	< 1.7	2.3	11	< 1.7	3.4	9.3
3S1E14D002	South Cope Lake	well-static	monitor	L	10/13/22	ng/L	7.7	< 1.6	1.9	5.4	29	< 1.6	4.9	34

Municipal Wells are Bold

Aquifer: U=Upper; L=Lower; D=Deep

Red Text = Concentration is above Response Level

TABLE 6-7
PFAS WATER QUALITY RESULTS FROM WELLS
2022 WATER YEAR
(Only PFAS Compounds with detected concentrations shown)

							PFAS COMPOUNDS (with Response Level)							
							PFBS	PFDA	PFHpA	PFHxA	PFHxS	PFNA	PFOA	PFOS
Well	WellName	Type	Category	Aquifer	Sampled	Units	5000	-	-	-	20	-	10	40
3S1E15M003	Bush/Valley South	well-static	monitor	L	9/20/22	ng/L	< 1.6	< 1.6	< 1.6	< 1.6	2.6	< 1.6	2.2	3.6
3S1E16A002	**Pleas 8**	**well-supply**	**muni**	**L**	**11/17/21**	**ng/L**	**5.38**	**<0.589**	**2.14**	**3.64**	**23.8**	**0.978**	**4.33**	**34.3**
3S1E16A004	Bush/Valley Mid	well-static	monitor	L	9/20/22	ng/L	5.5	< 1.6	3.2	5.5	28	< 1.6	5	35
3S1E16L005	**Pleas 5**	**well-supply**	**muni**	**L**	**11/17/21**	**ng/L**	**4.4**	**<0.62**	**1.86**	**3.47**	**16.9**	**<0.866**	**3.39**	**19.8**
3S1E16L007	**Pleas 6**	**well-supply**	**muni**	**L**	**11/17/21**	**ng/L**	**5.16**	**<0.607**	**1.9**	**3.95**	**20**	**<0.848**	**3.63**	**26.3**
3S1E16P005	Vervais Monitor	well-static	monitor	U	10/10/22	ng/L	25	8.1	3.5	6.5	4.8	4.4	14	21
3S1E17B004	Casterson	well-supply	supply	L	9/21/22	ng/L	4.8	< 1.9	< 1.9	4.6	14	< 1.9	3.2	8.4
3S1E18A006	**Hopyard 6**	**well-supply**	**muni**	**L**	**1/11/22**	**ng/L**	**< 2.0**	**< 2.0**	**< 2.0**	**< 2.0**	**< 2.0**	**< 2.0**	**< 2.0**	**< 2.0**
3S1E19A010	**SFWD South (B)**	**well-supply**	**muni**	**L**	**10/4/21**	**ng/L**	**2**	**<2**	**<2**	**<2**	**3.5**	**<2**	**<2**	**<2**
3S1E20B002	Fairgrounds Potable	well-supply	supply	L	11/17/21	ng/L	4.4	<0.62	1.86	3.47	16.9	<0.866	3.39	19.8
3S1E20B002	Fairgrounds Potable	well-supply	supply	L	2/9/22	ng/L	7.26	<0.588	1.85	3.93	20.3	<0.721	4.1	23.1
3S1E20C007	Key_Bern_U	well-static	monitor	U	9/26/22	ng/L	3.1	< 1.7	< 1.7	< 1.7	3	< 1.7	4.1	8.9
3S1E20C008	Key_Bern_L	well-static	nested	L	9/27/22	ng/L	< 1.7	< 1.7	< 1.7	< 1.7	3.4	< 1.7	< 1.7	3.6
3S1W12B002	Stoneridge Mall Rd	well-static	monitor	U	9/12/22	ng/L	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
3S1W12J001	DSRSD South	well-static	monitor	U	9/13/22	ng/L	< 1.8	< 1.8	4.6	5.7	6.5	2.5	19	55
3S2E07N002	Isabel & Arroyo Mocho	well-static	monitor	U	9/13/22	ng/L	2.7	< 1.6	< 1.6	2.6	< 1.6	< 1.6	3.5	3.8
3S2E07R003	**CWS 31**	**well-supply**	**muni**	**L**	**12/29/21**	**ng/L**	**<2**	**<2**	**<2**	**<2**	**4.6**	**<2**	**<2**	**5.1**
3S2E08N002	**CWS 14**	**well-supply**	**muni**	**L**	**10/28/21**	**ng/L**	**2.6**	**<2**	**<2**	**<2**	**3**	**<2**	**2.6**	**3.8**
3S2E18B001	**CWS 20**	**well-supply**	**muni**	**L**	**10/27/21**	**ng/L**	**<2**	**<2**	**<2**	**<2**	**2.8**	**<2**	**2.6**	**3.8**
3S2E19D007	Isabel Shallow	well-static	nested	U	8/9/22	ng/L	< 1.6	< 1.6	1.6	< 1.6	< 1.6	< 1.6	3.9	2
3S2E19D008	Isabel Middle 1	well-static	nested	L	8/9/22	ng/L	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
3S2E19D009	Isabel Middle 2	well-static	nested	L	8/11/22	ng/L	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
3S2E19D010	Isabel Deep	well-static	nested	L	8/11/22	ng/L	3.8	< 1.7	4.1	11	4.1	< 1.7	10	6.6
3S2E19N003	Shallow Cemex Nested	well-static	nested	U	8/10/22	ng/L	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
3S2E19N004	Deep Cemex Nested	well-static	nested	L	8/10/22	ng/L	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7

Municipal Wells are Bold
Aquifer: U=Upper; L=Lower; D=Deep
Red Text = Concentration is above Response Level

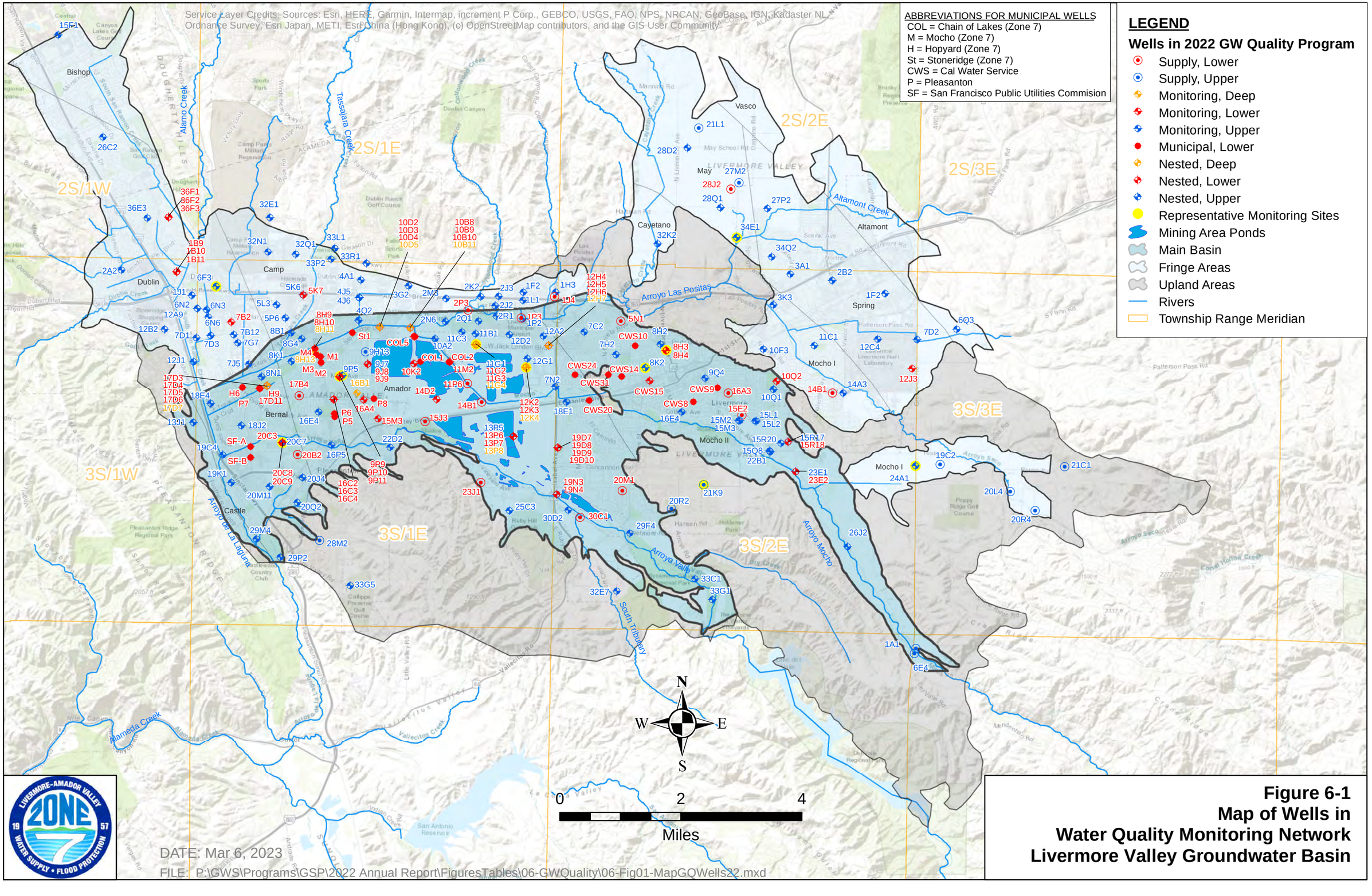

Figure 6-1
Map of Wells in
Water Quality Monitoring Network
Livermore Valley Groundwater Basin

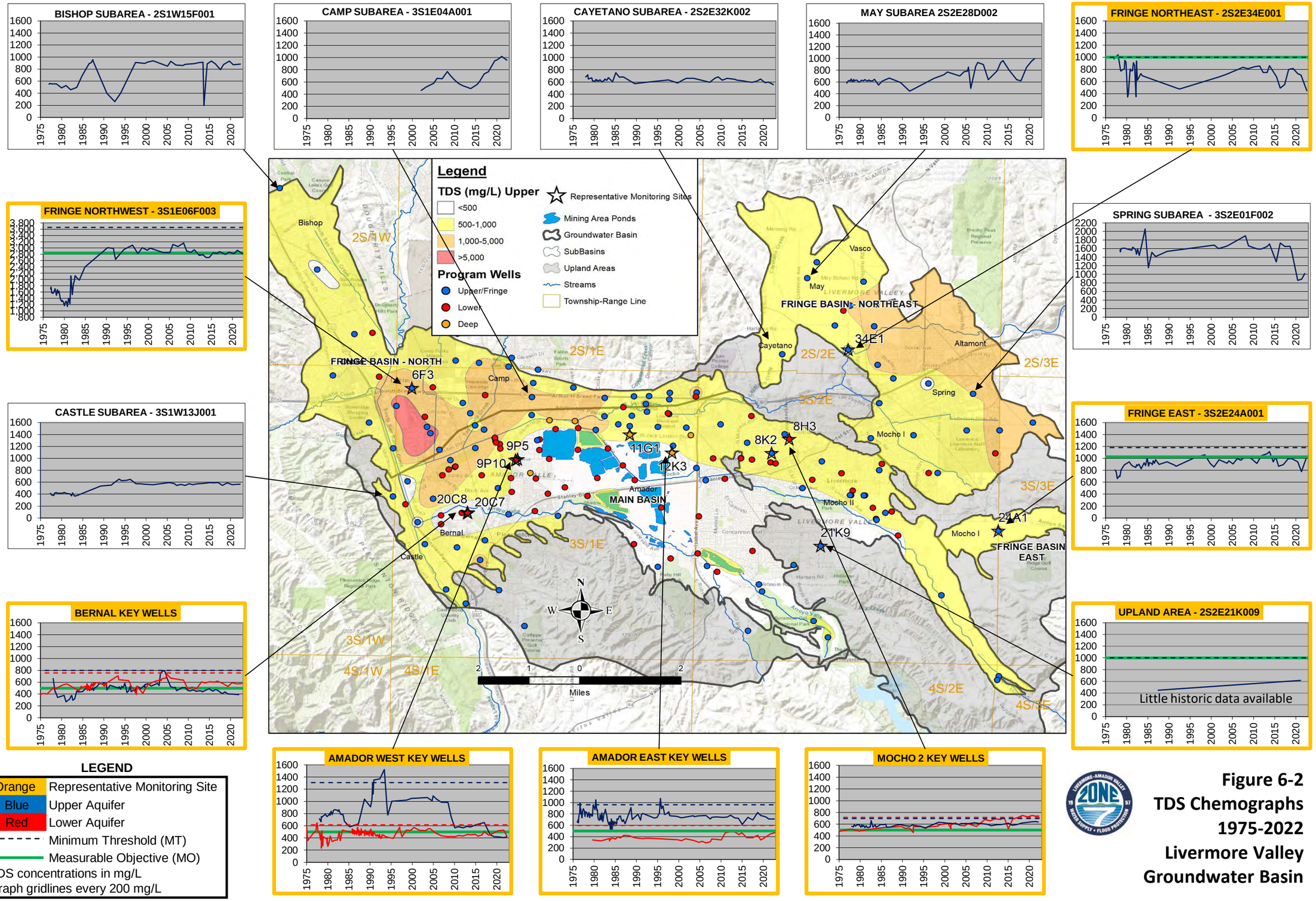

Figure 6-2
TDS Chemographs
1975-2022
Livermore Valley
Groundwater Basin

Some contours are based on past data from wells not sampled in this Water Year. Maximum shown if multiple samples were taken in Water Year.

LEGEND

2022 Wells with TDS Concentrations

11P6 Well Number (abbreviated)
3.67 = TDS Concentration in mg/L
ND = not detected above reporting limit
NA = not analyzed in this WY

- Supply
- Monitor
- Nested
- Mining

2022 TDS Concentrations (mg/L)

- <500
- 500-1,000
- 1,000-5,000
- >5,000
- Township-Range Line
- Streams
- Mining Area Ponds
- Groundwater Basin (DWR 2016)
- Upland Areas

2S/1W 2S/1E 2S/2E 2S/3E
3S/1W 3S/1E 3S/2E 3S/3E
4S/1W 4S/1E 4S/2E 4S/3E

N W E S

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Miles

DATE: Mar 6, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\06-GWQuality\06-Fig03-TDSUpper22.mxd

Figure 6-3
TDS Concentrations (mg/L)
Upper Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin

Some contours are based on past data from wells not sampled in this Water Year. Maximum shown if multiple samples were taken in Water Year.

ABBREVIATIONS FOR MUNICIPAL WELLS

COL = Chain of Lakes (Zone 7)
M = Mocho (Zone 7)
H = Hopyard (Zone 7)
CWS = Cal Water Service
St = Stoneridge (Zone 7)
P = Pleasanton
SF = San Francisco Public Utilities Commision

LEGEND

2022 Wells with TDS Concentrations

11P6 Well Number (abbreviated)
3.67 = TDS Concentration in mg/L
ND = not detected above reporting limit
NA = not analyzed in this WY

- Supply
- Monitor
- Municipal
- Nested
- Mining
- Streams

2022 TDS Concentrations (mg/L)

- <500
- 500-1,000
- 1,000-5,000
- >5,000
- Mining Area Ponds
- Groundwater Basin (DWR 2016)
- Main Basin Subarea Boundary
- Upland Areas

1B10 482
7B2 366
5K7 646
8H9 562
M4 674
M3 625
M2 525
St1 666
9H11 485
9J8 478
9P10 430
COL5 Mon 376
COL5 415
COL1 520
COL2 Mon 551
COL2 470
COL1 Mon 503
10B9 622
2P3 431
11G3 397
11P6 418
12K3 471
12H4 489
5N1 519
8H3 742
CWS24 310
8Q9 531
CWS9 560
16A3 655
10Q2 471
12J3 409
14B1 598
H7 659
H9 521
H6 654
17D11 219
17B4 740
16A4 509
14B1 451
15M3 410
R28 393
P42 439
19D10 463
15R18 399
15E2 275
23E2 638
23J1 314
20M1 546
30C1 469
SF-A 978
SF-B 721
20C8 578
20B2 515

Dublin
Pleasanton
Livermore
Bernal
Castle
Amador
Mocho
Mocho II
AMADOR VALLEY
LIVERMORE VALLEY
Camp Parks Military Reservation
Hacienda Crossings
Las Positas Golf Course
Livermore Municipal Airport
Lawrence Livermore Nat'l Laboratory
Emerald Glen Park
Robertson Park
Ruby Hill Golf Club
Castlewood Country Club
Callippe Preserve Golf Course
Sycamore Grove Regional Park
Lake del Valle
Arthur H Breed Fwy
South San Ramon Creek
Arroyo Valle
Arroyo del Valle
Vallecitos Valley
Dry Creek
Stanley Blvd
E Stanley Blvd
W Jack London Blvd
Dublin Blvd
Central Pkwy
Gleason Dr
Owens Dr
Gibraltar Dr
Las Positas Blvd
Stoneridge Dr
El Charro Rd
Croak Rd
Fallon Rd
Cottonwood Dr
Doolan Rd
Cayetano Creek
N Murrieta Blvd
Livermore Ave
Portola Ave
1st St
N Mines Rd
S Vasco Rd
Greenville Rd
Tesla Rd
Hopyard Rd
Black Ave
Valley Trails Dr
Santa Rita Rd
Foothill Rd Loop
Sinclair Fwy
Bernal Ave
Pleasanton Ridge
Shadow Cliffs
Isabel Ave
Murdell Ln
El Caminito
Hemme Ave
S Livermore Ave
Concannon Blvd
Wetmore Rd
Hansen Rd
Holdener Park
Arroyo Rd
Foothill Rd
Kilkare Rd
Little Valley Rd
Pleasanton Sunol Rd
Vallecitos Rd
Sunol
Mocho II Ave
Olivina Ave
E Ruby Hill Dr
N Ruby Hill Dr
Via di Salerno
Kallin Conn
Poppy Ridge Golf Course
The Course at Wente Vineyards
Mines Rd
1290 ft
1000 ft
500 ft

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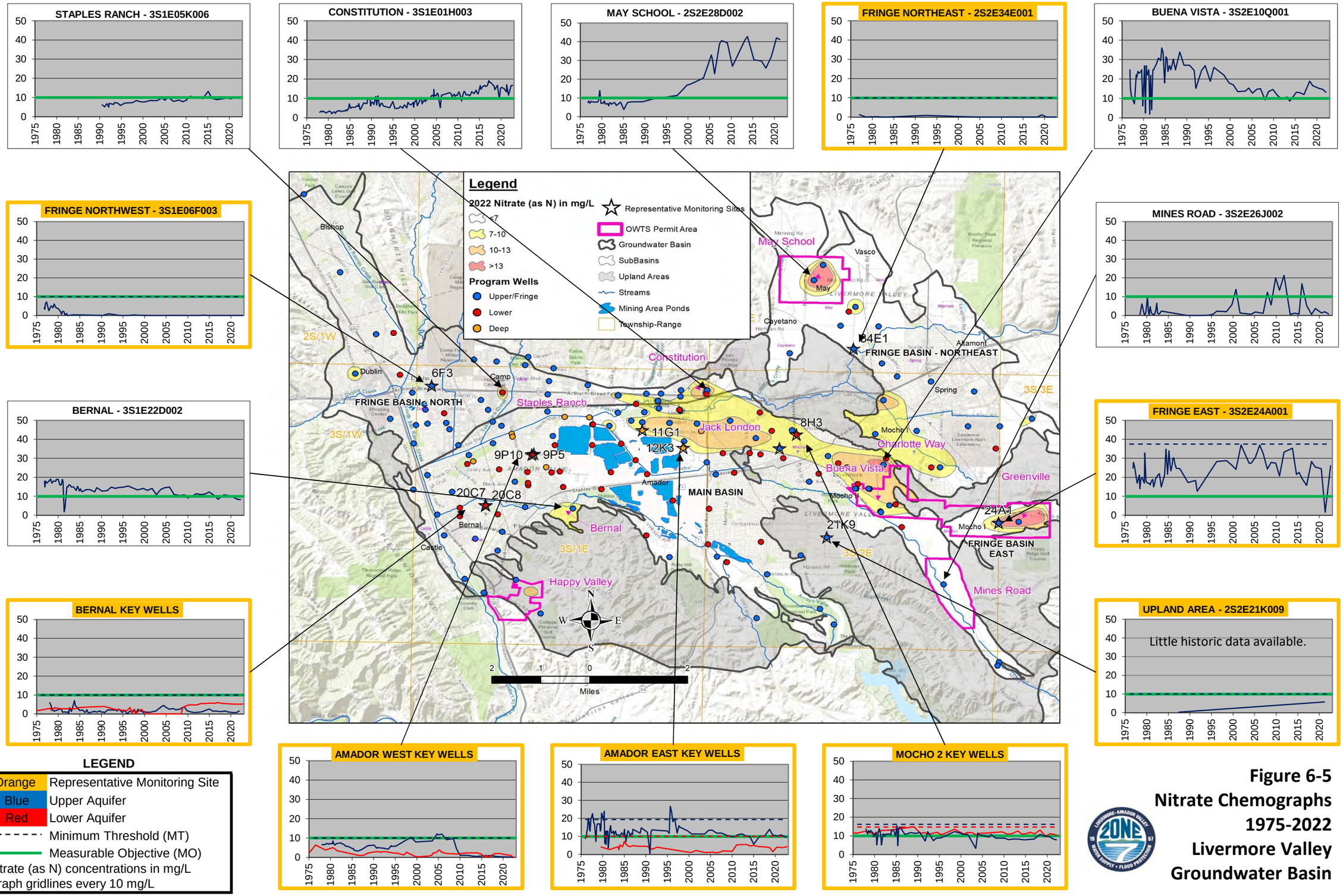
Feet

DATE: Feb 24, 2023
FILE: R:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\06-GWQuality\06-Fig04-TDSLower22.mxd

Figure 6-4
TDS Concentrations (mg/L)
Lower Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin



LEGEND

Orange	Representative Monitoring Site
Blue	Upper Aquifer
Red	Lower Aquifer
- - - - - -	Minimum Threshold (MT)
———	Measurable Objective (MO)

Nitrate (as N) concentrations in mg/L
Graph gridlines every 10 mg/L

Figure 6-5
Nitrate Chemographs
1975-2022
Livermore Valley
Groundwater Basin

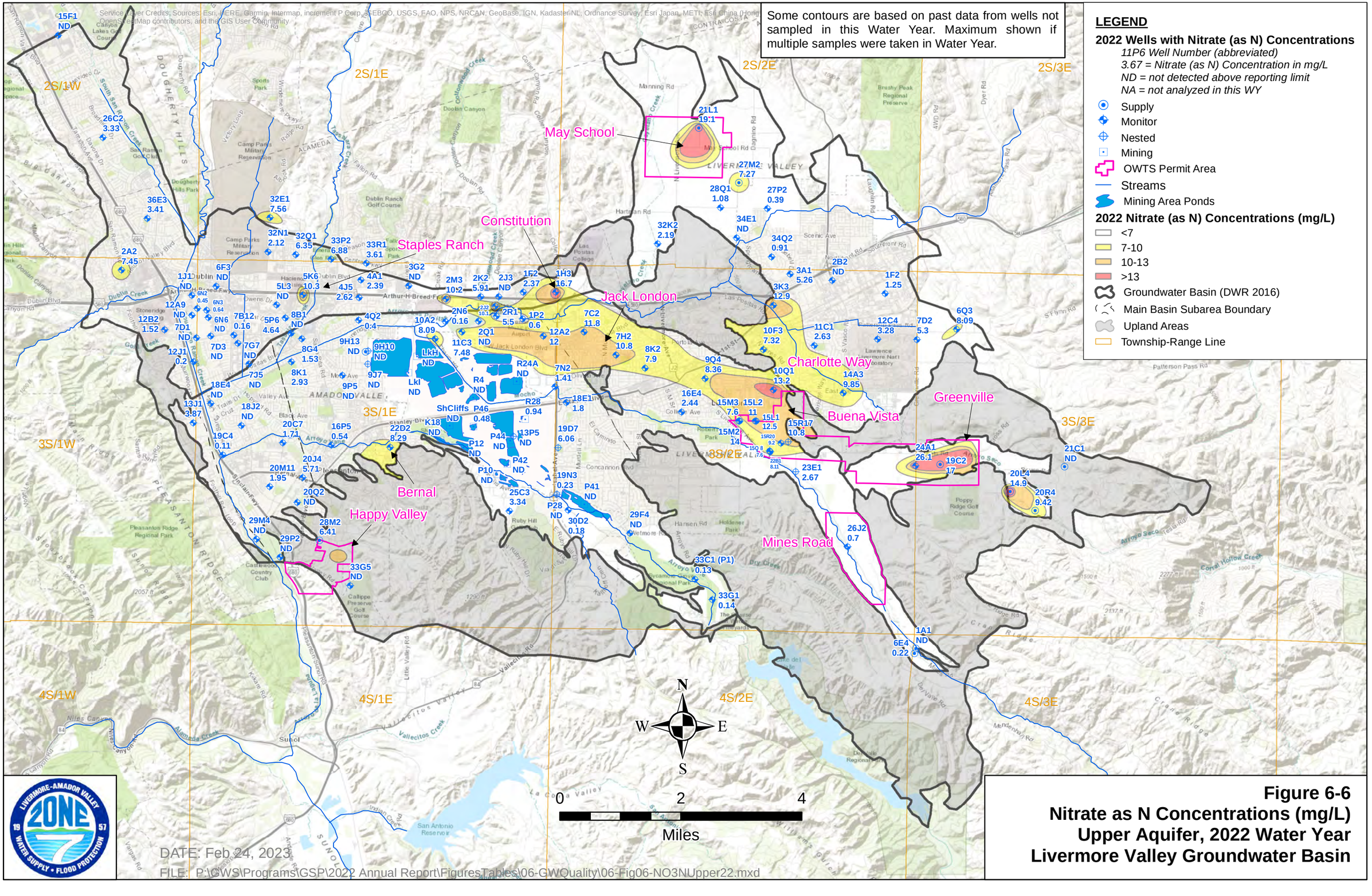


Figure 6-6
Nitrate as N Concentrations (mg/L)
Upper Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin

Maximum concentration shown if multiple samples were taken in water year.

ABBREVIATIONS FOR MUNICIPAL WELLS
COL = Chain of Lakes (Zone 7)
M = Mocho (Zone 7)
H = Hopyard (Zone 7)
CWS = Cal Water Service
St = Stoneridge (Zone 7)
P = Pleasanton
SF = San Francisco Public Utilities Commision

LEGEND

2022 Wells with Nitrate (as N) Concentrations
11P6 Well Number (abbreviated)
3.67 = Nitrate (as N) Concentration in mg/L
ND = not detected above reporting limit
NA = not analyzed in this WY

- Supply
- Monitor
- Municipal
- Nested
- Mining
- Mining Area Ponds

2022 Nitrate (as N) Concentrations (mg/L)
- <7
- 7-10
- 10-13
- >13
- Township-Range Line
- Streams
- OWTS Permit Area
- Groundwater Basin (DWR 2016)
- Main Basin Subarea Boundary
- Upland Areas

Staples Ranch
Constitution
Jack London
Charlotte Way
Buena Vista
Greenville
Bernal
Happy Valley
Mines Road
Unknown

2S/1W
2S/1E
3S/1W
3S/1E
3S/2E
3S/3E
4S/1E
4S/2E

5K7 1.08
7B2 0.36
St1 3.28
2P3 4.39
10B10 3.4
10B8 8.88
10B9 5.74
M4 2.53
M3 1.93
M2 1.07
9H11 ND
COL5 3.58
COL5 Mon 3.86
COL1 3.31
COL1 Mon 2.75
COL2 4.14
COL2 Mon 4.94
11G2 5.66
11G3 3.78
9P11 0.08
9P10 0.14
9P9 0.23
9J8 ND
9J9 3.5
11P6 0.6
14B1 0.75
12H4 4.52
12H5 2.65
12H6 2.11
12K2 1.96
12K3 4.31
CWS24 3.5
CWS31 5:1
CWS10 10
8H4 4.45
8H3 10.3
CWS14 4.3
CWS20 7.5
8Q9 5.39
CWS9 8.9
16A3 10.7
15E2 1.11
10Q2 6.17
14B1 9.35
12J3 0.37
15R18 0.93
23E2 0.11
H6 3.28
H9 3.16
H7 ND
17D11 7.01
17B4 5.1
P6 1.3
P5 2
16A4 1.13
15M3 1.31
R28 0.94
SF-A 1.49
SF-B 2.21
20C8 5.21
20B2 3.56
23J1 0.25
P42 ND
19D8 6.02
19D9 6.96
19D10 10.2
19N4 ND
20M1 2.24
30C1 4.95

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Feet

DATE: Mar 6, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\06-GWQuality\06-Fig07-NO3NLower22.mxd

Figure 6-7
Nitrate as N Concentrations (mg/L)
Lower Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin

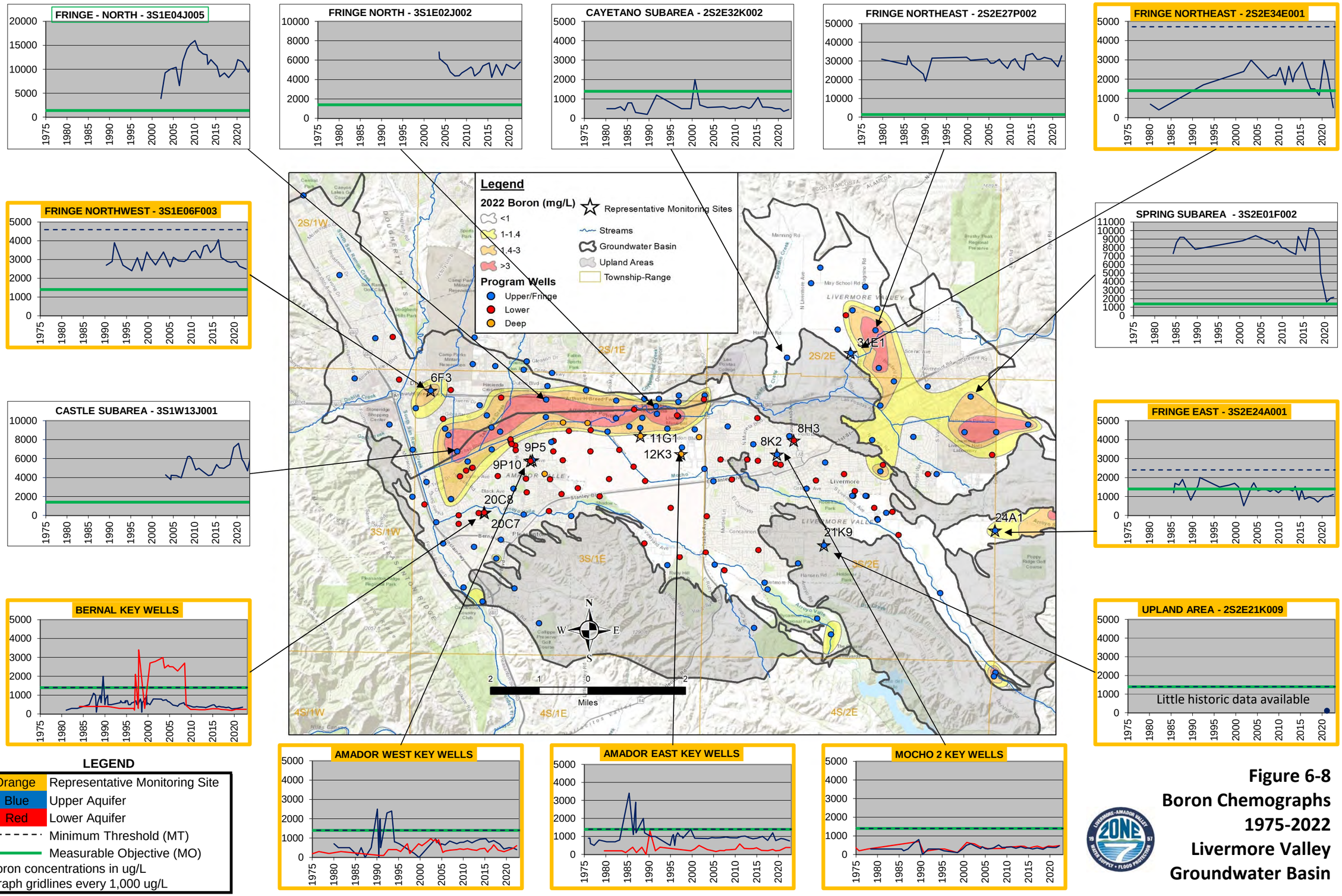

Figure 6-8
Boron Chemographs
1975-2022
Livermore Valley
Groundwater Basin

Some contours are based on past data from wells not sampled in this Water Year. Maximum shown if multiple samples were taken in Water Year.

LEGEND

2022 Wells with Boron Concentrations

11P6 Well Number (abbreviated)
367 = Boron Concentration in µg/L
ND = not detected above reporting limit
NA = not analyzed in this WY

- Supply
- Monitor
- Nested
- Mining
- Streams
- Township-Range Line
- Mining Area Ponds
- Groundwater Basin (DWR 2016)
- Main Basin Subarea Boundary
- Upland Areas

2022 Boron Concentrations (mg/L)

- <1,000
- 1,000-1,400
- 1,400-3,000
- >3,000

2S/1W 2S/1E 2S/2E 2S/3E
3S/1W 3S/1E 3S/2E 3S/3E
4S/1W 4S/1E 4S/2E 4S/3E

N W E S

0 2 4 Miles

DATE: Mar 6, 2023
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Figure 6-9
Boron Concentrations (µg/L)
Upper Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin

Maximum concentration shown if multiple samples were taken in water year.

ABBREVIATIONS FOR MUNICIPAL WELLS
COL = Chain of Lakes (Zone 7)
M = Mocho (Zone 7)
H = Hopyard (Zone 7)
CWS = Cal Water Service
St = Stoneridge (Zone 7)
P = Pleasanton
SF = San Francisco Public Utilities Commision

LEGEND

2022 Wells with Boron Concentrations
11P6 Well Number (abbreviated)
367 = Boron Concentration in µg/L
ND = not detected above reporting limit
NA = not analyzed in this WY
Supply
Monitor
Municipal
Nested
Mining
Streams

2022 Boron Concentrations (µg/L)
<1,000
1,000-1,400
1,400-3,000
>3,000
Groundwater Basin (DWR 2016)
Main Basin Subarea Boundary
Upland Areas
Mining Area Ponds
Township-Range Line

1B10 550
1B9 580
1B11 700
5K7 920
7B2 470
2P3 490
St1 810
10B10 430
10B9 1140
11G2 830
12H4 330
M4 1060
8H10 1470
9H11 820
COL5 Mon 210
12H5 330
8H3 480
8H4 600
11G3 270
12K2 270
12H6 240
9J9 250
9J8 660
COL1 500
COL2 400
12K3 390
M2 690
9P9 530
COL1 Mon 450
COL2 Mon 520
H6 620
H9 630
H7 2150
9P11 500
9P10 600
11P6 370
8Q9 400
10Q2 760
12J3 420
16A3 500
14B1 700
17B4 790
16A4 400
14B1 400
15E2 220
17D11 480
15M3 270
R28 280
20C8 250
20B2 410
19D8 ND
19D9 ND
19D10 ND
15R18 250
P42 320
23E2 2870
23J1 210
19N4 350
20M1 320
30C1 430

Livermore Municipal Airport
Las Positas Golf Course
Camp Parks Military Reservation
Hacienda Crossings
Emerald Glen Park
Fallon Sports Park
Cottonwood Creek
Doolan Canyon
Cayetano Creek
Tassajara Creek
South San Ramon Creek
Arroyo Las Positas
Arroyo Valle
Arroyo de la Laguna
Alamo Canal
Chain of Lakes
Shadow Cliffs
Ruby Hill Golf Club
Callippe Preserve Golf Course
Castlewood Country Club
Sycamore Grove Regional Park
Lawrence Livermore Nat'l Laboratory
Robertson Park
Poppy Ridge Golf Course
Lake del Valle
Dublin
Pleasanton
Livermore
Amador
Mocho
Bernal
Castle
LIVERMORE VALLEY
AMADOR VALLEY
PLEASANTON RIDGE
Arthur H Breed Fwy
Stanley Blvd
E Stanley Blvd
W Jack London Blvd
Olivina Ave
College Ave
Concannon Blvd
Vallecitos Rd
Vallecitos Valley
Hopyard Rd
Black Ave
Bernal Ave
Foothill Rd Loop
Sunol Blvd
Pleasanton Sunol Rd
Little Valley Rd
Kilkare Rd
Happy Valley Rd
Wetmore Rd
Hansen Rd
Holdener Park
Tesla Rd
Dry Creek
Mocho I
3S/1E
3S/2E
3S/3E
4S/1E
4S/2E
4S/3E

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Feet

DATE: Mar 6, 2023
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Figure 6-10
Boron Concentrations (µg/L)
Lower Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin

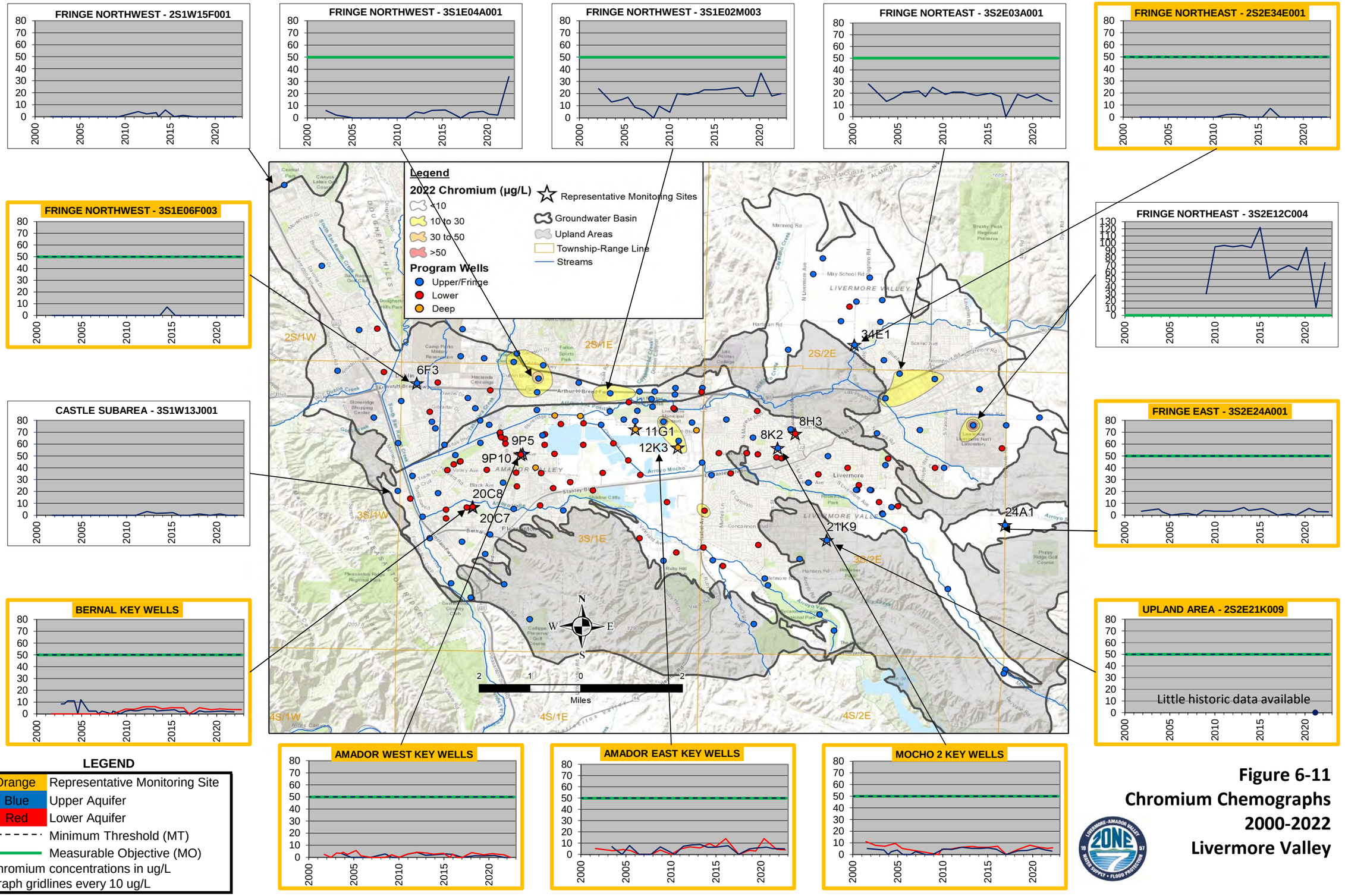


Figure 6-11
Chromium Chemographs
2000-2022
Livermore Valley

Some contours are based on past data from wells not sampled in this Water Year. Maximum shown if multiple samples were taken in Water Year.

LEGEND

2022 Wells with Cr (Total) Concentrations

11P6 Well Number (abbreviated)
3.67 = Cr Concentration in µg/L
ND = not detected above reporting limit
NA = not analyzed in this WY

- Supply
- Monitor
- Nested
- Mining
- Township-Range Line
- Streams
- Mining Area Ponds

2022 Chromium (Total) Concentrations (µg/L)

- <10
- 10 to 30
- 30 to 50
- >50
- Groundwater Basin (DWR 2016)
- Main Basin Subarea Boundary
- Upland Areas

2S/1W 2S/1E 2S/2E
3S/1W 3S/1E 3S/2E 3S/3E
4S/1W 4S/1E 4S/2E 4S/3E

N W E S

0 2 4
Miles

DATE: Mar 6, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\06-GWQuality\06-Fig12-CrUpper22.mxd

Figure 6-12
Total Chromium Concentrations (µg/L)
Upper Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin

Some contours are based on past data from wells not sampled in this Water Year. Maximum shown if multiple samples were taken in Water Year.

ABBREVIATIONS FOR MUNICIPAL WELLS
COL = Chain of Lakes (Zone 7)
M = Mocho (Zone 7)
H = Hopyard (Zone 7)
CWS = Cal Water Service
St = Stoneridge (Zone 7)
P = Pleasanton
SF = San Francisco Public Utilities Commision

LEGEND

2022 Wells with Cr (Total) Concentrations
11P6 Well Number (abbreviated)
367 = Cr Concentration in µg/L
ND = not detected above reporting limit
NA = not analyzed in this WY
Supply
Monitor
Municipal
Nested
Mining
Streams
Township-Range Line
Mining Area Ponds

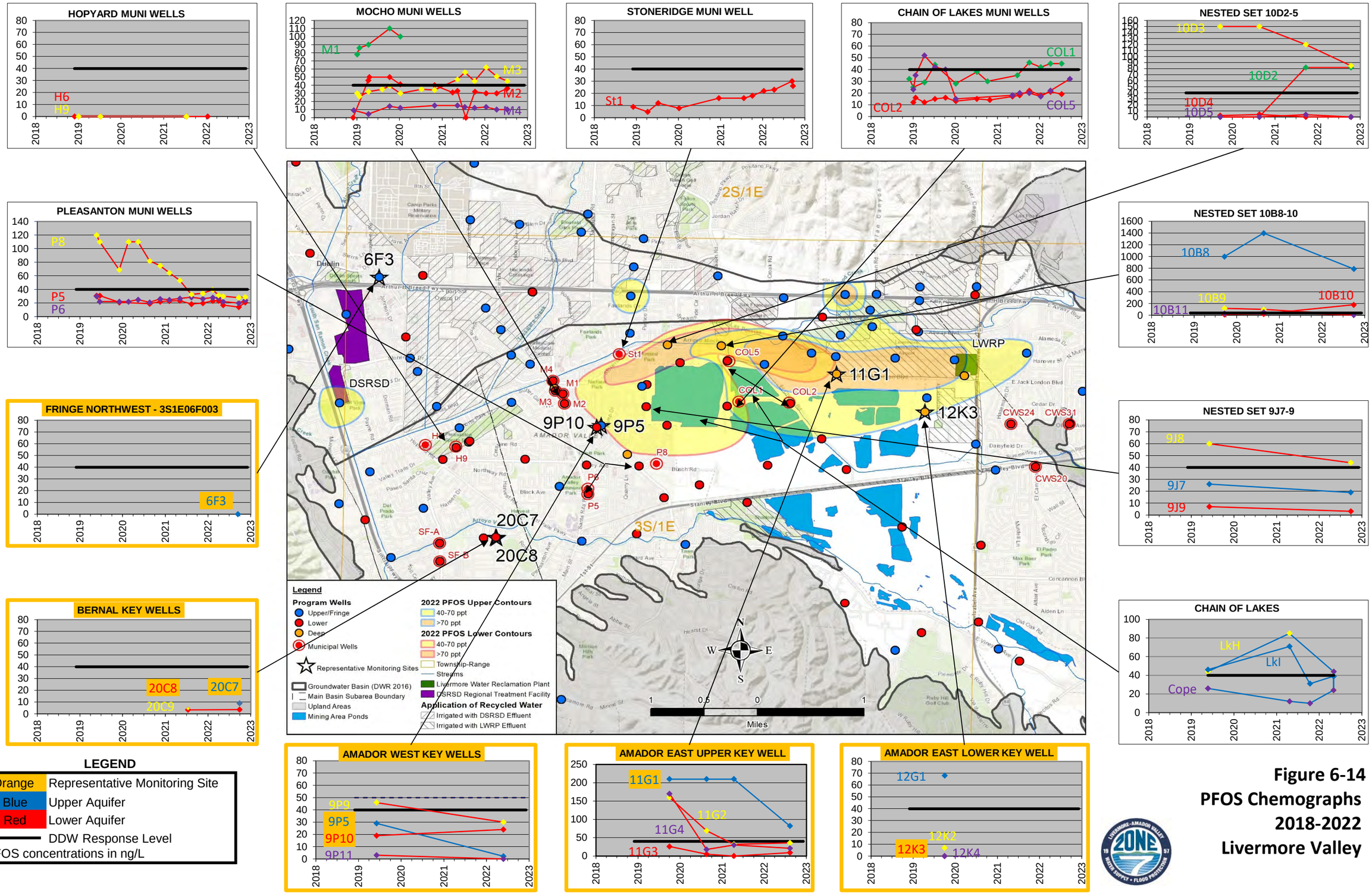
2022 Cr (as Total) Concentrations (µg/L)
<10
10-30
30-50
>50
Groundwater Basin (DWR 2016)
Main Basin Subarea Boundary
Upland Areas

1B10 ND
1B9 ND
1B11 ND
7B2 ND
5K7 ND
2P3 5.9
St1 6.1
10B8 13
10B9 6.4
10B10 8.1
COL5 11
COL5 Mon 8.6
M4 5.1
8H10 6.7
8H9 8.3
M2 3.8
M3 5.2
9H11 ND
9J9 8.5
9J8 ND
COL2 8.4
COL1 7.1
COL1 Mon 3.3
COL2 Mon 12
11G2 9.1
11G3 11
11P6 1.9
12H5 12
12H4 7.1
12H6 23
12K2 3.3
12K3 4.1
CWS24 ND
8H4 7.4
8H3 5.8
8Q9 3.3
CWS9 ND
16A3 2.6
10Q2 5.5
12J3 ND
14B1 9.3
15E2 ND
15R18 ND
23E2 ND
H6 5.9
H9 6.1
H7 ND
17D11 ND
9P9 2.7
9P11 3.5
9P10 ND
17B4 2.9
16A4 2.2
14B1 1.8
15M3 ND
R28 2.8
P42 ND
19D8 7.2
19D9 4.2
19D10 1.1
19N4 ND
20M1 ND
23J1 ND
30C1 8.7
SF-A ND
SF-B ND
20C8 3.6
20B2 2.5

Dublin
Camp Parks Military Reservation
Hacienda Crossings
Arthur H Breed Fwy
Owens Dr
Gibraltar Dr
Dublin Blvd
Emerald Glen Park
Central Pkwy
Gleason Park
Croak Rd
Dalton Rd
Cottonwood Dr
Doolan Rd
Cayetano
Las Positas Golf Course
Arroyo Las Positas
Livermore Municipal Airport
W Jack London Blvd
N Murrieta Blvd
Portola Ave
Livermore Ave
Lawrence Livermore Nat'l Laboratory
Vallecitos Rd
Stoneridge Dr
Las Positas Blvd
Tassajara Creek
South San Ramon Creek
Murrieta Blvd
Valley Trails Dr
Hopyard Rd
Santa Rita Rd
Valley Ave
Black Ave
Stanley Blvd
E Stanley Blvd
Mocho
AMADOR VALLEY
3S/1E
3S/2E
3S/3E
Shadow
Arroyo Valle
Bernal Ave
Pleasanton
Isabel Ave
El Caminto
Murdell Ln
Concannon Blvd
LIVERMORE VALLEY
Robertson Park
S Livermore Ave
College Ave
S M St
Charlotte Way
East Ave
Greenville Rd
Tesla Rd
Hansen Rd
Holdener Park
Wetmore Rd
Arroyo Rd
Dry Creek
Sycamore Grove Regional Park
Ruby Hill Golf Club
E Ruby Hill Dr
N Ruby Hill Dr
Via di Salute
Kallo Cmn
Sunol Blvd
Foothill Rd Loop
Sinclair Fwy
PLEASANTON RIDGE
Castlewood Country Club
Happy Valley Rd
Callippe Preserve Golf Course
1290 ft
1000 ft
Pleasanton Sunol Rd
Arroyo de la Laguna
Kilkare Rd
Little Valley Rd
Vallecitos Rd
Vallecitos Valley
Vallecitos Creek
4S/1E
4S/2E
4S/3E
The Course at Wente Vineyards
Lake del Valle
Poppy Ridge Golf Course
580
680
84
N
W
E
S
0 4,000 8,000
Feet

DATE: Mar 6, 2023
FILE: R:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\06-GWQuality\06-Fig13-CrLower22.mxd

Figure 6-13
Total Chromium Concentrations (µg/L)
Lower Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin



LEGEND

Orange	Representative Monitoring Site
Blue	Upper Aquifer
Red	Lower Aquifer
	DDW Response Level

PFOS concentrations in ng/L

Figure 6-14
PFOS Chemographs
2018-2022
Livermore Valley

Some contours are based on past data from wells not sampled in this Water Year. Maximum shown if multiple samples were taken in Water

LEGEND

2022 Wells with PFOS (ppt) Concentrations

11P6 Well Number (abbreviated)
3.67 = PFOS Concentration in ppt
2019 and 2020 WY Concentrations shown in gray
ND = not detected above reporting limit

- Supply
- Monitor
- Nested
- Mining
- Streams

2022 PFOS Concentrations Based on Max Concentration

- 40-70 ppt
- >70 ppt
- Township-Range Line
- Mining Area Ponds
- Groundwater Basin (DWR 2016)
- Main Basin Subarea Boundary
- Upland Areas
- Livermore Water Reclamation Plant
- DSRSD Regional Treatment Facility

Application of Recycled Water

- Irrigated with DSRSD Effluent
- Irrigated with LWRP Effluent

2S/1W
2S/1E
3S/1E
Dublin
Pleasanton
DSRSD
LWRP
AMADOR VALLEY
PLEASANTON RIDGE

6F3 ND
5L3 ND
5P6 4
8B1 ND
8G4 7
7G7 ND
12B2 ND
12J1 55
8K1 4.3
9P5 2.2
9H10 27
9J7 19
LkI 39
LkH 44
4J5 41
2K2 210
2J2 34
1F2 17
2N6 47
11C3 230
2Q1 8.4
10A2 210
7N2 3.8
R28 ND
13P5 3
P42 2.4
20C7 8.9
19D7 2
19N3 ND

N
W
E
S

0 3,000 6,000
Feet

DATE: Mar 6, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\06-GWQuality\06-Fig15-PFOSUpper22.mxd

Figure 6-15
PFOS Concentrations (ppt)
Upper Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin

Some contours are based on past data from wells not sampled in this Water Year. Maximum shown if multiple samples were taken in Water Year.

LEGEND

2021 Wells with PFOS (ppt) Concentrations

11P6 Well Number (abbreviated)
3.67 = PFOS Concentration in ppt
2019 and 2020 WY Concentrations shown in gray
ND = not detected above reporting limit

- Supply
- Monitor
- Municipal
- Nested

2022 PFOS Concentrations
Based on Max Concentrations

- 40-70 ppt
- >70 ppt

- Township-Range
- Streams
- Groundwater Basin (DWR 2016)
- Main Basin Subarea Boundary
- Upland Areas
- Mining Area Ponds
- Livermore Water Reclamation Plant
- DSRSD Regional Treatment Facility

Application of Recycled Water

- Irrigated with DSRSD Effluent
- Irrigated with LWRP Effluent

DSRSD
LWRP
3S/1E
Pleasanton
Dublin

10B10 180
10B8 790
10B9 9
11G3 9.2
11G2 36
COL5 32
COL1 46
COL2 22
COL1 Mon 63
8H9 9.2
8H10 22
M4 13
M2 36
St1 30
9H11 66
9J9 3.1
9J8 44
9P9 30
9P10 24
9P11 ND
11P6 10
14B1 9.3
CWS24 ND
CWS31 5.4
CWS20 3.8
H6 ND
17B4 8.4
16A4 35
P8 39.5
P6 28.1
P5 23.4
15M3 3.6
SF-A ND
SF-B 2.1
20C8 3.6
20B2 9
19D8 ND
19D9 ND
19D10 6.6
19N4 ND

N W E S

0 3,000 6,000
Feet

DATE: Mar 6, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\06-GWQuality\06-Fig16-PFOSLower22.mxd

Figure 6-16
PFOS Concentrations (ppt)
Lower Aquifer, 2022 Water Year
Livermore Valley Groundwater Basin

7 Land Subsidence Monitoring

7.1 Program Changes

Zone 7's 2021 Alternative GSP established SMCs for Land Subsidence as shown in ***Table 7-A*** below.

Table 7-A: SMCs for Land Subsidence

Undesirable Results Definition	Undesirable Results Criteria	Minimum Threshold (MT)	Measurable Objective (MO)
If the occurrence of land subsidence substantially interferes with beneficial uses of groundwater and infrastructure within the Basin during the planning and implementation horizon of this Alternative GSP.	Water levels in greater than 25% of the RMS-WLs decline below their respective MTs for two consecutive years, that result in a confirmed decrease of 0.4 ft of land surface in any given cycle with a goal of experiencing no inelastic subsidence spatially and temporally. Not applicable to Upland Management Area.	Main Basin and Fringe Area: Chronic Lowering of Groundwater Levels used as a proxy, with the additional constraint of no more than 0.4 ft of inelastic land subsidence in any year. Upland Area: No MTs established.	Main Basin and Fringe Area: Chronic Lowering of Groundwater Levels used as a proxy. Upland Area: No MOs established.

RMS-WL = Representative Monitoring Sites for Water Levels

The 2021 Alternative GSP recommended continuing with Interferometric Synthetic Aperture Radar (InSAR) surveying on an annual basis, in lieu of the benchmark land surveys, to evaluate land subsidence over the entire Basin. For the 2022 WY, Zone 7 used InSAR data publicly available through the DWR. This data can be viewed by the public with the SGMA Data Viewer at: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

For more information on the Land Subsidence program; see the following sections of the 2021 Alternative GSP:

- **Section 1.2.4:** Land Subsidence Program Update
- **Section 8.7:** Current and Historical Groundwater Conditions – Land Subsidence
- **Section 13.5:** Sustainability Indicators – Land Subsidence
- **Section 14.2.5:** Monitoring Network for Land Subsidence

- **Section 14.4:** Representative Monitoring

7.2 Results for the 2022 Water Year

Figure 7-1 shows the land surface elevation change (approximately 100-meter resolution) from Fall 2021 to Fall 2022. ***Figure 7-2*** shows cumulative land surface elevation change (raster obtained from DWR) from June 2015 (the earliest InSAR dataset with the Sentinel satellite) to Fall 2022 . Both figures show that land surface elevations generally rose (green) or dropped (yellow or pink) within 0.1 ft. These elevation changes are within the range Zone 7 considers to be "elastic deformation" (i.e., rebounds to the original elevation when groundwater levels return to previous levels).

Some areas in the mining area appear to have dropped more than 0.10 ft (indicated by orange or red), however, these changes are likely due to excavation and grading activities, and not from land subsidence.

7.3 Attached Tables and Figures

Figure 7-1*: Land Surface Elevation Change from Fall 2021 to Fall 2022*
Figure 7-2*: Land Surface Elevation Change from June 2015 to October 2022*

N
W E
S

0 2 4
Miles

LEGEND

InSAR Elevation Change (ft)

- < -0.40
- -0.40 - -0.20
- -0.20 - -0.10
- -0.10 - -0.05
- -0.05 - 0.00
- 0.00 - 0.05
- 0.05 - 0.10
- > 0.10

- Municipal Wells
- Mining Area
- Mining Pond Areas
- Main Basin
- Fringe SubAreas
- Upland Area

Stoneridge
COL 5
Mocho 4
COL 1
Mocho 3
Mocho 1
Hopyard 6
Hopyard 9
Mocho 2
COL 2
Pleas 8
Pleas 6
Pleas 5
SFWD North (A)
SFWD South (B)
CWS 24
CWS 31
CWS 10
CWS 19
CWS 8
CWS 9
CWS 20
CWS 14
CWS 15
CWS 5

DOUGHERTY HILLS
PLEASANTON RIDGE
Camp Parks Military Reservation
Dublin Ranch Golf Course
Brushy Peak Regional Preserve
Pleasanton Ridge Regional Park
Sunol
Arroyo Seco
Corral Hollow Creek
Crane Ridge
La Costa Valley
San Antonio Reservoir

DATE: Feb 02, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\07-Subsidence\07-Fig01-LandSurfaceChange21to22.mxd

Figure 7-1
Land Surface Elevation Change
Fall 2021 to Fall 2022
Livermore Valley Groundwater Basin

N
W E
S

0 2 4
Miles

LEGEND

Land Surface Elevation Change (ft)

- > 0.04
- -0.4 - -0.2
- -0.2 - -0.1
- -0.1 - -0.05
- -0.05 - 0
- 0 - 0.05
- 0.05 - 0.1
- > 0.10

- Municipal Wells
- Mining Area
- Mining Pond Areas
- Main Basin
- Fringe SubAreas
- Upland Area

Stoneridge
COL 5
Mocho 4
COL 1
COL 2
Mocho 3
Mocho 1
Mocho 2
Pleas 8
Hopyard 6
Hopyard 9
Pleas 6
Pleas 5
SFWD North (A)
SFWD South (B)
CWS 24
CWS 31
CWS 10
CWS 19
CWS 8
CWS 9
CWS 14
CWS 20
CWS 15
CWS 5

DATE: Feb 02, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\07-Subsidence\07-Fig02-LandSurfaceChange15to22.mxd

Figure 7-2
Land Surface Elevation Change from June 2015 to October 2022
Livermore Valley Groundwater Basin

8 Land Use Monitoring

8.1 Program Changes

There were no changes to the Land Use Monitoring Program during the 2022 WY. For more information on the Land Use program; see the following section of the 2021 Alternative GSP:

- **Section 5.1.4:** Existing Land Use and Water Use Sector and Source

8.2 Results for the 2022 Water Year

Figure 8-1 shows Land and Water Use overlying the Basin and ***Table 8-1*** tabulates the areas by Land Use Category, Water Use Type, and Basin Management Area. Although there was some in-fill development that occurred during the 2022 WY, no major land use change that would significantly affect the groundwater supply or groundwater quality was identified.

8.3 Attached Tables and Figures

Table 8-1*: Land Use Acreage, 2022 WY*
Figure 8-1*: Map of Land Use, 2022 WY*

TABLE 8-1
LAND USE ACREAGE (in acres)
2022 WATER YEAR
LIVERMORE VALLEY GROUNDWATER BASIN

Basin / Category / Irrigation Water Source	Main Basin					Fringe Areas					Upland Areas				
	DW	GW	RW	none	Total	DW	GW	RW	none	Total	DW	GW	RW	none	Total
Agriculture (non-vineyard)	56	94	0	0	150	0	28	0	0	28	146	47	0	0	193
Agriculture (vineyard)	1,498	19	0	0	1,517	707	0	0	0	707	1,852	1	0	0	1,853
Total Agricultural	***1,554***	***113***	***0***	***0***	***1,667***	***707***	***28***	***0***	***0***	***735***	***1,998***	***48***	***0***	***0***	***2,045***
Commercial and Business	1,406	42	400	0	1,849	3,889	117	1,268	0	5,274	387	15	28	0	430
Public	563	0	400	0	962	868	3	57	0	928	143	3	89	0	235
Public (Irrigated Park)	563	0	118	0	680	180	0	87	0	268	96	0	11	0	106
Residential (high density)	421	0	0	0	421	267	0	248	0	514	29	0	15	0	44
Residential (medium density)	6,446	0	17	0	6,463	5,283	0	45	0	5,328	2,938	0	49	0	2,987
Residential (low density)	147	150	0	0	297	20	1	0	0	21	186	193	0	0	379
Roads	0	0	0	78	78	0	0	0	701	701	0	0	0	93	93
Total Urban	***9,545***	***192***	***934***	***78***	***10,749***	***10,506***	***121***	***1,705***	***701***	***13,034***	***3,779***	***211***	***192***	***93***	***4,275***
Golf Course	140	90	126	0	356	230	15	66	0	311	466	160	0	0	626
Residential (rural)	41	155	0	0	196	19	382	0	0	401	166	192	0	0	359
Mining Area (pit)	0	0	0	1,908	1,908	0	0	0	0	0	0	0	0	0	0
Open Space	0	0	102	3,747	3,849	0	0	0	7,411	7,411	0	0	0	20,318	20,318
Water	0	0	0	1,084	1,084	0	0	0	65	65	0	0	0	170	170
Total Other	***181***	***245***	***229***	***6,739***	***7,393***	***249***	***398***	***66***	***7,476***	***8,188***	***632***	***352***	***0***	***20,488***	***21,472***
TOTALS FOR 2022 WY	**11,280**	**550**	**1,163**	**6,817**	**19,809**	**11,462**	**547**	**1,771**	**8,177**	**21,956**	**6,409**	**611**	**192**	**20,581**	**27,793**
TOTALS FOR 2021 WY	**11,280**	**550**	**1,163**	**6,817**	**19,809**	**11,483**	**537**	**1,750**	**8,206**	**21,957**	**6,409**	**622**	**192**	**20,587**	**27,793**
CHANGE SINCE PREVIOUS YEAR	**0**	**0**	**0**	**0**	**0**	**-21**	**9**	**21**	**-29**	**0**	**0**	**-11**	**0**	**-7**	**0**

Irrigation Water Sources
DW = Delivered Municipal Water
GW = Groundwater
RW = Recycled Water

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

N
W E
S

0 6,000 12,000
Feet

LEGEND

- Residential (rural)
- Residential (low density)
- Residential (medium density)
- Residential (high density)
- Commercial and Industrial
- Public
- Public (Irrigated Schools and Parks)
- Golf Course
- Agriculture (non-vineyard)
- Agriculture (vineyard)
- Mining Area (pit)
- Water
- Roads
- Open Space
- Municipal or Imported
- Groundwater
- Recycled Water

Basin Region

- Main Basin
- Fringe Area
- Upland Area

Date: Mar 6, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\08-LandUse\08-Fig01-LUMap22.mxd

Figure 8-1
Map of Land Use
2022 Water Year
Livermore Valley Groundwater Basin

9 Wastewater and Recycled Water Monitoring

9.1 Program Changes

There were no changes to the Wastewater and Recycled Water Monitoring Program during the 2022 WY. See ***Section 8.10.2*** of the 2021 Alternative GSP for specific details about the Wastewater and Recycled Water Program.

9.2 Results for the 2022 Water Year

9.2.1 Wastewater and Recycled Water Volumes

Wastewater and recycled water application areas for 2022 WY are shown on ***Figure 9-1***. In the 2022 WY, about 96% of the wastewater produced over the Basin was treated at Livermore Wastewater Reclamation Plant (LWRP) and Dublin San Ramon Services District (DSRSD). A summary of the wastewater volumes for the 2022 WY are presented in ***Table 9-A*** below.

Table 9-A: Municipal Wastewater and Recycled Water Volumes, 2022 WY

Water Type	LWRP	DSRSD	Total
Wastewater Influent	5,935	12,435	18,370
Treated Effluent Exported via LAVWMA*	4,934	6,333	11,267
Total Volume Recycled	1,958	5,257	7,215
RW Applied to Main Basin**	**451**	**402**	**853**

* Does not include Zone 7 Demin Plant discharge to LAVWMA via DSRSD
** Recycled water applied over the Main Basin as landscape irrigation
DSRSD Dublin San Ramon Services District
LAVWMA Livermore-Amador Valley Water Management Agency
LWRP Livermore Wastewater Reclamation Plant
RW Recycled Water

In the 2022 WY recycled water accounted for about 14% of the Basin's total water supply and about 2% of the inflow to the Main Basin; however, of greater benefit, the recycled water use potentially conserved up to 7,215 AF of water that might have otherwise come from groundwater storage.

The estimated 2022 WY leachate volumes from the Veterans (VA) Hospital wastewater treatment ponds located in southern Livermore, domestic onsite wastewater treatment systems (OWTS)

(e.g., septic systems), and leaking wastewater pipelines that run throughout the Basin are presented in ***Table 9-B*** below.

Table 9-B: Other Wastewater Volumes (AF), 2022 WY

	VA Hospital*	Septic Tanks*	Pipe Leakage**	Total
Wastewater Leachate	50	80	587	717

* Estimated total over the Main Basin
** Calculated. Includes leakage from sanitary sewer & RW pipes

9.2.2 Wastewater and Recycled Water Quality

9.2.2.1 Salt Loading

Table 9-C below presents the estimated salt loading over the Main Basin from applied wastewater and recycled water during the 2022 WY.

Table 9-C: Salt Loading from Applied Recycled Water and Wastewater, 2022 WY

Source	Volume (AF)	TDS Average (mg/L)	Salt Applied (tons)
LWRP RW	451	578	354
DSRSD RW	402	726	397
Total RW	*853*	*647*	*751*
VA Hospital	50	573	39
Septic	80	600	65
Pipe Leakage	587	470	375
Total WW	*717*	*492*	*479*
Total	***1,570***	***627***	***1,229***

DSRSD Dublin San Ramon Services District
LWRP Livermore Wastewater Reclamation Plant
RW Recycled Water
WW Wastewater

About 776 tons (approximately 5%) of the Main Basin's salt inflow (14,538 tons) was attributed to recycled water use over the Main Basin during the 2022 WY (see ***Table 12-2***). However, if potable water supplies had been used for this irrigation demand, the salt loading would have been about 520 tons (a reduction of only about 256 tons). Normally, this difference is significantly less than the volume of salt removed by Zone 7's Mocho Groundwater Demineralization Plant (MGDP); however due to the drought, the MGDP was used sparingly in the 2022 WY and only removed 7 tons of salt (see ***Table 12-C***).

Table 9-D below presents the estimated nitrogen loading over the Main Basin from applied wastewater and recycled water during the 2022 WY.

Table 9-D: Nitrogen Loading from Applied Recycled Water and Wastewater, 2022 WY

Source	Volume (AF)	Nitrogen Compounds (mg/L) NO3(N)	NO2(N)	TKN	Nitrogen Applied (lbs)
LWRP RW	451	0.1	0.8	52.5	64,751
DSRSD RW	402	0.8	1.6	30.0	33,510
Total RW	*853*	*0.4*	*1.2*	*41.9*	*98,262*
VA Hospital	50	11.1	0.1	5.0	1,025
Septic	80	35.0	0.0	0.0	1,719
Pipe Leakage	587	0.2	0.5	19.3	31,162
Total WW	*717*	*4.9*	*0.5*	*16.2*	*33,906*
Total	***1,570***	***2.5***	***0.8***	***30.2***	***132,167***

DSRSD Dublin San Ramon Services District
LWRP Livermore Wastewater Reclamation Plant
NO3(N) Nitrate as Nitrogen
NO2(N) Nitrite as Nitrogen
RW Recycled Water
TKN Total Kejldahl Nitrogen
WW Wastewater
lbs pounds

The table shows that about 132,167 pounds (lbs) of nitrogen was applied over the Main Basin during the 2022 WY. However, from a practical standpoint, much of the nitrogen will be removed from the percolate through soil denitrification and plant uptake processes.

9.3 Attached Tables and Figures

***Figure 9-1**: Wastewater and Recycled Water Application Areas, 2022 WY*

LEGEND

Wastewater Facities
- Veterans Hospital (VA) Facilities
- Livermore Water Reclamation Plant
- DSRSD Regional Treatment Facility

Source of Recycled Water
- DSRSD
- LWRP

Application of Recycled Water 2022
- DSRSD
- City of Livermore
- City of Pleasanton
- Main Basin
- Fringe Areas
- Upland Areas
- Rivers

Dublin
Dublin DSRSD
LWRP
Pleasanton
Livermore
AMADOR VALLEY
LIVERMORE VALLEY
PLEASANTON RIDGE
VA Ponds
VA Plant

N
W
E
S

0 6,000 12,000
Feet

DATE: Mar 6, 2023
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Figure 9-1
Wastewater and Recycled Water Application Areas 2022 WY
Livermore Valley Groundwater Basin

10 Groundwater Storage

10.1 Program Changes

As part of the 2021 Alternative GSP, Zone 7 refined its Hydrogeologic Conceptual Model (HCM) of the Basin as it relates to groundwater storage. Tasks performed for this effort included:

- Purchasing a license for RockWorks (a three dimensional [3D] geologic modeling software platform),
- Transferring the existing e-log and geology database to RockWorks,
- Extending the HCM to include the Fringe and Upland Areas,
- Preparing three new cross sections that trace through the major groundwater production areas of the Basin,
- Migrating the existing Areal Recharge Spreadsheet Model (ARM) to DWR's Integrated Water Flow Model Demand Calculator (IDC) platform, and
- Extending the IDC model to include the entire Basin.

Both methods were improved and/or adjusted this water year; the most significant change was to the calculation of the areal recharge totals as part of the HI method (see below). Therefore, the previous year's totals presented in this year's report may be slightly different than those presented in last year's report.

Starting this year, Zone 7 used the IDC model to calculate areal recharge totals for the basin instead of the ARM that Zone 7 had previously developed in-house. In addition to calculating areal recharge totals for the 2022 WY, the IDC model was used to recalculate the areal recharge totals from the 2016 to 2021 WYs (see ***Section 10.2.1***).

The 2021 Alternative GSP also established SMCs for Reduction of Groundwater Storage as shown in ***Table 10-A*** below.

Table 10-A: SMCs for Reduction of Groundwater Storage

Undesirable Results Definition	Undesirable Results Criteria	Minimum Threshold (MT)	Measurable Objective (MO)
If and when a reduction in storage in the Principal Aquifers of the Basin negatively affects the long-term viable access to groundwater for the beneficial uses and users within the Basin. Specifically, significant and unreasonable effects would include an aggregate reduction in usable groundwater storage of more than 50% within the Basin relative to the SGMA Baseline Storage volume for two consecutive years.	Water levels in greater than 25% of the RMS-WLs decline below their respective MTs for two consecutive years. Not applicable to Upland Management Area.	Main Basin and Fringe Area: Chronic Lowering of Groundwater Levels used as a proxy. Upland Area: No MTs established.	Main Basin and Fringe Area: Chronic Lowering of Groundwater Levels used as a proxy. Upland Area: No MOs established.

RMS-WL = Representative Monitoring Sites for Water Levels

The following sections in the 2021 Alternative GSP provide more information on the Groundwater Storage program and the improvements made to the HCM:

- **Section 1.2.2**: Groundwater Storage Program Updates
- **Section 8.4**: Current and Historical Groundwater Conditions – Groundwater Storage
- **Section 9**: Water Budget Information
- **Section 13.2**: Sustainability Management Criteria – Reduction of Groundwater Storage
- **Section 14.2.2**: Monitoring Network for Reduction of Groundwater Storage

10.2 Results for the 2022 Water Year

10.2.1 Total Storage

Zone 7 uses two methods for calculating groundwater storage in the Main Basin: The Groundwater Elevation (GWE) Method and the Hydrologic Inventory (HI) Method. The GWE method uses groundwater level data and storage coefficients for "nodes" (originally developed by DWR in 1974) to estimate the total volume of water in the Main Basin. The HI method involves accounting for inflows and outflows for each WY and adds the net change in storage to the previous year's volume. Storage volumes from the two methods are averaged to quantify the total storage of the Main Basin.

Figure 10-1 shows the Upper and Lower Aquifer groundwater elevations used to calculate the GWE method storage for the 2022 WY. The change in storage from Fall 2021 to Fall 2022 for each Main Basin node is shown in ***Figure 10-2***. ***Table 10-1*** shows the historical annual GWE groundwater storage volumes for each Subarea from the 1974 WY to 2022 WY.

The results of the HI method for the 2022 WY are summarized below in ***Table 10-B*** below. All the HI components are listed in ***Table 10-2*** along with their method of measurement and their approximate accuracy. The historic HI components and results for WYs 1974 to 2022 are tabulated in ***Table 10-3***, and charted in ***Figure 10-3*** along with the WY type (e.g., wet, normal, dry, etc.) noted for each year. ***Figure 10-4*** shows a map of the pumping well locations during the 2022 WY and a representation of the relative volumes of water pumped from each well.

Table 10-B: HI Method Groundwater Storage Supply and Demand Volumes, 2022 WY (AF)

CATEGORY	Sustainable Avg	2022	% of Avg	Change from 2021
SUPPLIES	**19,800**	**14,599**	**74%**	**4,796**
Stream Recharge Artificial	5,300	1,301	25%	1,024
Stream Recharge Natural	6,600	4,871	74%	2,445
Rainfall Recharge	4,300	3,884	90%	1,067
Applied Water Recharge	1,600	2,256	141%	221
Pipe Leakage	1,000	1,287	129%	39
Subsurface Inflow	1,000	1,000	100%	0
DEMANDS	**18,800**	**25,995**	**138%**	**-2,674**
Zone 7 Pumping excluding DSRSD	5,300	14,641	276%	-1,154
Other Pumping	8,400	6,105	73%	-906
Agricultural Pumping	400	752	188%	-39
Mining Losses	1,400	700	50%	0
Evapotranspiration (Eto)	3,200	3,798	119%	-574
Subsurface Outflow	100	0	0%	0
NET CHANGE (SUPPLY – DEMAND)	**1,000**	**-11,395**		**7,469**
TOTAL STORAGE (HI Method)		**214,880**		**-11,395**

AF = acre-feet
Avg = average
DSRSD = Dublin San Ramon Services District

The groundwater storage volumes at the end of the 2022 WY for both the GWE and HI methods are presented below in ***Table 10-C***. The total groundwater storage for the Main Basin at the end of 2022 WY was calculated to be 216.5 thousand acre-feet (TAF), with 88.5 TAF of groundwater available as operational storage, which is about 70% of the total operational storage capacity (i.e., 126 TAF from 1983 WY).

Table 10-C: Groundwater Storage Summary, 2022 WY (in TAF)*

Storage Calculation Method	End of 2021 WY	End of 2022 WY	Change in Storage
Groundwater Elevations (GWE)	219.9	218.0	-1.9
Hydrologic Inventory (HI)	226.3	214.9	-11.4
Total Storage (average of GWE & HI)	**223.1**	**216.5**	**-6.6**
Operational Storage**	**95.1**	**88.5**	**-6.6**

* Numbers rounded to nearest tenth TAF
** Operational Storage = Total Storage - Reserve Storage (i.e., 128 TAF)
GWE = Groundwater Elevation
HI = Hydrologic Inventory
TAF = Thousand acre-feet

Historically the difference groundwater storage values calculated by both the GWE and HI Methods have typically been within about 6 TAF. However, starting in about 2016 the difference between the HI and GWE methods increased to over 10 TAF in some years. As part of the 2021 Alternative GSP Update, Zone 7 migrated its in-house Aerial Recharge Model (ARM), which calculated rainfall and irrigation recharge, to the DWR's Integrated Water Flow Model Demand Calculator (IDC) model. Starting this year, the new IDC model was used to recalculate the rainfall and irrigation recharge values back to the 2016 WY, the results of which have been presented in the figures and tables in this year's report. As a result, the difference between the HI and GWE methods was only 3.1 TAF at the end of the 2022 WY.

10.2.2 Natural Recharge and Demand

Table 10-D below summarizes the "natural" recharge (inflows) and the "natural" demand (outflows to which natural recharge is allocated) for the 2022 WY.

Table 10-D: Natural Groundwater Inflow and Outflows, 2022 WY

Component	Estimated Sustainable Values (AF/Yr)	2022 WY (AF)	Percentage of Sustainable Average
Natural Recharge	13,400	12,011	90%
Natural Demand	13,400	11,354	85%
Net Natural Recharge	0	657	5%*

AF = acre-feet
AF/Yr = acre-feet per year
* = percent of Sustainable Natural Recharge

The retailer's Groundwater Pumping Quota (GPQ), along with their groundwater pumping volumes for the 2022 Calendar Year (CY), are shown in ***Table 10-E*** below. None of the retailers pumped more than their respective GPQ in 2022 WY.

Table 10-E: Retailer Groundwater Pumping and Quotas in 2022 Calendar Year (AF)

Retailer	GPQ	Carryover from 2021	Pumped in CY 2022	Carryover to 2022**
City of Pleasanton	3,500	565	2,458	700
Cal Water Service (CWS)	3,069	614	2,124	614
DSRSD (pumped by Zone 7)	645	0	645	0
City of Livermore (not used)*	31	-	0	-
Total	**7,214**	**1,179**	**5,227**	**1,314**

AF = Acre-feet
CY = Calendar Year
GPQ = Groundwater Pumping Quota
* = Livermore no longer pumps groundwater, GPQ not included in totals or carryover.
** = Maximum of 20% of GPQ can be carried over

10.2.3 Artificial Recharge and Demand—Conjunctive Use

Figure 10-5 shows the cumulative change net inflow/outflow from both natural and artificial components since 1974. ***Table 10-F*** below shows the artificial recharge and Zone 7's groundwater pumping totals for the 2022 WY.

Table 10-F: Conjunctive Use Supply and Demand, 2022 WY

Component	Estimated Sustainable Avg (AFY)	2022 WY (AF)	Percentage of Sustainable Average
Artificial Recharge	5,300	1,301	25%
Zone 7 Pumping	5,300	14,641	276%
Net Artificial Recharge	**0**	**-13,340**	**-252%***

AF = acre-feet
AFY = acre-feet per year
Avg = average
* = percent of Sustainable Artificial Recharge

Zone 7 implements conjunctive use practices within the Basin to the greatest extent possible given current hydrologic conditions and imported water supply availability. During the 2022 WY, Zone 7 released 1,773 AF from the South Bay Aqueduct (SBA) into the Arroyo Valle for artificial recharge and water rights, of which 1,301 AF recharged.

Due to the recent drought, in 2021 WY Zone 7 pumped 15,795 AF followed by 14,641 AF in the 2022 WY, the two highest pump totals in Zone 7's history. During that same time, Zone 7 was only able to artificially recharge 277 and 1,301 AF, respectively. However, since 1974, Zone 7 has artificially recharged 20,017 AF more than it has pumped. These totals do not include the water Zone 7 pumps for DSRSD (usually 645 acre-feet per year [AFY]), which is considered part of the "natural" demand.

10.3 Attached Tables and Figures

***Table 10-1**: Total Main Basin Storage by Subarea, 1974 to 2022 WYs*
***Table 10-2**: Description of Hydrologic Inventory Components*
***Table 10-3**: Historical Groundwater Storage, Hydrologic Inventory Method, 1974 to 2022 WYs*

***Figure 10-1**: Mean Groundwater Elevations by Node, Upper and Lower Aquifers, Fall 2022*
***Figure 10-2**: Change in Groundwater Storage, Fall 2021 to Fall 2022*
***Figure 10-3**: Graph of Groundwater Storage, 1974 to 2022 WYs*
***Figure 10-4**: Map of Municipal and Private Supply Wells*
***Figure 10-5**: Cumulative Change in Natural and Artificial Recharge and Demand, 1974 to* 2022 *WYs*

TABLE 10-1
TOTAL MAIN BASIN STORAGE BY SUBAREA (AF)
GROUNDWATER ELEVATION METHOD
1974 TO 2022 WATER YEARS

Water Year	Bernal	Amador		Mocho II	Total
		Amador West	Amador East		
1974	49,651	52,916	80,671	29,821	213,060
1975	51,149	54,220	80,840	28,872	215,080
1976	54,180	56,319	86,194	29,012	225,705
1977	51,970	53,968	81,889	27,954	215,782
1978	50,272	52,077	79,541	27,751	209,641
1979	52,863	56,739	89,122	29,210	227,933
1980	55,952	60,000	94,014	29,500	239,466
1981	57,910	61,890	95,688	30,224	245,712
1982	57,623	61,228	93,235	29,156	241,242
1983	58,654	63,488	100,642	31,492	254,277
1984	59,021	64,418	102,569	31,626	257,635
1985	58,487	64,024	95,703	31,568	249,782
1986	56,723	60,837	95,019	27,719	240,298
1987	55,723	58,635	91,170	25,147	230,675
1988	54,486	53,217	83,377	25,672	216,752
1989	52,754	51,260	82,836	27,433	214,282
1990	50,712	50,879	80,834	27,321	209,746
1991	44,627	49,348	76,543	24,631	195,148
1992	29,663	35,438	74,616	44,036	183,753
1993	29,749	38,787	83,714	58,498	210,748
1994	30,941	39,437	88,451	56,713	215,542
1995	32,193	43,156	89,301	60,834	225,484
1996	32,217	42,917	87,193	60,865	223,193
1997	32,240	41,992	88,828	59,157	222,217
1998	32,292	43,411	88,140	61,336	225,179
1999	32,065	43,310	86,508	60,595	222,479
2000	31,894	42,591	87,585	59,947	222,018
2001	30,720	40,853	73,393	58,231	203,198
2002	30,685	37,537	84,147	59,655	212,025
2003	30,597	41,563	87,510	60,749	220,419
2004	30,518	43,784	79,441	59,614	213,357
2005	31,969	48,734	93,670	61,720	236,093
2006	32,382	53,465	91,847	60,685	238,379
2007	32,401	54,368	90,478	54,733	231,980
2008	32,365	54,160	91,898	56,097	234,520
2009	32,350	51,088	91,755	57,605	232,798
2010	32,350	50,282	92,080	59,167	233,879
2011	32,353	50,631	92,729	59,214	234,927
2012	31,772	47,442	90,475	58,154	227,844
2013	30,892	44,226	87,086	58,684	220,889
2014	30,313	42,116	82,627	53,961	209,017
2015	31,411	46,309	81,465	55,215	214,401
2016	32,205	52,833	83,016	57,583	225,637
2017	32,391	66,825	86,119	59,564	244,899
2018	32,409	70,197	85,792	56,347	244,745
2019	32,410	69,427	85,031	60,942	247,810
2020	32,361	61,398	86,625	56,701	237,086
2021	30,580	52,657	84,477	52,156	219,871
2022	29,841	52,351	83,339	52,493	218,023

Calculated as one aquifer
Sum of Upper and Lower Aquifers

TABLE 10-2
DESCRIPTION OF HYDROLOGIC INVENTORY COMPONENTS
LIVERMORE VALLEY GROUNDWATER BASIN

COMPONENTS	*DESCRIPTION/REMARK*	*Direct/ Indirect*	*HOW CALCULATED/MEASURED*	*ESTIMATED ACCURACY*
SUPPLY INDICES				
Rainfall	Pleasanton rainfall (Parkside Office)	Direct	Measured by Zone 7	0.5 in
Evaporation	Evaporation at Lake Del Valle Station	Direct	Collected by DWR	0.5 in
Streamflow	Arroyo Valle Streamflow if Lake Del Valle Dam did not exist	Direct	USGS Stream Gage Station AV_BLC	10 AF
Water Year Type	Indicator of Water Year in Sacramento Valley	Direct	DWR California Data Exchange Center	-
SUPPLY COMPONENTS				
NATURAL STREAM RECHARGE				
ARROYO VALLE	AV natural recharge.	Indirect	Stream Inflows - Stream Outflows	100 AF
ARROYO MOCHO	AM natural recharge.	Indirect	Stream Inflows - Stream Outflows	100 AF
ARROYO LAS POSITAS	ALP natural recharge.	Indirect	Stream Inflows - Stream Outflows	100 AF
ARTIFICIAL RECHARGE				
ARROYO VALLE	Total artificial recharge on Arroyo Valle minus AV_RC_PR	Indirect	Stream Inflows - Stream Outflows	100 AF
ARROYO VALLE PRIOR RIGHTS	AVBLC flow that would have recharged if no dam. Subset of AV_RC.	Indirect	Formula based on AVBLC flow.	100 AF
ARROYO MOCHO	Total artificial recharge on Arroyo Mocho	Indirect	Stream Inflows - Stream Outflows	100 AF
ARROYO LAS POSITAS	Total artificial recharge on Arroyo Las Positas	Indirect	Stream Inflows - Stream Outflows	100 AF
INJECTION WELL RECHARGE	Injection at Hop 6 from 1998 to 2000	Direct	Metered by Zone 7	10 AF
RAINFALL RECHARGE	Recharge from rainfall	Indirect	Calculated by Areal Recharge Model	1000 AF
PIPE LEAKAGE	Pipe leakage that recharges the GW basin	Indirect	Estimated using length and age of pipes	500 AF
APPLIED WATER RECHARGE				
URBAN MUNICIPAL (GW & SBA)	Applied recharge in urban area - delivered water (gw & sba)	Indirect	Calculated by Areal Recharge Model	100 AF
URBAN RECYCLED WATER	Applied water recharge from urban area - recycled water	Indirect	Calculated using Wastewater Plant deliveries	10 AF
AGRICULTURAL (SBA)	Total applied recharge from 'untreated' ag sources (untreated SBA)	Indirect	Calculated by Areal Recharge Model	100 AF
AGRICULTURAL (GW)	Total applied water recharge from groundwater ag sources	Indirect	Calculated by Areal Recharge Model	100 AF
GOLF COURSES (GW)	Applied water from golf courses on groundwater	Indirect	Calculated by Areal Recharge Model	100 AF
GOLF COURSES (RW)	Applied water from golf courses from recycled water	Indirect	Calculated using Wastewater Plant deliveries	10 AF
SUBSURFACE BASIN INFLOW	Subsurface Inflow from Northern Fringe Basin	Indirect	Estimated historically groundwater contours	500 AF
DEMAND COMPONENTS				
MUNICIPAL PUMPING				
ZONE 7	Total pumping by Zone 7, including pumping to waste	Direct	Metered by Zone 7	10 AF
DSRSD	*Pumping by Zone 7 for DSRSD.*	*Direct*	*DSRSD Groundwater Pumping Quota*	*0 AF*
PLEASANTON	Pumping by Pleasanton.	Direct	Metered by Pleasatnon	10 AF
CALIFORNIA WATER SERVICE	Pumping by CWS.	Direct	Metered by CWS	10 AF
SFPUC	Pumping by SF Public Utilities Commission	Direct	Metered by SFPUC	10 AF
FAIRGROUNDS	Pumping by Alameda County Fairgrounds	Indirect	Metered by Fairgrounds	10 AF
DOMESTIC	Pumping from active domestic, supply, and potable wells	Indirect	Estimated: Number of Wells x 0.5 AF/yr	50 AF
GOLF COURSES				
CASTLEWOOD GOLF COURSE	*Pumping for Castlewood Golf Course*	*Indirect*	*Estimated using historical meter data*	*50 AF*
TRI VALLEY GOLF CENTER	*Pumping for TriValley Golf Driving Range*	*Indirect*	*Calculated by Areal Recharge Model*	*50 AF*
AGRICULTURAL PUMPING	Unmetered pumping for agriculture	Indirect	Calculated by Areal Recharge Model	100 AF
MINING				
EXPORT	Total mining area releases that leave the basin	Indirect	Calculated from metered data and stream recharge rate	50 AF
EVAPORATION	Pond evaporation & rainfall.	Indirect	Calculated using lake area, evaporation, and rainfall	100 AF
PROCESSING	Mining Area processing losses	Indirect	Estimated at 700 AF/Yr	100 AF
SUBSURFACE BASIN OUTFLOW	Basin overflow leaving basin	Indirect	Formula based on GW elevation and synoptic data	100 AF

TABLE 10-3
HISTORICAL GROUNDWATER STORAGE
HYDROLOGIC INVENTORY (HI) METHOD
1974-2022 WATER YEARS (in Acre-Feet, except where indicated)

	WATER YEAR (Oct - Sep)																	
COMPONENTS	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
INDICES																		
Rainfall at Livermore (in)	16.1	14.8	6.2	6.0	18.5	13.6	17.6	10.3	24.4	32.0	13.0	12.6	19.8	8.9	8.7	11.2	9.4
8 Station Rain Index (N. CA)(in)	78.6	48.8	28.3	19.0	71.6	39.1	59.6	37.6	84.8	88.5	58.1	37.8	72.1	28.6	34.9	50.1	36.0
Evap at Lake Del Valle (in)	60.9	62.7	63.5	66.0	64.2	67.7	59.7	72.1	60.5	59.7	70.2	64.9	61.1	64.0	66.9	63.6	65.9
Arroyo Valle Stream flow (AF)	30538	28307	475	177	43749	9721	45800	5817	61427	125882	25653	7282	67903	3023	1506	1988	815
Water Year Type*	W	W	C	C	AN	BN	AN	D	W	W	W	D	W	D	C	D	C
SUPPLY	**18,140**	**21,437**	**11,121**	**8,683**	**24,813**	**22,213**	**23,830**	**18,821**	**29,942**	**35,412**	**15,547**	**8,784**	**20,866**	**6,670**	**8,071**	**11,170**	**10,353**
Injection Well Recharge	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Stream Recharge	**11,340**	**15,400**	**6,910**	**3,820**	**16,330**	**16,110**	**16,480**	**15,040**	**16,420**	**17,158**	**9,486**	**4,747**	**9,045**	**3,565**	**4,549**	**7,880**	**7,026**
Artificial Stream Recharge	3,509	6,750	5,695	3,190	6,442	12,266	10,211	11,918	5,952	901	0	0	0	0	1,172	4,320	4,488
Arroyo Valle	*1,439*	*4,320*	*1,875*	*1,300*	*3,002*	*5,886*	*4,541*	*6,328*	*2,442*	*0*	*0*	*0*	*0*	*0*	*0*	*139*	*304*
Arroyo Mocho	*1,670*	*1,830*	*3,220*	*1,290*	*2,840*	*5,780*	*5,270*	*5,130*	*3,290*	*901*	*0*	*0*	*0*	*0*	*1,172*	*4,181*	*4,184*
Arroyo las Positas	*400*	*600*	*600*	*600*	*600*	*600*	*400*	*460*	*220*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Natural Stream Recharge	6,060	7,110	1,100	630	8,850	2,860	4,850	2,200	8,620	14,387	8,326	3,541	8,168	2,696	2,653	2,589	2,250
Arroyo Valle	*2,400*	*2,950*	*360*	*290*	*2,450*	*1,290*	*1,750*	*840*	*2,970*	*4,893*	*2,580*	*751*	*2,831*	*527*	*679*	*458*	*418*
Arroyo Mocho	*3,160*	*3,760*	*540*	*140*	*5,900*	*1,170*	*2,500*	*880*	*4,810*	*8,514*	*4,616*	*1,716*	*4,176*	*843*	*902*	*809*	*428*
Arroyo las Positas	*500*	*400*	*200*	*200*	*500*	*400*	*600*	*480*	*840*	*980*	*1,130*	*1,074*	*1,161*	*1,326*	*1,072*	*1,322*	*1,404*
Arroyo Valle Prior Rights	1,771	1,540	115	0	1,038	984	1,419	922	1,848	1,870	1,160	1,206	877	869	724	971	288
Rainfall Recharge	**3,031**	**2,523**	**0**	**0**	**4,398**	**2,002**	**3,891**	**967**	**11,423**	**16,357**	**3,110**	**1,249**	**9,008**	**290**	**398**	**283**	**141**
Pipe Leakage	**31**	**37**	**44**	**51**	**60**	**71**	**82**	**95**	**109**	**124**	**139**	**155**	**169**	**185**	**200**	**217**	**233**
Applied Water Recharge	**2,738**	**2,477**	**3,158**	**3,022**	**2,795**	**3,041**	**2,727**	**2,089**	**1,360**	**1,344**	**2,162**	**1,884**	**1,904**	**1,860**	**2,004**	**1,630**	**1,694**
Urban - Municipal	1,074	766	1,354	1,375	1,087	1,179	810	1,284	668	690	1,253	1,027	998	1,328	1,377	1,053	1,025
Urban - Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urban - Recycled Water	0	0	27	16	26	13	21	7	12	8	16	6	12	8	5	14	5
Agriculture - Municipal (SBA)	74	109	157	124	95	118	147	182	140	165	208	182	232	245	289	240	265
Agriculture/Golf - Groundwater	384	280	513	525	352	388	281	241	174	139	198	210	190	137	152	140	153
Agriculture/Golf - Recycled	0	0	64	68	75	73	73	60	54	63	62	55	61	47	63	60	64
Others	1,206	1,322	1,042	915	1,160	1,270	1,394	315	312	279	425	404	411	95	118	123	182
Subsurface Basin Inflow	**1,000**	**1,000**	**1,010**	**1,790**	**1,230**	**990**	**650**	**630**	**630**	**430**	**650**	**750**	**740**	**770**	**920**	**1,160**	**1,260**
DEMAND	**18,618**	**15,929**	**15,432**	**14,636**	**12,871**	**15,819**	**15,727**	**19,349**	**18,349**	**26,220**	**19,750**	**18,506**	**22,550**	**14,575**	**17,176**	**16,143**	**16,045**
Municipal Pumpage	**11,806**	**9,881**	**7,782**	**6,721**	**7,022**	**8,207**	**6,982**	**7,361**	**7,281**	**7,965**	**8,473**	**7,990**	**8,652**	**8,152**	**9,431**	**10,393**	**11,255**
Zone 7 (excluding DSRSD)	5,403	3,090	1,292	309	776	816	41	0	0	25	348	1,199	1,163	480	2,017	3,213	3,327
Zone 7 for DSRSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
City of Pleasanton	2,264	2,497	1,707	3,271	2,640	3,273	2,961	3,089	3,565	3,886	3,486	3,056	3,705	3,310	3,548	3,316	3,856
Cal. Water Service	2,612	2,852	2,781	1,312	1,964	2,358	2,489	2,695	2,286	2,660	3,035	2,788	2,774	3,276	2,761	2,850	3,073
Camp Parks	769	808	980	925	796	881	819	808	713	630	647	40	0	0	0	0	0
SFWD	302	242	495	374	397	413	372	402	348	321	378	353	484	491	472	443	362
Fairgrounds	200	200	200	200	200	200	200	267	217	242	281	272	280	280	280	280	280
Domestic	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Golf Courses	156	92	227	230	149	166	0	0	52	101	198	182	146	215	253	191	257
3S/1E 1P3	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*46*
Castlewood	*156*	*92*	*227*	*230*	*149*	*166*	*0*	*0*	*52*	*101*	*198*	*182*	*146*	*215*	*253*	*191*	*211*
Tri-Valley Golf	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Agricultural Pumpage	**3,744**	**2,217**	**4,596**	**4,970**	**3,191**	**3,711**	**2,628**	**2,433**	**1,295**	**1,342**	**1,556**	**1,914**	**1,911**	**1,470**	**1,476**	**1,166**	**1,478**
SFWD	500	0	62	304	252	365	168	513	150	549	107	410	543	663	493	359	548
Concannon	6	15	20	20	20	70	250	112	0	0	68	0	60	26	59	0	0
Calculated	3,238	2,202	4,514	4,646	2,919	3,276	2,210	1,808	1,145	793	1,381	1,504	1,308	781	924	807	930
Mining Use	**3,068**	**3,831**	**3,054**	**2,945**	**2,658**	**3,751**	**5,586**	**9,005**	**7,613**	**13,953**	**7,481**	**7,402**	**11,387**	**4,353**	**5,869**	**4,484**	**3,312**
Subsurface Basin Overflow	**0**	**0**	**0**	**0**	**0**	**150**	**530**	**550**	**2,160**	**2,960**	**2,240**	**1,200**	**600**	**600**	**400**	**100**	**0**
NET RECHARGE (AF)	**-478**	**5,508**	**-4,311**	**-5,953**	**11,942**	**6,394**	**8,103**	**-528**	**11,593**	**9,192**	**-4,203**	**-9,722**	**-1,684**	**-7,906**	**-9,106**	**-4,973**	**-5,692**
INVENTORY STORAGE (AF)	**211,522**	**217,030**	**212,719**	**206,766**	**218,708**	**225,102**	**233,205**	**232,677**	**244,270**	**253,462**	**249,259**	**239,537**	**237,853**	**229,947**	**220,841**	**215,868**	**210,176**

STORAGE CALCULATION	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
INVENTORY (Rounded to TAF)	212	217	213	207	219	225	233	233	244	253	249	240	238	230	221	216	210
GW ELEVATIONS (Rounded to TAF)	213	215	226	216	210	228	239	246	241	254	258	250	240	231	217	214	210
AVERAGE STORAGE (TAF)	**212**	**216**	**219**	**211**	**214**	**227**	**236**	**239**	**243**	**254**	**253**	**245**	**239**	**230**	**219**	**215**	**210**
AVAILABLE STORAGE (TAF)	**84**	**88**	**91**	**83**	**86**	**99**	**108**	**111**	**115**	**126**	**125**	**117**	**111**	**102**	**91**	**87**	**82**

Artificial Components Natural Components

*Water Year Type (CDEC Sacramento Valley)
W = Wet; AN = Above Normal;
BN = Below Normal; D = Dry; C = Critical

TABLE 10-3
HISTORICAL GROUNDWATER STORAGE
HYDROLOGIC INVENTORY (HI) METHOD
1974-2022 WATER YEARS (in Acre-Feet, except where indicated)

	WATER YEAR (Oct - Sep)																			
COMPONENTS	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
INDICES																				
Rainfall at Livermore (in)	11.3	11.6	21.3	11.8	21.3	20.0	15.1	25.3	13.1	14.1	11.0	11.2	17.0	13.1	19.3	17.5	9.7	10.7	11.4	14.8
8 Station Rain Index (N. CA)(in)	32.2	36.0	65.3	31.8	85.4	61.3	68.8	82.4	54.8	56.7	33.0	46.3	59.7	47.3	57.4	80.1	37.3	34.9	46.8	53.6
Evap at Lake Del Valle (in)	64.7	68.2	64.2	65.5	58.3	71.6	69.5	57.2	61.0	68.3	68.5	73.2	69.9	72.1	63.6	68.6	68.9	72.7	71.6	64.0
Arroyo Valle Stream flow (AF)	9909	11692	52831	3424	67142	51058	54115	87819	15169	18949	8156	7848	19648	11410	26930	28325	2027	18059	11231	12914
Water Year Type*	C	C	AN	C	W	W	W	W	W	AN	D	D	AN	BN	AN	W	D	C	D	BN
SUPPLY	**12,715**	**10,610**	**28,529**	**16,095**	**29,095**	**22,556**	**24,184**	**27,853**	**20,780**	**23,211**	**15,691**	**24,052**	**29,840**	**19,778**	**31,021**	**23,960**	**14,998**	**16,258**	**18,659**	**25,382**
Injection Well Recharge	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**652**	**1,524**	**1,146**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Stream Recharge	**8,347**	**5,247**	**14,714**	**11,838**	**13,058**	**11,109**	**12,284**	**13,603**	**10,813**	**12,842**	**8,601**	**16,195**	**21,483**	**12,885**	**21,025**	**13,418**	**9,154**	**8,448**	**11,249**	**17,144**
Artificial Stream Recharge	3,261	914	5,621	7,883	4,672	2,968	5,314	2,343	5,174	8,019	3,428	10,588	11,409	8,084	11,143	4,583	4,811	2,229	3,984	6,773
Arroyo Valle	*82*	*412*	*1,182*	*798*	*179*	*144*	*1,827*	*413*	*1,181*	*890*	*1,476*	*1,831*	*1,547*	*1,670*	*2,277*	*1,216*	*2,879*	*2,229*	*2,104*	*2,459*
Arroyo Mocho	*3,178*	*502*	*4,439*	*7,085*	*4,493*	*2,824*	*3,487*	*1,930*	*3,993*	*7,129*	*1,930*	*8,755*	*9,862*	*6,414*	*8,698*	*3,205*	*1,932*	*0*	*1,880*	*4,314*
Arroyo las Positas	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*22*	*2*	*0*	*0*	*168*	*162*	*0*	*0*	*0*	*0*
Natural Stream Recharge	4,418	3,997	8,247	3,080	7,259	7,743	6,607	10,533	5,091	4,178	4,512	4,476	8,462	3,458	9,589	6,905	3,536	5,913	6,018	10,371
Arroyo Valle	*1,215*	*970*	*2,754*	*735*	*2,818*	*1,426*	*2,753*	*4,401*	*1,796*	*1,389*	*2,440*	*2,259*	*4,397*	*1,447*	*5,980*	*3,043*	*1,941*	*4,030*	*3,958*	*6,909*
Arroyo Mocho	*1,883*	*1,711*	*3,903*	*1,263*	*3,144*	*5,226*	*2,670*	*4,560*	*1,833*	*1,539*	*961*	*1,279*	*2,980*	*1,082*	*2,854*	*3,104*	*858*	*1,077*	*970*	*2,547*
Arroyo las Positas	*1,320*	*1,315*	*1,591*	*1,082*	*1,297*	*1,091*	*1,184*	*1,572*	*1,462*	*1,250*	*1,111*	*939*	*1,085*	*929*	*755*	*758*	*737*	*806*	*1,090*	*915*
Arroyo Valle Prior Rights	668	337	846	876	1,127	398	362	727	548	644	660	1,131	1,612	1,343	293	1,930	807	306	1,247	0
Rainfall Recharge	**1,838**	**1,760**	**10,761**	**1,242**	**13,243**	**8,176**	**8,634**	**10,692**	**5,540**	**5,924**	**3,644**	**4,239**	**4,899**	**3,192**	**6,378**	**6,969**	**1,987**	**3,782**	**3,375**	**4,315**
Pipe Leakage	**249**	**267**	**285**	**304**	**324**	**344**	**365**	**387**	**410**	**434**	**461**	**490**	**518**	**548**	**579**	**610**	**642**	**675**	**708**	**742**
Applied Water Recharge	**602**	**1,766**	**1,440**	**1,621**	**1,480**	**2,007**	**2,221**	**1,709**	**1,743**	**1,960**	**1,985**	**2,129**	**1,940**	**2,153**	**2,039**	**1,962**	**2,214**	**2,353**	**2,327**	**2,181**
Urban - Municipal	222	1,288	1,108	1,252	1,060	1,467	1,632	1,472	1,549	1,743	1,770	1,888	1,749	1,926	1,834	1,747	1,983	2,124	2,064	1,894
Urban - Groundwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urban - Recycled Water	2	0	11	14	13	18	21	15	12	21	19	30	10	14	15	26	24	7	52	84
Agriculture - Municipal (SBA)	242	279	177	192	257	347	401	104	57	64	59	67	66	64	63	63	62	68	68	67
Agriculture/Golf - Groundwater	109	133	96	100	92	100	109	68	60	67	67	73	68	73	70	67	75	80	78	72
Agriculture/Golf - Recycled	26	66	48	63	58	75	58	50	65	66	69	72	47	75	58	59	71	74	66	64
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subsurface Basin Inflow	**1,680**	**1,570**	**1,330**	**1,090**	**990**	**920**	**680**	**810**	**750**	**906**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
DEMAND	**21,104**	**17,237**	**13,555**	**15,503**	**16,064**	**20,683**	**25,574**	**25,342**	**25,691**	**26,885**	**27,357**	**23,991**	**21,531**	**24,338**	**17,828**	**15,169**	**18,636**	**19,269**	**23,656**	**21,091**
Municipal Pumpage	**17,355**	**13,331**	**9,132**	**6,499**	**4,594**	**6,324**	**8,824**	**10,264**	**11,832**	**15,520**	**17,806**	**19,307**	**17,123**	**19,635**	**14,686**	**11,697**	**12,681**	**13,516**	**18,022**	**16,064**
Zone 7 (excluding DSRSD)	8,119	5,136	2,215	213	368	2,388	1,565	1,682	4,912	6,140	9,864	11,047	7,734	11,175	6,213	3,157	4,146	6,210	9,439	8,274
Zone 7 for DSRSD	0	0	0	0	0	0	0	0	0	0	0	0	645	645	645	645	645	645	645	645
City of Pleasanton	4,164	3,368	3,252	2,578	1,262	1,333	3,208	3,935	2,563	4,558	3,112	3,579	3,674	3,688	3,604	3,587	3,638	2,387	3,660	3,280
Cal. Water Service	3,966	3,744	2,570	2,626	2,053	1,551	2,947	3,595	3,271	3,567	3,707	3,458	3,979	2,911	3,166	3,106	2,971	3,143	3,123	2,844
Camp Parks	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SFWD	408	410	414	396	370	411	477	460	380	532	472	448	423	481	436	467	494	492	446	417
Fairgrounds	346	336	282	325	285	343	342	230	333	369	318	423	327	365	284	441	443	289	335	284
Domestic	100	113	113	116	116	117	117	113	116	109	109	134	134	167	131	93	96	109	123	112
Golf Courses	252	222	286	245	139	182	169	249	256	245	223	218	208	203	207	199	249	241	250	208
3S/1E 1P3	*101*	*36*	*138*	*36*	*41*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Castlewood	*151*	*186*	*131*	*186*	*82*	*159*	*146*	*236*	*235*	*223*	*193*	*193*	*193*	*173*	*191*	*177*	*222*	*213*	*222*	*188*
Tri-Valley Golf	*0*	*0*	*17*	*23*	*16*	*23*	*23*	*13*	*21*	*22*	*30*	*25*	*15*	*30*	*16*	*22*	*27*	*28*	*28*	*20*
Agricultural Pumpage	**382**	**355**	**213**	**218**	**150**	**212**	**266**	**73**	**81**	**231**	**227**	**119**	**93**	**92**	**88**	**88**	**87**	**96**	**95**	**94**
SFWD	20	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Concannon	11	0	0	0	0	0	0	0	0	140	143	25	0	2	0	0	0	0	0	0
Calculated	351	346	213	218	150	212	266	73	81	91	84	94	93	91	88	88	87	96	95	94
Mining Use	**3,367**	**3,551**	**4,210**	**8,786**	**11,120**	**13,381**	**15,724**	**14,255**	**13,416**	**11,010**	**9,324**	**4,564**	**4,314**	**4,610**	**3,055**	**3,385**	**4,947**	**4,452**	**5,346**	**4,934**
Subsurface Basin Overflow	**0**	**0**	**0**	**0**	**200**	**766**	**760**	**750**	**362**	**125**	**0**	**0**	**0**	**0**	**0**	**0**	**921**	**1,205**	**194**	**0**
NET RECHARGE (AF)	**-8,389**	**-6,628**	**14,974**	**592**	**13,031**	**1,873**	**-1,390**	**2,511**	**-4,911**	**-3,674**	**-11,666**	**62**	**8,309**	**-4,560**	**13,193**	**8,790**	**-3,639**	**-3,011**	**-4,997**	**4,290**
INVENTORY STORAGE (AF)	**201,787**	**195,159**	**210,133**	**210,725**	**223,756**	**225,629**	**224,239**	**226,750**	**221,839**	**218,165**	**206,499**	**206,561**	**214,870**	**210,310**	**223,503**	**232,293**	**228,654**	**225,643**	**220,646**	**224,936**

STORAGE CALCULATION	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
INVENTORY (Rounded to TAF)	202	195	210	211	224	226	224	227	222	218	206	207	215	210	224	232	229	226	221	225
GW ELEVATIONS (Rounded to TAF)	195	184	211	216	225	223	222	225	222	222	203	212	220	213	236	238	232	235	233	234
AVERAGE STORAGE (TAF)	**198**	**189**	**210**	**213**	**225**	**224**	**223**	**226**	**222**	**220**	**205**	**209**	**218**	**212**	**230**	**235**	**230**	**230**	**227**	**229**
AVAILABLE STORAGE (TAF)	**70**	**61**	**82**	**85**	**97**	**96**	**95**	**98**	**94**	**92**	**77**	**81**	**90**	**84**	**102**	**107**	**102**	**102**	**99**	**101**

Artificial Components Natural Components

*Water Year Type (CDEC Sacramento Valley)
W = Wet; AN = Above Normal;
BN = Below Normal; D = Dry; C = Critical

TABLE 10-3
HISTORICAL GROUNDWATER STORAGE
HYDROLOGIC INVENTORY (HI) METHOD
1974-2022 WATER YEARS (in Acre-Feet, except where indicated)

	WATER YEAR (Oct - Sep)												1974 - 2022		
COMPONENTS	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**AVG**	**Sust Avg**	**TOTAL**
INDICES															
Rainfall at Livermore (in)	16.2	8.8	10.7	6.8	13.1	15.4	25.6	12.4	17.1	10.5	5.1	11.0	14		
8 Station Rain Index (N. CA)(in)	72.8	41.5	46.3	31.3	37.2	57.8	94.6	40.9	70.7	31.7	24.0	43.0	52		
Evap at Lake Del Valle (in)	64.5	73.2	73.9	78.3	73.6	72.6	69.3	73.4	72.8	76.4	80.2	74.9	68		
Arroyo Valle Stream flow (AF)	28634	1557	7801	272	2217	19436	89173	2783	36944	2701	2423	11866	24174		**1184525**
Water Year Type*	W	BN	D	C	C	BN	W	BN	W	D	C	BN			
SUPPLY	**27,315**	**18,442**	**20,158**	**10,452**	**18,753**	**29,018**	**38,181**	**17,943**	**23,096**	**14,021**	**9,803**	**14,599**	**19,856**	**19,800**	**972,922**
Injection Well Recharge	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**68**	**0**	**3,322**
Stream Recharge	**17,595**	**12,734**	**13,457**	**5,820**	**11,469**	**18,083**	**20,495**	**9,560**	**10,605**	**5,972**	**2,703**	**6,172**	**11,621**	**11,900**	**569,427**
Artificial Stream Recharge	4,555	8,778	7,887	3,826	3,766	8,910	9,615	6,773	2,943	2,461	277	1,301	5,125	5,300	251,106
Arroyo Valle	*768*	*3,613*	*1,916*	*924*	*3,718*	*3,983*	*3,271*	*3,778*	*2,168*	*2,045*	*277*	*1,301*	*1,758*	*1,640*	*86,133*
Arroyo Mocho	*3,671*	*5,059*	*5,961*	*2,844*	*0*	*4,927*	*6,344*	*2,995*	*775*	*416*	*0*	*0*	*3,261*	*3,530*	*159,802*
Arroyo las Positas	*116*	*106*	*10*	*58*	*48*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*106*	*130*	*5,172*
Natural Stream Recharge	11,272	3,355	4,200	1,987	6,822	8,289	10,433	1,938	6,439	2,595	1,887	4,581	5,614	5,700	275,082
Arroyo Valle	*8,540*	*1,676*	*2,790*	*891*	*4,567*	*4,749*	*6,053*	*740*	*3,419*	*793*	*569*	*2,136*	*2,490*	*1,800*	*122,020*
Arroyo Mocho	*2,293*	*1,225*	*838*	*587*	*1,748*	*2,794*	*3,775*	*590*	*2,393*	*1,072*	*586*	*1,318*	*2,235*	*2,600*	*109,528*
Arroyo las Positas	*439*	*454*	*572*	*509*	*507*	*746*	*605*	*608*	*627*	*730*	*732*	*1,127*	*888*	*1,300*	*43,534*
Arroyo Valle Prior Rights	1,768	601	1,370	7	881	884	447	849	1,223	916	539	290	882	900	43,238
Rainfall Recharge	**5,771**	**1,462**	**2,708**	**1,075**	**3,735**	**6,368**	**12,377**	**3,926**	**7,628**	**3,593**	**2,818**	**3,884**	**4,592**	**4,300**	**225,005**
Pipe Leakage	**776**	**811**	**847**	**884**	**921**	**958**	**996**	**1,034**	**1,146**	**1,209**	**1,248**	**1,287**	**479**	**1,000**	**23,457**
Applied Water Recharge	**2,172**	**2,435**	**2,147**	**1,674**	**1,629**	**2,609**	**3,313**	**2,423**	**2,717**	**2,247**	**2,035**	**2,256**	**2,110**	**1,600**	**103,375**
Urban - Municipal	1,849	2,061	1,750	1,229	1,143	1,523	2,156	1,393	1,778	1,250	1,016	1,278	1,399	1,280	68,545
Urban - Groundwater	0	0	0	0	0	61	82	67	80	62	54	63	10	26	470
Urban - Recycled Water	133	159	189	220	275	160	147	106	119	140	148	128	52	0	2,529
Agriculture - Municipal (SBA)	61	68	64	66	61	735	801	716	616	656	670	669	223	92	10,919
Agriculture/Golf - Groundwater	70	78	69	86	85	72	67	74	69	72	79	75	143	158	7,009
Agriculture/Golf - Recycled	59	70	75	73	65	59	60	66	57	67	68	42	60	44	2,930
Others	0	0	0	0	0	0	0	0	0	0	0	0	224	0	10,973
Subsurface Basin Inflow	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**986**	**1,000**	**48,336**
DEMAND	**20,421**	**28,880**	**25,700**	**22,604**	**12,717**	**13,457**	**14,182**	**17,456**	**19,703**	**22,055**	**28,668**	**25,995**	**19,797**	**18,800**	**970,042**
Municipal Pumpage	**13,430**	**20,463**	**16,823**	**16,662**	**8,284**	**9,176**	**10,714**	**11,966**	**14,635**	**16,349**	**22,806**	**20,746**	**12,074**	**13,700**	**591,622**
Zone 7 (excluding DSRSD)	5,618	11,461	8,909	8,137	1,920	1,357	3,243	4,215	8,021	11,101	15,795	14,641	4,651	5,300	227,915
Zone 7 for DSRSD	646	644	646	645	645	645	645	645	645	645	645	645	263	645	12,901
City of Pleasanton	3,435	3,900	3,301	3,740	2,775	3,752	4,222	3,913	3,785	2,701	3,802	2,587	3,261	3,500	159,775
Cal. Water Service	2,673	3,333	2,770	3,085	2,012	2,575	1,878	2,389	1,296	904	1,475	1,756	2,715	3,070	133,011
Camp Parks	0	0	0	0	0	0	0	0	0	0	0	0	180	0	8,819
SFWD	442	482	482	398	309	286	214	253	286	322	360	406	402	450	19,722
Fairgrounds	301	318	350	286	268	231	208	196	270	321	353	357	291	310	14,237
Domestic	107	90	105	115	112	110	107	115	116	108	107	107	109	200	5,337
Golf Courses	208	236	260	257	243	220	198	240	216	247	269	246	202	225	9,905
3S/1E 1P3	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*8*	*0*	*397*
Castlewood	*187*	*214*	*233*	*227*	*213*	*195*	*176*	*218*	*194*	*225*	*242*	*216*	*180*	*205*	*8,809*
Tri-Valley Golf	*21*	*22*	*27*	*30*	*30*	*25*	*22*	*22*	*22*	*22*	*27*	*30*	*14*	*20*	*699*
Agricultural Pumpage	**85**	**95**	**486**	**640**	**590**	**684**	**655**	**691**	**674**	**720**	**791**	**752**	**1,045**	**400**	**51,222**
SFWD	0	0	0	0	0	0	0	0	0	0	0	0	123	0	6,015
Concannon	0	0	0	0	0	0	0	0	0	0	0	0	21	0	1,047
Calculated	85	95	486	640	590	684	655	691	674	720	791	752	901	400	44,160
Mining Use	**6,906**	**8,322**	**8,391**	**5,302**	**3,843**	**3,597**	**2,813**	**4,236**	**3,585**	**4,840**	**5,072**	**4,498**	**6,304**	**4,600**	**308,906**
Subsurface Basin Overflow	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**564**	**809**	**146**	**0**	**0**	**373**	**100**	**18,292**
NET RECHARGE (AF)	**6,893**	**-10,438**	**-5,542**	**-12,153**	**6,037**	**15,561**	**23,999**	**487**	**3,394**	**-8,034**	**-18,865**	**-11,395**	**59**	**1,000**	**2,879**
INVENTORY STORAGE (AF)	**231,829**	**221,391**	**215,849**	**203,696**	**209,733**	**225,294**	**249,293**	**249,780**	**253,174**	**245,140**	**226,275**	**214,880**	**223,620**	**13,400**	

STORAGE CALCULATION	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
INVENTORY (Rounded to TAF)	232	221	216	204	210	225	249	250	253	245	226	215
GW ELEVATIONS (Rounded to TAF)	235	228	221	209	214	226	245	245	248	237	220	218
AVERAGE STORAGE (TAF)	**233**	**225**	**218**	**206**	**212**	**225**	**247**	**247**	**250**	**241**	**223**	**216**
AVAILABLE STORAGE (TAF)	**105**	**97**	**90**	**78**	**84**	**97**	**119**	**119**	**122**	**113**	**95**	**88**

Artificial Components Natural Components

*Water Year Type (CDEC Sacramento Valley)
W = Wet; AN = Above Normal;
BN = Below Normal; D = Dry; C = Critical

LEGEND

Node (with Mean GW Elev, Fall 2022)

U= Upper; L = Lower

- Fringe Area (Single Aquifer)
- Main Basin (U=Upper; L=Lower)
- Upland Area
- Streams

Node 1
416.5

Node 2
397.5

Node 3
381.6

Node 4
364.5

Node 5
370.8

Node 6
337.7

Node 7
342

Node 8
347

Node 9
341.7

Node 10
324.6

Node 11
342.9

Node 12
324.4

Node 13
314.8

Node 14
311.3

Node
15A
298.2

Node 15
U: 267.8
L: 266.2

Node
16A
297.3

Node 16
U: 268.6
L: 264.7

Node 17
U: 295.7
L: 266.3

Node 18
U: 254.6
L: 240.8

Node 19
U: 266.9
L: 258.9

Node 20
U: 272.9
L: 281

Node 21
341.4

Node 22
325.3

Node 23
U: 273.9
L: 264.7

Node 24
U: 256.2
L: 235.9

Node 25
U: 296.1
L: 225.7

Node 26
U: 275.8
L: 253.8

Node 27
335.1

Node 28
352.6

Node 29
U: 333.1
L: 230.1

Node 30
U: 303.9
L: 224.6

Node 31
U: 308.6
L: 239.7

Node 32
396.2

Node 33
U: 365.3
L: 243.3

Node 34
U: 335.4
L: 216.6

Node 35
U: 344.5
L: 246.5

Node 36
U: 446.8
L: 456

Node 37
403.2

Node 38
U: 394.3
L: 380.3

Node 39
U: 438.2
L: 419.6

Node 40
U: 527.2
L: 503.6

Node 41
U: 691.4
L: 640.4

Node 42
U: 511.5
L: 499.7

Node 43
525.9

Node 44
738

Node 45
536.9

Node 46
516.8

Node 47
501.8

N
W E
S

0 2 4
Miles

DATE: Feb 23, 2023
FILE: P:\GWS\Programs\GSP\2022 Annual Report\FiguresTables\10-GWStorage\10-Fig01-MapNodalGWE22.mxd

Figure 10-1
Mean Groundwater Elevation By Node
Upper and Lower Aquifers; Fall 2022
Livermore Valley Groundwater Basin

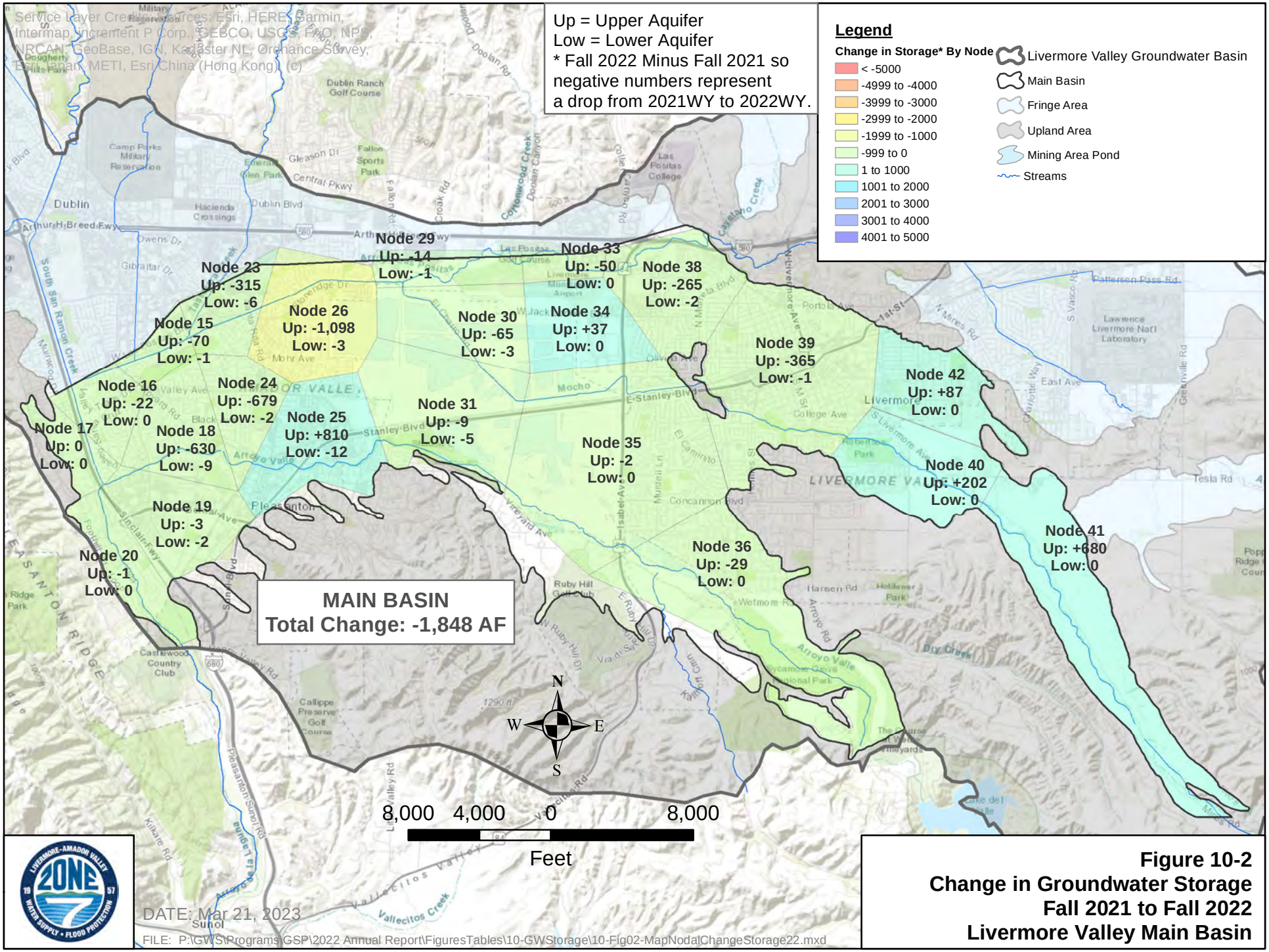
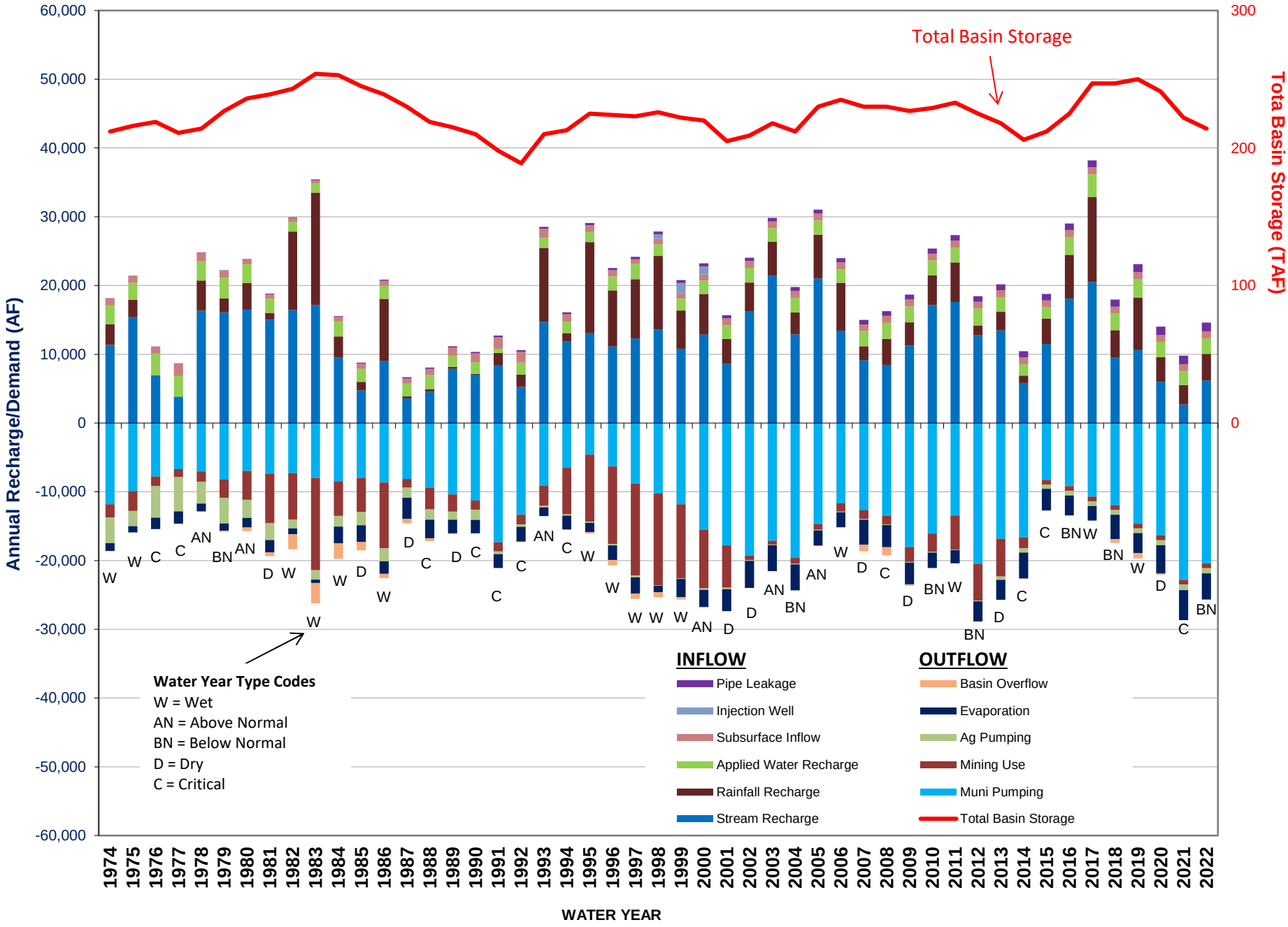


Figure 10-2
Change in Groundwater Storage
Fall 2021 to Fall 2022
Livermore Valley Main Basin

FIGURE 10-3
GRAPH OF GROUNDWATER STORAGE 1974 - 2022 WATER YEARS
LIVERMORE VALLEY GROUNDWATER BASIN



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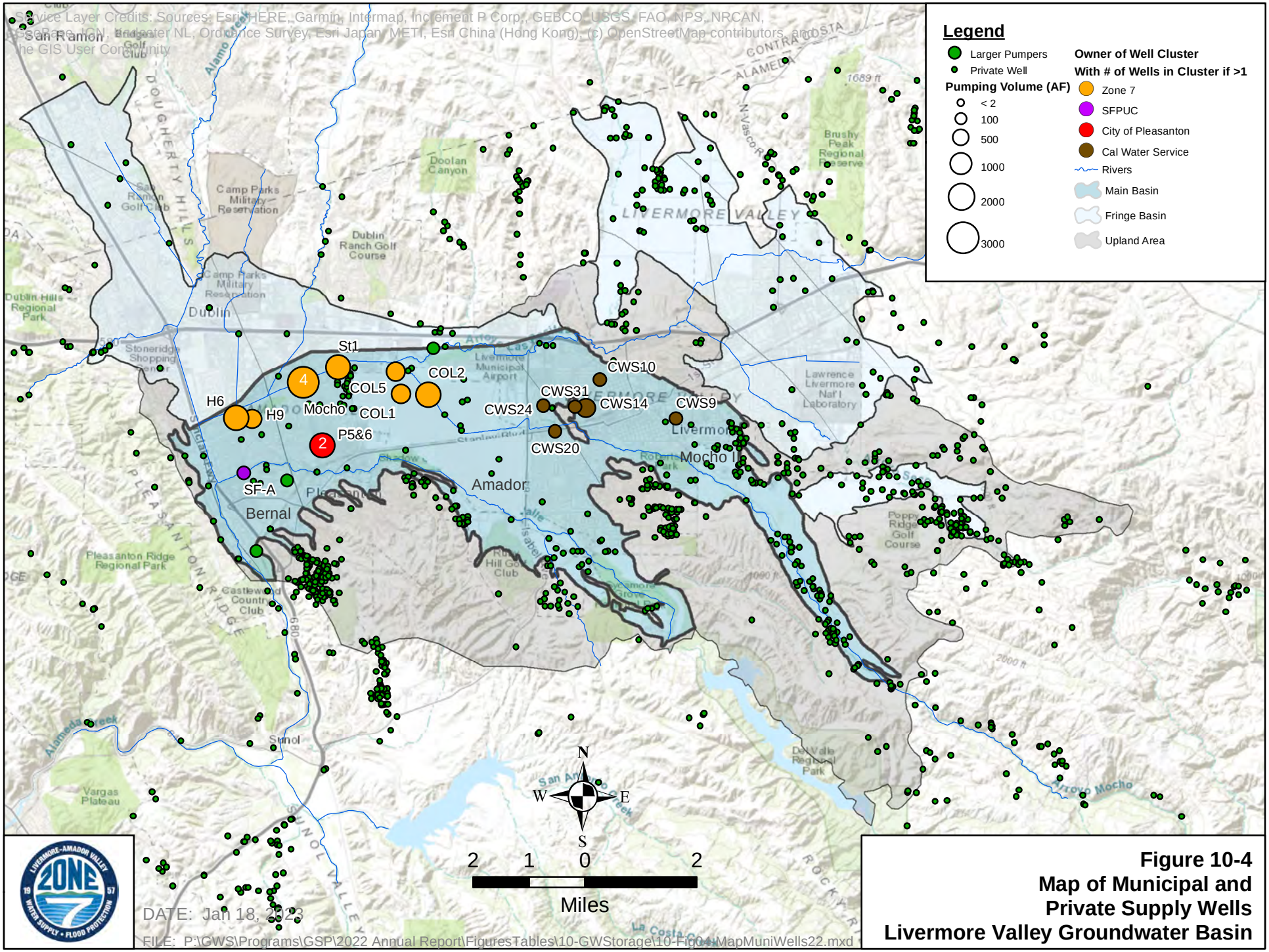

Figure 10-4
Map of Municipal and Private Supply Wells
Livermore Valley Groundwater Basin

FIGURE 10-5
CUMULATIVE CHANGE IN NATURAL AND ARTIFICIAL RECHARGE AND DEMAND 1974 - 2022 WATER YEARS
LIVERMORE VALLEY GROUNDWATER BASIN

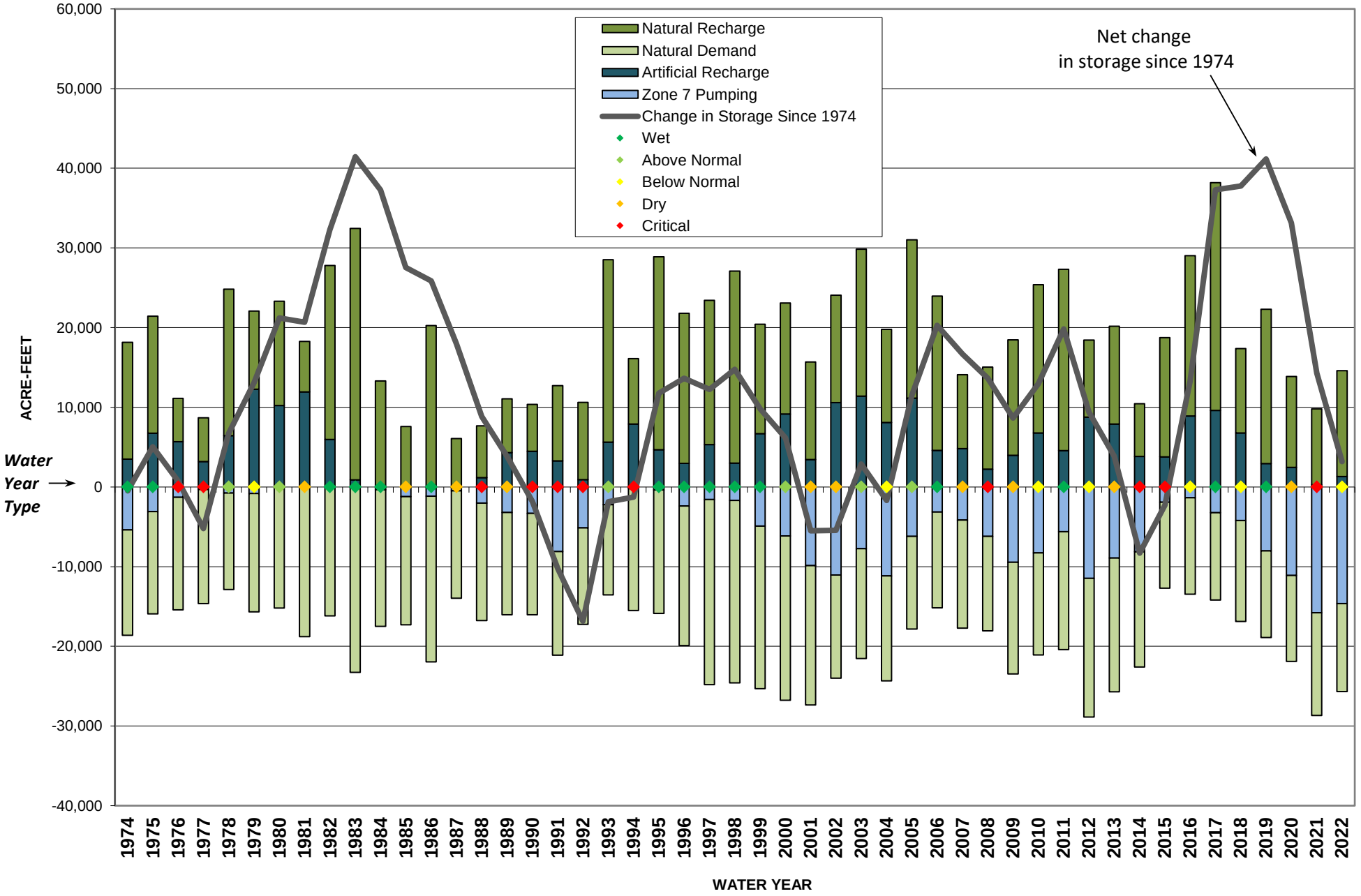

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Figure 10-5

11 Groundwater Supply Sustainability

11.1 Import of Surface Water

Imported surface water supplies secured by Zone 7 for the 2022 CY are shown in ***Table 11-A*** below***, Figure 11-1***, and are summarized below include:

- The State Water Project (SWP) allocation for the 2022 CY was 5% of Zone 7's maximum allocation (80,619 AF) for 4,031 AF. None of this was used for the 2022 CY, and therefore all of it was carried over the 2023 CY. Zone 7 did import 1,506 AF of water from its Article 56 allocation (previous year's carryover).

- Zone 7 imported 5,025 AF of water that was banked at San Luis Reservoir via that South Bay Aqueduct (SBA).

- Zone 7 imported 9,570 AF of its total 105,475 AF banked in the Kern Groundwater Basin (Semitropic and Cawelo Water Districts) and transferred 8,750 AF from the Kern Groundwater Basin to San Luis Reservoir.

- Zone 7 imported 896 AF from the Lover River Yuba Accord (Yuba) and 1,500 AF from the Mojave Water Agency.

- Total imported surface water supplies in the 2022 CY (18,497 AF) made up 47% of regional water demands.

Table 11-A: Imported and Local Surface Water Sources (AF)*

Source	Available at end of 2021**	Added in 2022	Used in 2022	Carryover to 2023
State Water Project	**5,931**	**12,781**	**6,531**	**12,181**
Table A (5% Allocation for 2022)		4,031	0	4,031
Article 56	1,506	0	1,506	0
San Luis Reservoir	4,425	8,750	5,025	8,150
Kern Groundwater Basin	**105,475**	**600**	**18,320**	**87,755**
Semitropic Delivered to Zone 7	75,570	0	4,990	70,580
Semitropic to San Luis Reservoir	0	600	5,300	-4,700
Cawelo Delivered to Zone 7	29,905	0	4,580	25,325
Cawelo To San Luis Reservoir	0	0	3,450	-3,450
Other Imported	**0**	**2,396**	**2,396**	**0**
Yuba/Dry Year Transfer Program	0	896	896	0
Mojave Water Agency Transfer	0	1,500	1,500	0
TOTAL IMPORTED (not including water to San Luis Reservoir)	**111,406**	**15,177**	**18,497**	**108,086**
TOTAL LOCAL: Lake Del Valle (AV Water Rights)	**2,300**	**3,790**	**3,790**	**2,300**
TOTAL IMPORTED AND LOCAL	**113,706**	**18,967**	**22,287**	**110,386**

* = All values accounted for and reported on a calendar year (CY) basis

** = updated slightly from previous year's report (113,966 AF Total)

AV = acre-feet

AV = Arroyo Valle

11.2 Basin-wide Water Production and Use

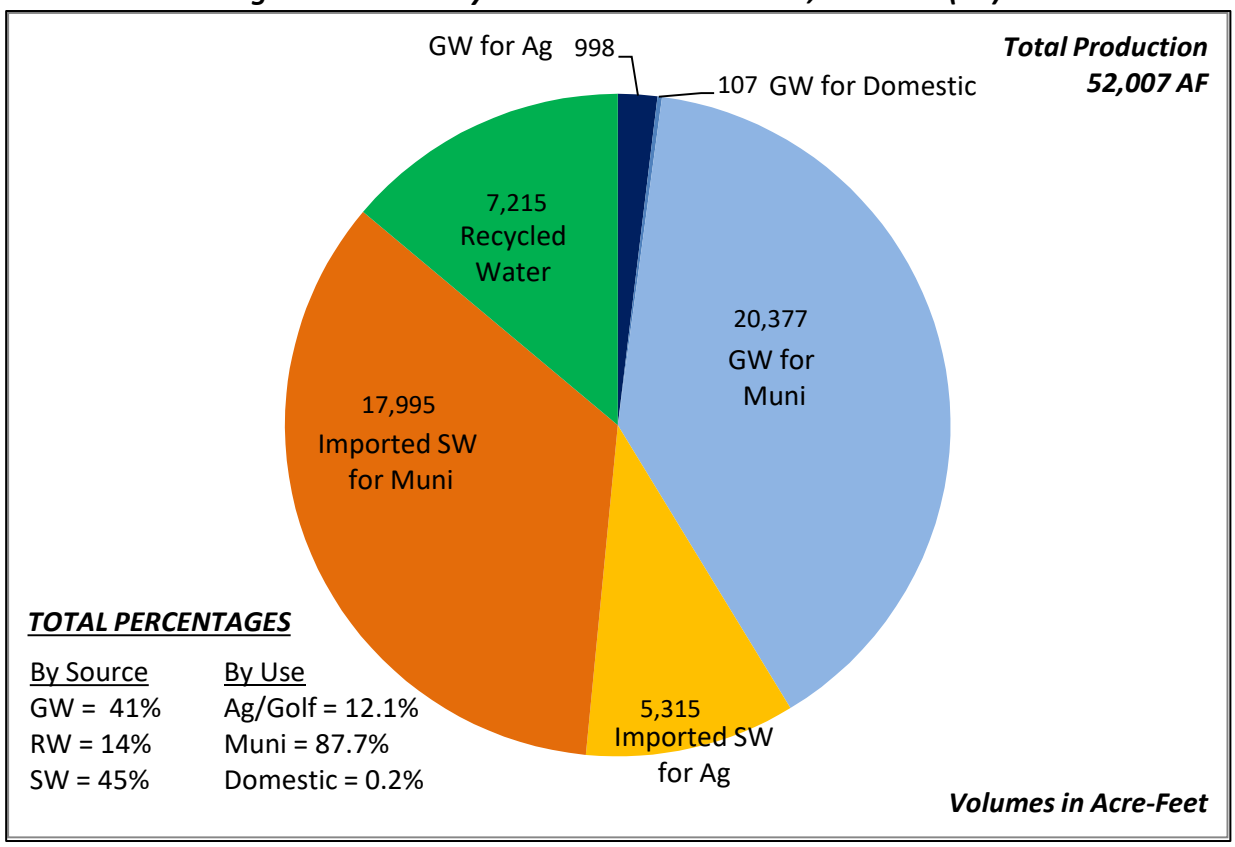
The volume of water produced and used in the Basin is shown in ***Figure 11-A*** (by WY) and ***Figure 11-1*** (by WY except where noted). ***Figure 11-2*** shows the historical percentage of groundwater production relative to total Basin-wide production from the 1974 to 2022 WYs. The following activities occurred during the 2022 WY:

- Total groundwater production in the Basin (including by Zone 7, retailers, agriculture, domestic, etc.) supplied about 41% of the total Basin-wide water demand in the 2022 WY.

- Of the 15,286 AF of groundwater pumped by Zone 7 (including pumped by Zone 7 for DSRSD) during the 2022 WY, about 15,271 AF went into production; the remainder of which is accounted for in pumping losses and exported brine from the groundwater demineralization process.

- Zone 7's total produced groundwater was about 46% of the total treated water production that Zone 7 delivered to its retailers during the 2022 WY (on average, groundwater makes up about 16% of Zone 7's annual treated water deliveries).

Figure 11-A: Valley-Wide Water Production, 2022 WY (AF)



Ag = Agriculture; Muni = Municipal; GW= Groundwater; RW = Recycled Water; SW = Surface Water

11.3 Basin Management Actions in 2022 WY

Zone 7 implements conjunctive use practices within the Basin to the greatest extent possible given current hydrologic conditions and imported water supply availability. During the 2022 WY, Zone 7 released 1,773 AF from the SBA into the Arroyo Valle for artificial recharge and water rights, of which 1,301 AF recharged.

As described in ***Section 5.2.2***, the water elevation in the RMS-WL for the Amador East Subarea Lower Aquifer (3S1E12K003) dropped below the MO in June 2022 and had a seasonal low at 25.3 ft below the MO on September 2, 2022 (but was still 13.6 ft above the MT). Zone 7 closely monitored the water level in this RMS-WL well as it approached and exceeded the MO. In response, Zone 7 performed the following management actions:

- Increased the measurement interval in the 3S1E12K003 RMS-WL well from monthly to weekly from June to December 2022,

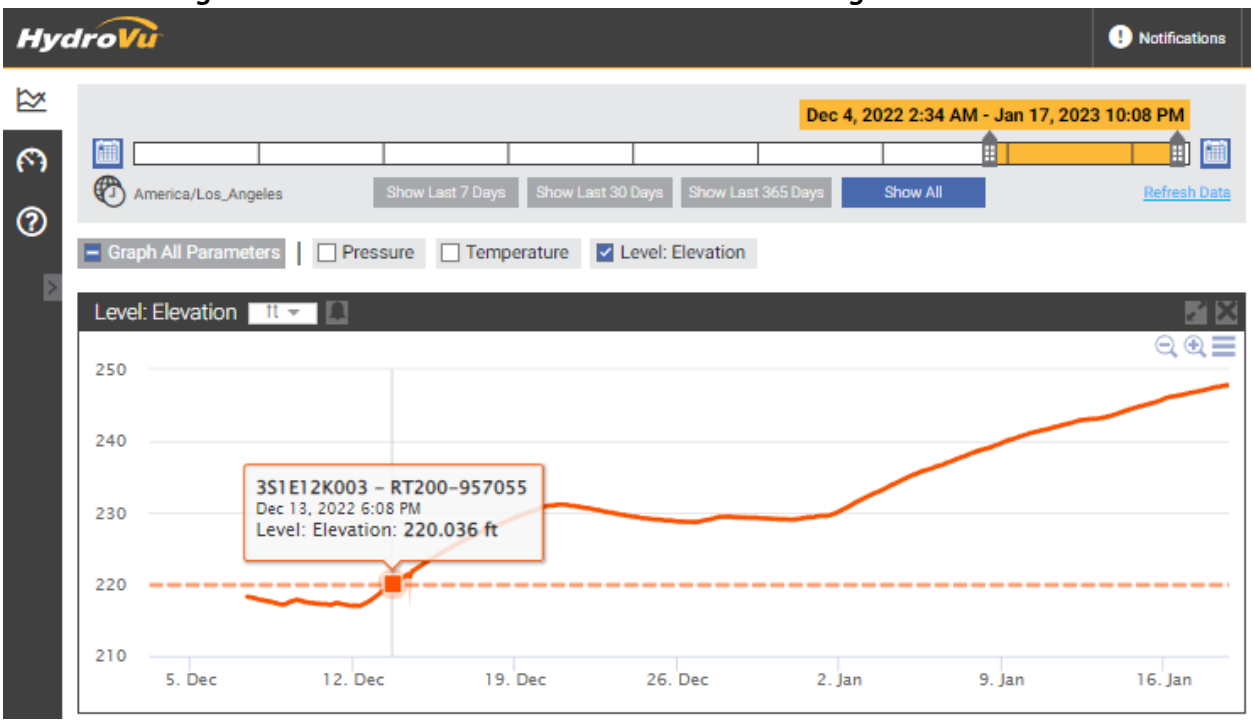
- Evaluated various telemetry systems that could allow staff to view real-time data remotely without having to visit the well. Zone 7 pilot-tested InSitu's VuLink and OTT's Hydromet 1000 systems and, based on findings, selected InSitu's VuLink system for basin-Early in the 2023 WY, Zone 7 installed InSitu VuLink devices in seven wells (including five RMS-WL wells) with water level readings occurring every 15 minutes. As these installations occurred during the 2023 WY, they will be discussed in more detail in next year's annual report, and Zone 7 has plans to add several more in the next few years.

- Reduced pumping in Zone 7's nearby Chain of Lakes and Stoneridge wells, and

- Communicated with Cal Water Services regarding their two municipal wells (CWS 20 and CWS 24) in the Basin to the east of the RMS-WL.

As a result of these management actions (and assisted by rainfall later in the month), the water level in this RMS-WL began increasing after September 2, 2022, and exceeded the MO (219.9 ft msl) on December 13, 2022 (see ***Figure 11-B*** below).

Figure 11-B: Probe Groundwater Elevations starting December 2022

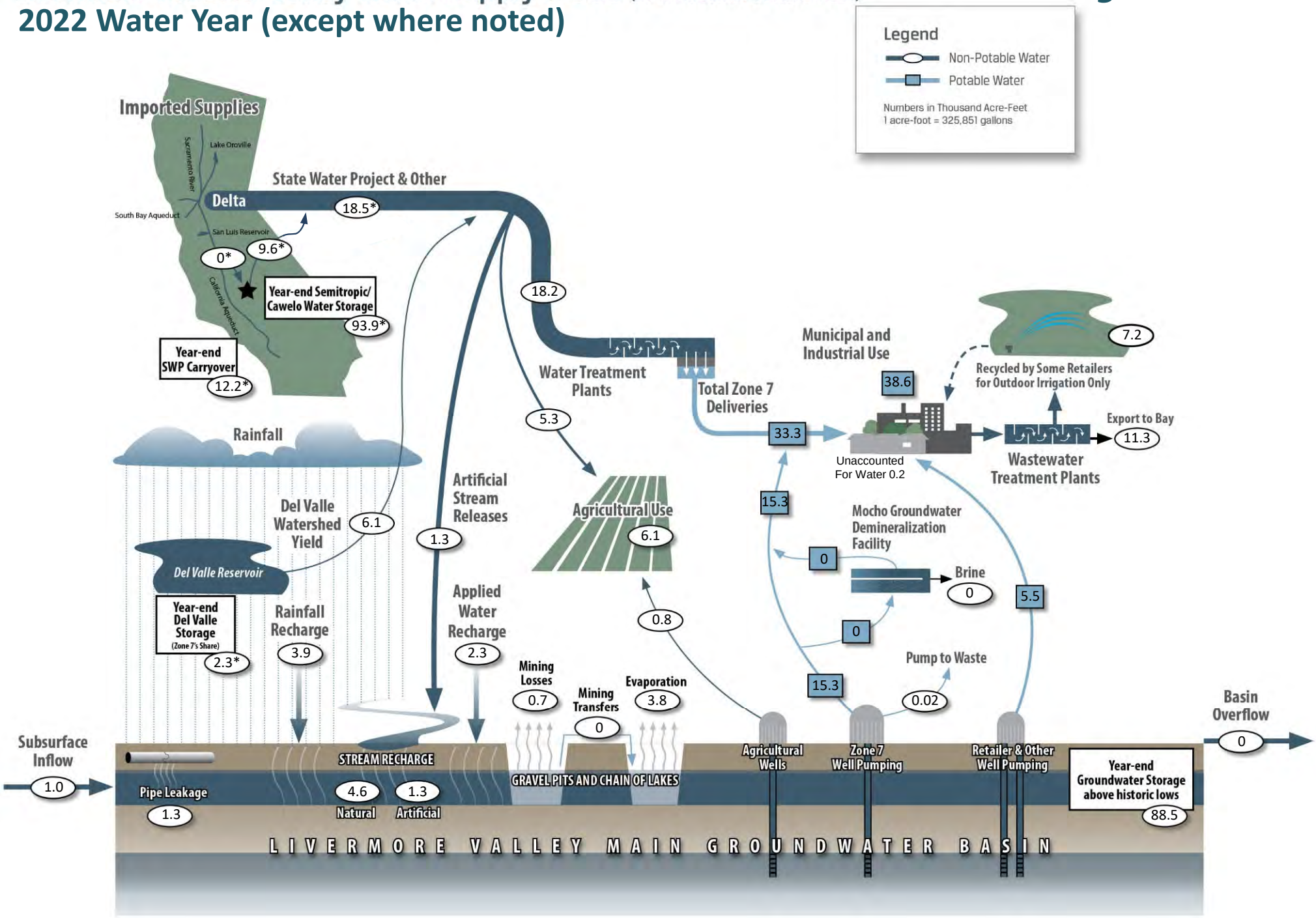


11.4 Attached Tables and Figures

Figure 11-1*: Livermore-Amador Valley Water Supply and Use, 2022 WY*
Figure 11-2*: Valley Water Production from Imported Water and Groundwater, 1974 to 2022 WYs*

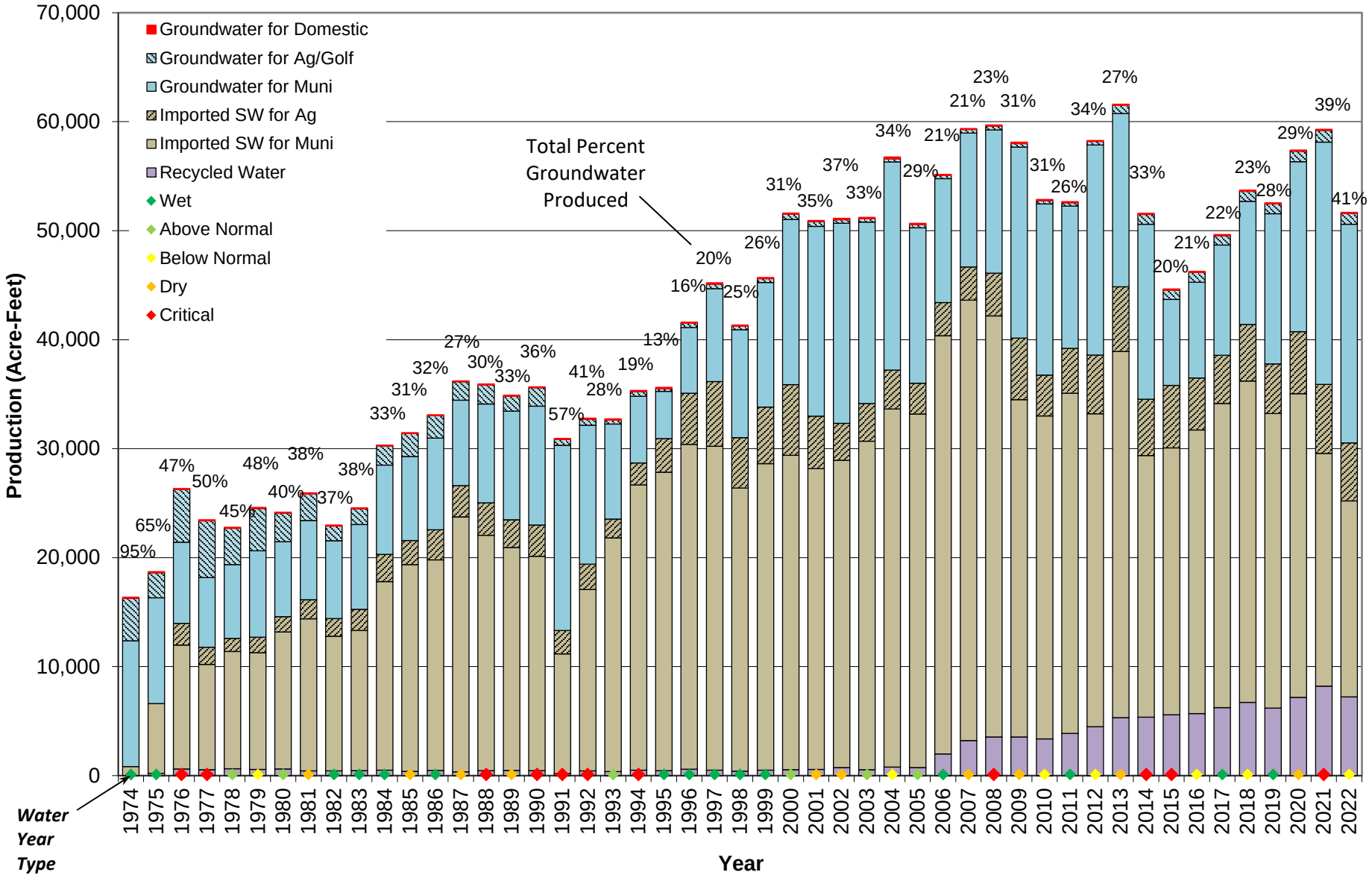
Livermore-Amador Valley Water Supply & Use (in Thousands of Acre-Feet)
2022 Water Year (except where noted)

Figure 11-1



* 2022 Calendar Year

FIGURE 11-2
VALLEY WATER PRODUCTION FROM IMPORTED WATER AND GROUNDWATER
1974 TO 2022 WATER YEARS



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12 Water Quality Sustainability

12.1 Well Ordinance Program

In addition to being a GSA, Zone 7 is a well permitting agency for the eastern part of Alameda County. Zone 7 administers the associated well permitting program within its service area including the three incorporated cities (Dublin, Livermore, and Pleasanton) pursuant to a Memorandum of Understanding (MOU) with Alameda County and ordinances adopted by the three cities. As a result, any planned new well construction, soil-boring construction, or well destruction must be permitted by Zone 7 before the work is started. Additionally, all unused or abandoned wells must be properly destroyed, or, if there are plans to use the well in the future, a signed statement of future intent must be filed with Zone 7.

During the 2022 WY, Zone 7 issued 136 drilling permits, 6 less than in the 2021 WY. ***Table 12-A*** details the breakdown of the types of permits issued during the 2022 WY and their quantities.

Table 12-A: Well Ordinance Permits Issued in the 2022 WY

Permit Type	Quantity
Geotechnical Investigations	78
Well Destructions	17
Contamination Investigations/Remediation	8
Water Supply Wells	17
Groundwater Monitoring	15
Cathodic Protection Wells	1
Total	***136***

- Seventeen (17) water supply well permits were issued in the 2022 WY. The pre-drought average was 25 per year.

- About 74% of the permitted well work was physically inspected by Zone 7 permit compliance staff; the remaining 26% could proceed with self-monitoring and reporting efforts when a licensed professional was supervising the project.

12.2 Toxic Site Surveillance Program

12.2.1 Program Description

Through the Toxic Site Surveillance (TSS) Program, Zone 7 documents and tracks polluted sites that pose a potential threat to drinking water. In general, the TSS Program monitors two types of contamination threatening groundwater: petroleum-based fuel products and industrial chemical contamination (e.g., chlorinated solvents).

The locations of all the toxic sites, and their proximity to the Basin's municipal water wells, are shown on the accompanying individual area maps (***Figure 12-1*** through ***Figure 12-3***, Livermore, Pleasanton/Sunol, and Dublin, respectively). ***Table 12-1*** contains a list of the active sites including the case status, its priority, and agency responsible for providing oversight for the case. In addition, copies of plans, reports, directive letters, and background data on the cases can be found at the State Water Resources Control Board's (SWRCB) GeoTracker website: http://geotracker.waterboards.ca.gov/. The GeoTracker number for each case (if one is assigned) is also included in ***Table 12-1***.

12.2.2 Program Changes

There were no changes to the TSS Program during the 2022 WY.

12.2.3 Results for the 2021 Water Year

12.2.3.1 Cases Closed

Four toxic sites were granted "Case Closed" status in the 2022 WY. Their locations are shown on ***Figure 12-4*** and are summarized below.

- **Site 6: Alco Santa Rita OES, Dublin**. Geotracker regulatory closure action states "No threat to groundwater or human health". Closure letter describing closure criteria has not been uploaded to Geotracker. Staff did not object to the closure, as the contamination was limited only to soil and not to groundwater.

- **Site 84: Arrow Rentals, Livermore.** This LUST case was evaluated for closure consistent with the State Water Resource Control Board's Low-Threat Underground Storage Tank Closure Policy (LTCP) for petroleum related contaminants. Alameda County Department of Environmental Health (ACDEH) determined that the site met all the LTCP General Criteria and Media Specific Criteria. This case met LTCP Media Specific Evaluation Groundwater case closure scenario 2 for moderate stabilized contaminant plumes. Case closure was granted for the current commercial land use as a vacant commercial rental yard and vacant office building.

- **Site 313: Just Tires, Livermore**. ACDEH had evaluated this SCP case for closure consistent with the State Water Resources Control Board's LTCP for petroleum related contaminants and Environmental Screening Levels (ESLs) promulgated by the San Francisco Regional Water Quality Control Board (RWQCB) for volatile organic compounds and has determined that residual subsurface contamination at the site presents a low risk to human health and the environment. Remediation at this site included excavation of contamination at the source.

- **Site 326: Former Livermore Sewage Ponds, Livermore**. This case met the criteria in the State Water Resources Control Board's 2009 Assessment Tool for Closure of Low-Threat Chlorinated Solvent Sites. The results of soil, groundwater, and soil gas sampling conducted at the site do not indicate that the former sewage ponds are the source of the diffuse residual VOC concentrations detected at the site and in the nearby well. The location of two lost groundwater monitoring wells still needs to be addressed.

12.2.3.2 Sites Pending Closure Review

"Case Closure" was requested by representatives for the three contamination sites listed below. Their locations are provided on ***Figure 12-4***. At the end of the 2022 WY, the lead agencies were still considering the requests but may ask for additional information before making their decision. Cases approved for closure by ACDEH must be reviewed and accepted by the RWQCB before they are officially closed. Information on each pending closure request, including Zone 7's recommendations, is summarized as follows:

- **Site 37: Applied Biosystems, Pleasanton**. This site has been operating under an Operation and Maintenance Agreement (OMA) since 2003 which required biannual groundwater monitoring. DTSC determined that the OMA for the site should be terminated. The OMA is no longer warranted because groundwater cleanup goals (California drinking water maximum contaminant levels) have been met, as documented in the Five-Year Remedial Action Review Report, dated April 18, 2018. Staff does not object to the closure of this case if the remaining tasks are completed to DTSC satisfaction.

- **Site 259: Chevron #30-7233/Mills Square Park, Livermore**. There are two cases associated with this site, T0600196622 for LUST and T10000010536 for lead. ACDEH has determined that the case investigating lead appears to qualify for case closure based on the goal to remove lead-impacted soil exceeding residential and construction worker human health screening levels from ground surface to 3.0 ft in depth and from 3.0 ft to 10 ft in depth respectively, relative to the redeveloped park elevation. This cleanup goal was proposed to accommodate the park redevelopment and allow possible future land use that could include construction of multifamily or low-income residential land use. The LUST case was evaluated for closure in conformance with the State Water Resource Control Board's LTCP for leaking underground storage tanks. ACDEH has determined that the site meets all the LTCP General Criteria and Media Specific Criteria. If a change in land use other than as a commercial service station (i.e., residential, commercial, conservative

land use, or if site redevelopment is planned), ACDEH must be notified. Staff does not object to closures.

- **Site 317: Walgreens Spill, Sunol**. Case was approved for closure by ACDEH under the LTCP. To finalize the case closure, ACDEH required the RP to remove any remaining waste from the site and to provide a report by April 22, 2018. In response, Apex submitted a Site Cleanup Program Case Closure letter to ACDEH in October 2020. Case closure is still pending. There was no progress in the 2022 WY. Staff does not object to the case closure if the remaining tasks are completed to ACDEH satisfaction.

12.2.3.3 New Cases

One new case was added to the Zone 7 TSS Program in the 2022 WY. The location is provided on ***Figure 12-4***.

- **Site 21: Shell Redevelopment, Sunol**. ACDEH opened a new case (T10000019989) for the proposed redevelopment of a gas station to residential use. This site was previously investigated for a fuel leak and closed under case T0600101259 under LTCP Scenario 5.

12.3 Salt Management

12.3.1 Program Changes

Zone 7's long-term salt management strategy includes monitoring and increasing municipal supply pumping, increasing operation of the Mocho Groundwater Demineralization Plant (MGDP), and conducting artificial groundwater recharge with low TDS water. No changes were made involving the Salt Management Program (SMP) or SMP strategies in the 2022 WY.

As mentioned above in ***Section 10.1***, groundwater storage volumes from the 2016 WY to present were recalculated for this year's report. Therefore, the previous year's salt totals presented in this year's report may be slightly different than those presented in last year's report.

12.3.2 Results for the 2021 Water Year

Salt balance calculations for the 2022 WY are tabulated in ***Table 12-B*** (summary) below and attached ***Table 12-2*** (detailed). ***Table 12-3*** summarizes the salt balance calculations from 1974 to 2022 WY. ***Figure 12-5*** graphs the salt inflows, outflows, and resulting Basin-wide salt concentrations from 1974 to 2022 WY.

Table 12-B: Salt Loading Summary, 2022 WY

Category	Volume (AF)	Salt Mass (Tons)	TDS Concentration (mg/L)	Change in Concentration from 2021 WY (mg/L)
Inflow	14,538	16,905	856	-50
Outflow	25,995	16,569	469	-14
Net (In – Out)	-11,457	336		
Basin Total	**214,880**	**227,022**	**778**	**40**

The following is a summary of the salt management actions conducted by Zone 7 during the 2022 WY:

- The total salt mass in the Main Basin increased 336 tons.
- The salt load increase and groundwater storage decrease during the WY caused the end-of-water-year theoretical average TDS concentration for the Main Basin to increase by 40 mg/L from the previous WY average.

The MGDP was operated sparingly throughout the 2022 WY to conserve water during the drought:

- During the 2022 WY, the MGDP produced 2 AF of brine (compared to 143 AF in the 2021 WY) that resulted in the export of about 7 tons of salt from the Main Basin through the Livermore-Amador Valley Water Management Agency (LAVWMA) pipeline (compared to 448 tons in the 2020 WY).
- Since its inception, the MGDP has exported over 19,086 tons of salt from the Livermore Valley (see ***Table 12-C*** below).

Table 12-C: Salts Removed by Zone 7's Mocho Groundwater Demineralization Plant

Water Year	Brine Volume Exported from Valley (AF)	Average Brine TDS Concentration (mg/L)	Salt Mass Exported (Tons)	Salt Removed per AF of Brine Export (Tons/AF)
2009	192	3,059	798	4.16
2010	675	3,010	2,760	4.09
2011	429	3,445	2,008	4.68
2012	935	3,198	4,062	4.34
2013	518	3,522	2,478	4.78
2014	214	3,607	1,049	4.9
2015	16	3,474	76	4.75
2016	51	2,662	184	3.61
2017	244	2,863	949	3.89
2018	268	3,209	1,168	4.36
2019	480	2,867	1,869	3.89
2020	344	2,633	1,230	3.58
2021	143	2,307	448	3.13
2022	2	2,609	7	3.5
TOTAL	**4,511**	**3,115**	**19,086**	**4.23**

AF = acre-feet TDS = total dissolved solids

mg/L = milligrams per liter

12.4 Attached Tables and Figures

***Table 12-1**: Toxic Site Surveillance - Active Site Summary, 2022 WY*
***Table 12-2**: Salt Loading 2022 WY*
***Table 12-3**: Historical Salt Loading, 1974 to 2022 WYs*

***Figure 12-1**: Toxic Site Surveillance; Livermore Area Sites*
***Figure 12-2**: Toxic Site Surveillance; Pleasanton and Sunol Area Sites*
***Figure 12-3**: Toxic Site Surveillance; Dublin Area Sites*
***Figure 12-4**: Toxic Site Surveillance; Cases with Status Changes in 2022 WY*
***Figure 12-5**: Main Basin Salt Loading and TDS Concentration, 1974 to 2022 WY*

TABLE 12-1
TOXIC SITES SURVEILLANCE - ACTIVE SITES SUMMARY
2022 WATER YEAR

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
1	Lawrence Livermore National Laboratory	Lawrence Livermore Lab	7000 East Avenue	Livermore	3A3	7	DTSC	

GEOTRACKER ID: T0600191466

CHEMICAL	CONCENTRATION ug/L
TCE	660

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
5	Sandia National Laboratory	Sandia National Labs	7011 East Avenue	Livermore	3A3	8	RWQCB	

GEOTRACKER ID: T0600191470

CHEMICAL	CONCENTRATION ug/L
TPHd	ND
NO3	NS
CCL4	1.8
CR(IV)	NS-dry

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
10	Industrial Ladder Company	Industrial Ladder Company	115 North Mines Road	Livermore	2A4	1	RWQCB	

CHEMICAL	CONCENTRATION ug/L
1,2-DCE	
TCE	
PCE	
1,2-DCE	

GEOTRACKER ID: T10000009051

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
11	Intel	Intel Livermore Fabrication Plant 3	250 North Mines Road	Livermore	2A3	8	RWQCB	

CHEMICAL	CONCENTRATION ug/L
TCE	
1,2-DCE	
VC	
PCE	

GEOTRACKER ID: SL18368788

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
21	Shell Oil	First Street Shell	4212 First Street	Pleasanton	2A3	3A	ACEH	ACEH opened new case (T10000019989) for proposed redevelopment of gas station to residential. This site was previously investigated and closed under case T0600101259.

CHEMICAL	CONCENTRATION ug/L
TPHg	1,400
MTBE	1,800
BENZ	140

GEOTRACKER ID: T10000019989

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
36	Richmond Lox/ Salinas Reinforcement	Salinas Reinforcing Inc.	355 South Vasco Road	Livermore	3A3	5C	RWQCB	

GEOTRACKER ID: SL18266687

CHEMICAL	CONCENTRATION ug/L
TCE	770
TPHg	NA
BENZ	NA

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
37	Applied Biosystems (formerly Kaiser Aluminum & Chemical)	Applied Biosystems	6001 (Formerly 6177) Sunol Boulevard	Pleasanton	2C	8	DTSC	

GEOTRACKER ID: 01280050

CHEMICAL	CONCENTRATION ug/L
PCE	22
TCE	0.59
1,1-DCE	9.8

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
115	LASC/MOSC (Livermore Arcade)	Livermore Arcade (Miller's Outpost)	1410/1554 First Street	Livermore	1A2	7	RWQCB	

GEOTRACKER ID: SL18227625

CHEMICAL	CONCENTRATION ug/L
PCE	14
TCE	3.9
cis-1,2-DCE	6.9
Vinyl Chloride	6.3

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
137	Busick Air Conditioning	Busick Gearing Properties	6341 Scarlett Court	Dublin	2A3	5C	RWQCB	

CHEMICAL	CONCENTRATION ug/L
TCE	5,200
PCE	120

GEOTRACKER ID: SL20256874

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
149	Kaiser Sand and Gravel	Hanson Aggregates	3000 Busch Road	Pleasanton	2A4	8	ACEH	Long term management: T10000009398. The site's remaining environmental concerns will be conducted under two new SCP cases (RO0003458 and RO0003459).

CHEMICAL	CONCENTRATION ug/L
BENZ	ND
TPHd	50

GEOTRACKER ID: T10000009398

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
164	Mike Fuller/Jeff Pitcock	Fuller Card Lock/Bay Counties CFN	533 Exchange Court and National Drive	Livermore	2A2	3B	ACEH	

CHEMICAL	CONCENTRATION ug/L
PET	

GEOTRACKER ID: T10000011486

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
212	GE Nuclear Energy	Vallecitos Nuclear Center	6705 Vallecitos Road	Sunol	3A3	8	RWQCB	

CHEMICAL	CONCENTRATION ug/L
RAD	
TDS	1,200
NO3	91

GEOTRACKER ID: T10000000620

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
232	Bordoni Ranch LLC and Green Valley Corporation Tenancy in Common	Groth Brothers Chevrolet	59 South L Street	Livermore	2A2	8	RWQCB	

CHEMICAL	CONCENTRATION ug/L
BENZ	46
MTBE	1,200
TPHg	61,000
PCE	3000

GEOTRACKER ID: SL0600147081

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
242	Alameda County Fairgrounds	Fairground Main Well (3S/1E 20B 2)	4501 Pleasanton Avenue	Pleasanton	1A1	1		The former American Cleaners is suspected to be the source for this site. Please refer to Geotracker T10000008240 for more information.

CHEMICAL	CONCENTRATION ug/L
PCE	16

GEOTRACKER ID: T10000008240

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
250	Murray Kelsoe	Sunol Tree Gas	3004 andrade Road	Sunol	1A1	7	RWQCB	

CHEMICAL	CONCENTRATION ug/L
TBA	23.3
TPHg	54.3
MTBE	94.5

GEOTRACKER ID: T0600114064

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
259	City of Livermore	CHEVRON #30-7233 /Mills Square Park/Performing Arts Theater	2259 First Street	Livermore	2C	8	ACEH	Lust case T0600196622 closed as of 2/6/2023. Lead case T10000010536 pending closure review.

CHEMICAL	CONCENTRATION ug/L
TPHg	3000
BENZ	0.5
TPHd	140

GEOTRACKER ID: T0600196622

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
284	Gabriel Chiu	Former Crow Canyon Dry Cleaner	7272 or 7242 San Ramon Road	Dublin	3C	5C	ACEH	

CHEMICAL	CONCENTRATION ug/L
TCE	3
PCE	22

GEOTRACKER ID: T06019764784

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
291	Country Club Cleaners	Perciva/Metro Valley Cleaners	224 Rickenbacker Circle	Livermore	3A2	5C	ACEH	

CHEMICAL	CONCENTRATION ug/L
PCE	4.9

GEOTRACKER ID: T06019748481

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
298	Chevron	Former Chevron Records Facility	6400 Sierra Court	Dublin	2B4	7	RWQCB	

CHEMICAL	CONCENTRATION ug/L
TCE	690
cis 1,2-DCE	1200
VC	20

GEOTRACKER ID: SL0600196603

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
299	TDW Construction	Nica Metals	101 Greenville Road	Livermore	3A2	3A	ACEH	

CHEMICAL	CONCENTRATION ug/L
GRO	unknown

GEOTRACKER ID: SLT19765274

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
302	Federal Corrections Institution Dublin	FCI Dublin	5701 8th Street	Dublin	3A1	3B	ACEH	

CHEMICAL	CONCENTRATION ug/L
TPHd	680,000

GEOTRACKER ID: SLT19749067

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
307	City of Pleasanton Public Works	City of Pleasanton Theater Parking Lot	0 Kottinger Drive	Pleasanton	3B1	5C	ACEH	

CHEMICAL	CONCENTRATION ug/L
TPHg	
TPHmo	

GEOTRACKER ID: T10000001164

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
308	Stockbridge/BHV Emerald Place Land Co	Green on Park Place	5411 Martinelli Way	Dublin	3B2	3B	ACEH	

GEOTRACKER ID: T10000005547

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
311	Crown Chevrolet	Aster Apartments/Crown Chevrolet Cadillac Isuzu	6775 Golden Gate Drive (formerly 7544 Dublin Boulevard)	Dublin	3A1	5R	ACEH	

CHEMICAL	CONCENTRATION ug/L
TPHg	4,900
TPHd	6,200
TPHmo	64
PCE	75
TCE	3.5

GEOTRACKER ID: T10000010517

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
312	Cemex	Cemex Sunol	6527 Calaveras Road	Sunol	3A1	1	ACEH	

GEOTRACKER ID: T10000003431

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
317	Walgreens	Walgreens Spill Sunol	9494 Koopman Road	Sunol	2C	8	ACEH	

CHEMICAL	CONCENTRATION ug/L
TPHd	349

GEOTRACKER ID: T10000006478

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
318	E&B Natural Resources Management Corporation	G.I.G Oil Production Facility	8467 Patterson Pass Road	Livermore	2A4	8	ACEH	

CHEMICAL	CONCENTRATION ug/L

GEOTRACKER ID: T10000007269

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
319	Johnson Drive Holdings I, LLC/Clorox Products Manufacturing	Former Clorox Site - Building 7	7200 - 7208 Johnson Drive	Pleasanton	2A2	5R	RWQCB	

GEOTRACKER ID: T10000007118

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
320	Ready Family Partnership, LP	Dublin Crossroads Center & Park Ave Cleaners	7100-7120 Dublin Boulevard	Dublin	2A4	5C	ACEH	

GEOTRACKER ID: T10000004783

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
322	Pacific Locomotive Association DBA Niles Canyon Railway	Niles Canyon Railway	9 Kilkare Road	Sunol	3B1	7	ACEH	

CHEMICAL	CONCENTRATION ug/L
PCE	36

GEOTRACKER ID: T10000006021

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
323	Stoll Main Street Trust	Former American Cleaners	555 Main Street	Pleasanton	1A4	3A	RWQCB	

CHEMICAL	CONCENTRATION ug/L
PCE	27,000
TCE	1,200
Cis 1,2 DCE	2,000

GEOTRACKER ID: T10000008240

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
324	MidPen Housing Corporation	Chestnut Square	1651 and 1665 Chestnut Street	Livermore	1A2	8	ACDEH	Cases T10000016233, T10000016234, and T10000007202.

CHEMICAL	CONCENTRATION ug/L
PCE	15
TPHd	130

GEOTRACKER ID: T10000007202

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
325	MidPen Housing Corporation	217 North N St	217 North N Street	Livermore	2A1	8	ACDEH	Cases T10000011094, SL0608152426 and T10000016944.

CHEMICAL	CONCENTRATION ug/L
PCE	13

GEOTRACKER ID: T10000011094

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
327	BMMR USA, Inc.	VIP Cleaners	1809 Santa Rita Road, Suite F	Pleasanton	2A2	7	RWQCB	

CHEMICAL	CONCENTRATION ug/L
PCE	140
TPHg	130

GEOTRACKER ID: T10000008254

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
329	Terrell Bates & Kimberly R Trust	Pleasanton French Laundry (Former)	560 Main Street	Pleasanton	2A4	3A	RWQCB	

CHEMICAL	CONCENTRATION ug/L
PCE	4.8

GEOTRACKER ID: T10000008241

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
330	FFHS Associates - Gateway, L.P. ; Margo Foster	City Cleaners	4855 Hopyard Road, Suite C	Pleasanton	2A4	5R	RWQCB	
GEOTRACKER ID:	T10000008237							
332	Renn Transportation	Renn Transportation Fuel Spill	I-680	Sunol	2A2	7	ACDEH	
GEOTRACKER ID:	T10000013696							
335	J Cleaners	J Cleaners	2093 Railroad Avenue	Livermore	1A2	3A	RWQCB	
GEOTRACKER ID:	T10000008401							

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
336	Old Train Depot	Old Train Depot	2009 Railroad Avenue	Livermore	1A2	5C	RWQCB	

CHEMICAL	CONCENTRATION ug/L
PCE	
TPHd	
TPHg	

GEOTRACKER ID: T10000016758

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
337	Pacific Avenue Cleaners	Pacific Avenue Cleaners	3018 Pacific Avenue	Livermore	1A2	5C	RWQCB	

CHEMICAL	CONCENTRATION ug/L
PCE	

GEOTRACKER ID: T10000008716

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
338	Quality Cleaners	Quality Cleaners	2048 First Street	Livermore	1A1	3A	RWQCB	

CHEMICAL	CONCENTRATION ug/L
PCE	3.05
TCE	
cis-1,2-DCE	
Vinyl Chloride	4.14
TPHd	
TPHmo	

GEOTRACKER ID: T10000014462

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
339	Sparklizing Cleaners	Sparklizing Cleaners	855 Rincon	Livermore	1A2	5C	RWQCB	https://geotracker.waterboards.ca.gov/profile_report?global_id=T10000008739
GEOTRACKER ID: T10000008739								
340	Arroyo Crossing	Arroyo Crossing	1364 Arroyo Road	Livermore	3A1	7	RWQCB	
GEOTRACKER ID: SL0600174278								
341	Warmington Homes - Hansen Hills	Warmington Homes - Hansen Hills	Silvergate Drive	Livermore	3A1	NR	RWQCB	
GEOTRACKER ID: SL18307727								

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES
342	Camp Parks	Camp Parks	0 Parks RFTA	Dublin	2A1	3A	ACEH	
GEOTRACKER ID: T06019796867								
343	Laguna Oaks Site	Laguna Oaks Site	3465 Old Foothill Road	Pleasanton	3A1	3B	RWQCB	
GEOTRACKER ID: T06019749061								
344	Pleasanton Assisted Living Facility	Pleasanton Assisted Living Facility	0 JUNIPERO ST & SUNOL	Pleasanton	3A2	3B	RWQCB	
GEOTRACKER ID: T06019724209								

Z7 ID	OWNER	SITE NAME	ADDRESS	CITY	PRIORITY	STATUS	LEAD AGENCY	NOTES

Z7 ID - corresponds to file number in TSS database and the location on site maps
OWNER - responsible party for the contamination investigation/cleanup
SITE NAME - indicates a site name if different from owner
PRIORITY - the first number of the priority code indicates whether the case is high priority (1), moderate priority (2), or low priority (3).
STATUS - the status code is based on the RWQCB ranking of the progress of a case (see below)
NOTES - highlights, cureent activites, or concerns at a site.

CASE STATUS CODES:
1 - Leak Confirmed
3A - Preliminary Site Assessment Workplan Submitted
3B - Preliminary Site Assessment Underway
5C - Pollution Characterization Underway
5R Remediation Workplan (Corrective Action Plan) Submitted
7 - Remediation Underway
8 - Post Remediation Monitoring Begun
CL - Case Closure
NR - Further investigation not required
ReO - Reopened

CONCENTRATION ug/L - the most recent concentration in groundwater in micrograms per liter (parts per billion)
CHEMICAL - the chemicals of concern at the site.

BENZ - benzene
CCl4 - carbon tetrachloride
Cr(VI) - hexavalent chromium
1,2-DCE - 1,2-dichloromethene
DRO - diesel range organics
GRO - gasoline range organics
MTBE - methyl tertiary-butyl ether
NO3 - nitrate
PCE - tetrachloroethene
TBA - tertiary-butyl alchohol
TCE - trichloroethene
TOLU - toluene
TPHd - total petroleum hydrocarbons diesel
TPHg - total petroleum hydrocarbons gasoline
TPHmo - total petroleum hydrocarbons motoroil
VC - vinyl chloride
XYL - xylenes

TABLE 12-2
MAIN BASIN SALT LOADING
2022 WATER YEAR

INFLOW COMPONENTS	SURFACE WATER			RECHARGED WATER			SALT LOAD
	Volume Applied (AF)	TDS Conc (mg/L)	% Recharged	Volume Recharged (AF)	TDS Conc (mg/L)	Salt Load (Tons)	(Tons per TAF of Rch)
NATURAL STREAM RECHARGE	**21,473**	**497**	**21%**	**4,582**	**497**	**3,096**	**680**
Arroyo Valle	**15,427**	**290**	**14%**	**2,137**	**290**	**842**	**390**
Arroyo Mocho	2,165	592	61%	**1,318**	**592**	**1,060**	**800**
Arroyo Las Positas	3,880	780	29%	**1,127**	**780**	**1,194**	**1,060**
ARROYO VALLE PRIOR RIGHTS	**11,866**	**260**	**2%**	**290**	**260**	**102**	**350**
ARTIFICIAL STREAM RECHARGE	**1,773**	**260**	**73%**	**1,301**	**260**	**460**	**350**
Arroyo Valle	1,773	260	73%	**1,301**	**260**	**460**	**350**
Arroyo Mocho	0	260	0%	**0**	**260**	**0**	**0**
Arroyo Las Positas	0	260	0%	**0**	**260**	**0**	**0**
INJECTION WELL RECHARGE	**-**	**-**	**-**	**0**	**0**	**0**	**0**
RAINFALL RECHARGE	**9,231**	**0**	**42%**	**3,884**	**0**	**0**	**0**
LAKE RECHARGE	-	-	-	*-56*	*473*	*-36*	*650*
LEAKAGE	**-**	**-**	**-**	**1,287**	**500**	**874**	**680**
APPLIED WATER RECHARGE	**17,218**	**441**	**13%**	**2,193**	**3,465**	**10,322**	**4,710**
Urban - Municipal	12,424	451	10%	1,278	4,387	7,618	5,960
Urban - Recycled Water	642	680	20%	128	3,398	593	4,620
Agricultural - Municipal (SBA)	3,329	317	20%	669	1,578	1,434	2,140
Agricultural - Groundwater	612	594	12%	75	4,839	494	6,580
Golf Courses - Groundwater	0	510	#DIV/0!	0	0	0	0
Golf Courses - Recycled Water	212	637	20%	42	3,187	183	4,330
SUBSURFACE BASIN INFLOW				**1,000**	**1,510**	**2,051**	**2,050**
TOTAL INFLOW				**14,538**	**856**	**16,905**	**1,160**

OUTFLOW COMPONENTS		WATER EXTRACTED			SALT REMOVED
		Volume Removed (AF)	TDS Conc (mg/L)	Salt Removed (Tons)	(Tons/TAF of Export)
MUNICIPAL PUMPAGE		**20,746**	**551**	**15,542**	**750**
Zone 7 Wells - Hop, Stone, COL		**8,794**	**565**	**6,749**	**770**
Zone 7 Wells - Mocho		**6,492**	**597**	**5,264**	**810**
Demin Salts Exported from Valley	*(subset of Zone 7 - Mocho)*	*2*	*2,609*	*6*	*3,750*
Other		**5,460**	**476**	**3,529**	**650**
AGRICULTURAL PUMPAGE (all salt is reapplied)		**752**	**594**	**607**	**810**
MINING USE		**4,498**	**69**	**420**	**90**
Stream Export		0	442	0	0
	Discharge to Cope	*0*	*473*	*0*	*0*
Evaporation		3,798	0	0	0
Processing Losses		700	442	420	600
GROUNDWATER BASIN OVERFLOW		**0**	**570**	**0**	**0**
TOTAL OUTFLOW		**25,995**	**469**	**16,569**	**640**

NET IN 2022 WY	**-11,457**	**-22**	**336**	

TABLE 12-3
HISTORICAL SALT LOADING (in tons)
1974 TO 2022 WATER YEARS

SALT INFLOW COMPONENTS	1974	1975	1976	1977	1978	1979	1980
NATURAL STREAM RECHARGE	**3,210**	**3,464**	**874**	**581**	**4,638**	**1,723**	**2,706**
Total Arroyo Valle	**1,018**	**1,041**	**391**	**315**	**957**	**707**	**777**
Flood releases recharge	100	344	0	0	216	0	128
Non Flood Natural Inflow	918	697	391	315	741	707	649
Arroyo Mocho	**1,717**	**2,043**	**293**	**76**	**3,206**	**636**	**1,358**
Arroyo Las Positas	**475**	**380**	**190**	**190**	**475**	**380**	**571**
AV PRIOR RIGHTS	**361**	**418**	**31**	**0**	**494**	**267**	**386**
ARTIFICIAL STREAM RECHARGE	**986**	**2,201**	**1,914**	**2,289**	**3,286**	**3,699**	**2,897**
Arroyo Valle	293	1,174	509	883	1,427	1,599	1,234
Arroyo Mocho	340	497	875	876	1,350	1,570	1,432
Arroyo Las Positas	353	530	530	530	509	530	231
INJECTION WELL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**
RAINFALL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake Recharge	*0*	*0*	*0*	*0*	*0*	*0*	*0*
LEAKAGE	**21**	**25**	**30**	**35**	**41**	**48**	**56**
APPLIED WATER RECHARGE	**7,670**	**7,218**	**9,123**	**10,675**	**8,352**	**8,304**	**7,175**
Urban - Municipal	3,359	3,508	3,457	4,607	3,858	3,434	3,115
Urban - Recycled Water	1,815	1,930	2,232	1,937	1,928	2,119	1,966
Agricultural - Municipal (SBA)	202	304	437	890	485	331	416
Agricultural - Groundwater	2,294	1,476	2,997	3,241	2,081	2,420	1,678
Golf Courses - Groundwater	0	0	0	0	0	0	0
Golf Courses - Recycled Water	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0
SUBSURFACE BASIN INFLOW	**2,038**	**2,038**	**2,058**	**3,648**	**2,506**	**2,017**	**1,325**
NET INFLOW	**14,286**	**15,364**	**14,030**	**17,228**	**19,317**	**16,058**	**14,545**

OUTFLOW COMPONENTS	1974	1975	1976	1977	1978	1979	1980
MUNICIPAL PUMPAGE	**-7,217**	**-6,577**	**-5,074**	**-4,382**	**-4,579**	**-5,351**	**-4,458**
Zone 7 Wells - Hop, Stone, COL	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Zone 7 Wells - Mocho	**-3,303**	**-2,057**	**-842**	**-201**	**-506**	**-532**	**-26**
Demin Salts Exported from Valley	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Other Pumpage	**-3,914**	**-4,520**	**-4,232**	**-4,181**	**-4,073**	**-4,819**	**-4,432**
AGRICULTURAL PUMPAGE	**-2,289**	**-1,476**	**-2,997**	**-3,241**	**-2,081**	**-2,420**	**-1,678**
MINING USE	**-1,126**	**-1,725**	**-802**	**-668**	**-869**	**-1,603**	**-2,508**
Stream Export	-745	-1,345	-422	-287	-489	-1,223	-2,127
Evaporation	0	0	0	0	0	0	0
Processing Losses	-380	-380	-380	-380	-380	-380	-380
GROUNDWATER BASIN OVERFLOW	**0**	**0**	**0**	**0**	**0**	**-173**	**-612**
NET OUTFLOW	**-10,632**	**-9,778**	**-8,873**	**-8,291**	**-7,529**	**-9,547**	**-9,256**

NET SALT INFLOW (Tons)	**3,654**	**5,586**	**5,157**	**8,937**	**11,788**	**6,511**	**5,289**
CUMULATIVE SALT INFLOW (Tons)*	**3,654**	**9,240**	**14,397**	**23,334**	**35,122**	**41,633**	**46,922**

TDS Concentration Calculations	1974	1975	1976	1977	1978	1979	1980
Net Basin Recharge (AF)	-478	5,508	-4,311	-5,953	11,942	6,394	8,103
Basin Storage (HI Method)(AF)	211,522	217,030	212,719	206,766	218,708	225,102	233,205
Total Salt in Main Basin (tons)	133,252	138,838	143,995	152,932	164,720	171,231	176,520
Main Basin TDS Concentration (mg/L)	**464**	**471**	**498**	**544**	**554**	**560**	**557**
Cumulative Increase in TDS Conc (mg/L)**	**14**	**21**	**48**	**94**	**104**	**110**	**107**

* Basinwide salt buildup since 1973

** Basinwide TDS concentration increase relative to 1973 value of 450 mg/L

TABLE 12-3
HISTORICAL SALT LOADING (in tons)
1974 TO 2022 WATER YEARS

SALT INFLOW COMPONENTS	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
NATURAL STREAM RECHARGE	**1,513**	**4,803**	**7,657**	**5,286**	**3,058**	**4,941**	**2,852**	**2,610**	**2,782**	**2,480**
Total Arroyo Valle	**579**	**1,048**	**1,433**	**936**	**375**	**779**	**232**	**372**	**187**	**206**
Flood releases recharge	0	271	624	20	0	415	0	0	0	0
Non Flood Natural Inflow	579	777	809	916	375	364	232	372	187	206
Arroyo Mocho	**478**	**2,614**	**4,626**	**2,508**	**932**	**2,269**	**458**	**490**	**440**	**233**
Arroyo Las Positas	**456**	**1,141**	**1,598**	**1,842**	**1,751**	**1,893**	**2,162**	**1,748**	**2,155**	**2,041**
AV PRIOR RIGHTS	**251**	**502**	**381**	**236**	**328**	**286**	**283**	**325**	**356**	**125**
ARTIFICIAL STREAM RECHARGE	**3,238**	**1,617**	**184**	**0**	**0**	**0**	**0**	**525**	**1,585**	**1,809**
Arroyo Valle	1,719	663	0	0	0	0	0	0	51	132
Arroyo Mocho	1,394	894	184	0	0	0	0	525	1,534	1,677
Arroyo Las Positas	125	60	0	0	0	0	0	0	0	0
INJECTION WELL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
RAINFALL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake Recharge	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
LEAKAGE	**65**	**74**	**84**	**94**	**105**	**115**	**125**	**136**	**147**	**158**
APPLIED WATER RECHARGE	**5,507**	**4,709**	**4,723**	**5,046**	**5,938**	**6,632**	**5,558**	**6,834**	**6,015**	**6,541**
Urban - Municipal	3,035	3,076	3,064	3,183	3,592	4,100	3,810	4,791	4,498	4,850
Urban - Recycled Water	400	322	375	410	413	386	316	402	334	339
Agricultural - Municipal (SBA)	519	427	332	438	512	718	434	598	367	445
Agricultural - Groundwater	1,553	884	952	1,015	1,421	1,428	998	1,043	816	907
Golf Courses - Groundwater	0	0	0	0	0	0	0	0	0	0
Golf Courses - Recycled Water	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0
SUBSURFACE BASIN INFLOW	**1,284**	**1,284**	**876**	**1,325**	**1,528**	**1,508**	**1,569**	**1,875**	**2,364**	**2,568**
NET INFLOW	**11,858**	**12,989**	**13,905**	**11,987**	**10,957**	**13,482**	**10,387**	**12,305**	**13,249**	**13,681**

OUTFLOW COMPONENTS	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
MUNICIPAL PUMPAGE	**-4,700**	**-4,748**	**-5,410**	**-5,525**	**-5,752**	**-6,465**	**-5,537**	**-6,662**	**-6,915**	**-7,185**
Zone 7 Wells - Hop, Stone, COL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-54**	**-441**
Zone 7 Wells - Mocho	**0**	**0**	**-17**	**-227**	**-863**	**-869**	**-326**	**-1,425**	**-2,082**	**-1,683**
Demin Salts Exported from Valley	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Other Pumpage	**-4,700**	**-4,748**	**-5,393**	**-5,298**	**-4,889**	**-5,595**	**-5,211**	**-5,237**	**-4,779**	**-5,062**
AGRICULTURAL PUMPAGE	**-1,553**	**-844**	**-912**	**-1,015**	**-1,378**	**-1,428**	**-998**	**-1,043**	**-776**	**-944**
MINING USE	**-4,372**	**-4,161**	**-7,834**	**-2,857**	**-2,814**	**-6,011**	**-839**	**-2,301**	**-1,728**	**-918**
Stream Export	-3,992	-3,781	-7,454	-2,476	-2,433	-5,535	-364	-1,825	-1,253	-443
Evaporation	0	0	0	0	0	0	0	0	0	0
Processing Losses	-380	-380	-380	-380	-380	-475	-475	-475	-475	-475
GROUNDWATER BASIN OVERFLOW	**-635**	**-2,494**	**-3,418**	**-2,587**	**-1,386**	**-693**	**-693**	**-462**	**-122**	**0**
NET OUTFLOW	**-11,260**	**-12,247**	**-17,574**	**-11,984**	**-11,330**	**-14,597**	**-8,067**	**-10,468**	**-9,541**	**-9,047**

NET SALT INFLOW (Tons)	**598**	**742**	**-3,669**	**3**	**-373**	**-1,115**	**2,320**	**1,837**	**3,708**	**4,634**
CUMULATIVE SALT INFLOW (Tons)*	**47,520**	**48,262**	**44,593**	**44,596**	**44,223**	**43,108**	**45,428**	**47,265**	**50,973**	**55,607**

TDS Concentration Calculations	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Net Basin Recharge (AF)	-528	11,593	9,192	-4,203	-9,722	-1,684	-7,906	-9,106	-4,973	-5,692
Basin Storage (HI Method)(AF)	232,677	244,270	253,462	249,259	239,537	237,853	229,947	220,841	215,868	210,176
Total Salt in Main Basin (tons)	177,118	177,860	174,191	174,194	173,821	172,706	175,026	176,863	180,571	185,205
Main Basin TDS Concentration (mg/L)	**560**	**536**	**506**	**514**	**534**	**535**	**560**	**590**	**616**	**649**
Cumulative Increase in TDS Conc (mg/L)**	**110**	**86**	**56**	**64**	**84**	**85**	**110**	**140**	**166**	**199**

* Basinwide salt buildup since 1973

** Basinwide TDS concentration increase relative to 1973 value of 450 mg/L

TABLE 12-3
HISTORICAL SALT LOADING (in tons)
1974 TO 2022 WATER YEARS

SALT INFLOW COMPONENTS	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NATURAL STREAM RECHARGE	**3,356**	**3,665**	**5,743**	**2,544**	**4,376**	**4,331**	**4,639**	**5,704**	**3,727**	**3,409**
Total Arroyo Valle	**575**	**743**	**1,083**	**300**	**1,034**	**400**	**1,450**	**1,661**	**1,361**	**956**
Flood releases recharge	98	0	528	0	472	336	183	524	0	55
Non Flood Natural Inflow	477	743	555	300	562	64	1,267	1,137	1,361	901
Arroyo Mocho	**1,023**	**814**	**2,174**	**995**	**1,580**	**2,627**	**1,741**	**2,292**	**996**	**857**
Arroyo Las Positas	**1,758**	**2,108**	**2,486**	**1,249**	**1,762**	**1,304**	**1,448**	**1,751**	**1,370**	**1,596**
AV PRIOR RIGHTS	**290**	**151**	**276**	**321**	**306**	**87**	**93**	**188**	**149**	**175**
ARTIFICIAL STREAM RECHARGE	**1,590**	**410**	**1,953**	**2,795**	**1,026**	**491**	**1,325**	**500**	**1,352**	**2,276**
Arroyo Valle	36	185	385	293	49	31	472	107	321	242
Arroyo Mocho	1,554	225	1,568	2,502	977	460	853	393	1,031	2,034
Arroyo Las Positas	0	0	0	0	0	0	0	0	0	0
INJECTION WELL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**204**	**497**	**498**
RAINFALL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake Recharge	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
LEAKAGE	**169**	**181**	**193**	**206**	**220**	**234**	**248**	**263**	**279**	**294**
APPLIED WATER RECHARGE	**6,918**	**5,793**	**5,109**	**4,989**	**3,323**	**4,071**	**4,887**	**4,367**	**3,479**	**4,314**
Urban - Municipal	6,023	4,884	4,370	4,221	2,700	3,207	3,927	3,744	2,841	3,489
Urban - Recycled Water	162	368	363	392	352	460	385	274	40	83
Agricultural - Municipal (SBA)	370	311	234	246	183	274	420	280	241	302
Agricultural - Groundwater	363	230	142	130	88	130	155	69	34	54
Golf Courses - Groundwater	0	0	0	0	0	0	0	0	102	123
Golf Courses - Recycled Water	0	0	0	0	0	0	0	0	221	263
Others	0	0	0	0	0	0	0	0	0	0
SUBSURFACE BASIN INFLOW	**3,423**	**3,199**	**2,710**	**2,221**	**2,017**	**1,875**	**1,386**	**1,651**	**1,528**	**1,846**
NET INFLOW	**15,746**	**13,399**	**15,984**	**13,076**	**11,268**	**11,089**	**12,578**	**12,877**	**11,011**	**12,812**

OUTFLOW COMPONENTS	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
MUNICIPAL PUMPAGE	**-11,014**	**-8,752**	**-6,072**	**-3,867**	**-2,681**	**-3,874**	**-5,192**	**-6,468**	**-6,101**	**-8,560**
Zone 7 Wells - Hop, Stone, COL	**-1,679**	**-1,185**	**-859**	**-85**	**-87**	**-754**	**-270**	**-475**	**-2,362**	**-2,553**
Zone 7 Wells - Mocho	**-3,313**	**-2,111**	**-609**	**-24**	**-125**	**-767**	**-682**	**-397**	**-167**	**-783**
Demin Salts Exported from Valley	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Other Pumpage	**-6,023**	**-5,455**	**-4,604**	**-3,757**	**-2,469**	**-2,353**	**-4,240**	**-5,596**	**-3,572**	**-5,224**
AGRICULTURAL PUMPAGE	**-249**	**-236**	**-142**	**-130**	**-88**	**-130**	**-155**	**-47**	**-46**	**-188**
MINING USE	**-970**	**-1,007**	**-2,134**	**-4,928**	**-6,883**	**-7,507**	**-9,983**	**-9,588**	**-8,642**	**-5,792**
Stream Export	-495	-532	-1,658	-4,453	-6,408	-7,041	-9,460	-9,084	-8,081	-5,316
Evaporation	0	0	0	0	0	0	0	0	0	0
Processing Losses	-475	-475	-475	-475	-475	-466	-523	-504	-561	-475
GROUNDWATER BASIN OVERFLOW	**0**	**0**	**0**	**0**	**-226**	**-968**	**-960**	**-998**	**-482**	**-175**
NET OUTFLOW	**-12,233**	**-9,995**	**-8,348**	**-8,925**	**-9,878**	**-12,479**	**-16,290**	**-17,101**	**-15,271**	**-14,715**

NET SALT INFLOW (Tons)	**3,513**	**3,404**	**7,636**	**4,151**	**1,390**	**-1,390**	**-3,712**	**-4,224**	**-4,260**	**-1,903**
CUMULATIVE SALT INFLOW (Tons)*	**59,120**	**62,524**	**70,160**	**74,311**	**75,701**	**74,311**	**70,599**	**66,375**	**62,115**	**60,212**

TDS Concentration Calculations	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Net Basin Recharge (AF)	-8,389	-6,628	14,974	592	13,031	1,873	-1,390	2,511	-4,911	-3,674
Basin Storage (HI Method)(AF)	201,787	195,159	210,133	210,725	223,756	225,629	224,239	226,750	221,839	218,165
Total Salt in Main Basin (tons)	188,718	192,122	199,758	203,909	205,299	203,909	200,197	195,973	191,713	189,810
Main Basin TDS Concentration (mg/L)	**688**	**725**	**700**	**712**	**675**	**665**	**657**	**636**	**636**	**640**
Cumulative Increase in TDS Conc (mg/L)**	**238**	**275**	**250**	**262**	**225**	**215**	**207**	**186**	**186**	**190**

* Basinwide salt buildup since 1973

** Basinwide TDS concentration increase relative to 1973 value of 450 mg/L

TABLE 12-3
HISTORICAL SALT LOADING (in tons)
1974 TO 2022 WATER YEARS

SALT INFLOW COMPONENTS	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
NATURAL STREAM RECHARGE	**3,666**	**3,267**	**7,097**	**3,105**	**5,796**	**4,962**	**3,260**	**4,078**	**4,367**	**5,080**
Total Arroyo Valle	**1,823**	**1,399**	**2,833**	**1,081**	**3,652**	**2,274**	**1,450**	**2,691**	**2,554**	**2,974**
Flood releases recharge	0	193	302	0	731	0	0	327	0	1,383
Non Flood Natural Inflow	1,823	1,206	2,531	1,081	2,921	2,274	1,450	2,364	2,554	1,591
Arroyo Mocho	**575**	**886**	**2,996**	**838**	**1,241**	**1,813**	**839**	**380**	**540**	**1,211**
Arroyo Las Positas	**1,268**	**982**	**1,268**	**1,186**	**903**	**875**	**971**	**1,007**	**1,273**	**895**
AV PRIOR RIGHTS	**224**	**399**	**416**	**383**	**80**	**524**	**219**	**100**	**407**	**0**
ARTIFICIAL STREAM RECHARGE	**1,351**	**3,503**	**2,811**	**2,480**	**1,949**	**1,266**	**1,359**	**727**	**1,248**	**1,690**
Arroyo Valle	501	647	399	476	619	330	782	727	686	635
Arroyo Mocho	839	2,855	2,412	2,004	1,300	914	577	0	562	1,055
Arroyo Las Positas	11	1	0	0	30	22	0	0	0	0
INJECTION WELL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
RAINFALL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake Recharge	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
LEAKAGE	**313**	**333**	**352**	**372**	**393**	**414**	**436**	**458**	**481**	**504**
APPLIED WATER RECHARGE	**5,074**	**5,606**	**4,618**	**5,090**	**4,824**	**3,223**	**5,157**	**6,258**	**6,152**	**5,079**
Urban - Municipal	4,217	4,559	3,884	4,217	4,142	2,501	4,337	5,208	5,060	3,975
Urban - Recycled Water	79	136	44	60	40	107	96	30	202	327
Agricultural - Municipal (SBA)	308	378	294	300	293	249	230	474	416	323
Agricultural - Groundwater	49	53	54	57	42	42	42	46	45	45
Golf Courses - Groundwater	137	147	139	140	154	84	163	188	172	160
Golf Courses - Recycled Water	284	333	203	316	153	240	289	312	257	249
Others	0	0	0	0	0	0	0	0	0	0
SUBSURFACE BASIN INFLOW	**1,970**	**1,970**	**1,970**	**1,970**	**2,513**	**2,309**	**2,174**	**2,214**	**2,106**	**1,997**
NET INFLOW	**12,598**	**15,078**	**17,264**	**13,400**	**15,555**	**12,698**	**12,605**	**13,835**	**14,761**	**14,350**

OUTFLOW COMPONENTS	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
MUNICIPAL PUMPAGE	**-10,467**	**-12,061**	**-11,096**	**-12,419**	**-10,057**	**-5,557**	**-8,423**	**-9,271**	**-14,577**	**-12,609**
Zone 7 Wells - Hop, Stone, COL	**-3,867**	**-3,690**	**-3,360**	**-4,198**	**-1,858**	**-1,382**	**-1,340**	**-3,217**	**-3,920**	**-1,290**
Zone 7 Wells - Mocho	**-1,745**	**-3,322**	**-2,271**	**-3,762**	**-3,003**	**-1,170**	**-1,976**	**-1,402**	**-5,448**	**-6,563**
Demin Salts Exported from Valley	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*-798*	*2,759*
Other Pumpage	**-4,855**	**-5,049**	**-5,465**	**-4,459**	**-5,196**	**-3,005**	**-5,107**	**-4,651**	**-5,208**	**-4,756**
AGRICULTURAL PUMPAGE	**-182**	**-94**	**-73**	**-79**	**-80**	**-46**	**-43**	**-68**	**-68**	**-73**
MINING USE	**-4,520**	**-475**	**-276**	**-438**	**-454**	**-658**	**-584**	**-714**	**-1,341**	**-1,428**
Stream Export	-4,006	-111	0	-84	-94	-218	-274	-305	-913	-1,057
Evaporation	0	0	0	0	0	0	0	0	0	0
Processing Losses	-514	-364	-276	-354	-360	-440	-310	-409	-428	-371
GROUNDWATER BASIN OVERFLOW	**0**	**0**	**0**	**0**	**0**	**0**	**-738**	**-1,080**	**-171**	**0**
NET OUTFLOW	**-15,169**	**-12,630**	**-11,445**	**-12,936**	**-10,591**	**-6,261**	**-9,788**	**-11,133**	**-16,157**	**-14,110**

NET SALT INFLOW (Tons)	**-2,571**	**2,448**	**5,819**	**464**	**4,964**	**6,437**	**2,817**	**2,702**	**-1,396**	**240**
CUMULATIVE SALT INFLOW (Tons)*	**57,641**	**60,089**	**65,908**	**66,372**	**71,336**	**77,773**	**80,590**	**83,292**	**81,896**	**82,136**

TDS Concentration Calculations	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Net Basin Recharge (AF)	-11,666	62	8,309	-4,560	13,193	8,790	-3,639	-3,011	-4,997	4,290
Basin Storage (HI Method)(AF)	206,499	206,561	214,870	210,310	223,503	232,293	228,654	225,643	220,646	224,936
Total Salt in Main Basin (tons)	187,239	189,687	195,506	195,970	200,934	207,371	210,188	212,890	211,494	211,734
Main Basin TDS Concentration (mg/L)	**667**	**676**	**670**	**686**	**662**	**657**	**677**	**695**	**706**	**693**
Cumulative Increase in TDS Conc (mg/L)**	**217**	**226**	**220**	**236**	**212**	**207**	**227**	**245**	**256**	**243**

* Basinwide salt buildup since 1973

** Basinwide TDS concentration increase relative to 1973 value of 450 mg/L

TABLE 12-3
HISTORICAL SALT LOADING (in tons)
1974 TO 2022 WATER YEARS

SALT INFLOW COMPONENTS	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NATURAL STREAM RECHARGE	**5,459**	**2,026**	**2,242**	**1,820**	**3,735**	**3,366**	**4,948**	**1,315**	**3,499**	**1,952**
Total Arroyo Valle	**3,039**	**553**	**963**	**356**	**1,664**	**1,620**	**2,392**	**249**	**1,153**	**285**
Flood releases recharge	150	0	0	0	0	0	404	0	16	0
Non Flood Natural Inflow	2,889	553	963	356	1,664	1,620	1,988	249	1,137	285
Arroyo Mocho	**2,056**	**949**	**751**	**973**	**1,472**	**945**	**1,882**	**430**	**1,648**	**834**
Arroyo Las Positas	**364**	**524**	**528**	**491**	**599**	**801**	**674**	**636**	**698**	**833**
AV PRIOR RIGHTS	**384**	**196**	**409**	**3**	**395**	**288**	**91**	**208**	**249**	**249**
ARTIFICIAL STREAM RECHARGE	**882**	**2,851**	**2,519**	**1,483**	**1,689**	**2,571**	**2,046**	**1,494**	**558**	**675**
Arroyo Valle	167	1,178	573	339	1,667	1,299	667	924	442	556
Arroyo Mocho	698	1,649	1,943	1,120	0	1,272	1,379	570	116	119
Arroyo Las Positas	17	24	3	24	22	0	0	0	0	0
INJECTION WELL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
RAINFALL RECHARGE	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lake Recharge	*0*	*0*	*0*	*1,603*	*2,736*	*3,641*	*6,743*	*8,295*	*6,864*	*3,979*
LEAKAGE	**527**	**551**	**403**	**600**	**625**	**651**	**677**	**703**	**778**	**821**
APPLIED WATER RECHARGE	**4,295**	**6,074**	**8,158**	**5,654**	**6,505**	**6,810**	**5,023**	**6,675**	**7,016**	**8,357**
Urban - Municipal	3,107	4,625	6,457	3,685	3,969	4,285	3,361	4,633	4,973	5,811
Urban - Recycled Water	542	588	291	778	1,251	721	535	397	536	631
Agricultural - Municipal (SBA)	240	414	945	495	556	1,092	498	966	798	1,165
Agricultural - Groundwater	50	57	27	244	250	448	411	433	492	504
Golf Courses - Groundwater	113	131	184	181	183	0	0	0	0	0
Golf Courses - Recycled Water	243	259	254	271	296	264	218	246	217	246
Others	0	0	0	0	0	0	0	0	0	0
SUBSURFACE BASIN INFLOW	**2,024**	**2,092**	**448**	**1,834**	**2,051**	**2,078**	**2,106**	**2,078**	**2,187**	**2,201**
NET INFLOW	**13,571**	**13,790**	**14,179**	**11,394**	**15,000**	**15,764**	**14,891**	**12,473**	**14,287**	**14,255**

OUTFLOW COMPONENTS	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
MUNICIPAL PUMPAGE	**-9,873**	**-16,765**	**-12,781**	**-11,831**	**-6,080**	**-6,194**	**-7,635**	**-8,700**	**-10,427**	**-12,388**
Zone 7 Wells - Hop, Stone, COL	**-1,197**	**-2,785**	**-3,595**	**-2,639**	**-870**	**-750**	**-1,107**	**-1,938**	**-1,982**	**-4,441**
Zone 7 Wells - Mocho	**-4,040**	**-8,204**	**-3,997**	**-3,713**	**-1,080**	**-666**	**-2,200**	**-2,642**	**-4,895**	**-4,890**
Demin Salts Exported from Valley	*2,006*	*4,064*	*2,479*	*1,047*	*76*	*183*	*949*	*1,168*	*1,869*	*1,231*
Other Pumpage	**-4,625**	**-5,766**	**-5,179**	**-5,583**	**-4,128**	**-4,779**	**-4,326**	**-4,120**	**-3,549**	**-3,057**
AGRICULTURAL PUMPAGE	**-68**	**-77**	**-393**	**-515**	**-490**	**-550**	**-505**	**-532**	**-605**	**-619**
MINING USE	**-2,756**	**-3,064**	**-3,042**	**-502**	**-417**	**-378**	**-364**	**-388**	**-368**	**-363**
Stream Export	-2,368	-2,665	-2,655	-442	0	0	0	0	0	0
Evaporation	0	0	0	0	0	0	0	0	0	0
Processing Losses	-388	-399	-387	-364	-417	-378	-364	-388	-372	-363
GROUNDWATER BASIN OVERFLOW	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-506**	**-758**	**-113**
NET OUTFLOW	**-12,697**	**-19,906**	**-16,216**	**-12,848**	**-6,987**	**-7,122**	**-8,504**	**-10,126**	**-12,158**	**-13,483**

NET SALT INFLOW (Tons)	**874**	**-6,116**	**-2,037**	**-1,454**	**8,013**	**8,642**	**6,387**	**2,347**	**2,129**	**772**
CUMULATIVE SALT INFLOW (Tons)*	**83,010**	**76,894**	**74,857**	**73,403**	**81,416**	**90,058**	**96,445**	**98,792**	**100,921**	**101,693**

TDS Concentration Calculations	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Net Basin Recharge (AF)	6,893	-10,438	-5,542	-12,153	6,037	15,561	23,999	487	3,394	-8,034
Basin Storage (HI Method)(AF)	231,829	221,391	215,849	203,696	209,733	225,294	249,293	249,780	253,174	245,140
Total Salt in Main Basin (tons)	212,608	206,492	204,455	203,001	211,014	219,656	226,043	228,390	230,519	231,291
Main Basin TDS Concentration (mg/L)	**675**	**687**	**697**	**734**	**741**	**718**	**667**	**673**	**670**	**695**
Cumulative Increase in TDS Conc (mg/L)**	**225**	**237**	**247**	**284**	**291**	**268**	**217**	**223**	**220**	**245**

* Basinwide salt buildup since 1973

** Basinwide TDS concentration increase relative to 1973 value of 450 mg/L

TABLE 12-3
HISTORICAL SALT LOADING (in tons)
1974 TO 2022 WATER YEARS

SALT INFLOW COMPONENTS	2021	2022	AVG	TOTAL
NATURAL STREAM RECHARGE	**1,599**	**3,095**	**3,600**	**176,406**
Total Arroyo Valle	**273**	**841**	**1,164**	**57,035**
Flood releases recharge	0	208	164	8,028
Non Flood Natural Inflow	273	633	1,000	49,007
Arroyo Mocho	**391**	**1,060**	**1,310**	**64,186**
Arroyo Las Positas	**935**	**1,194**	**1,126**	**55,185**
AV PRIOR RIGHTS	**168**	**102**	**256**	**12,560**
ARTIFICIAL STREAM RECHARGE	**87**	**460**	**1,544**	**75,647**
Arroyo Valle	87	460	530	25,966
Arroyo Mocho	0	0	941	46,129
Arroyo Las Positas	0	0	72	3,552
INJECTION WELL RECHARGE	**0**	**0**	**24**	**1,199**
RAINFALL RECHARGE	**0**	**0**	**0**	**0**
Lake Recharge	*299*	*-36*	*696*	*34,124*
LEAKAGE	**848**	**874**	**322**	**15,760**
APPLIED WATER RECHARGE	**9,479**	**10,322**	**6,096**	**298,719**
Urban - Municipal	6,704	7,618	4,165	204,071
Urban - Recycled Water	672	593	595	29,159
Agricultural - Municipal (SBA)	1,288	1,434	487	23,872
Agricultural - Groundwater	520	494	674	33,004
Golf Courses - Groundwater	0	0	51	2,501
Golf Courses - Recycled Water	295	183	125	6,112
Others	0	0		
SUBSURFACE BASIN INFLOW	**2,119**	**2,051**	**2,003**	**98,129**
NET INFLOW	**14,300**	**16,904**	**13,845**	**678,420**

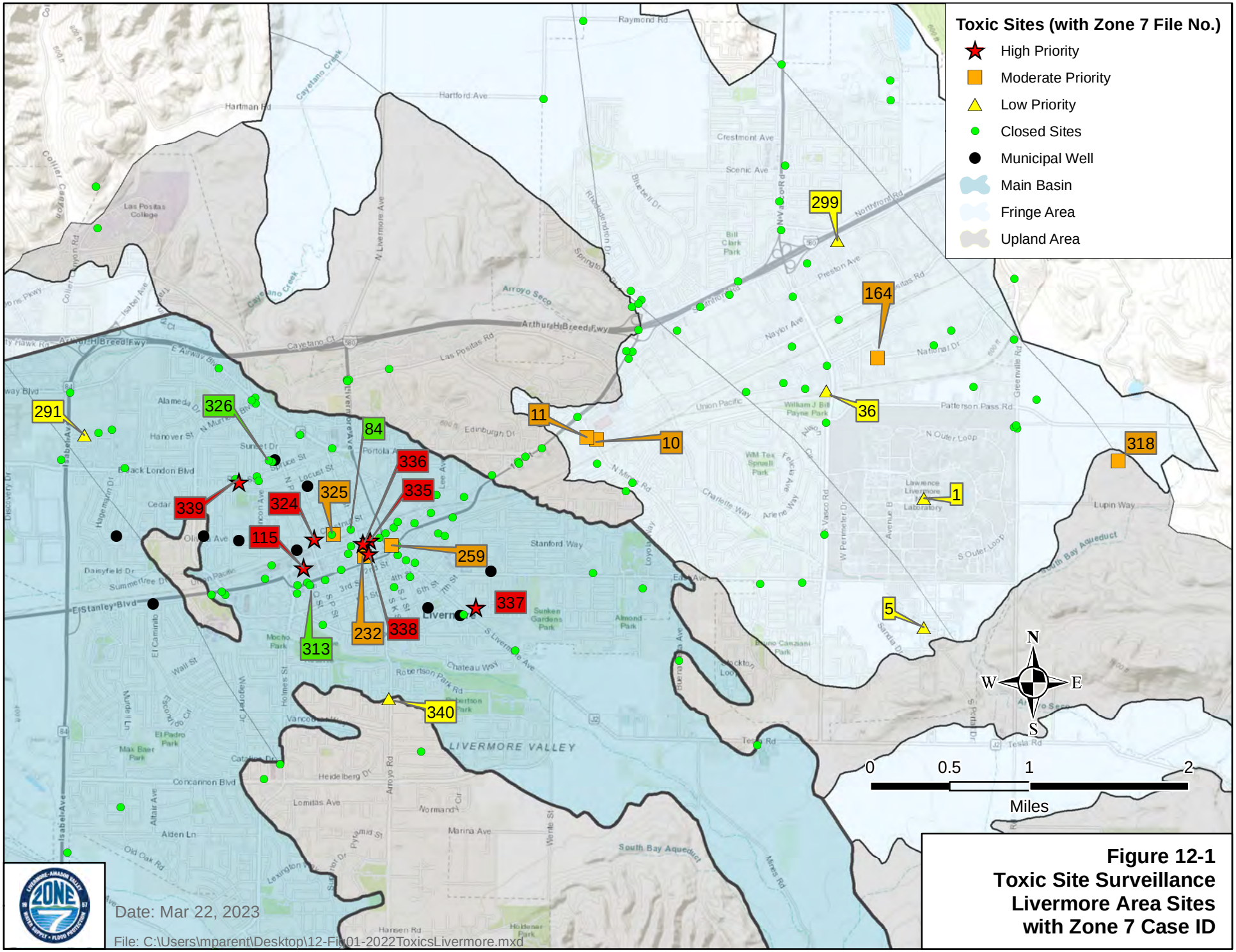
OUTFLOW COMPONENTS	2021	2022	AVERAGE	TOTAL
MUNICIPAL PUMPAGE	**-17,856**	**-15,542**	**-10,734**	**-372,498**
Zone 7 Wells - Hop, Stone, COL	**-6,420**	**-6,749**	**-2,813**	**-67,509**
Zone 7 Wells - Mocho	**-6,961**	**-5,264**	**-3,325**	**-79,799**
Demin Salts Exported from Valley	*449*	*6*	*357*	*17,488*
Other Pumpage	**-4,475**	**-3,529**	**-4,596**	**-225,190**
AGRICULTURAL PUMPAGE	**-639**	**-607**	**-712**	**-34,891**
MINING USE	**-409**	**-420**	**-3,297**	**-161,539**
Stream Export	0	0	-2,121	-103,914
Evaporation	0	0	0	0
Processing Losses	-409	-420	-415	-20,314
GROUNDWATER BASIN OVERFLOW	**0**	**0**	**-417**	**-20,450**
NET OUTFLOW	**-18,904**	**-16,569**	**-11,857**	**-580,996**

NET SALT INFLOW (Tons)	**-4,604**	**335**	**1,988**	**97,424**
CUMULATIVE SALT INFLOW (Tons)*	**97,089**	**97,424**		

TDS Concentration Calculations	2021	2022
Net Basin Recharge (AF)	-18,865	-11,395
Basin Storage (HI Method)(AF)	226,275	214,880
Total Salt in Main Basin (tons)	226,687	227,022
Main Basin TDS Concentration (mg/L)	**737**	**778**
Cumulative Increase in TDS Conc (mg/L)**	**287**	**328**

* Basinwide salt buildup since 1973

** Basinwide TDS concentration increase relative to 1973 value of 450 mg/L



Date: Mar 22, 2023

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Figure 12-1
Toxic Site Surveillance
Livermore Area Sites
with Zone 7 Case ID

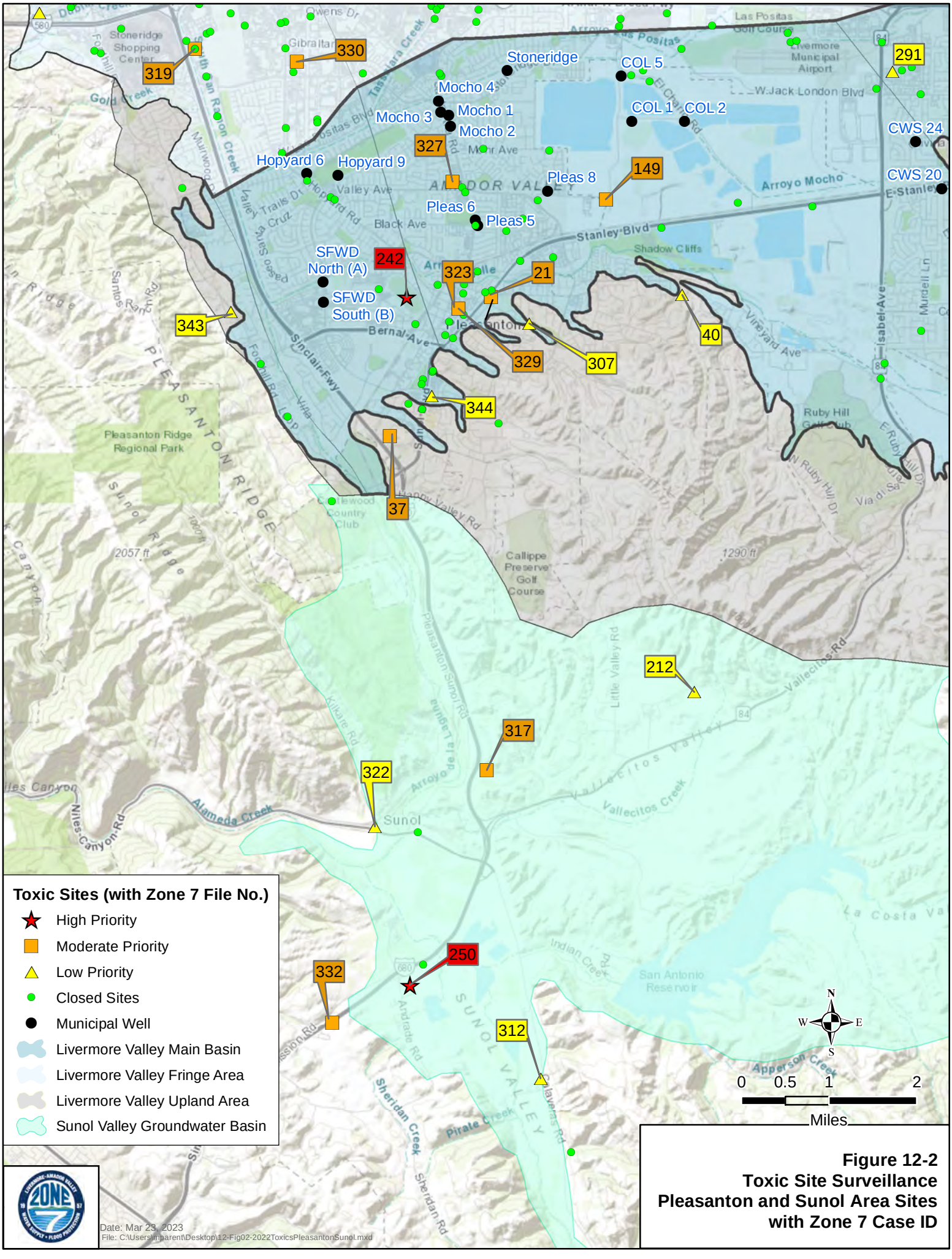
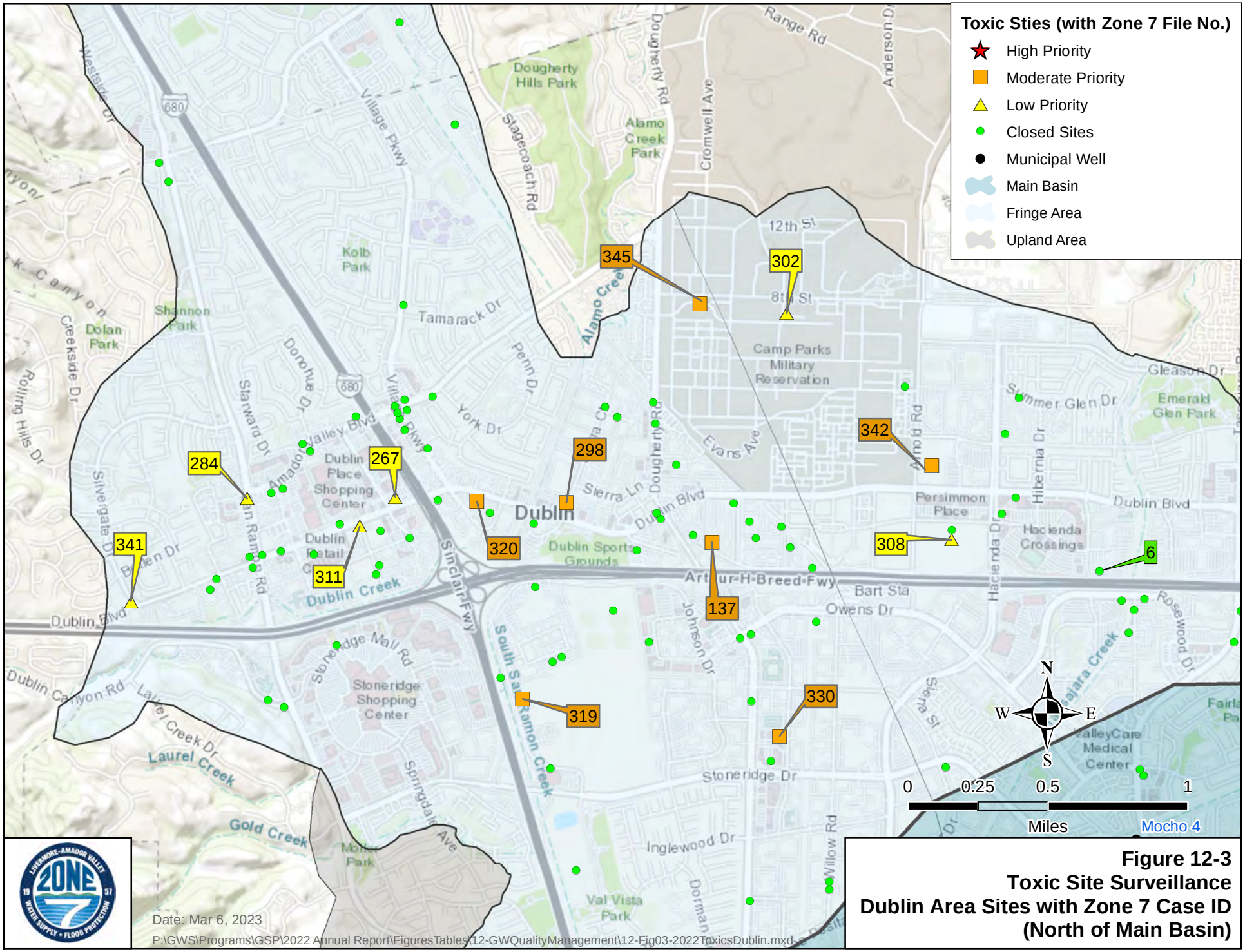


Figure 12-2
Toxic Site Surveillance
Pleasanton and Sunol Area Sites
with Zone 7 Case ID

Date: Mar 23, 2023
File: C:\Users\mparent\Desktop\12-Fig02-2022ToxicsPleasantonSunol.mxd



Date: Mar 6, 2023

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Figure 12-3
Toxic Site Surveillance
Dublin Area Sites with Zone 7 Case ID
(North of Main Basin)

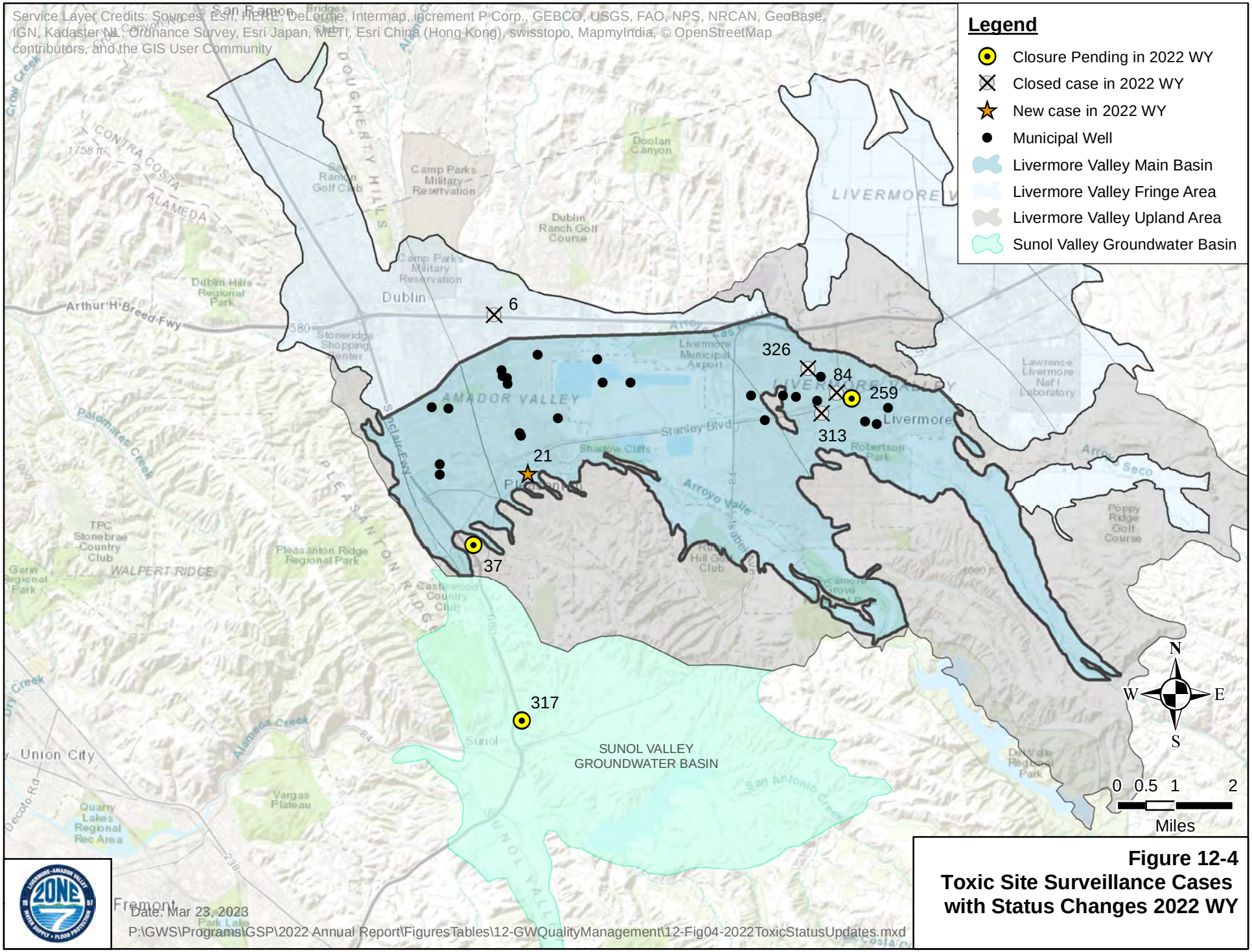

Figure 12-4
Toxic Site Surveillance Cases with Status Changes 2022 WY

Date: Mar 23, 2023
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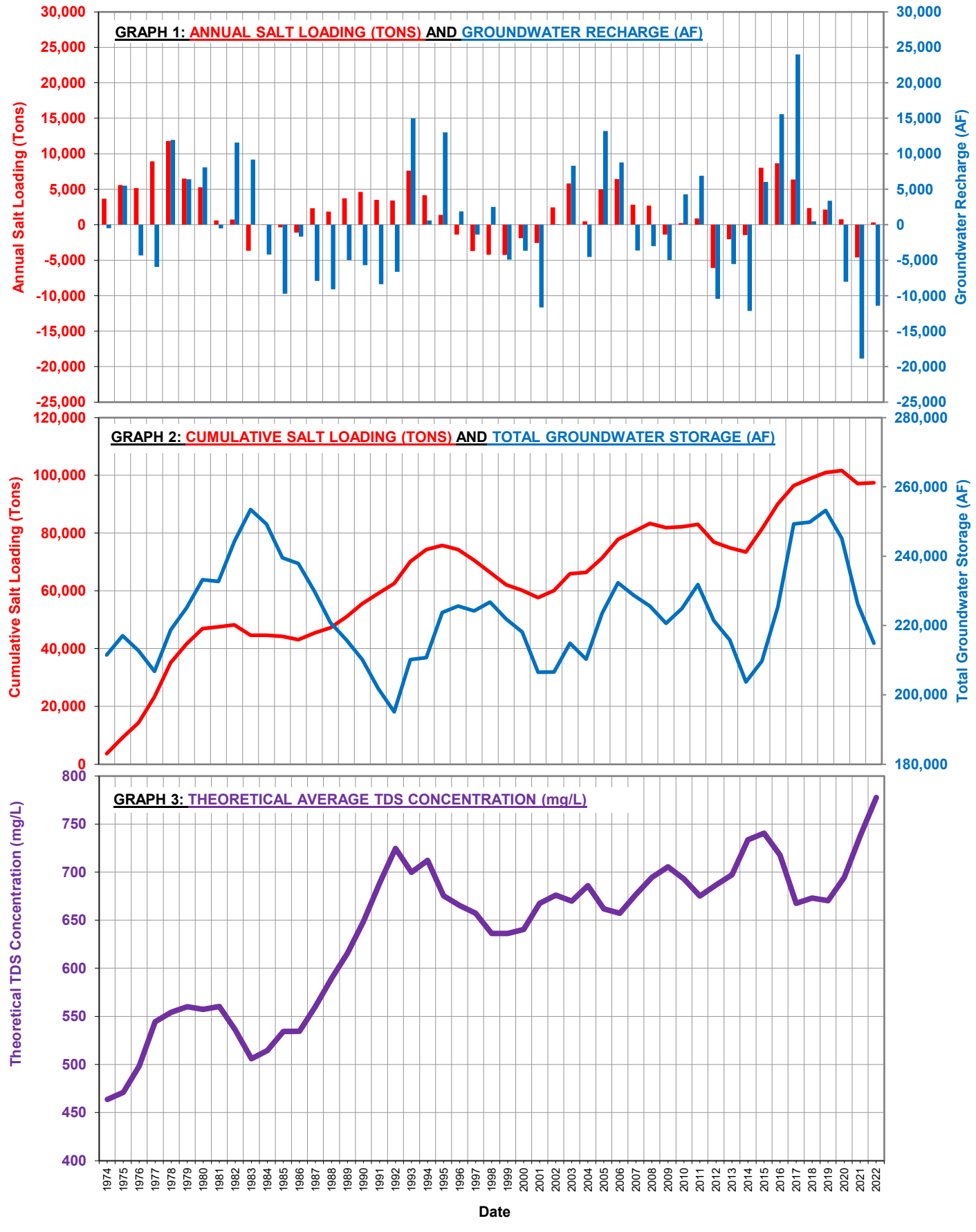
FIGURE 12-5
MAIN BASIN SALT LOADING AND TDS CONCENTRATION
1974 to 2022 WATER YEARS



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