Arroyo Santa Rosa Valley Groundwater Basin

Annual Report Water Years 2022 and 2023

April 2024

Prepared for

Fox Canyon Groundwater Management Agency and
Arroyo Santa Rosa Basin Groundwater Sustainability Agency

FOX CANYON GROUNDWATER MANAGEMENT AGENCY EST. 1982

ASRGSA Arroyo Santa Rosa Basin Groundwater Sustainability Agency

Arroyo Santa Rosa Valley Groundwater Basin

Annual Report Water Years 2022 and 2023

Prepared for

Fox Canyon Groundwater Management Agency and
Arroyo Santa Rosa Basin Groundwater Sustainability Agency

Prepared by

Bondy Groundwater Consulting, Inc.

PROFESSIONAL GEOLOGIST BRYAN TODD BONDY No. 7676 STATE OF CALIFORNIA

CERTIFIED HYDROGEOLOGIST BRYAN TODD BONDY No. 821 STATE OF CALIFORNIA

Bryan Bondy, PG, CHG
Project Manager

and

INTERA Incorporated

PROFESSIONAL GEOLOGIST STEVEN HUMPHREY No. 10024 STATE OF CALIFORNIA

Steven Humphrey, PG
Senior Hydrogeologist

Executive Summary

> **§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.***

The Arroyo Santa Rosa Basin Groundwater Sustainability Agency (ASRGSA) and Fox Canyon Groundwater Management Agency (FCGMA) (the GSAs) adopted the Groundwater Sustainability Plan (GSP) for the Arroyo Santa Rosa Valley Groundwater Basin (ASRVGB, or Basin) on May 25, 2023, and this is the first Annual Report in compliance with California Code of Regulations §356.2. The GSP included data collected within the Basin through water year 2021; therefore, this Annual Report includes data collected during water years 2022 and 2023.

Water year types for 2022 and 2023 were determined to be critical and wet, respectively, based on precipitation data. Basin-wide measured groundwater levels generally increased in water years 2022 and 2023, due to the decrease in pumping and increase in precipitation in the Basin compared to historical data. Groundwater level trends for individual wells in 2022 and 2023 were generally upward, except for two monitoring wells. Groundwater quality generally remained stable for water years 2022 and 2023, compared to historical data.

Extraction rates via pumping for water years 2022 and 2023 were lower than the historical average primarily due to Camrosa Water District wells being inactive. Change in storage for the Basin was calculated using the updated numerical groundwater model of the Basin and increased for both water years 2022 and 2023. Total water use within the Basin by agricultural, municipal, and domestic users is sourced from groundwater and imported water from outside of the Basin. Estimated total water use in the Basin for water years 2022 and 2023 were 4,845 acre-feet per year (AF/yr) and 4,125 AF/yr, respectively.

GSP implementation is evaluated through comparing monitoring data to Sustainable Management Criteria (SMC) for each applicable sustainability indicator: chronic lowering of groundwater levels, reduction of groundwater storage, land subsidence, degraded water quality, and depletion of interconnected surface water. Groundwater levels measured in water years 2022 and 2023 were compared to SMC established for chronic lowering of groundwater levels, reduction of groundwater storage (which has groundwater levels as a proxy), and land subsidence (which has groundwater levels as a proxy) sustainability indicators, and no monitoring wells exceeded the minimum threshold in water years 2022 and 2023. For the degraded water quality sustainability indicator, all analyzed constituents met measurable objectives for water years 2022 and 2023. For the depletion of interconnected surface water sustainability indicator, modeled depletion results indicate the measurable objective was met for water years 2022 and 2023.

Progress for two GSP projects described in the GSP (ASRGSA and FCGMA, 2023) included ongoing feasibility studies for the installation of desalter wells and recharge basins.

Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

AFY	acre-feet per year
ASRGSA	Arroyo Santa Rosa Basin Groundwater Sustainability Agency
ASRVGB	Arroyo Santa Rosa Valley Groundwater Basin
Basin	Arroyo Santa Rosa Valley Groundwater Basin
Camrosa	Camrosa Water District
CCWTMP	Calleguas Creek Watershed TMDL Compliance Monitoring Program
cfs	cubic feet per second
CMWD	Calleguas Municipal Water District
DMS	Data Management System
DWR	Department of Water Resources
FCGMA	Fox Canyon Groundwater Management Agency
ft	feet
GSAs	Arroyo Santa Rosa Basin Groundwater Sustainability Agency and the Fox Canyon Groundwater Management Agency
GSP	Groundwater Sustainability Plan
InSAR	interferometric synthetic aperture radar
ISW	interconnected surface water
M&I	Municipal and Industrial
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
RWQCB	Regional Water Quality Control Board
SGMA	Sustainable Groundwater Management Act
SMC	sustainable management criteria
TCP	1,2,3-trichloropropane
TDS	total dissolved solids
VCWPD	Ventura County Watershed Protection District
WQO	Water Quality Objective
WWTP	Wastewater Treatment Plant

1.0 Introduction [§356.2(a)]

§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.

This document is the first Annual Report for the Arroyo Santa Rosa Valley Groundwater Basin (Department of Water Resources [DWR] Basin No. 4-007; referred to herein as ASRVGB or Basin), fulfilling requirements set forth by the Sustainable Groundwater Management Act (SGMA) Groundwater Sustainability Plan (GSP) Regulation Code §356.2. The GSP was adopted by the Arroyo Santa Rosa Basin Groundwater Sustainability Agency (ASRGSA) and the Fox Canyon Groundwater Management Agency (FCGMA) (collectively referred to as the GSAs) on May 25, 2023. The GSP reports data through water year 2021 (ending September 30, 2021) for the Basin. This Annual Report presents data and information for water years 2022 and 2023 for the Basin. The numerical groundwater model developed for the GSP was updated for this Annual Report to simulate water years 2022 and 2023 and was used to calculate groundwater flow directions, groundwater extraction, change in groundwater in storage, and streamflow depletion for the Basin.

To track progress of the GSP implementation, water years 2022 and 2023 data are compared against Sustainable Management Criteria (SMC) established in the adopted GSP (ASRGSA and FCGMA, 2023). This Annual Report also provides updates to the status of projects and management actions described in the adopted GSP.

1.1 Background

The ASRVGB is a very low-priority groundwater subbasin located in the center of the Calleguas Creek Watershed in the rural unincorporated community of Santa Rosa Valley, the southeastern portion of Ventura County near the City of Thousand Oaks and the City of Camarillo (Figure 1.1). The Basin is bordered by the Tierra Rejada Groundwater Basin (DWR Basin No. 4-015) to the east, the Conejo Valley Groundwater Basin (DWR Basin No. 4-010) to the south, the Pleasant Valley Groundwater Basin (DWR Basin No. 4-006) to the west, and the Las Posas Valley Groundwater Basin (DWR Basin No. 4-008) to the north. The Basin is managed by two GSAs: the FCGMA covering the portion of the Basin within its jurisdictional boundary (i.e., the portion west of the Bailey Fault) and the ASRGSA covering the portion of the Basin outside the FCGMA jurisdictional boundary (i.e., the portion east of the Bailey Fault) (Figure 1.2).

The ASRVGB is in an elongated east-trending valley and consists of multiple layers of alternating fine- and coarse-grained unconsolidated deposits, semi-consolidated deposits, and consolidated formations underlain by volcanic bedrock. The Basin is roughly centered on an east-west oriented structural syncline, and sedimentary deposits are thickest in the center and westernmost areas, thinning out to the Basin margins. The aquifer system consists of a single principal aquifer, is semi-confined and is characterized by distinct upper and lower groundwater-producing zones in the west with the stratification absent or not apparent to the east. A key hydraulic feature within the Basin is the Bailey Fault, which acts as a relative barrier to flow, separating the western third of the Basin from the rest of the Basin and is the basis of dividing the Basin into two management areas: ASRGSA management area and FCGMA management area (Figure 1.2).

Inflow into the Basin comes from mountain-block fracture flow from the Conejo volcanics from the south and east, infiltration of streamflow, recharge as infiltration of precipitation and agricultural and urban return flows, and mountain-front recharge from the Las Posas Hills in the north (ASRGSA and FCGMA, 2023). The Arroyo Conejo and Conejo Creek are the major surface water features recharging the groundwater in the southern and southwestern areas of the Basin and is a perennial surface water system due to a constant source of effluent from the Hill Canyon Wastewater Treatment Plant (WWTP). The shallow groundwater in the vicinity of the Arroyo Conejo and Conejo Creek consists primarily of recirculated surface water discharges sourced from the Hill Canyon WWTP and urban runoff from Conejo Valley, both of which enter the Basin via Hill Canyon. Groundwater extraction is the primary outflow component for the Basin, and shallow groundwater also discharges to the Conejo Creek in the southwestern area.

Historically, local groundwater provided approximately half of the water used in the Basin for M&I (i.e., municipal), agricultural, and domestic uses. Historically, municipal pumping constituted the largest component of groundwater extractions, followed by agricultural extractions and one domestic well. However, since 2019 municipal pumping has declined due to Camrosa Water District supply wells being inactive due to water quality issues. The other sources of water supply for the Basin are imported water purchases from Calleguas Municipal Water District (CMWD), groundwater extracted from wells in the neighboring Tierra Rejada and Pleasant Valley Groundwater Basins, and non-potable surface water, which includes Conejo Creek Project water.

2.0 Groundwater Conditions [§356.2(b)]

This section describes data updates to precipitation and water year types for the Basin, groundwater elevations, groundwater quality, groundwater extraction, surface water supplies, total water use, and change in groundwater in storage for the Basin.

Groundwater data for water years 2022 and 2023 were collected from a variety of sources and incorporated into the ASRVGB Data Management System (DMS), which is described further in the GSP (ASRGSA and FCGMA, 2023). Groundwater levels were monitored by Camrosa Water District (Camrosa) and Ventura County Watershed Protection District (VCWPD). Groundwater quality data were collected by Camrosa and VCWPD, and water suppliers are required to report sampling analysis results to the California Division of Drinking Water. Groundwater extraction data were obtained from Camrosa, FCGMA, and the County of Ventura. Surface water supply data were provided by VCWPD, Calleguas Creek Watershed TMDL Compliance Monitoring Program (CCWTMP), and Hill Canyon WWTP.

2.1 Precipitation and Water Year Types

Precipitation data were provided by Ventura County Public Works Agency from gages 500A (Camrosa Water District) and 502 (Santa Rosa Valley - Basin 2) and were updated for water years 2022 and 2023 (Figures 2.1 and 2.2). Total precipitation for water years 2022 and 2023 was 10.5 and 26.3 inches, respectively, compared to the average of 13.2 inches for the historical period 1929-2021.

Water year types for water years 2022 and 2023 were critical and wet, respectively (Figure 2.2), and were classified based on total annual precipitation (from VCWPD rainfall gages 500A and 502) for a given water year compared to long-term historical precipitation trends from precipitation gages within the Basin (see Section 3.3 in the GSP [ASRGSA and FCGMA, 2023]).

2.2 Numerical Groundwater Model Update

The numerical groundwater model constructed for the GSP simulated water years 2012-2021 to calculate the historical, current, and projected water budget components, including streamflow depletion from pumping wells adjacent to the Conejo Creek (ASRGSA and FCGMA, 2023). For this Annual Report, the numerical model was updated to represent water years 2022 and 2023, and calculated and estimated inputs were developed based on the same methods documented in the GSP (See Appendix G, ASRGSA and FCGMA, 2023).

2.3 Groundwater Elevations [§356.2(b)(1)(A),(B)]

§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:*

(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.***

Groundwater elevations were updated through water year 2023 for monitoring wells in the ASRVGB monitoring network (Figure 2.3), which are provided by Camrosa and VCWPD. Figure 2.3 also shows the groundwater production zones in which wells are screened. As discussed in the GSP, groundwater generally flows from east to west in the Basin, following the surface drainage and topographic gradient of the Basin, with localized depressions caused by extraction wells and localized highs in recharge areas (ASRGSA and FCGMA, 2023). Southeast of the Bailey Fault, groundwater flow is generally from east to west, but flow from the Hill Canyon area (i.e., the Arroyo Conejo) is from south to north. Northwest of the Bailey Fault, groundwater flow is generally towards the center of the area.

2.3.1 Groundwater Elevation Contours [§356.2(b)(1)(A)]

Modeled groundwater levels were used to produce groundwater level contour maps discussed below. Observed groundwater levels for seasonal lows (fall) and highs (spring) for water years 2022 and 2023 in both upper and lower groundwater production zones are included on respective contour maps for reference. Observed data may not agree with contours due to a lack of observed data, differences in measurement date compared to modeled date, and differences inherent in the model calibration.

Groundwater level contours for the water year 2022 wet season (March 2022) in the upper groundwater production zone indicate flow directions are consistent with historical wet conditions; however, observed groundwater levels are relatively higher in the ASRGSA management area likely due to continued recovery of groundwater levels from the inactivity of Camrosa production wells since 2019 (Figure 2.4a). Groundwater level contours for the water year 2022 wet season (March 2022) in the lower groundwater production zone are generally consistent with the upper groundwater production zone, but localized depressions are observed at pumping well locations (e.g., well 02N20W24Q03S; Figure 2.4b). The water year 2022 dry season (November 2022) groundwater level contours in both upper and lower groundwater production zones indicate similar flow directions compared to the wet season in both management areas, but with overall lower groundwater levels (Figure 2.5a and Figure 2.5b).

Groundwater level contours for the water year 2023 wet season (March 2023) in the Basin upper groundwater production zone indicate flow directions are consistent with historical wet conditions; however, groundwater levels have overall increased in comparison to water year 2022, likely due to increased recharge from infiltration of precipitation and streamflow (Figure 2.6a). Groundwater level contours for the water year 2023 wet season (March 2023) in the lower groundwater production zone are also consistent with historical conditions. Observed groundwater levels have overall increased throughout the Basin by ~10-20 ft in comparison to water year 2022 (Figure 2.6b). Groundwater level contours for the water year 2023 dry season (October 2023) in the upper groundwater production zone indicate flow directions are consistent with historical dry conditions; however, observed groundwater levels in the FCGMA management area are slightly lower and groundwater levels measured in well 02N20W26B03S are slightly higher in comparison to historical dry season conditions (Figure 2.7a). Groundwater level contours for the water year 2023 dry season (October 2023) in the lower groundwater production zone are consistent with water year 2022; however, observed groundwater levels at wells 02N20W24Q03S and 02N20W25C05S have increased by ~20 ft (Figure 2.7b).

2.3.2 Groundwater Elevation Hydrographs [§356.2(b)(1)(B)]

Groundwater elevation hydrographs for key monitoring wells in the Basin are shown with water year types on Figure 2.8. The temporal trend during water years 2022 and 2023 is upward for all monitoring wells except for wells 02N20W23G01S (FCGMA) and 02N19W20M04S (ASRGSA). The upward trends are due to a combination of decreased pumping and increased recharge from the water year 2023 wet conditions.

2.4 Groundwater Quality

Maps of available data for average concentrations of key indicator constituents for water years 2022 and 2023 in the Basin are shown on Figures 2.9 through 2.13 and described below.

The average nitrate concentrations for water years 2022 and 2023 ranged from 1.4 to 19.8 mg/L based on sampling results for seven and nine out of the fourteen water quality monitoring wells, respectively (Figure 2.9a and Figure 2.9b). The nitrate results are consistent with historical data for the Basin (see GSP section 3.1.3.3; ASRGSA and FCGMA, 2023). Elevated nitrate concentrations (i.e., above state maximum contaminant level) are observed across the Basin; however, lower concentrations are observed at bedrock well 02N19W20M04S and Camrosa production wells 02N20W25C02/04/05.

The average TDS concentrations for water years 2022 and 2023 ranged from 760 to 1,060 mg/L based on sampling results for seven and nine out of the fourteen water quality monitoring wells, respectively (Figure 2.10a and Figure 2.10b). The TDS results are consistent with historical data for the Basin (see GSP section 3.1.3.3; ASRGSA and FCGMA, 2023). Similar to nitrate, elevated TDS concentrations (i.e., above

Basin Plan Water Quality Objectives [WQO]) are observed across the Basin. TDS concentrations are generally higher in the southwest area of the Basin, and lower in the center and northwest.

The average chloride concentrations for water years 2022 and 2023 ranged from 104 mg/L to 215 mg/L based on sampling results for seven and nine out of the fourteen water quality monitoring wells, respectively (Figure 2.11a and Figure 2.11b). The chloride results are generally consistent with historical data for the Basin (see GSP section 3.1.3.3; ASRGSA and FCGMA, 2023). Elevated chloride concentrations (i.e., above the WQO) are spatially consistent with TDS and nitrate with generally higher concentrations in the southwest; however, well 02N20W24M02S showed an increase relative to the historical data, with the highest concentrations analyzed in the Basin for water year 2023.

The average sulfate concentrations for water years 2022 and 2023 ranged from 76.2 mg/L to 218 mg/L based on sampling results for seven and ten out of the fourteen water quality monitoring wells, respectively (Figure 2.12a and Figure 2.12b). The sulfate results are consistent with historical data for the Basin (see GSP section 3.1.3.3; ASRGSA and FCGMA, 2023). Sulfate concentrations do not exceed the WQO, but the distribution of higher concentrations is consistent with nitrate, TDS, and chloride, with generally higher concentrations in the southwest.

The average boron concentrations for water years 2022 and 2023 are generally low throughout the Basin, which is consistent with historical data (Figure 2.13a and Figure 2.13b). Analytical results were available for seven out of the fourteen water quality monitoring wells. Water year 2023 had slightly higher concentrations throughout the Basin, with concentrations at the WQO in the southwest.

The groundwater quality sampling results for 1,2,3-trichloropropane (TCP) were non-detect (<5 ng/L) for water years 2022 and 2023 (Figure 2.14a and Figure 2.14b). The number of sampled monitoring wells was very low for water years 2022 and 2023, due to the production wells affected by high TCP levels being inactive.

Please see the GSP Section 3.1.3.3 for additional detail on the groundwater quality for the Basin (ASRGSA and FCGMA, 2023).

2.5 Groundwater Extraction [§356.2(b)(2)]

§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:*

(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.

Groundwater extraction within the Basin is reported by both Camrosa and FCGMA. For the FCGMA management area, reported biannual agricultural groundwater extractions were provided by FCGMA through March of 2022; however, records have not been available since, and were estimated for this Annual Report based on historical averages, which have been observed to be relatively stable regardless of climate conditions. For the ASRGSA management area, reported monthly groundwater extraction data for M&I uses were provided by Camrosa, and all private active agricultural well extraction rates were estimated based on crop demand and available pumping data (see Appendix G in the GSP; ASRGSA and FCGMA, 2023). The extraction rate of the single domestic well located in the Basin was 2.5 acre-feet per year (AFY) based on the annual usage statements submitted by the well owner to the County of Ventura.

Groundwater extraction volumes for water years 2022 and 2023 are summarized by water use sector in Table 2.1. Total extraction via pumping wells for water years 2022 (2,884 AFY) and 2023 (2,766 AFY) were both less than the historical average of 4,530 AFY (2012-2021). Agricultural groundwater use accounts for 93% and 94% of the total extraction via pumping wells for water years 2022 and 2023. Camrosa operated the M&I extraction wells within the Basin, which is fed into the District's distribution system; however, the majority of extracted water meets agricultural demands (estimated to be ~80% historically, based on accounting records). The volumes extracted from each well for water years 2022 and 2023 are shown on Figures 2.15 and 2.16, respectively.

2.6 Surface Water Supply [§356.2(b)(3)]

§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:*

(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.

Surface water supplies are currently not diverted within the ASRVGB for M&I or agricultural uses. Water supply within the Basin relies on groundwater extractions and water from outside the Basin, such as purchased imported water from CMWD and non-potable Conejo Creek Project surface water diversions from the Conejo Creek (ASRGSA and FCGMA, 2023). Imported water purchased from CMWD consists primarily of surface water imported from the State Water Project via Metropolitan Water District of Southern California. The surface water used for agriculture was taken as the difference between total demands for the basin and the groundwater used for agriculture (see Section 2.7). For M&I surface water use, Camrosa records of purchased imported water and metered Conejo Creek water intakes were used to estimate the amount of surface water in potable and non-potable water delivered to M&I parcels identified within the Basin (see Table 2.2). Total estimated surface water supply volumes for water years 2022 and 2023 were 1,881 AFY and 1,474 AFY, respectively (Table 2.2 and Figure 2.17).

2.7 Total Water Use [§356.2(b)(4)]

> **§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:*
>
> ***(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.***

Water demands in the ASRVGB consist of M&I, agricultural, and domestic demands, which are met by a mix of groundwater extractions and deliveries for potable and non-potable use from outside the Basin. Agricultural groundwater use is supplied by FCGMA and ASRGSA management area agricultural extraction wells (Section 2.5) and Camrosa's non-potable extraction wells. M&I groundwater use is supplied by Camrosa's potable and non-potable groundwater extraction wells, and if in-basin demands are not met then Camrosa's imported groundwater from potable extraction wells outside the basin are used. Agricultural and M&I surface water use is described in the previous Section 2.6. Sources of water supplied from outside the Basin are metered and delivered for M&I and agricultural uses through Camrosa's potable and non-potable distribution systems. Water year 2022 and 2023 water use sources are detailed in Table 2.2 and Figure 2.17. The total water use components were measured or estimated using methods described in Section 2.5 and 2.6 in this report and the GSP (ASRGSA and FCGMA, 2023).

The total water used within the Basin during water years 2022 and 2023 was 4,845 AFY and 4,125 AFY, respectively (Table 2.2 and Figure 2.17).

2.8 Change in Storage [§356.2(b)(5)(A),(B)]

> **§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:*
>
> ***(b)*** *A detailed description and graphical representation of the following conditions of the basin managed in the Plan:*
>
> ***(5) 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.***

The updated numerical groundwater model was used to calculate change in groundwater in storage for the ASRVGB principal aquifer (combined upper and lower groundwater production zones) for water years 2022 and 2023, which are shown in Figures 2.18 and 2.19.

Total change in storage between water years 2021 and 2022 was calculated to increase by 849 AF (Figure 2.18). Change in storage for the Basin was also calculated for each management area and the ASRGSA management area accounts for 97% of the total change in storage for the principal aquifer (Figure 2.18). This is due to decreases in Camrosa pumping, despite water year 2022 being a critical water year type.

Total change in storage between water years 2022 and 2023 was calculated to increase by 1,894 AF (Figure 2.19). Consistent with the previous water year, the ASRGSA management area accounts for 99% of the total change in storage for the principal aquifer (Figure 2.19). The change in storage was much higher compared to the previous water year due to the combination of continued decreases in Camrosa pumping and increases in recharge from the wet water year type for 2023.

Figure 2.20 shows water year type, groundwater pumping, annual change in groundwater in storage for the Basin, and cumulative change in groundwater in storage for the Basin, starting in 2012. Change in storage for the Basin for water years 2022 and 2023 was 1,083 AF and 2,263 AF, respectively. Change in storage for the principal aquifer was 78% and 84% of the total change in storage for the Basin for water years 2022 and 2023, respectively.

3.0 Plan Implementation [§356.2(c)]

§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:*

(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.

The plan implementation for the ASRVGB GSP was initiated with the submittal of the GSP to DWR in June of 2023. Progress towards implementing the GSP is evaluated in this Annual Report through comparing monitoring data to SMC for each applicable sustainability indicator for the past two water years (2022 and 2023). All currently available monitoring data, consisting of groundwater levels, groundwater quality, precipitation, and streamflow, are evaluated for this Annual Report.

3.1 Chronic Lowering of Groundwater Levels, Reduction of Groundwater Storage, and Land Subsidence

SMC are the same for the chronic lowering of groundwater levels, reduction of groundwater storage, and land subsidence sustainability indicators because groundwater levels are used as a proxy. Groundwater levels were evaluated through water year 2023 for three monitoring wells in the FCGMA and eleven monitoring wells in the ASRGSA. For each well, observed groundwater levels were plotted against their respective minimum thresholds, measurable objectives, and interim milestones (Figure 3.1). Out of eleven monitoring wells within the ASRGSA (Figure 2.3), one well (02N20W23Q02S) was not evaluated due to a lack of reliable data (see Appendix J in GSP; ASRGSA and FCGMA, 2023). Table 3.1 summarizes SMC and the minimum groundwater level observed at each well for water years 2022 and 2023.

Spring high groundwater levels observed in each water year 2022 and 2023 were evaluated against SMC, and no monitoring wells were below their respective minimum threshold for both water years. Most monitoring wells either met their respective 5-year interim milestones or measurable objectives (Table 3.1). For water year 2022 in the FCGMA management area, one well was between its minimum thresholds and 5-year interim milestone, one well met its 5-year interim milestone, and one well met its measurable objective. For water year 2022 in the ASRGSA management area, two wells were between their minimum thresholds and 5-year interim milestones, 2 wells met their 5-year interim milestone, and 5 wells met their measurable objective. For water year 2023 in the FCGMA management area, one well met its 5-year interim milestone, and two wells met their measurable objective. For water year 2023 in the ASRGSA management area, two wells were between their minimum thresholds and 5-year interim milestones and 7 wells met their measurable objectives. The combination of minimum threshold exceedances that are deemed to cause significant and unreasonable effects for chronic lowering of groundwater levels was specified to be minimum threshold exceedances in more than 50% of the groundwater level monitoring sites for either management area for 2 successive years. Currently, the combination of minimum threshold exceedances is 33% for one management area; therefore, there are no significant and unreasonable effects within the basin. Excluding this one minimum threshold exceedance, the implementation plan for the chronic lowering of groundwater levels and reduction of groundwater storage sustainability indicators is in good status.

3.1.1 Land Subsidence InSAR data

As described in GSP, no land subsidence has been documented historically in the Basin and the Basin is considered to have a low estimated potential for inelastic land subsidence. Numerical modeling for the water budget suggests that future groundwater levels will remain above historical low levels, which would prevent inelastic subsidence due to groundwater extraction (see Appendix G in the GSP; ASRGSA and FCGMA, 2023). Nonetheless, the GSP included annual review of interferometric synthetic aperture radar (InSAR) data (subject to continued availability from DWR) to confirm the absence of land subsidence related to groundwater conditions.

DWR provides land surface displacement data for the Basin on their SGMA Data Viewer Web-based geographic information system viewer (DWR, 2023), which includes InSAR measurements for water years 2022 and 2023 (TRE Altamira, Inc., 2023). This land surface displacement dataset was downloaded and reviewed. The reported cumulative vertical displacement from the InSAR measurements during water years 2022 and 2023 was consistently well below the accuracy range, and the areas falling below the accuracy range are shown in gray on Figures 3.2 and 3.3. This indicates that there is no measurable land subsidence due to groundwater withdrawal within the Basin.

3.2 Degraded Water Quality

The water quality monitoring network is shown on Figure 3.4. For each key indicator constituent (nitrate, TDS, chloride, sulfate, boron, and TCP), available analytical results were plotted against their respective minimum thresholds, measurable objectives, and interim milestones (Figure 3.5a through Figure 3.5f). Table 3.2 summarizes, by constituent, the SMC and the average concentration for all wells in each management area for water years 2022 and 2023. All water quality analytical results met their respective measurable objectives for water years 2022 and 2023.

3.3 Depletion of Interconnected Surface Water

The Arroyo Conejo and Conejo Creek are interconnected with shallow groundwater in the Basin, and a small amount of direct depletions occur due to groundwater pumping adjacent to the creek. The Arroyo Conejo and Conejo Creek stream system has primarily losing conditions; however, it is perennial due to the constant source of water from the Hill Canyon WWTP effluent and additional surface water flow from the North and South Fork Arroyo Conejo streams that drain Conejo Valley. Based on the numerical model results, the GSP concluded that significant and unreasonable effects have not occurred historically and that undesirable results are not expected to occur as long as future depletions do not exceed the maximum historical depletion rate. The GSAs have developed SMC for the depletion of interconnected surface water (ISW) sustainability indicator to ensure that potential undesirable results related to groundwater extraction are avoided. The minimum threshold and measurable objective are equal and were estimated by the numerical model to be 1,150 AFY, which includes both direct and indirect depletion (ASRGSA and FCGMA, 2023).

Two active surface water flow gages (gage 800 and Confluence Flume maintained by CCWTMP and Hill Canyon WWTP, respectively) provide streamflow data for the Arroyo Conejo and Conejo Creek (Figure 3.6). The numerical model was updated with the available surface water data, and model results were used to evaluate streamflow depletions for water years 2022 and 2023 using methodology developed in the GSP (See Section 4.1 in the GSP; ASRGSA and FCGMA, 2023). Figure 3.7 shows annual streamflow depletion plotted against the minimum threshold and measurable objective for the Basin, which indicates the measurable objective is met for water years 2022 and 2023.

3.4 Seawater Intrusion

The GSP concluded that the seawater intrusion sustainability indicator is not applicable to the ASRVGB because it is an inland basin with no connection to the ocean. The Basin is located over 10 miles inland from the Pacific Ocean and is hydraulically upgradient and structurally up-dip of the lower Pleasant Valley Basin, which extends west to the Pacific Ocean. The lowest observed groundwater level elevations at the western boundary of the Basin are ~100 ft above mean sea level. Seawater intrusion is observed near the coastline in the Oxnard Plain Basin in west Ventura County, and seawater would need to migrate through that basin and the Pleasant Valley Basin before reaching the ASRVGB.

3.5 Projects and Management Actions

There are four projects that were described in the GSP (ASRGSA and FCGMA, 2023):

1. Groundwater Monitoring Network Enhancement Project
2. Water Quality Management Coordination Project
3. Arroyo Santa Rosa Basin Desalter Project
4. Arroyo Santa Rosa Basin Recharge Project

There has been no progress on the Groundwater Monitoring Network Enhancement and Water Quality Management Coordination Projects since the GSP implementation in June 2023. For the Arroyo Santa Rosa Basin Desalter and Basin Recharge Projects, feasibility studies have been initiated in December 2022, and are currently ongoing.

4.0 References

Department of Water Resources (DWR). 2023. SGMA Data Viewer Web-based geographic information system viewer. Accessed January 2024. Available at https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer.

TRE Altamira, Inc. 2023. InSAR Land Surveying and Mapping Services to DWR Supporting SGMA Technical Report. October 2023 Update.

Arroyo Santa Rosa Basin Groundwater Sustainability Agency (ASRGSA) and Fox Canyon Groundwater Management Agency (FCGMA). 2023. Arroyo Santa Rosa Valley Groundwater Basin Groundwater Sustainability Plan. June 2023.

Figures

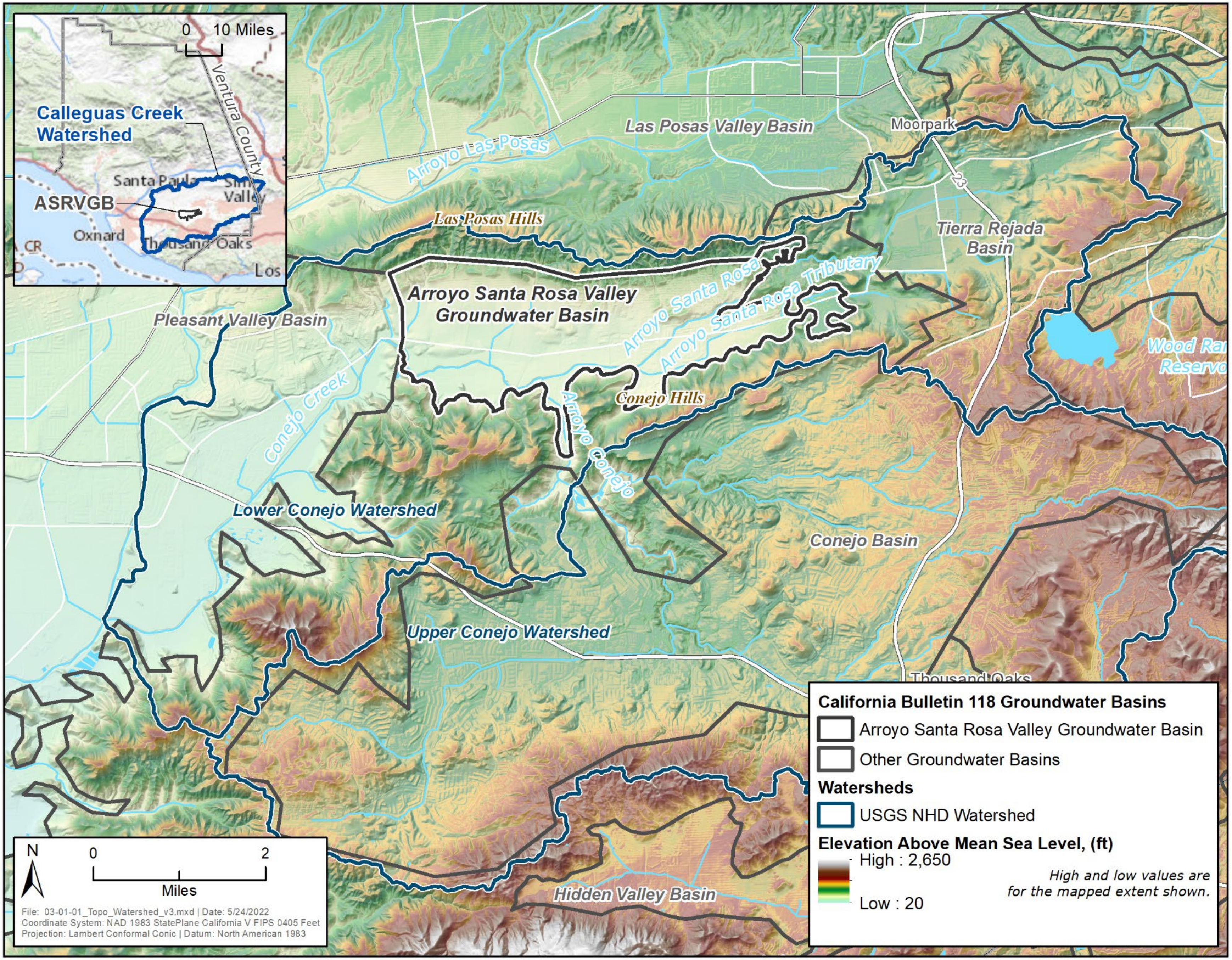

Figure 1.1 Arroyo Santa Rosa Valley Groundwater Basin Boundary Map.

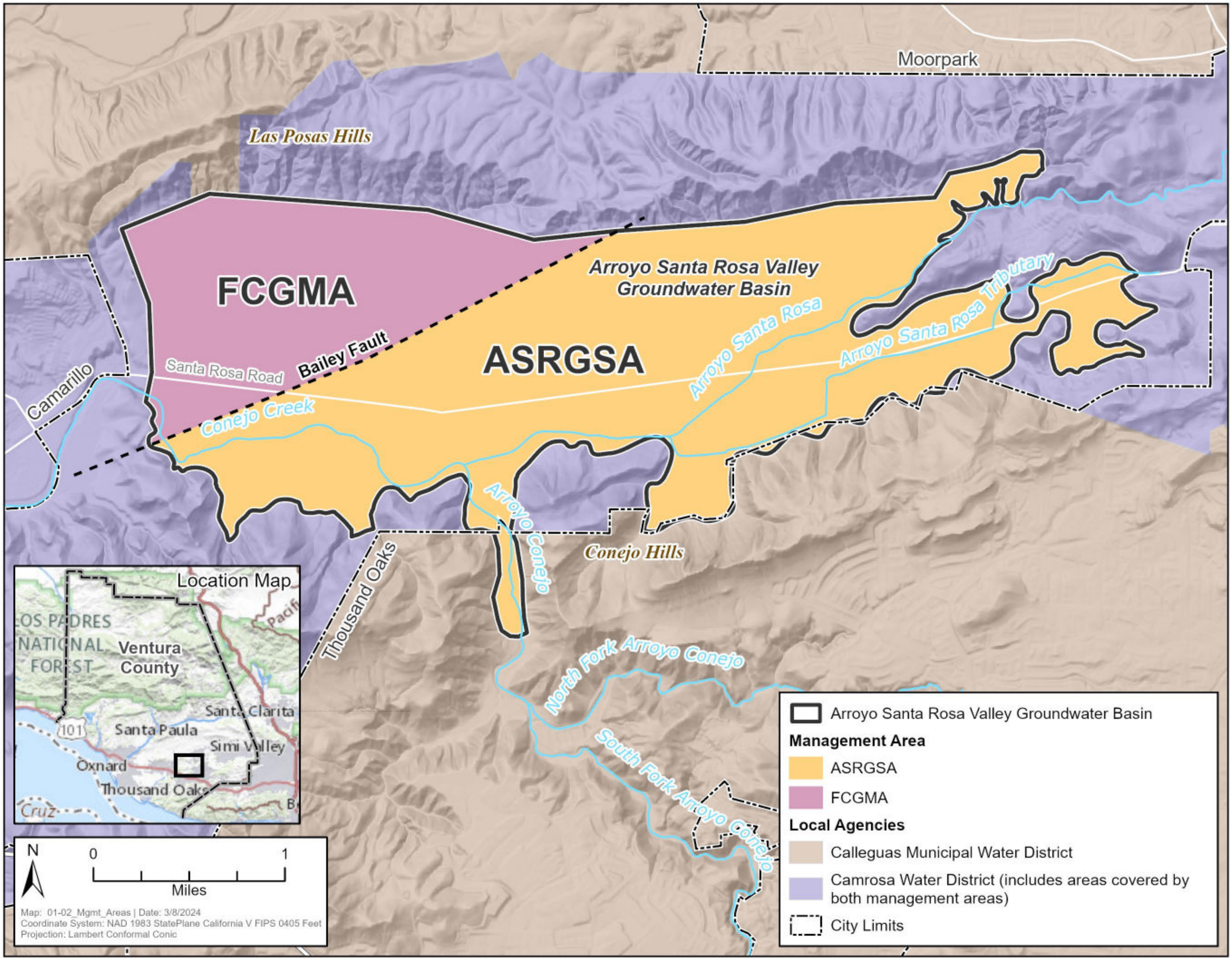

Figure 1.2 Arroyo Santa Rosa Valley Groundwater Basin Management Areas.

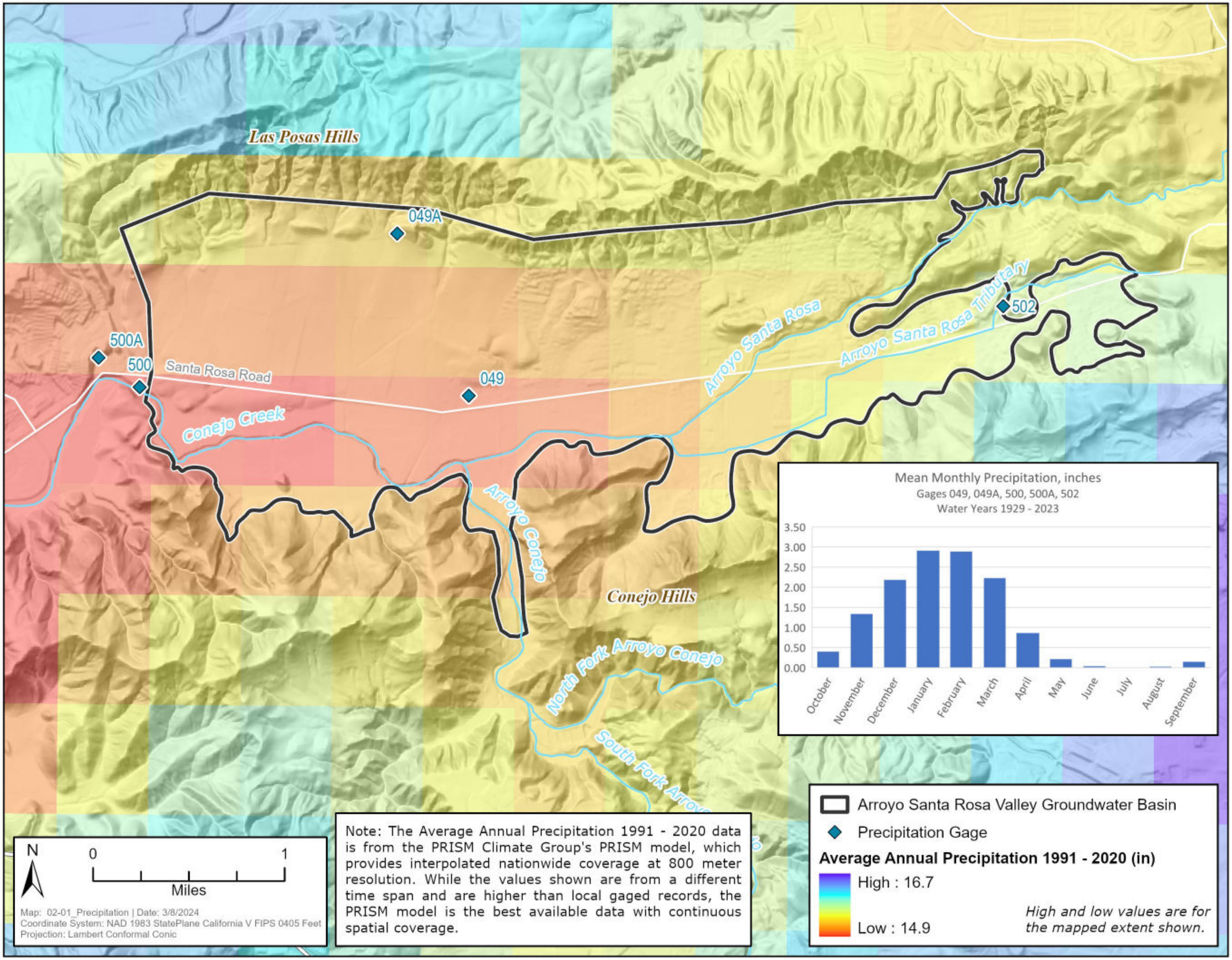

Figure 2.1 Precipitation Map in ASRVGB.

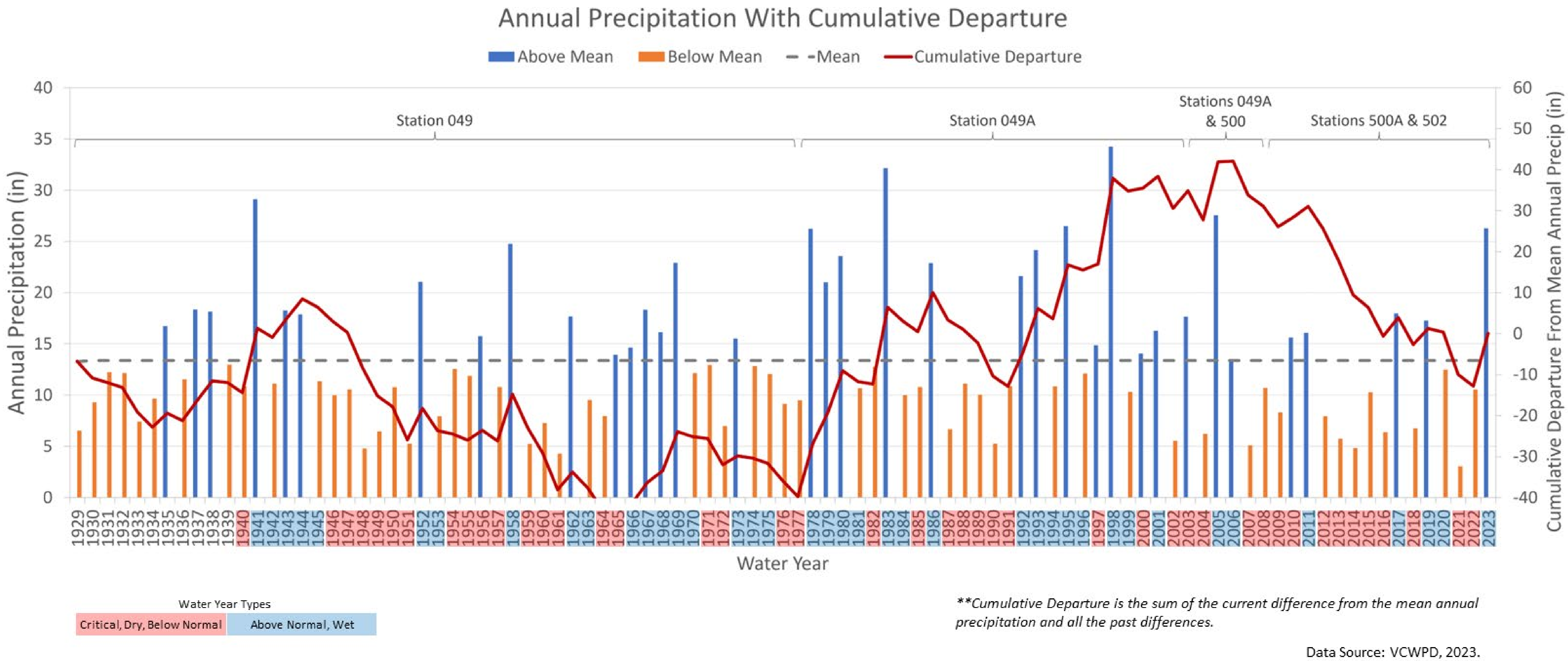

Figure 2.2 Annual and Cumulative Departure from Mean Precipitation .

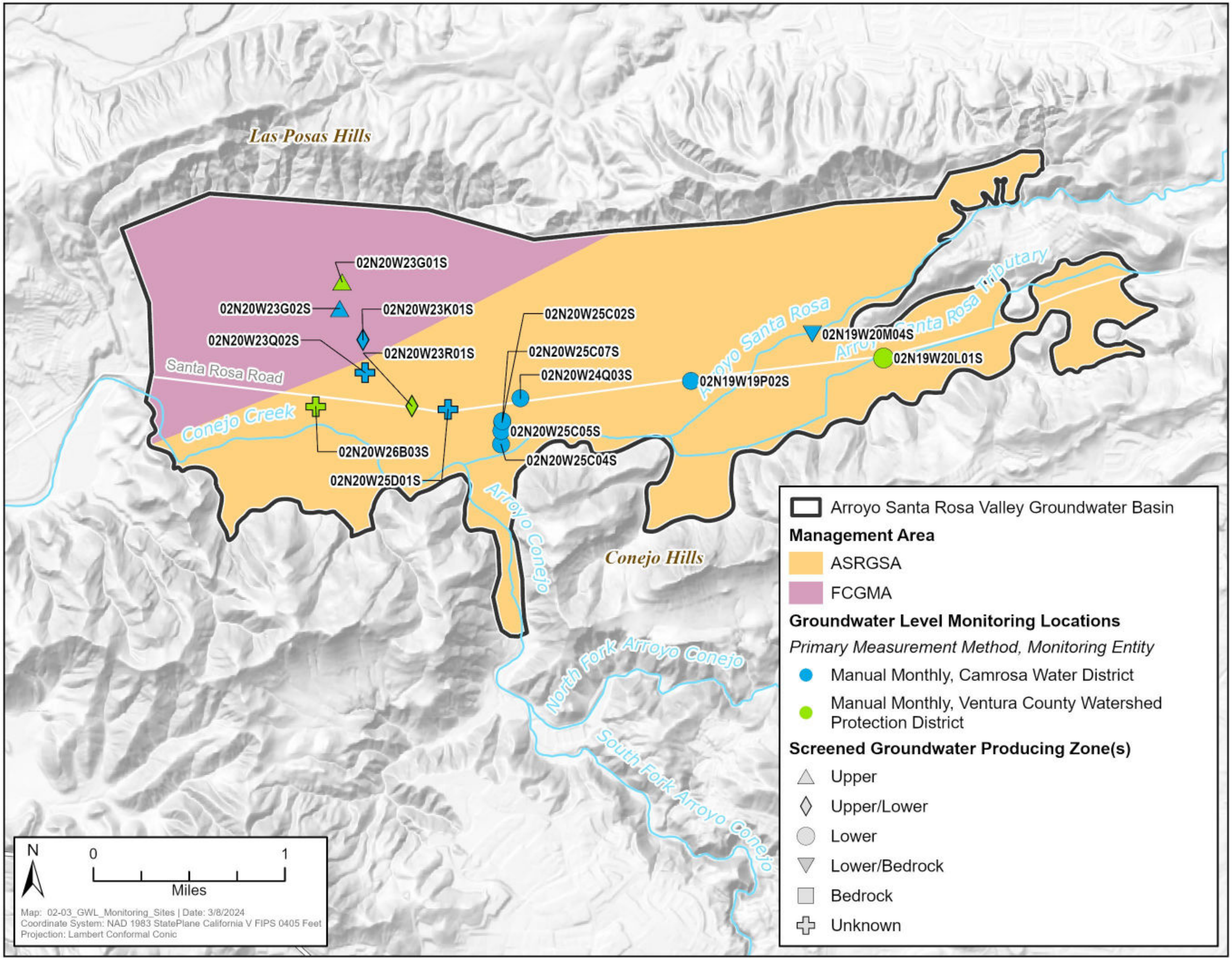

Figure 2.3 Groundwater Level Monitoring Network Wells.

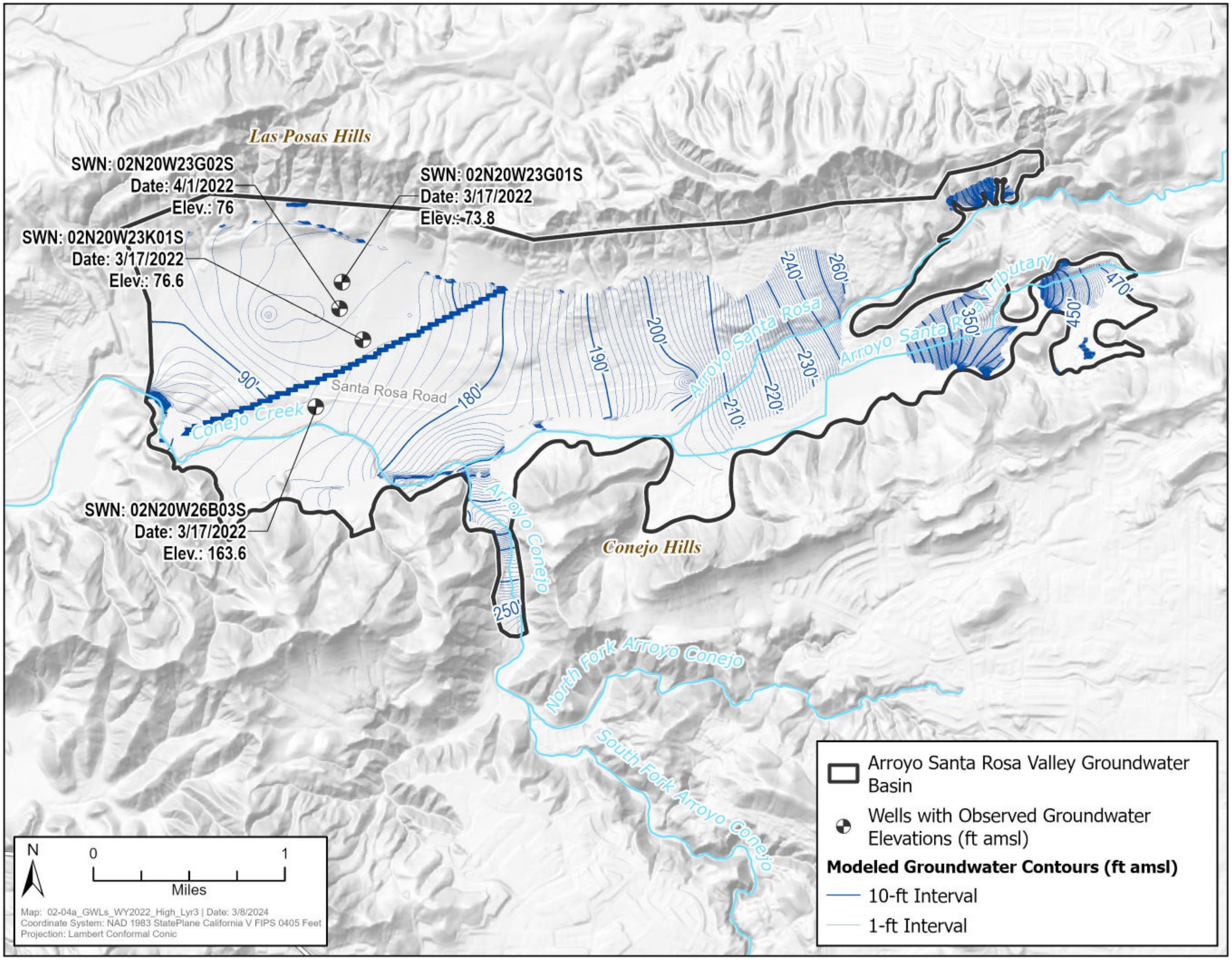

Figure 2.4a Contour Map for High Modeled Groundwater Levels (Wet Season) in the Upper Groundwater Production Zone – Spring Water Year 2022.

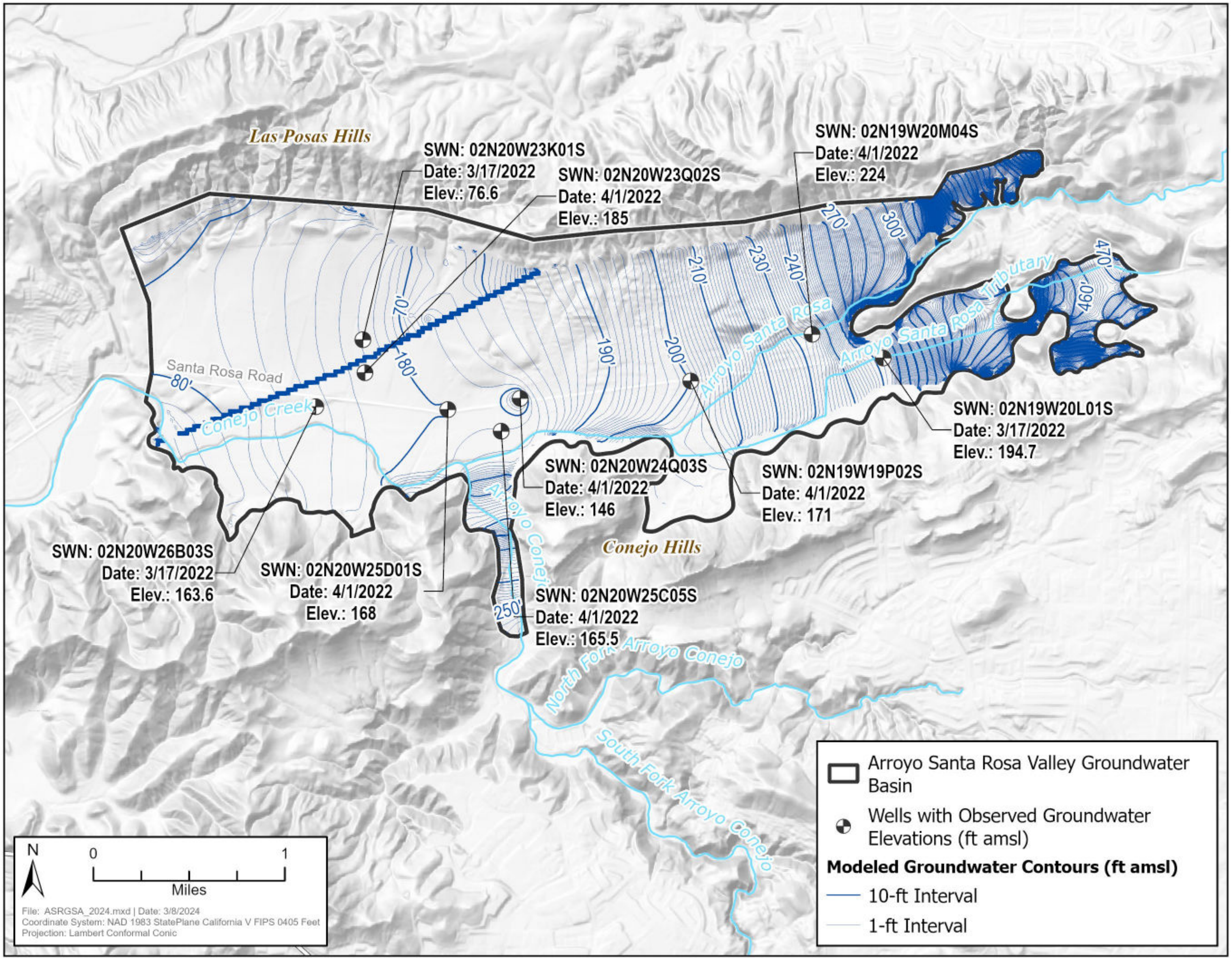

Figure 2.4b Contour Map for High Modeled Groundwater Levels (Wet Season) in the Lower Groundwater Production Zone – Spring Water Year 2022.

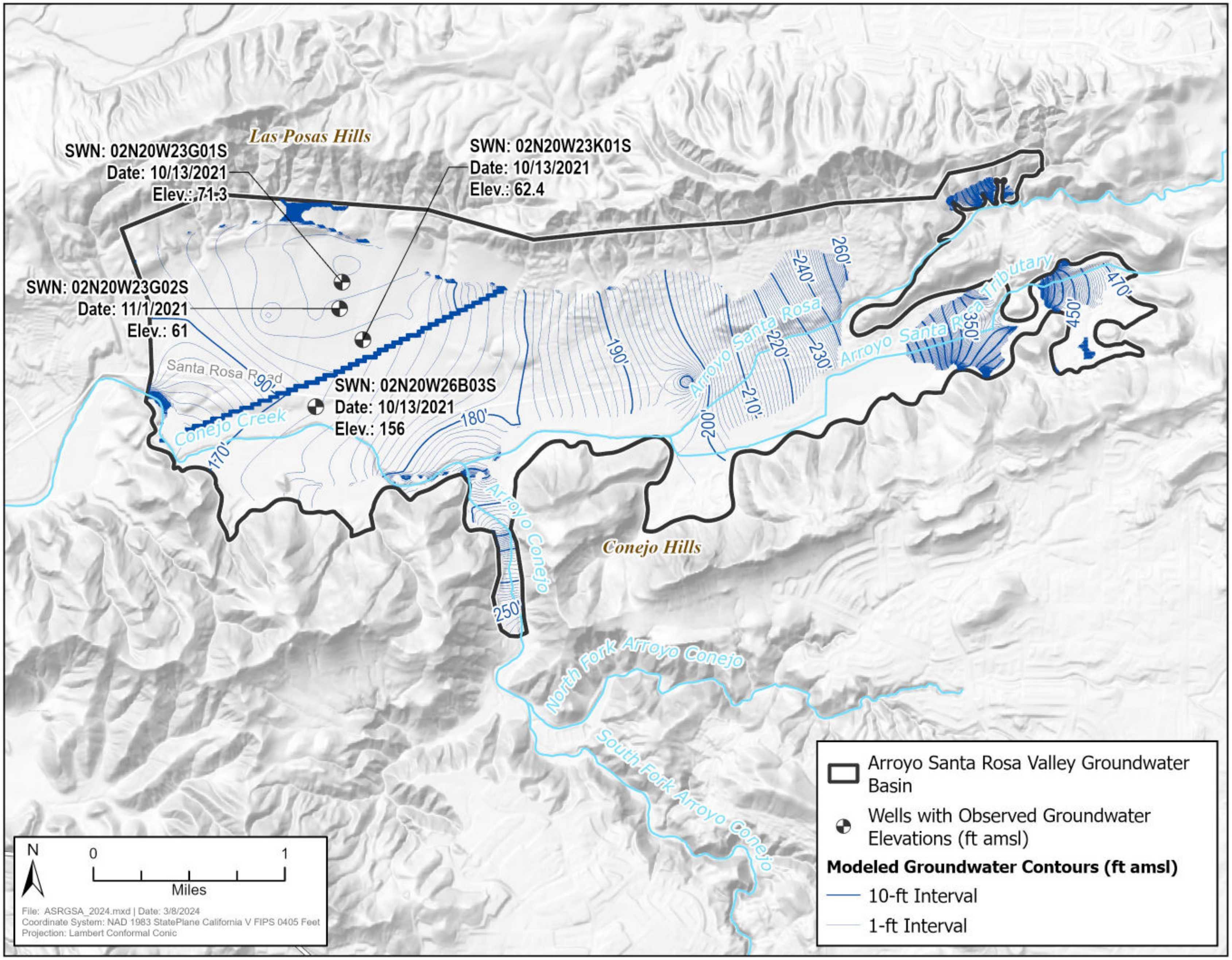

Figure 2.5a Contour Map for Low Modeled Groundwater Levels (Dry Season) in the Upper Groundwater Production Zone – Fall Water Year 2022.

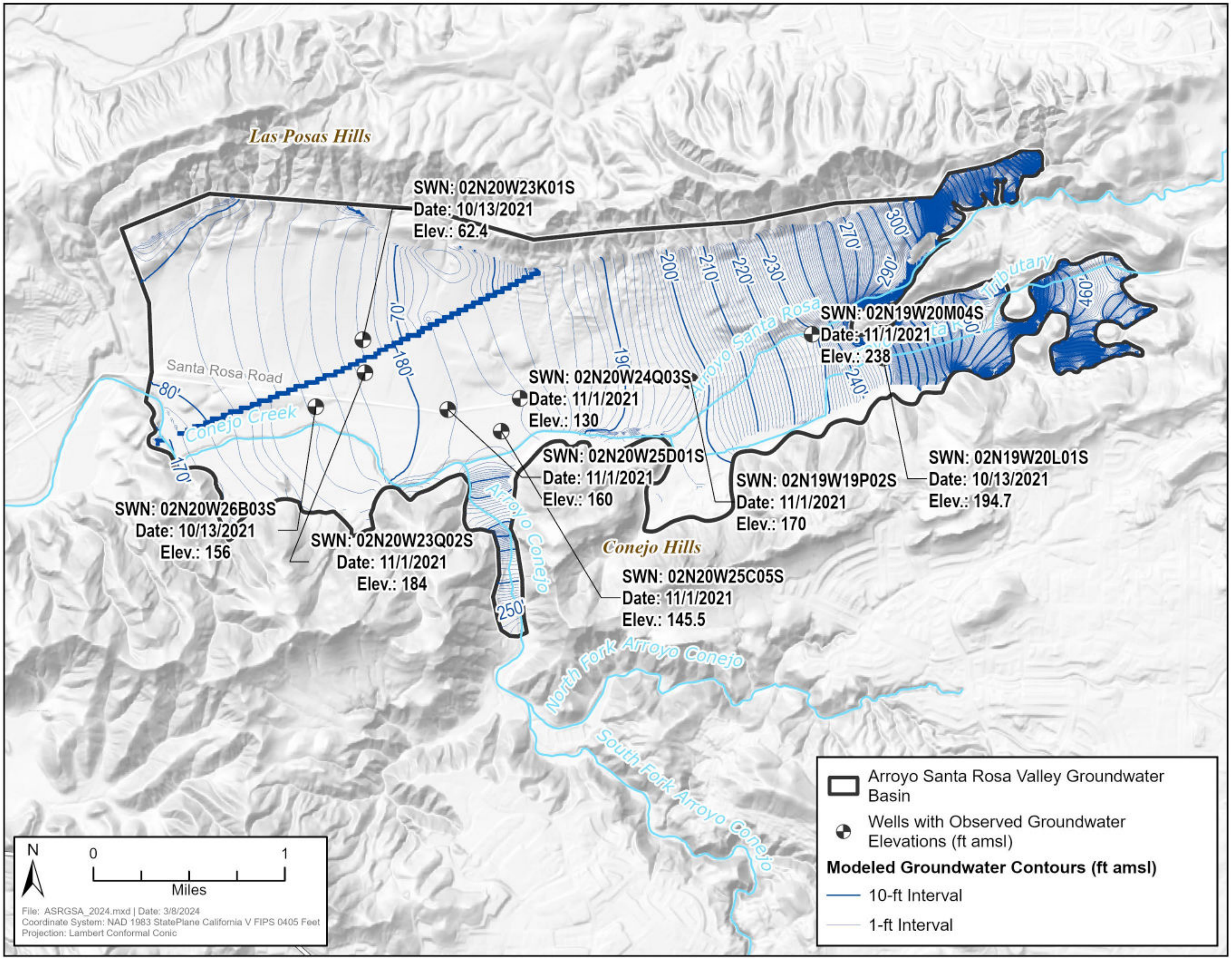

Figure 2.5b Contour Map for Low Modeled Groundwater Levels (Dry Season) in the Lower Groundwater Production Zone – Fall Water Year 2022.

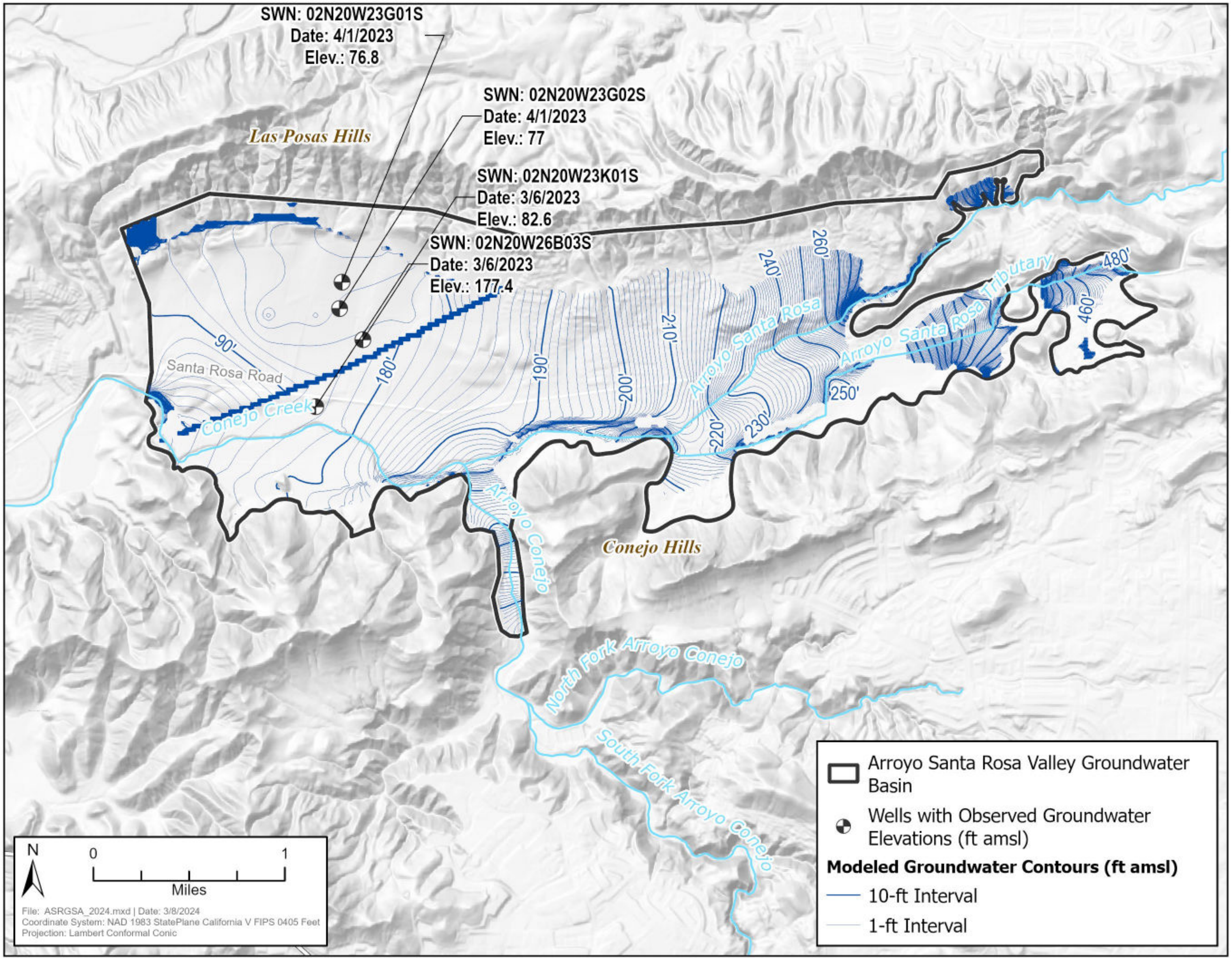

Figure 2.6a Contour Map for High Modeled Groundwater Levels (Wet Season) in the Upper Groundwater Production Zone – Spring Water Year 2023.

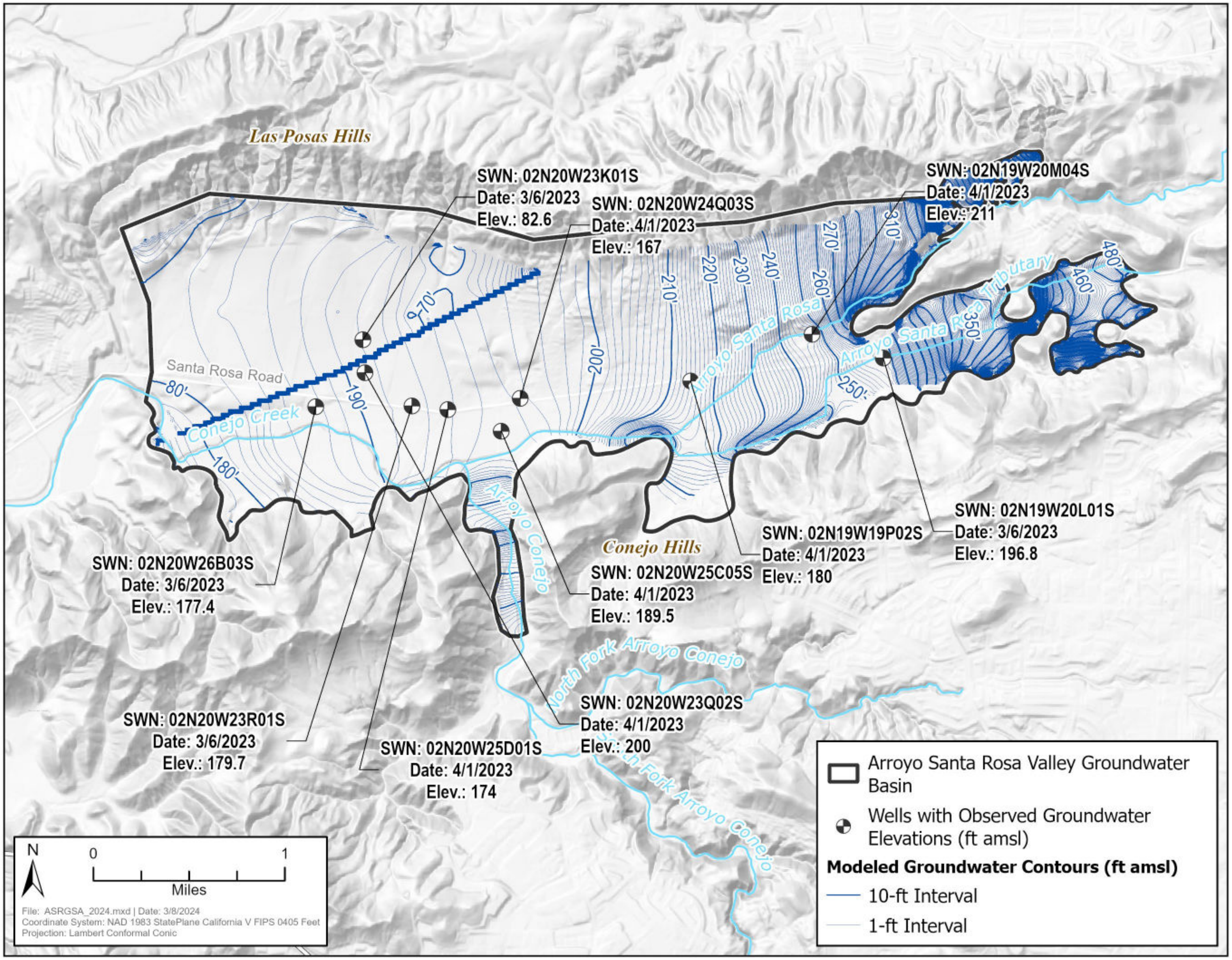

Figure 2.6b Contour Map for High Modeled Groundwater Levels (Wet Season) in the Lower Groundwater Production Zone – Spring Water Year 2023.

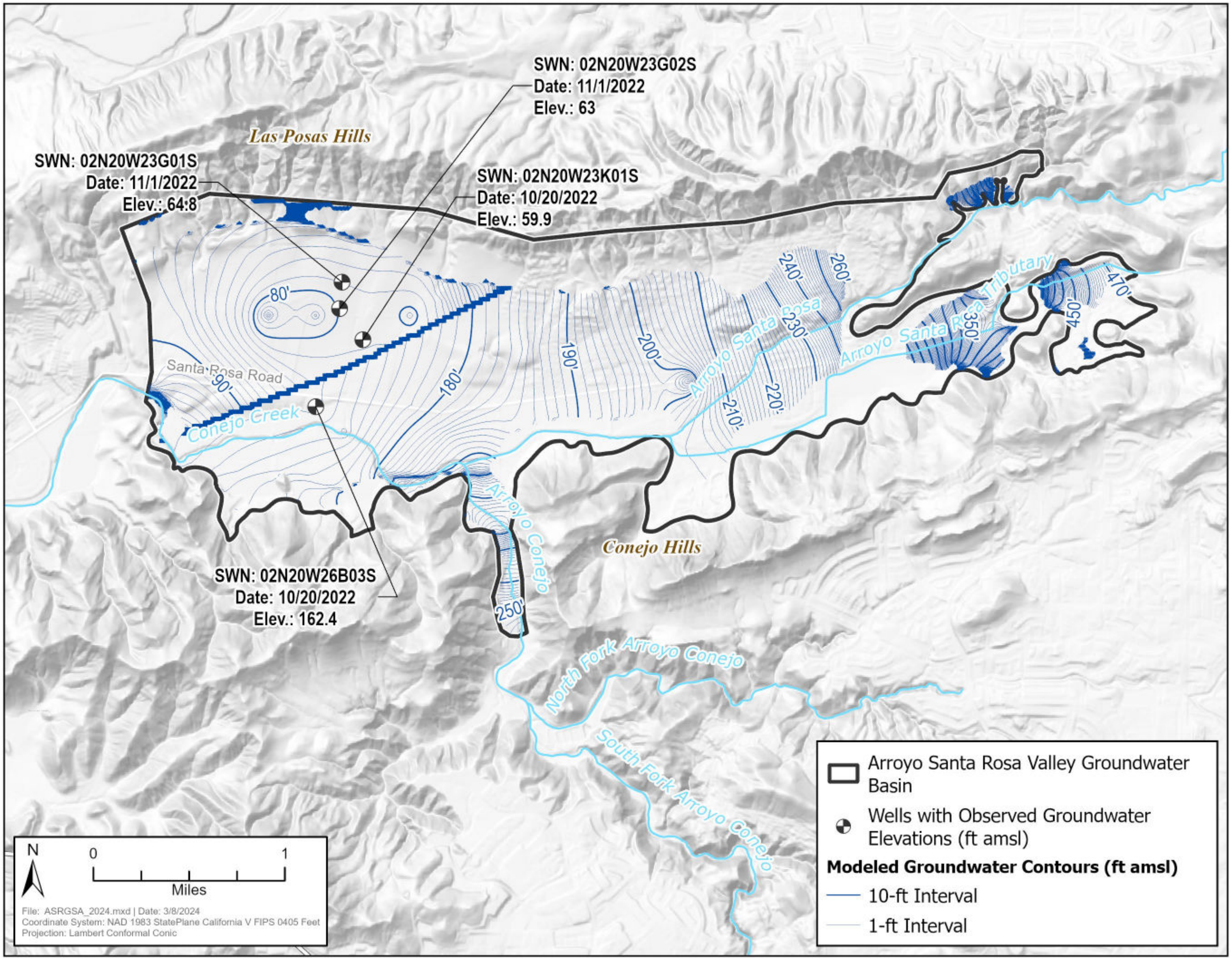

Figure 2.7a Contour Map for Low Modeled Groundwater Levels (Dry Season) in the Upper Groundwater Production Zone – Fall Water Year 2023.

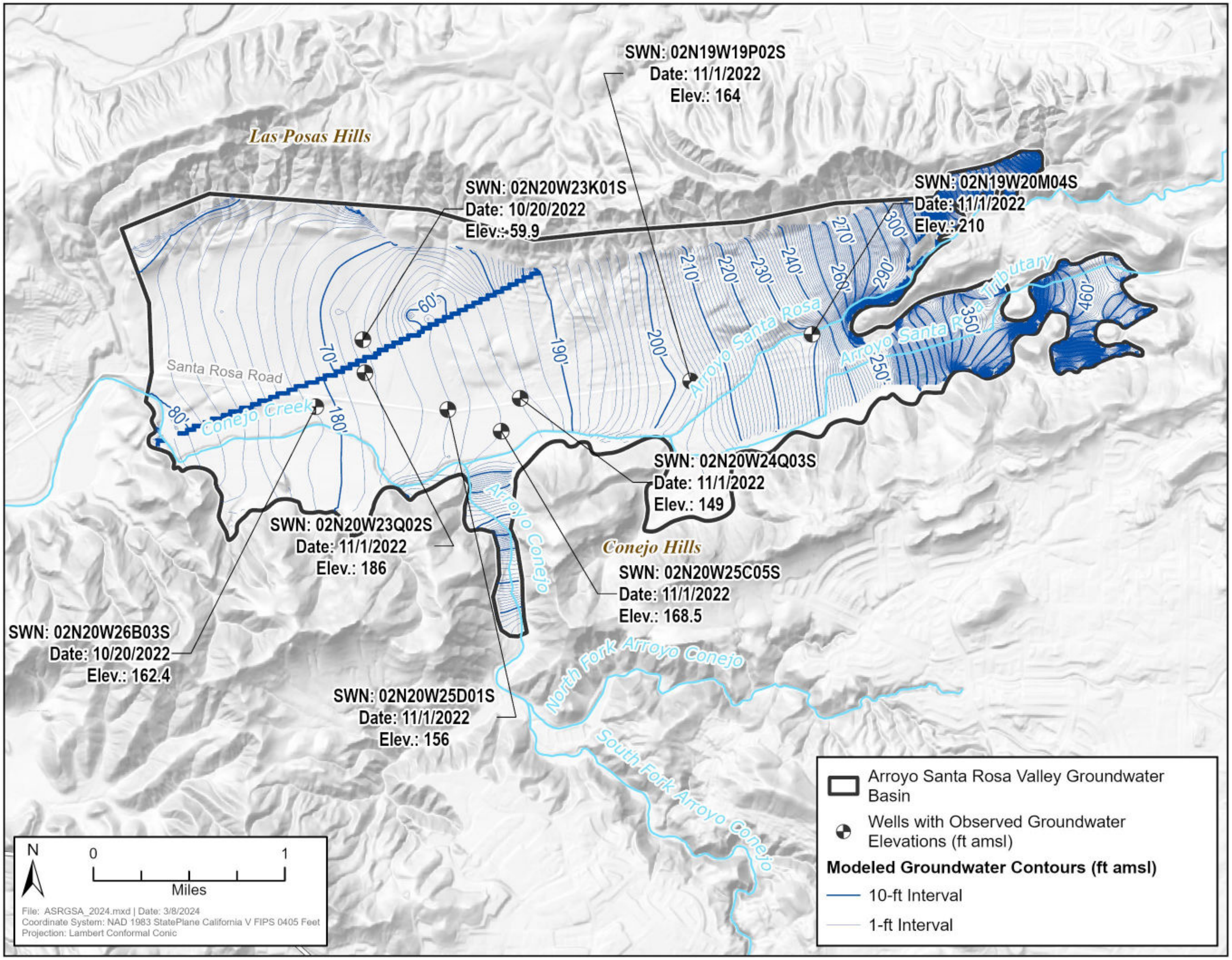

Figure 2.7b Contour Map for Low Modeled Groundwater Levels (Dry Season) in the Lower Groundwater Production Zone – Fall Water Year 2023.

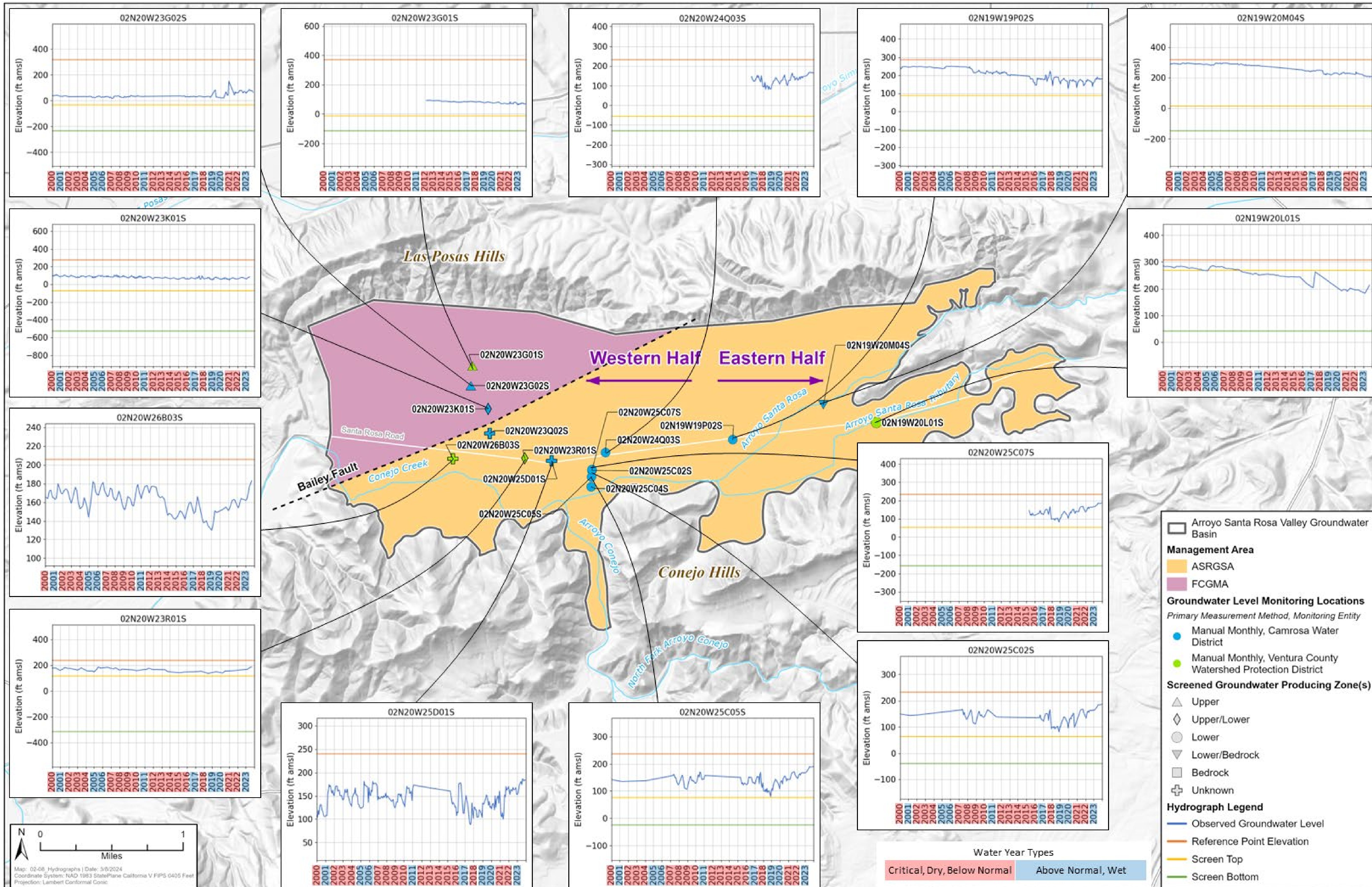

Figure 2.8 Groundwater Level Hydrographs for Key Wells in ASRVGB.

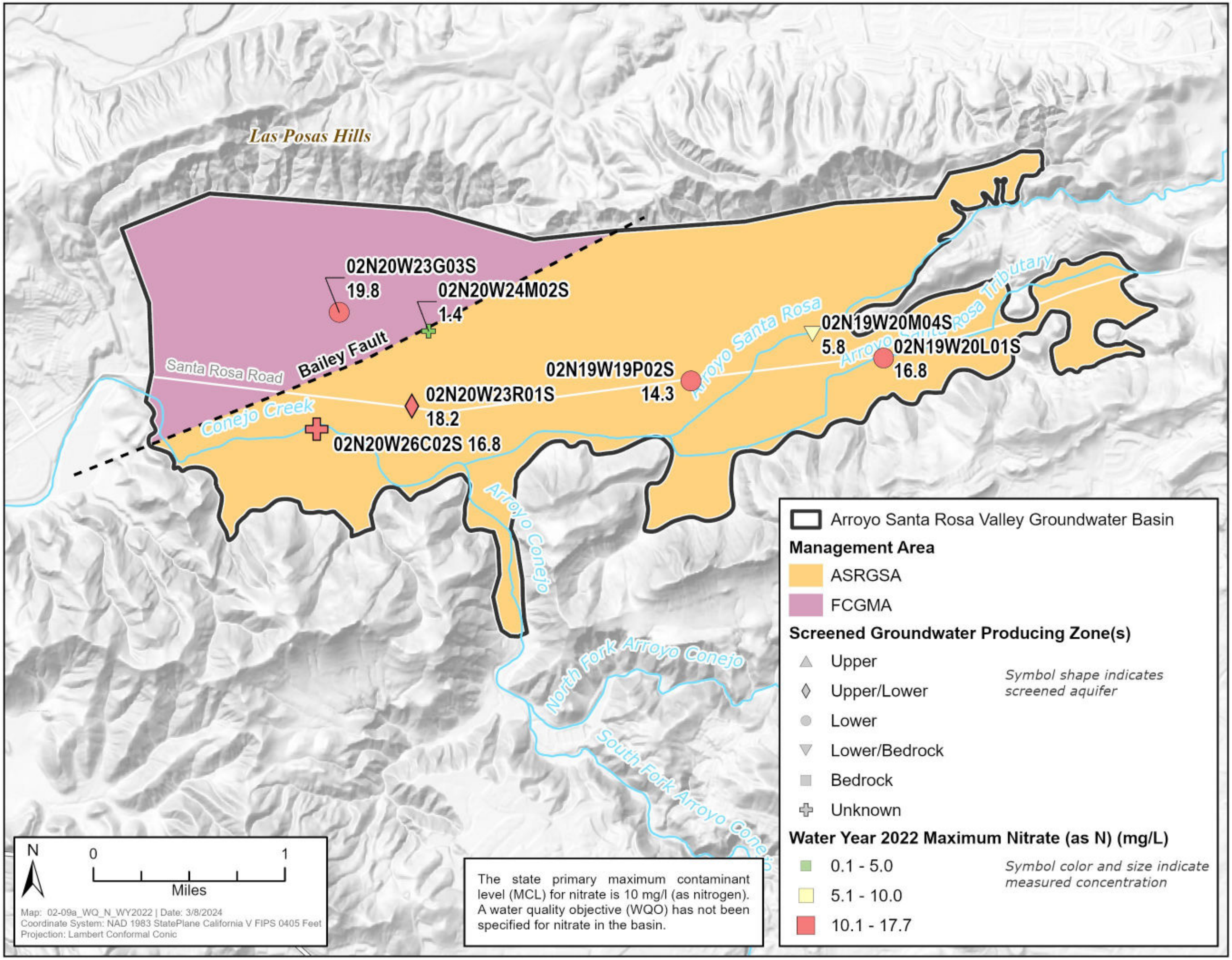

Figure 2.9a Average Nitrate as N Concentration in ASRVGB, Water Year 2022.

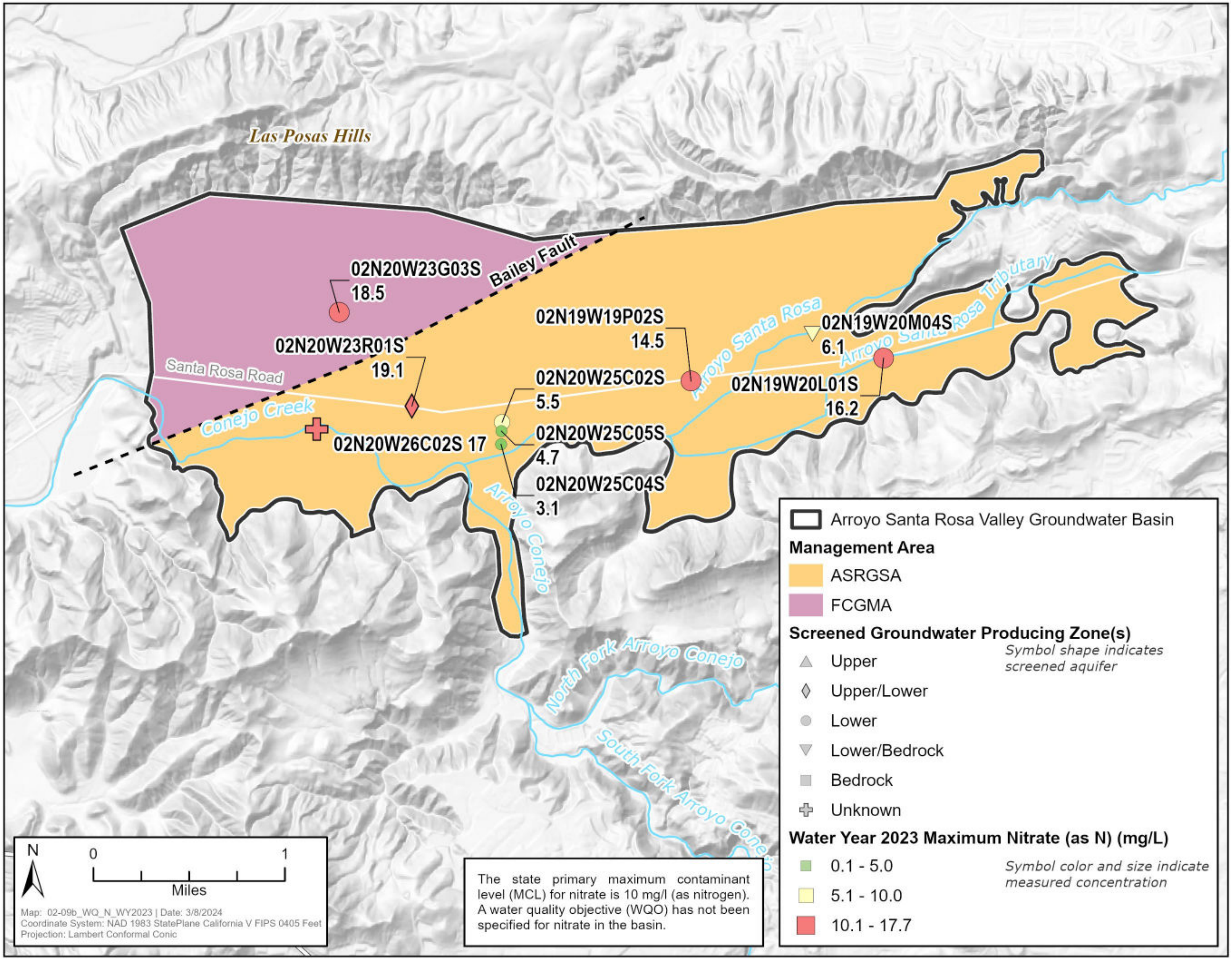

Figure 2.9b Average Nitrate as N Concentration in ASRVGB, Water Year 2023.

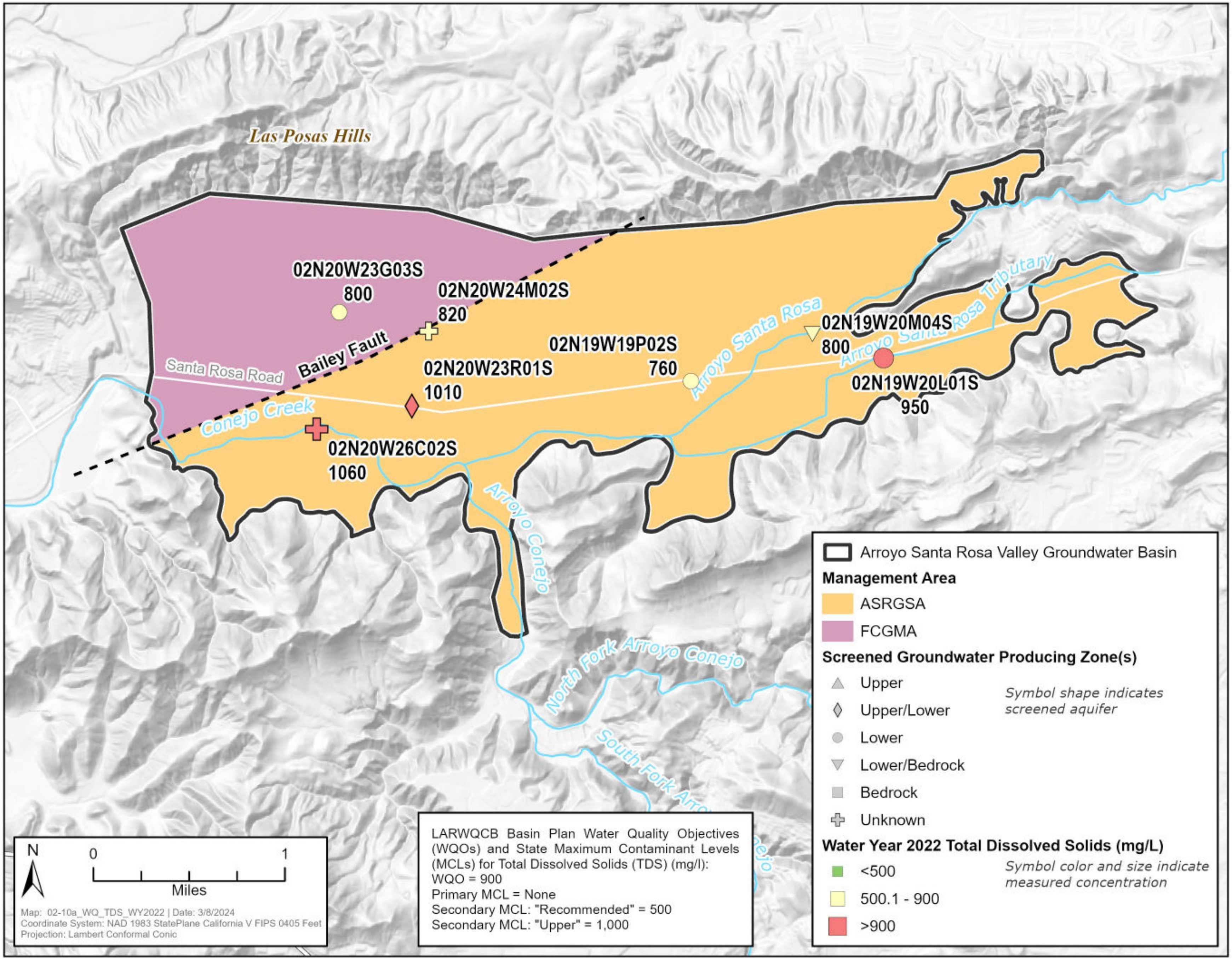

Figure 2.10a Average Total Dissolved Solids Concentration in ASRVGB, Water Year 2022.

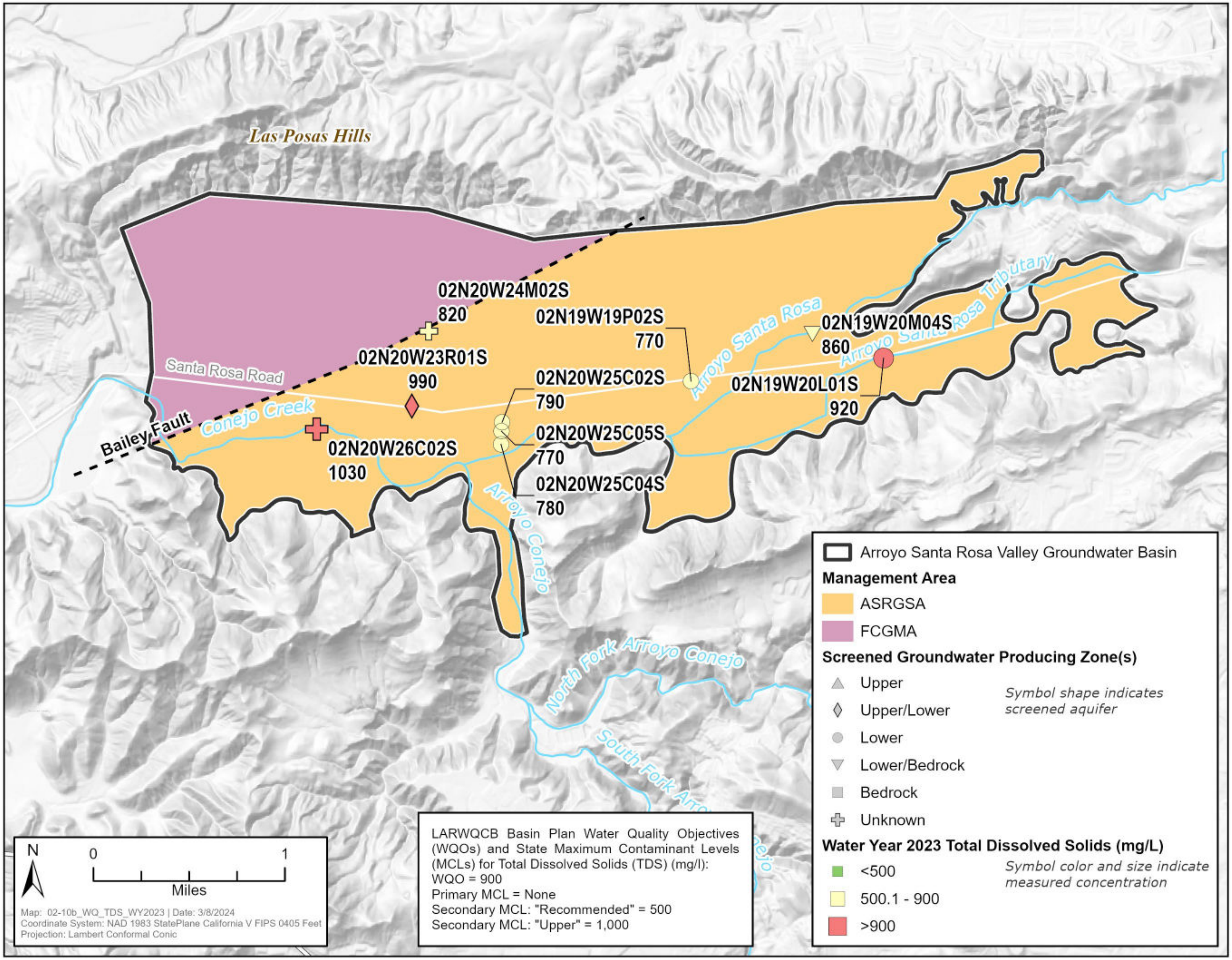

Figure 2.10b Average Total Dissolved Solids Concentration in ASRVGB, Water Year 2023.

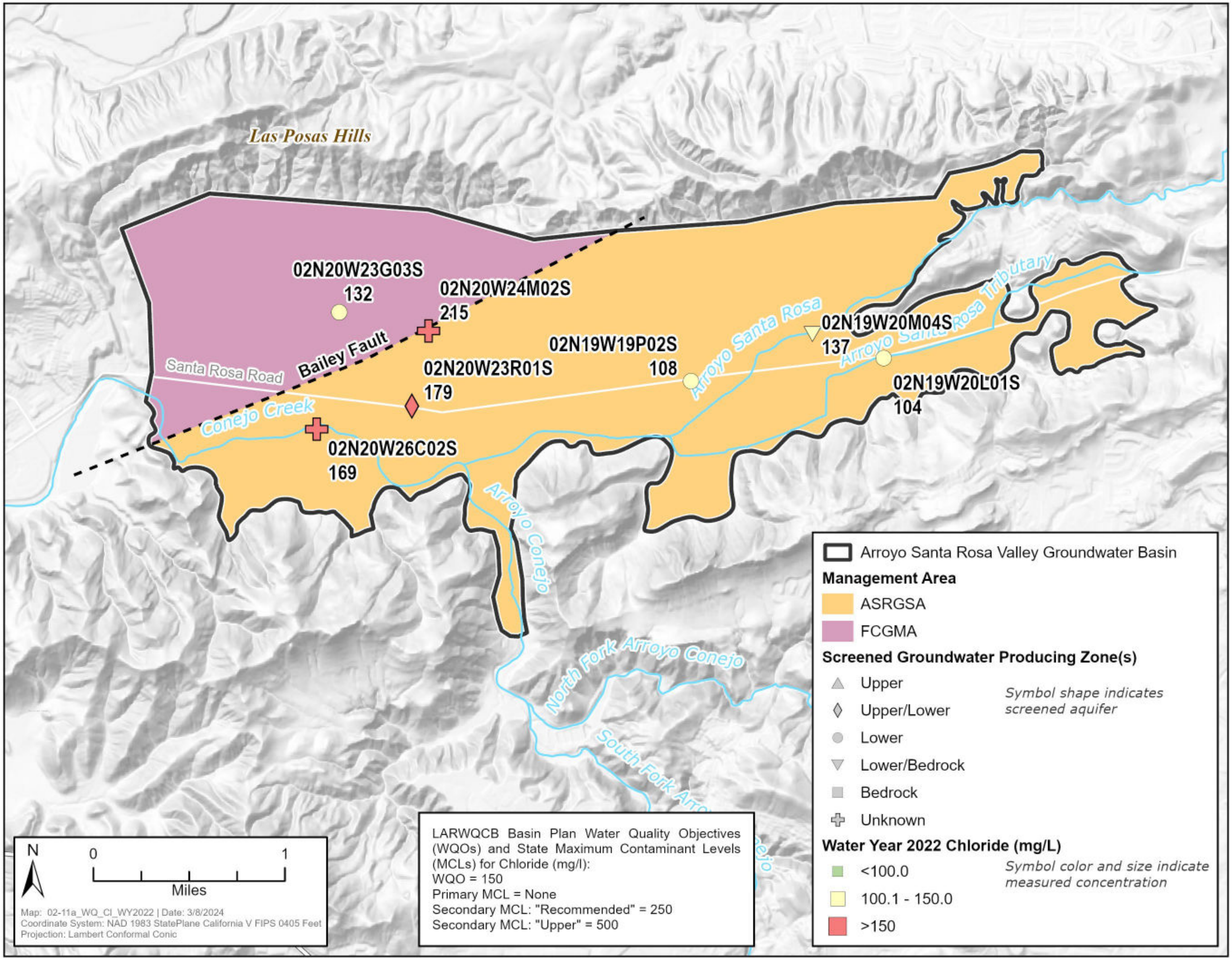

Figure 2.11a Average Chloride Concentration in ASRVGB, Water Year 2022.

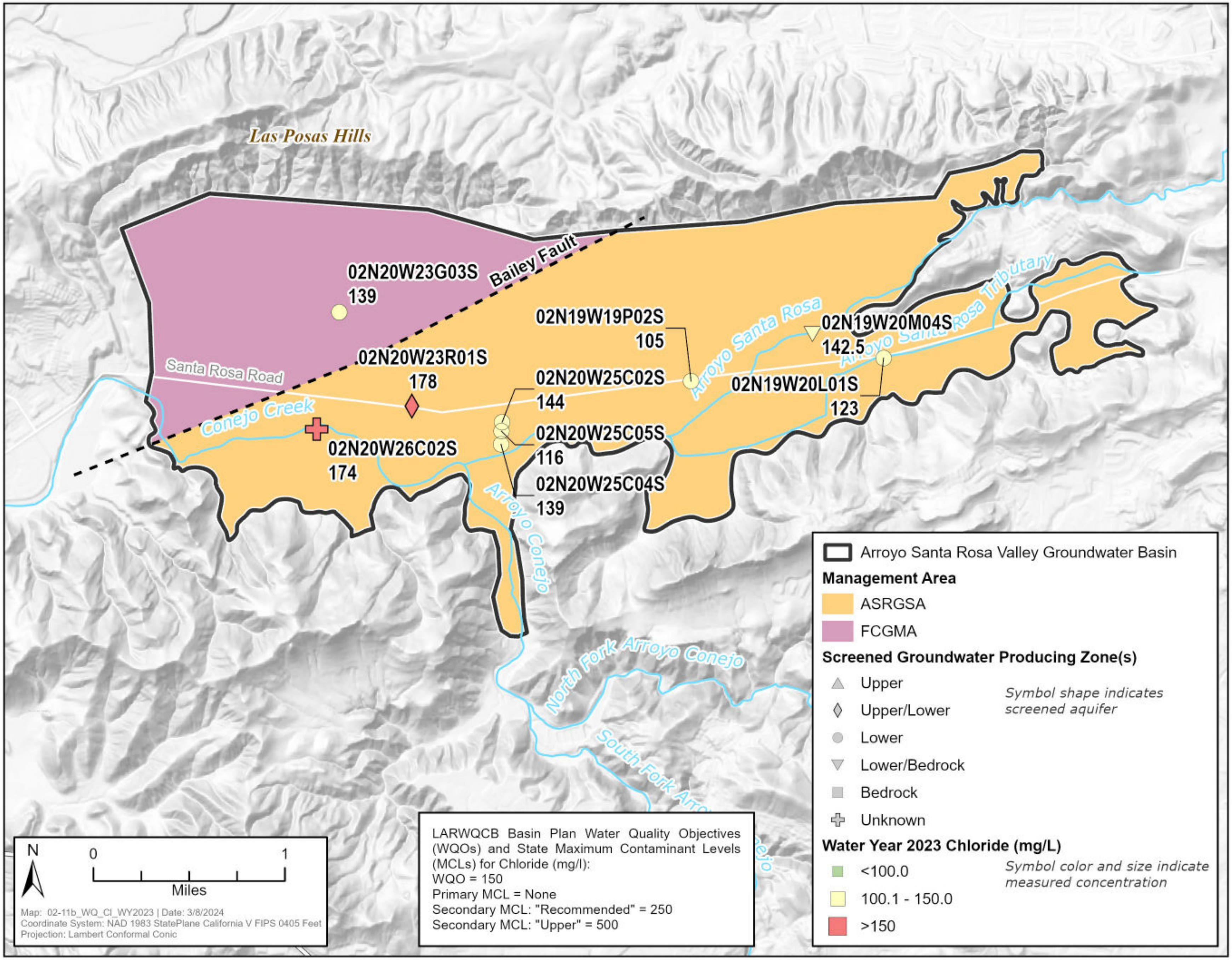

Figure 2.11b Average Chloride Concentration in ASRVGB, Water Year 2023.

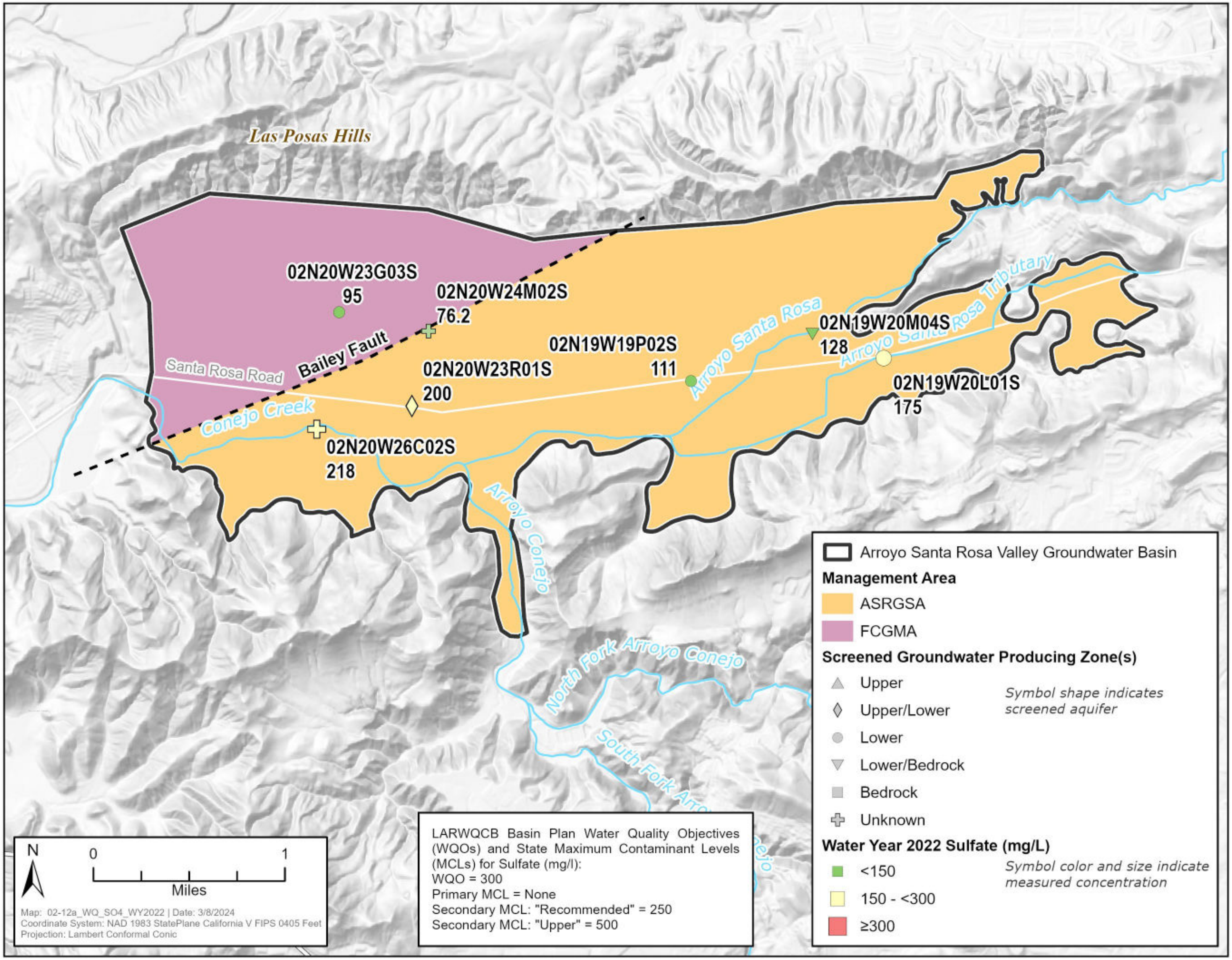

Figure 2.12a Average Sulfate Concentration in ASRVGB, Water Year 2022.

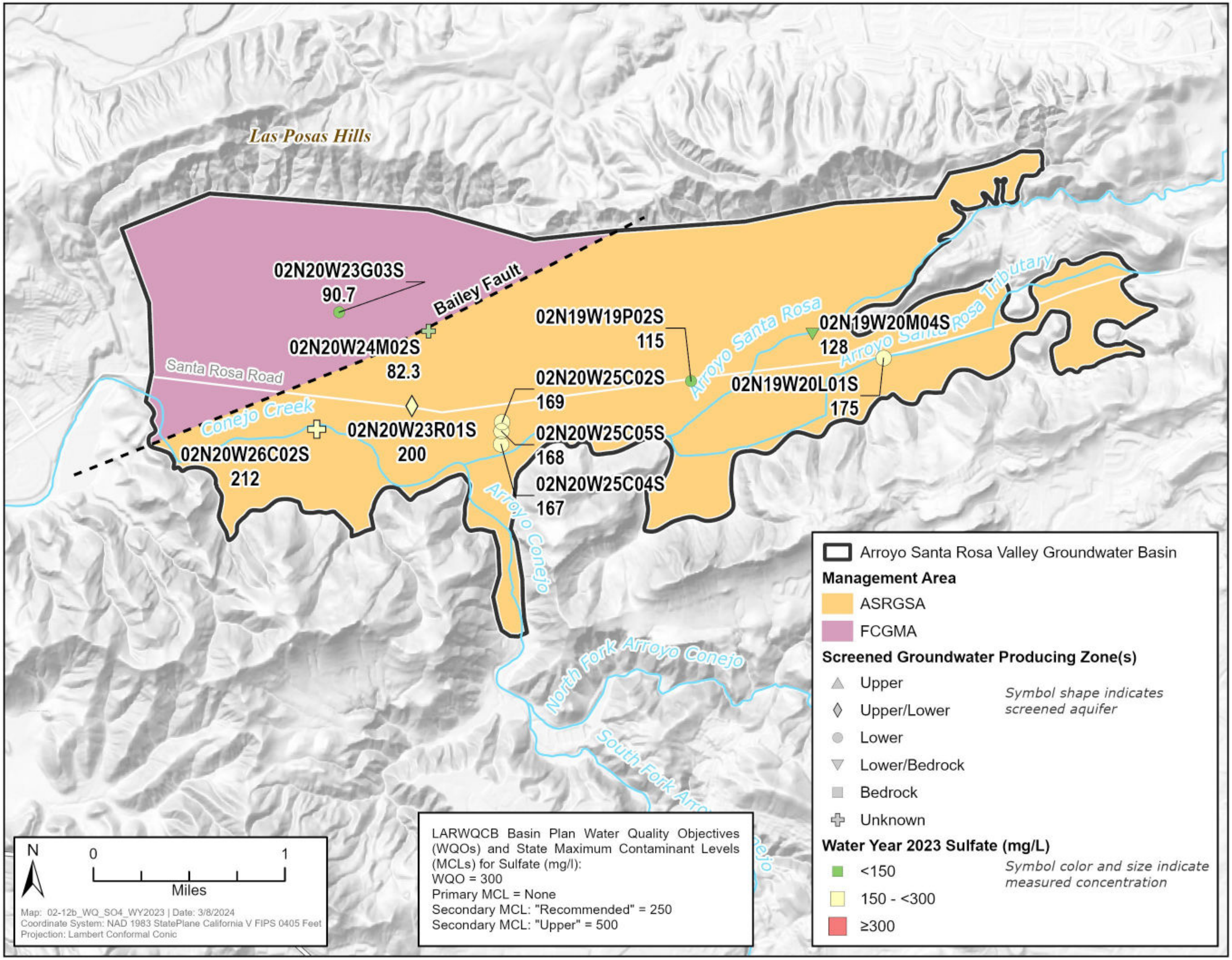

Figure 2.12b Average Sulfate Concentration in ASRVGB, Water Year 2023.

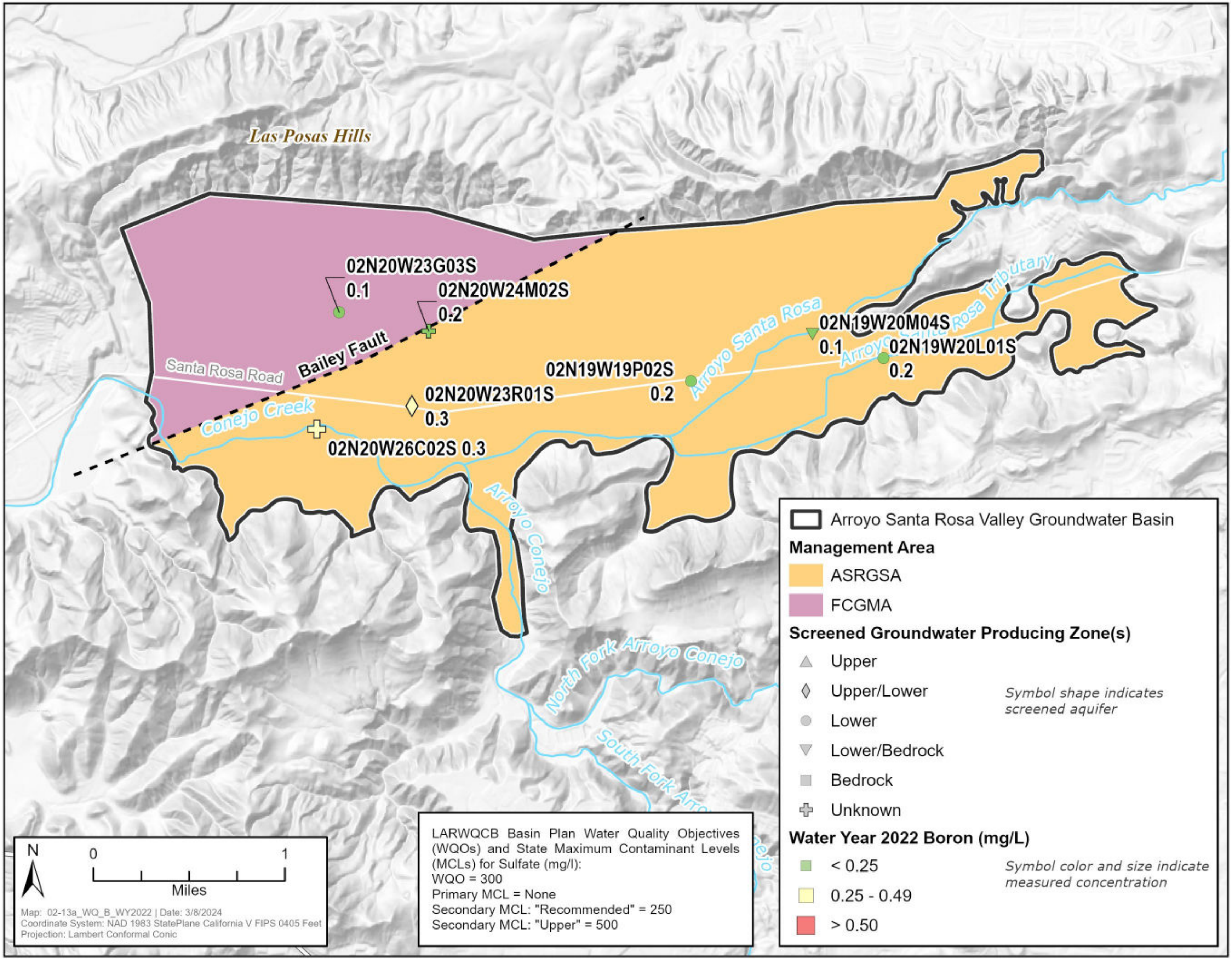

Figure 2.13a Average Boron Concentration in ASRVGB, Water Year 2022.

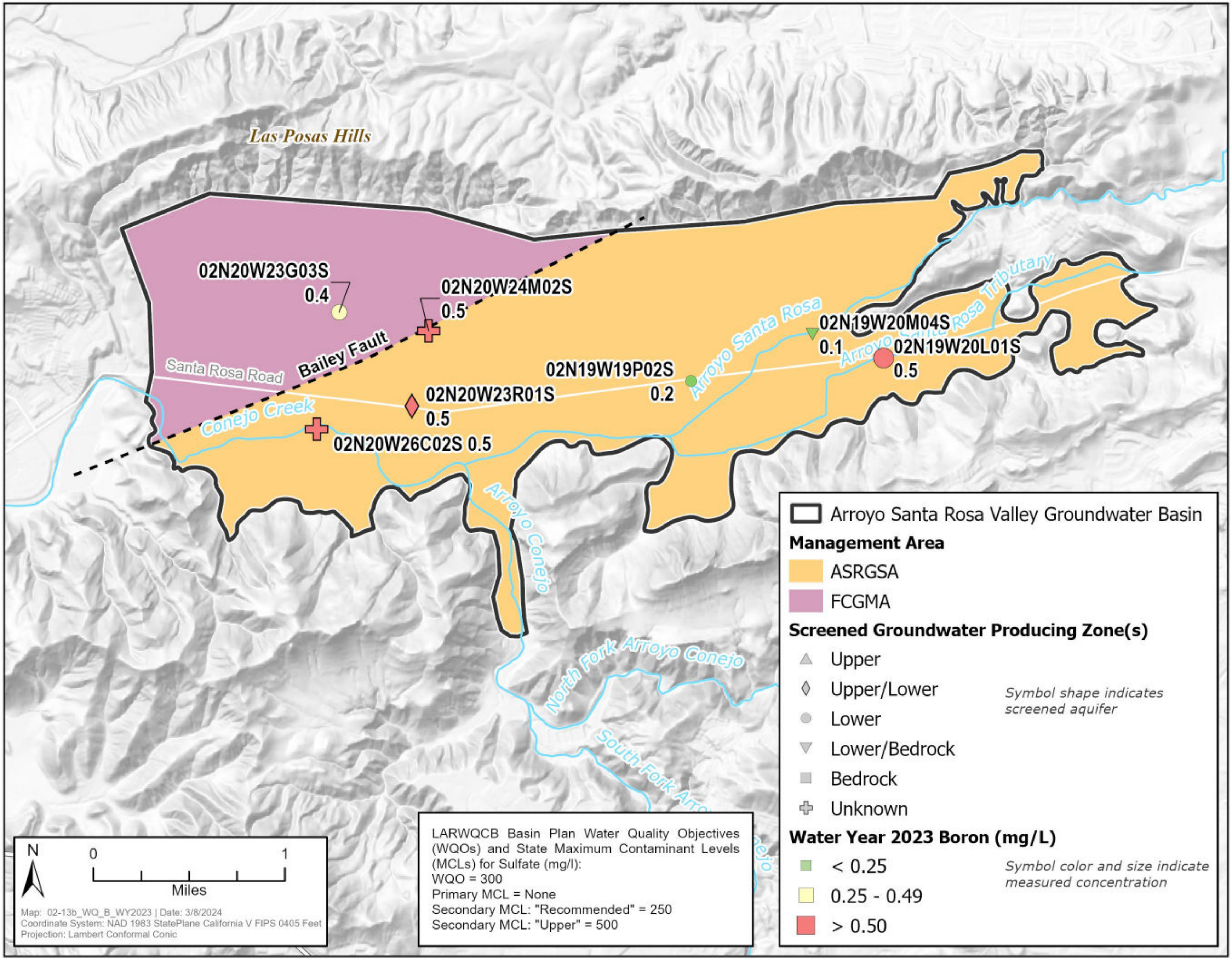

Figure 2.13b Average Boron Concentration in ASRVGB, Water Year 2023.

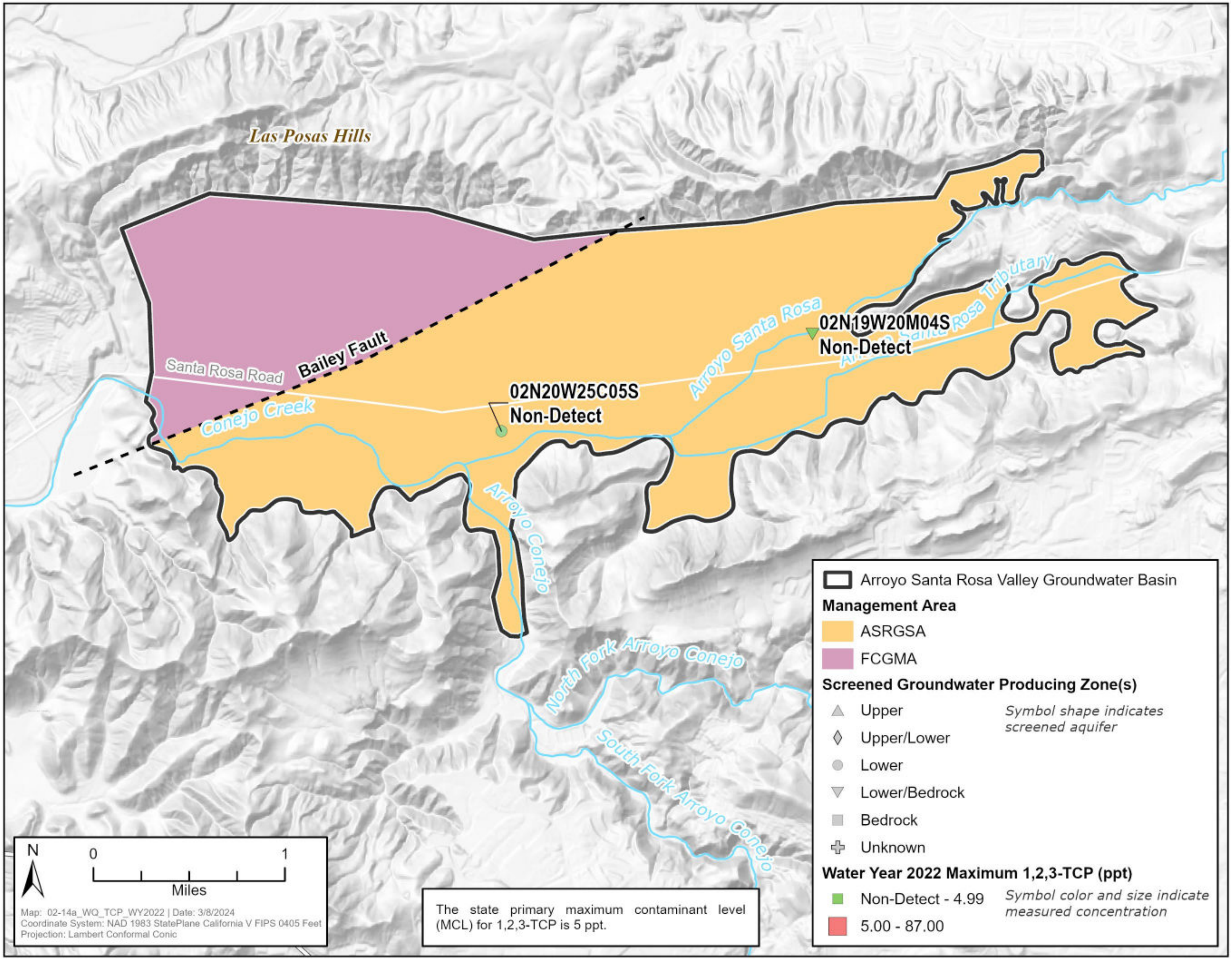

Figure 2.14a Average 1,2,3-Trichloropropane Concentration in ASRVGB, Water Year 2022.

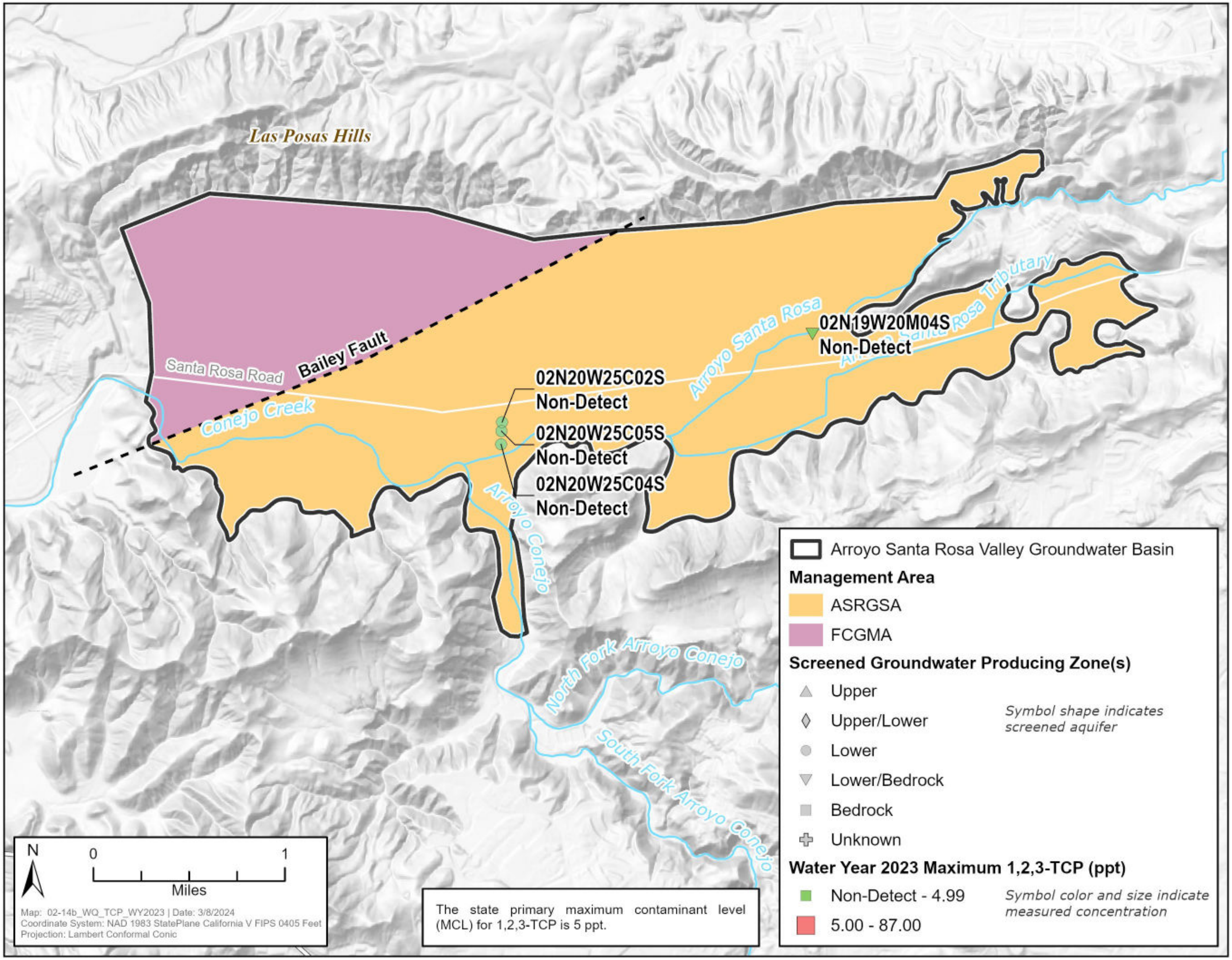

Figure 2.14b Average 1,2,3-Trichloropropane Concentration in ASRVGB, Water Year 2023.

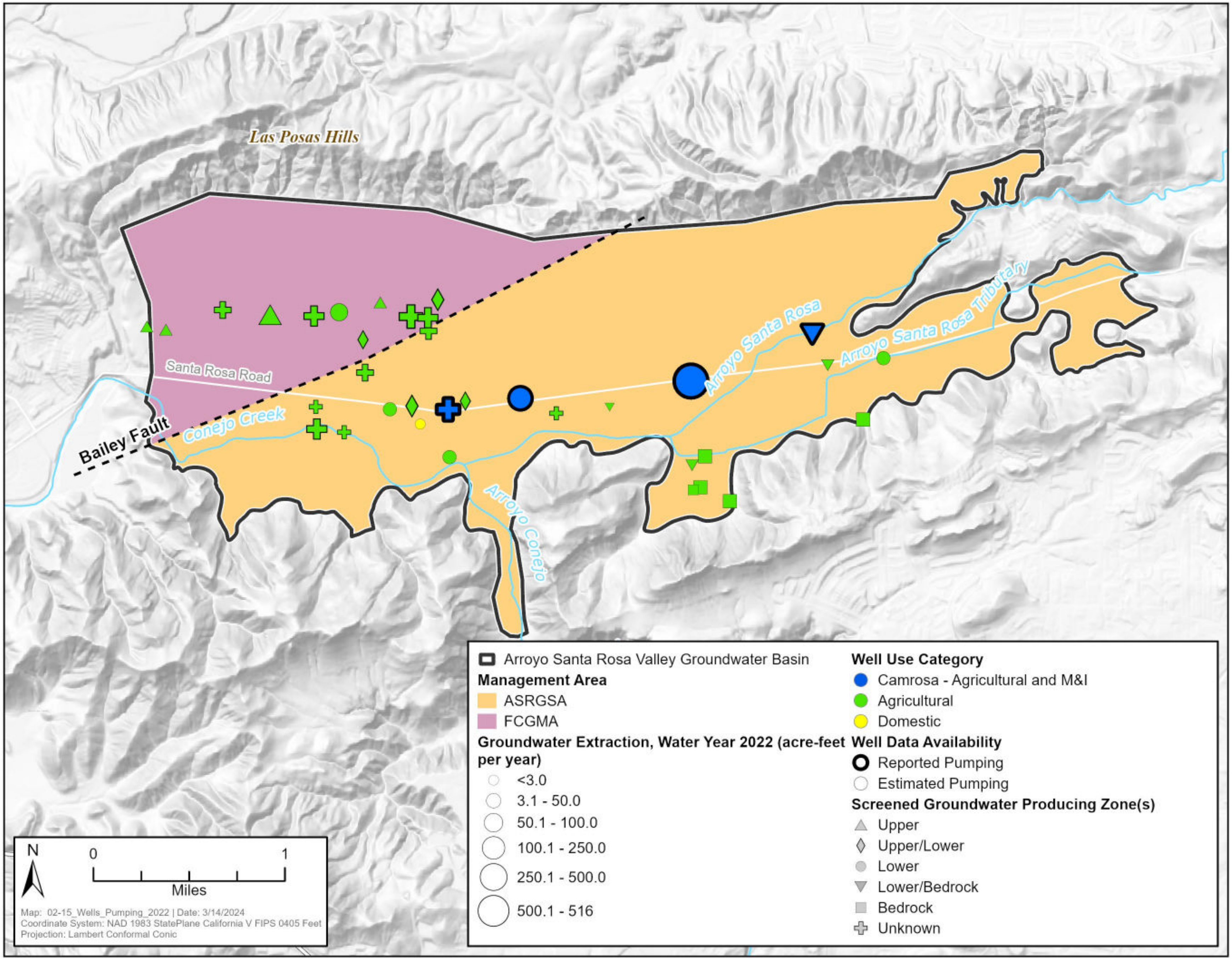

Figure 2.15 Extraction Well Rates, Water Year 2022.

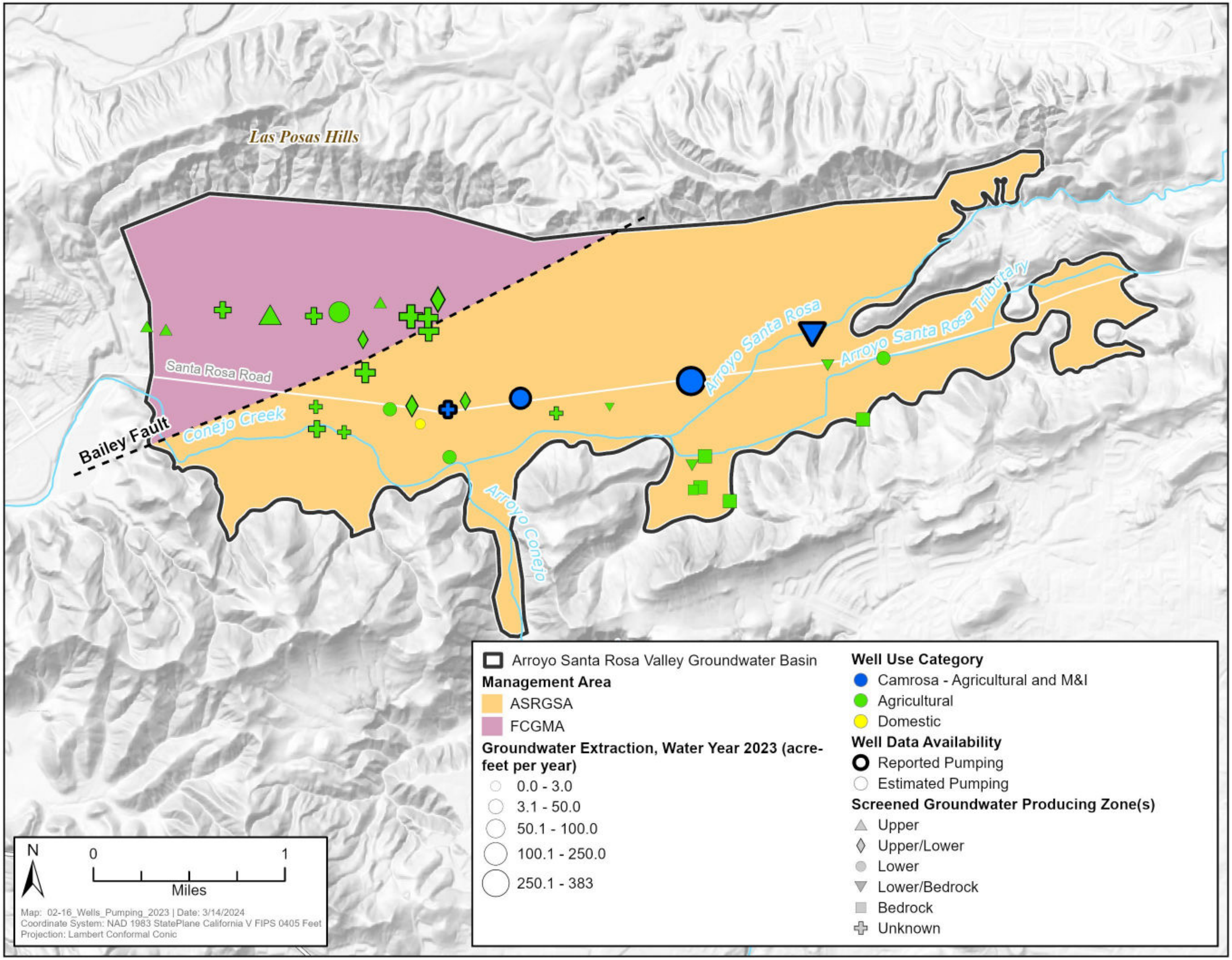

Figure 2.16 Extraction Well Rates, Water Year 2023.

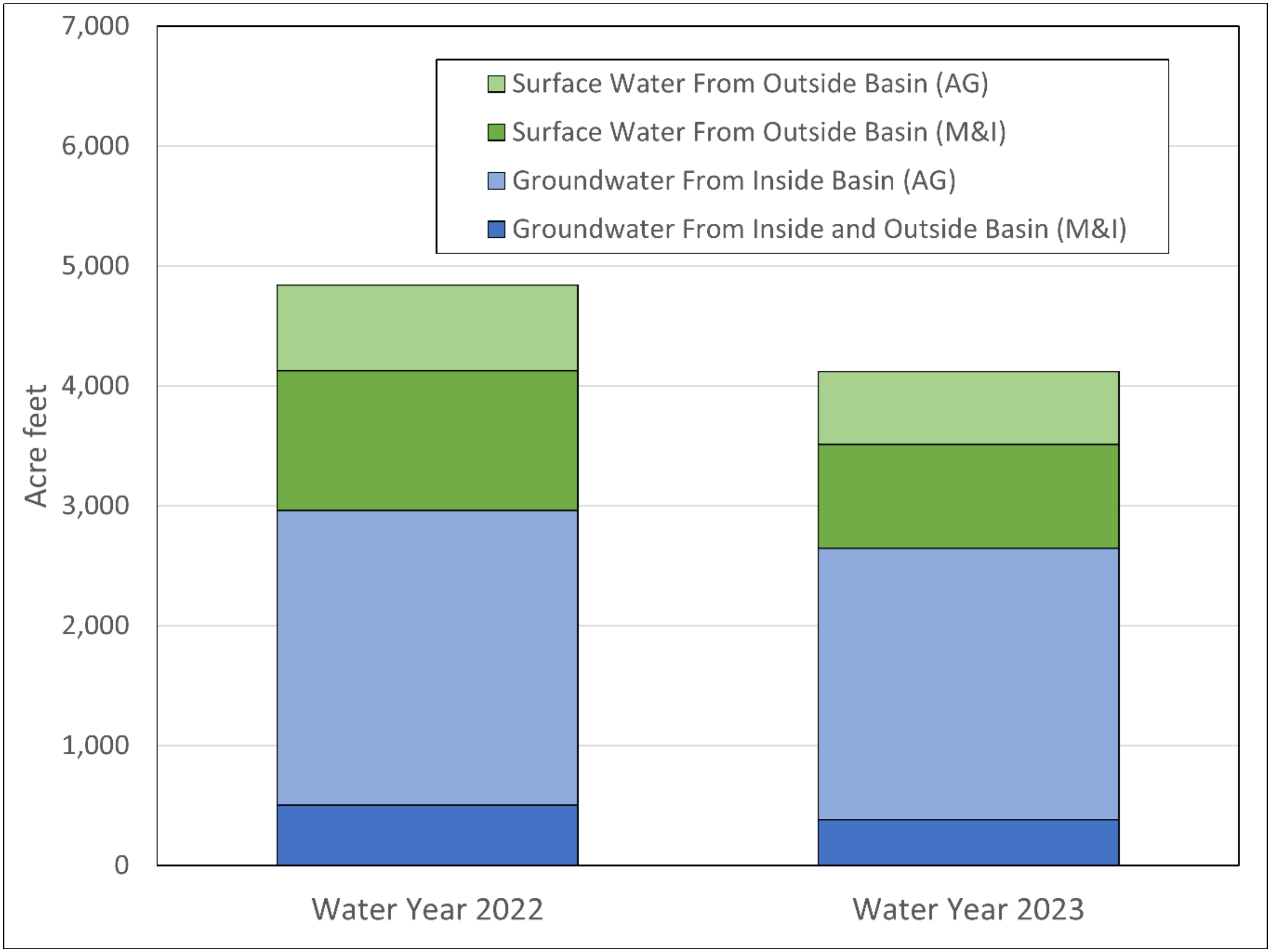

Figure 2.17 Total Water Use Within ASRVGB During Water Years 2022 and 2023.

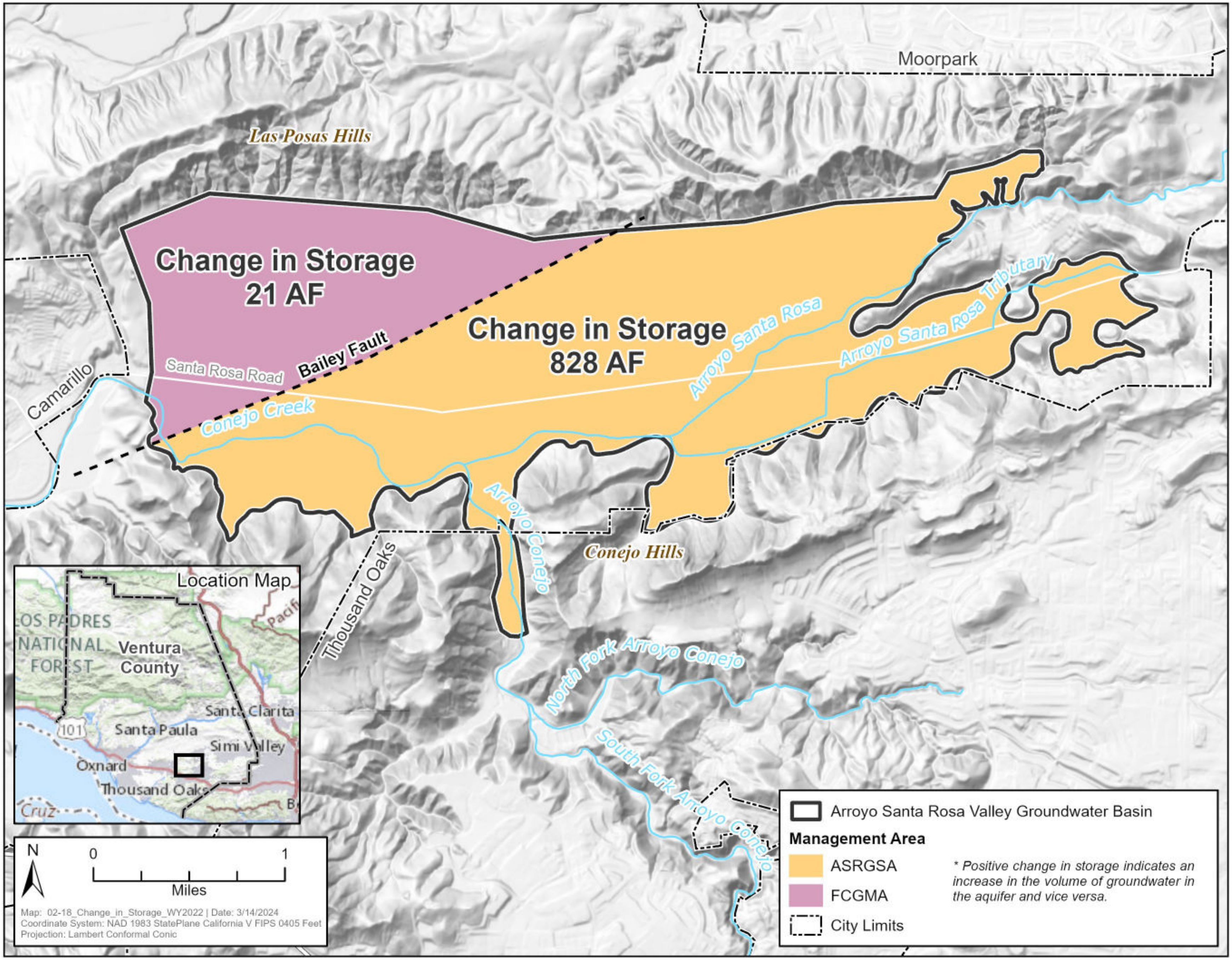

Figure 2.18 Change in Groundwater in Storage Map from Water Years 2021 to 2022 .

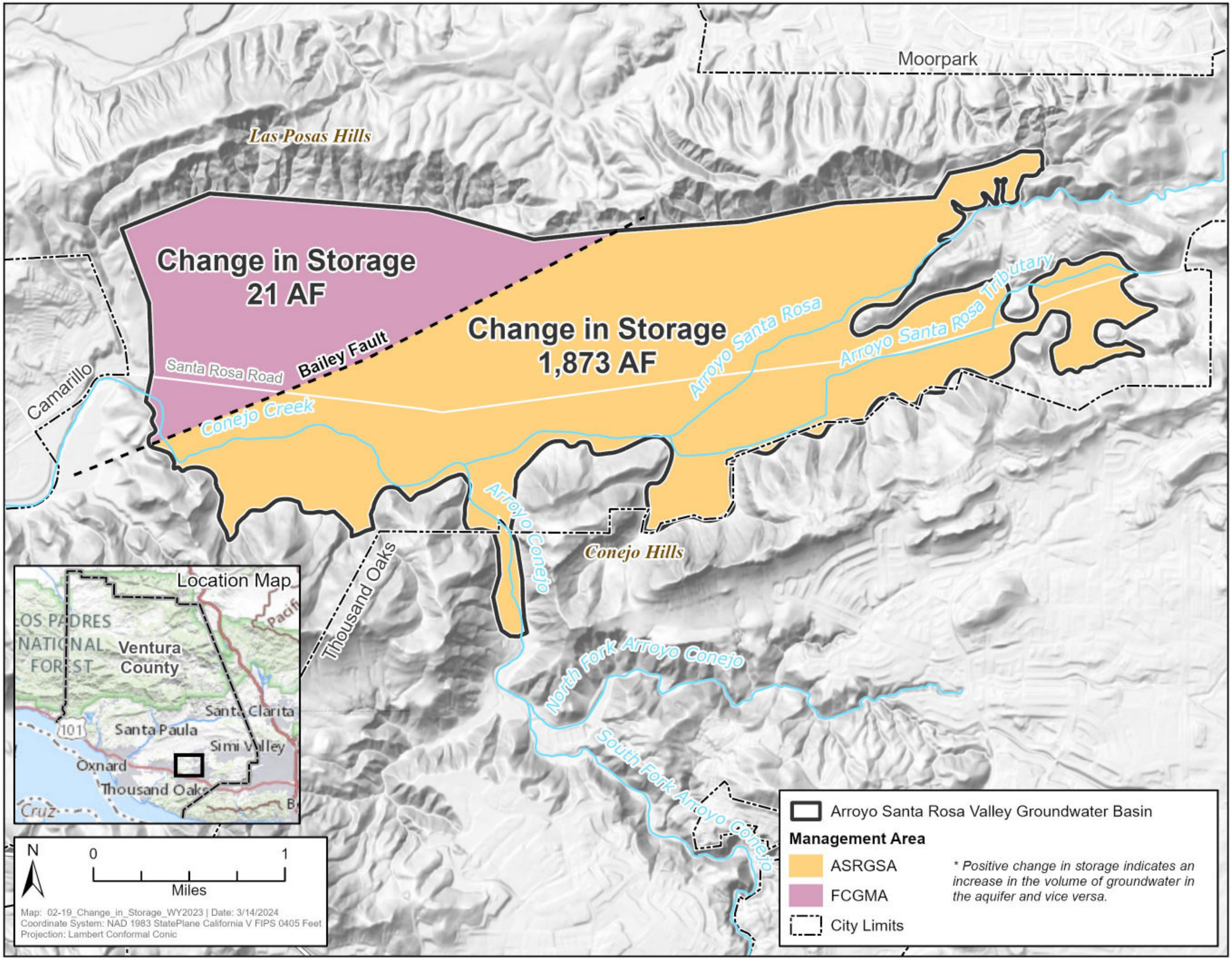

Figure 2.19 Change in Groundwater in Storage Map from Water Years 2022 to 2023.

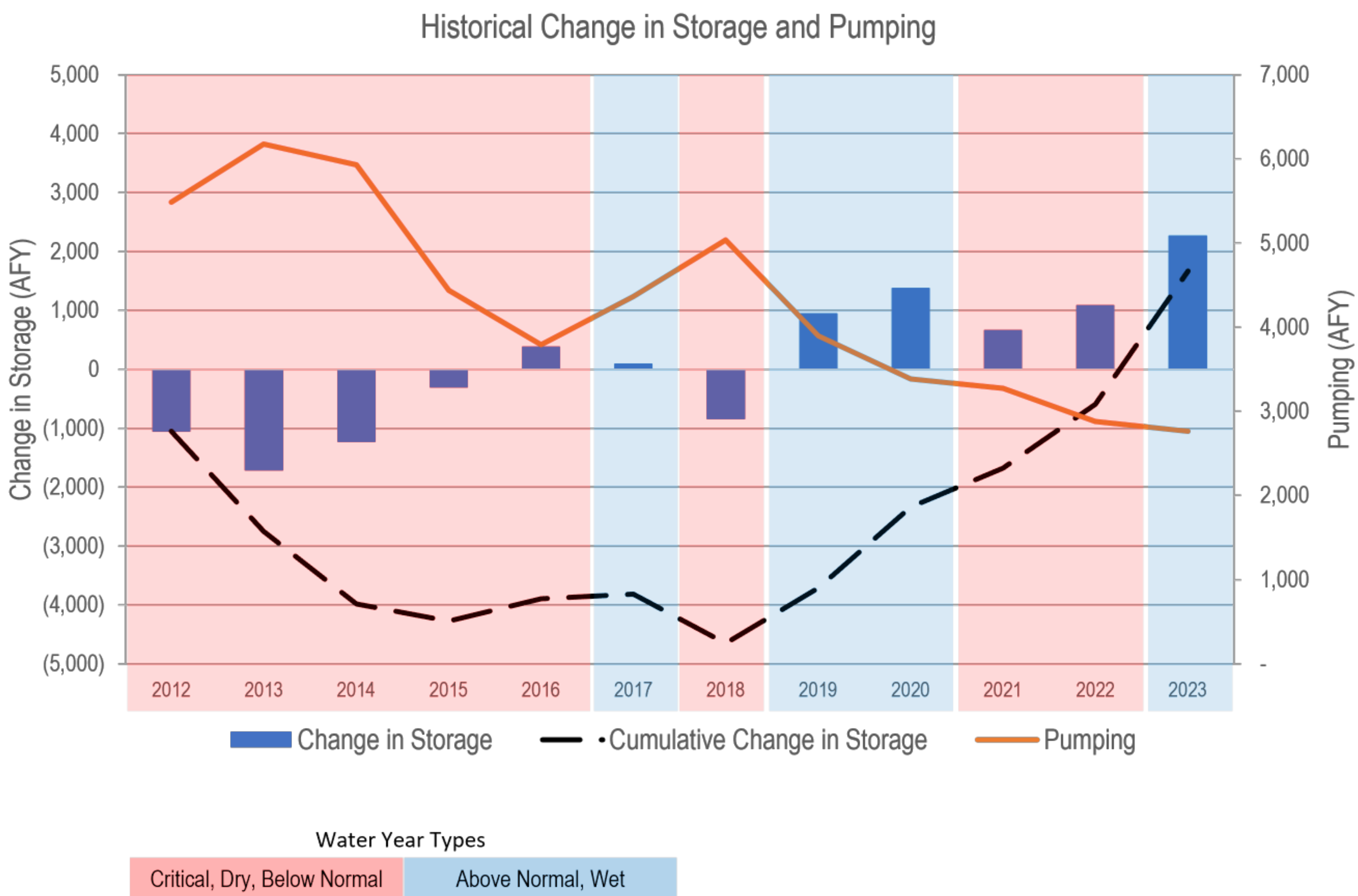

Figure 2.20 Change in Groundwater in Storage with Annual Groundwater Extraction and Water Year Type.

Figure 3.1 Groundwater Level Hydrographs with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

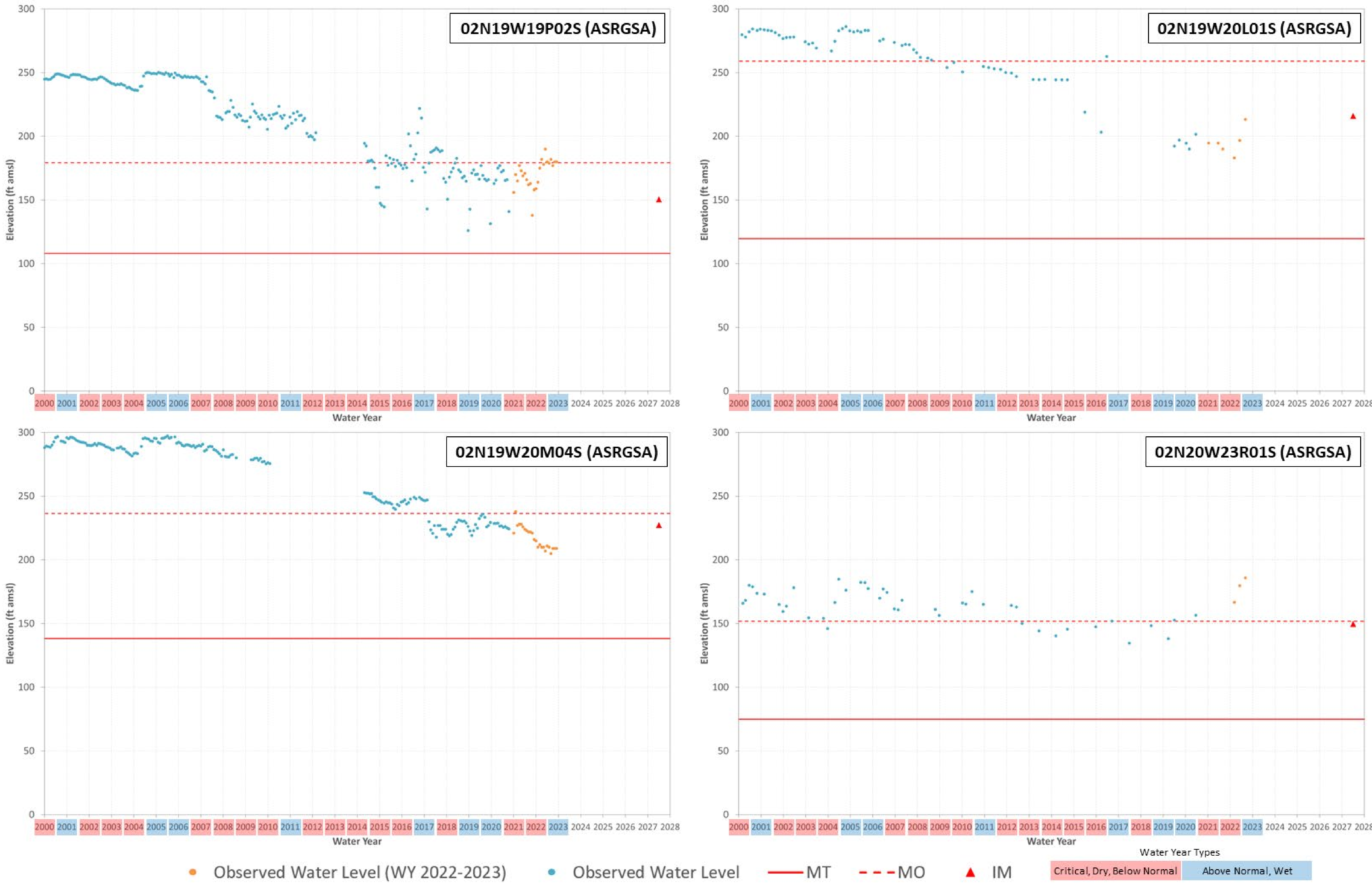

Figure 3.1 Groundwater Level Hydrographs with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

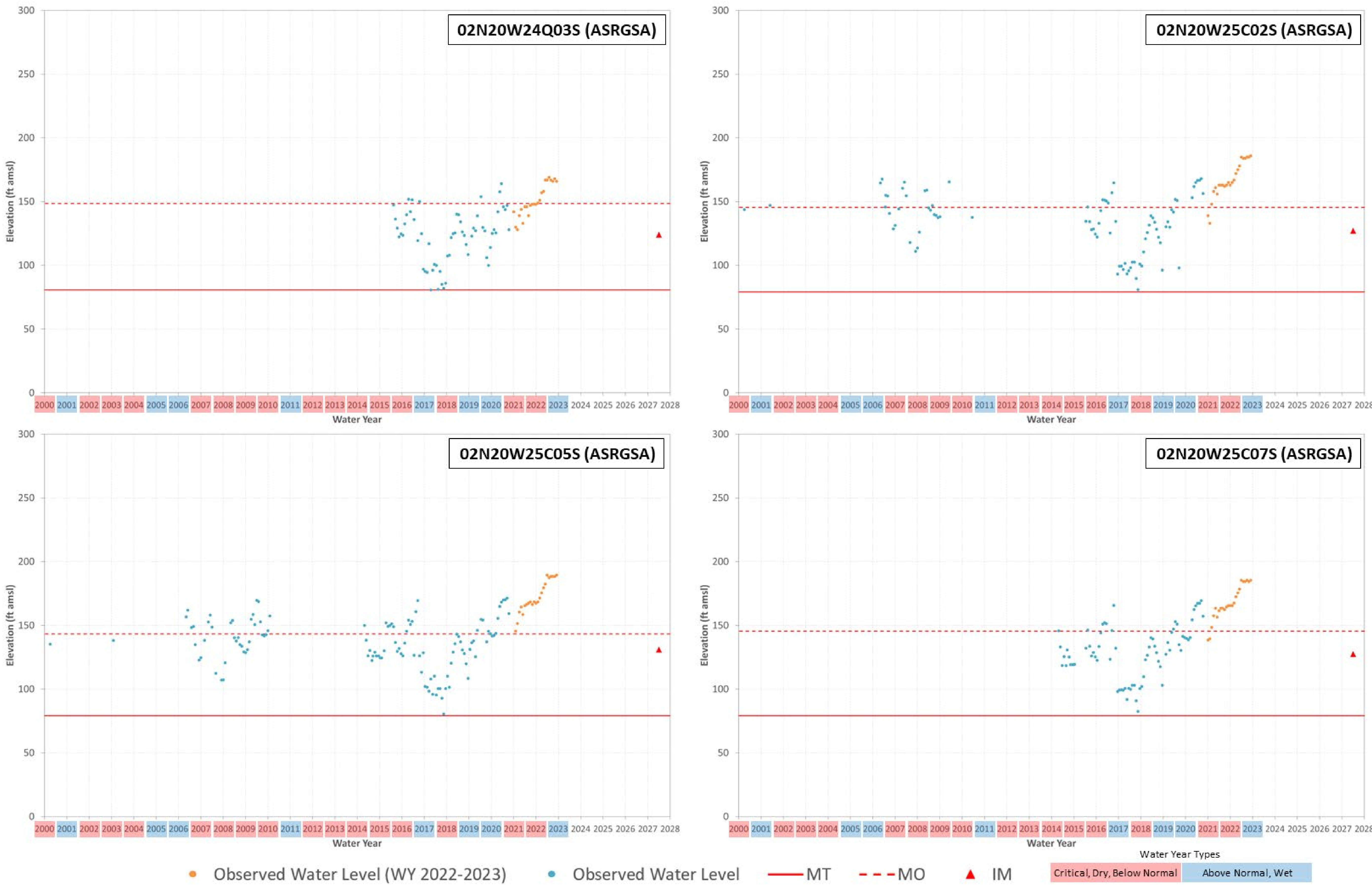

Figure 3.1 Groundwater Level Hydrographs with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

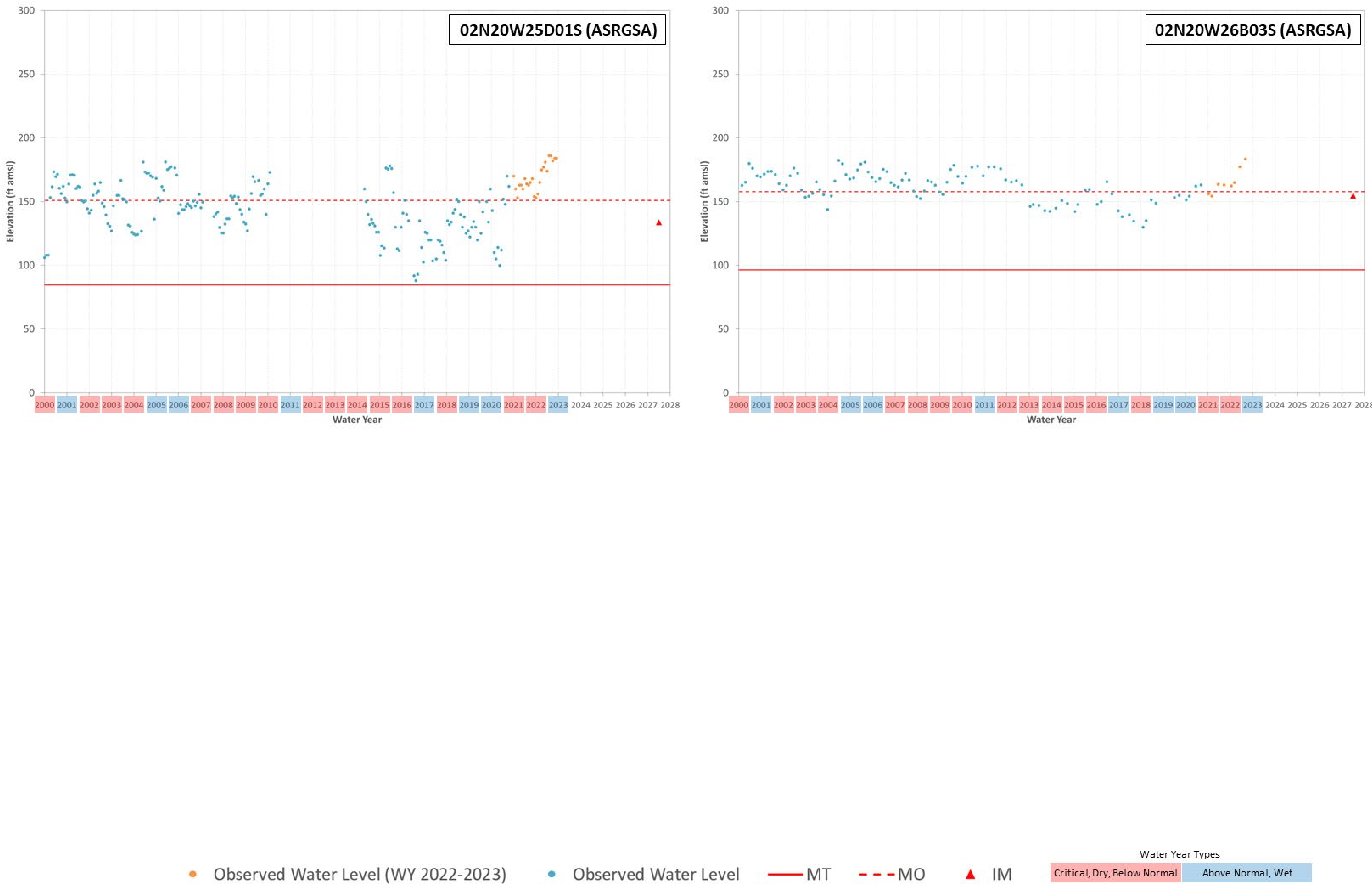

Figure 3.1 Groundwater Level Hydrographs with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

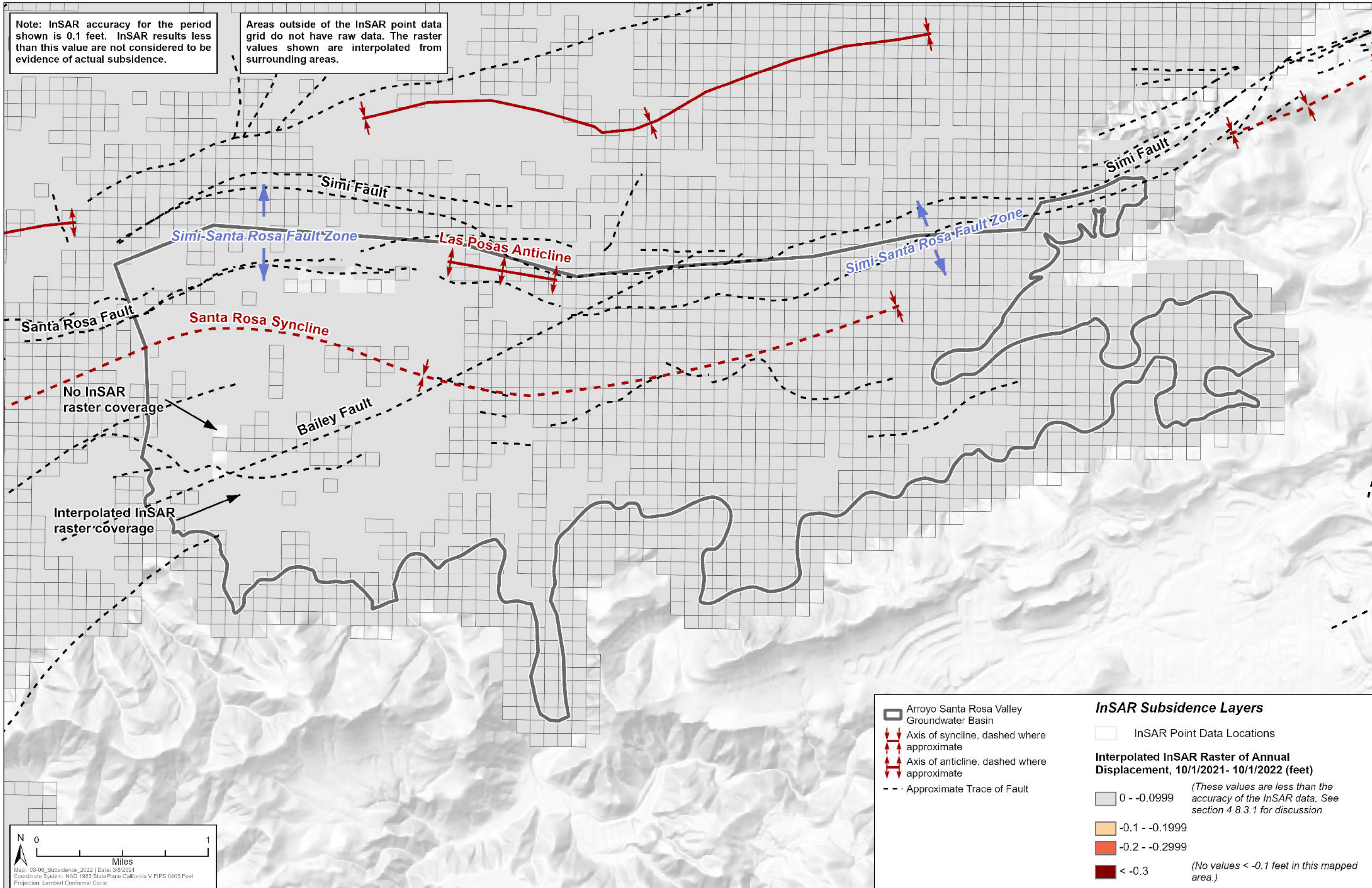

Figure 3.2 Subsidence for ASRVGB Between Water Years 2021 and 2022.

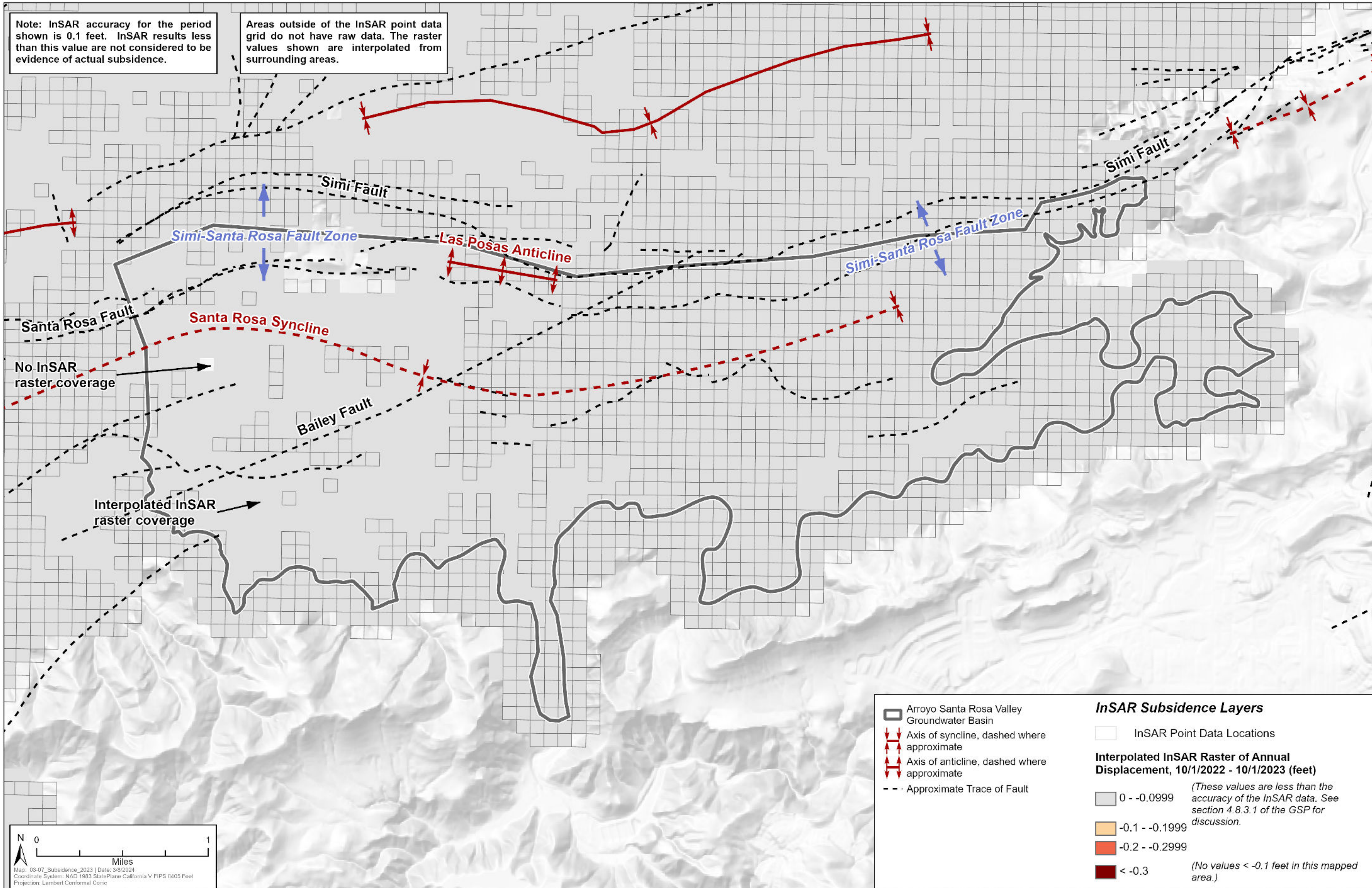

Figure 3.3 Subsidence for ASRVGB Between Water Years 2022 and 2023.

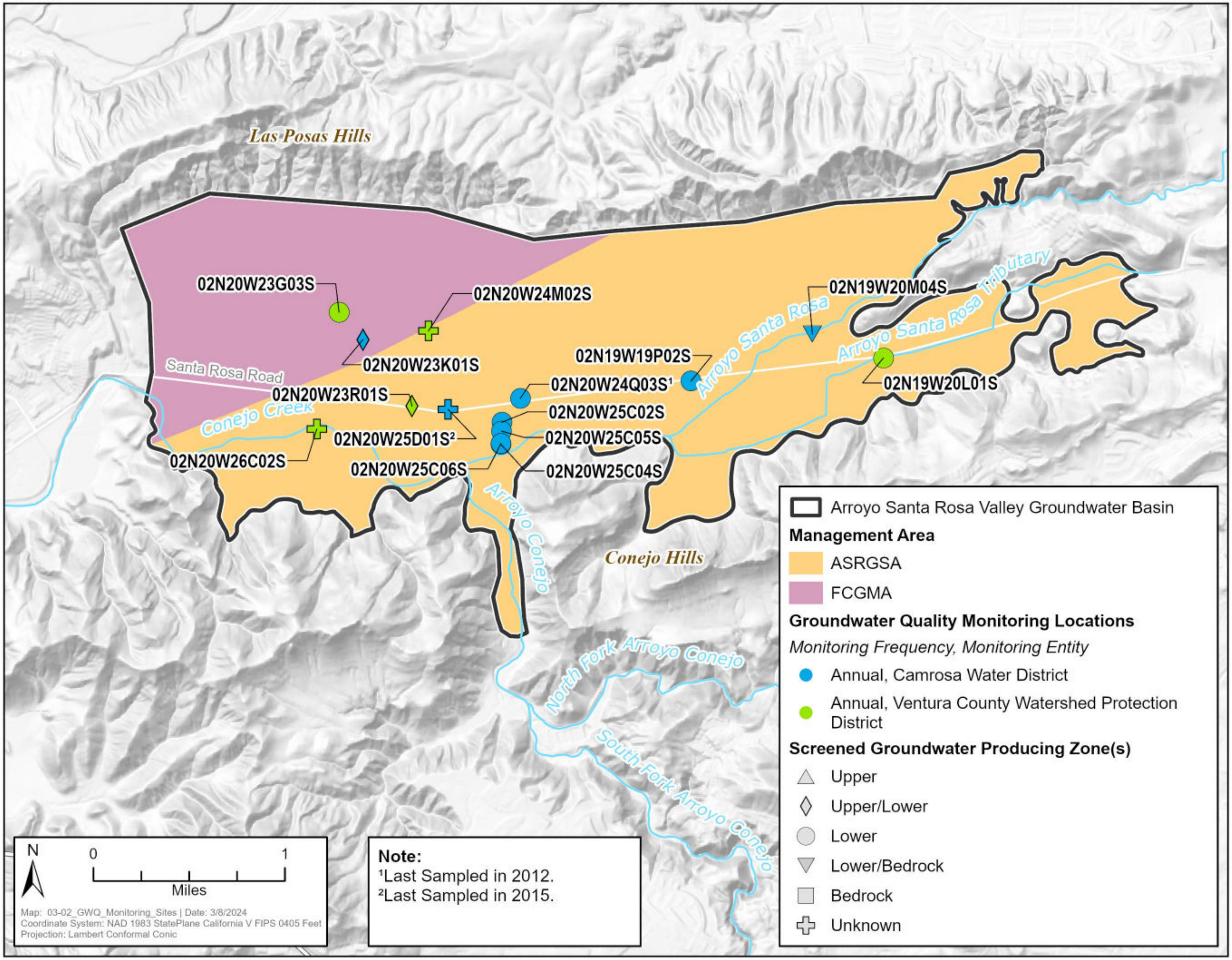

Figure 3.4 Groundwater Quality Monitoring Network Wells.

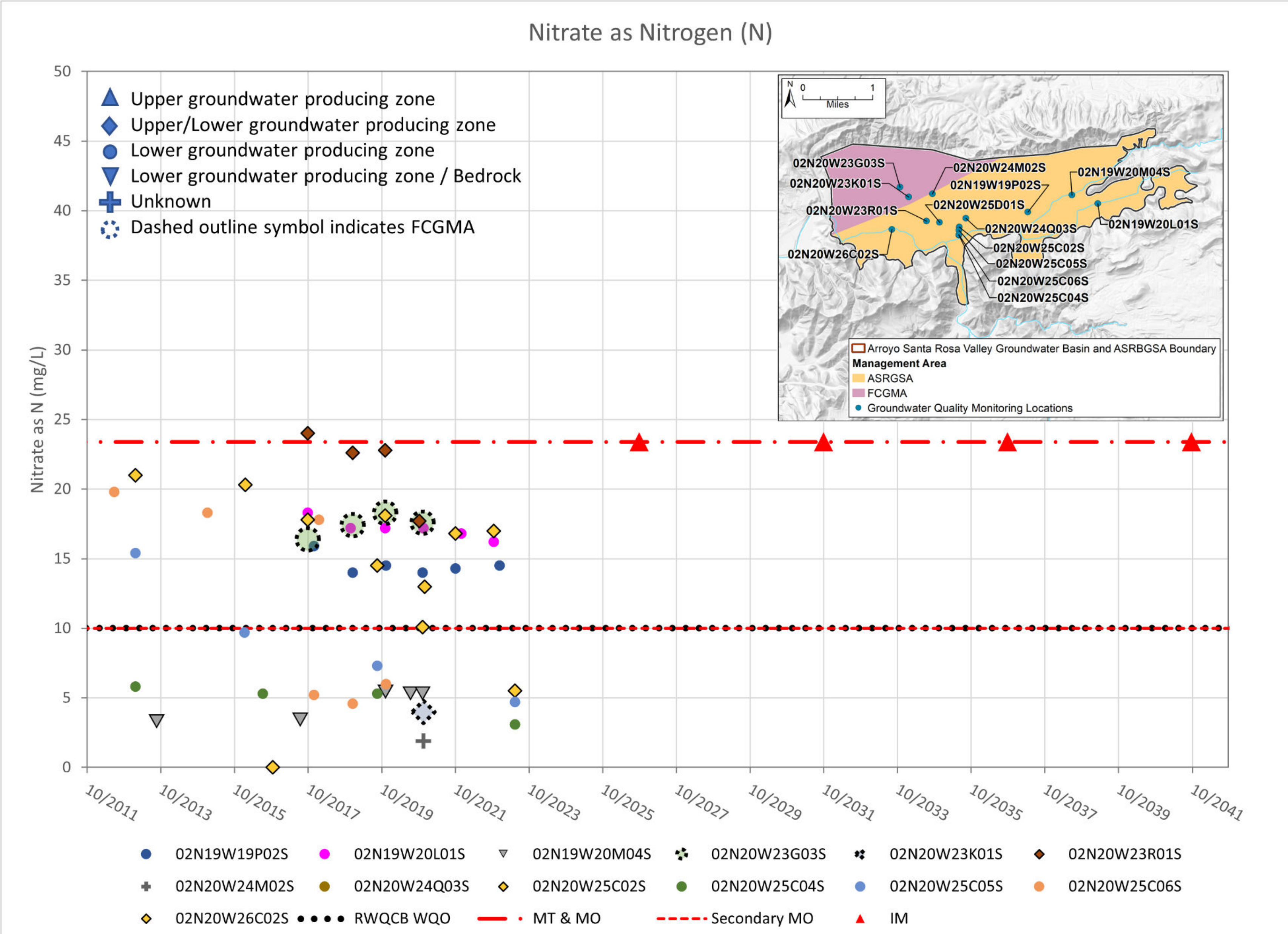

Figure 3.5a Nitrate as N Chemograph with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

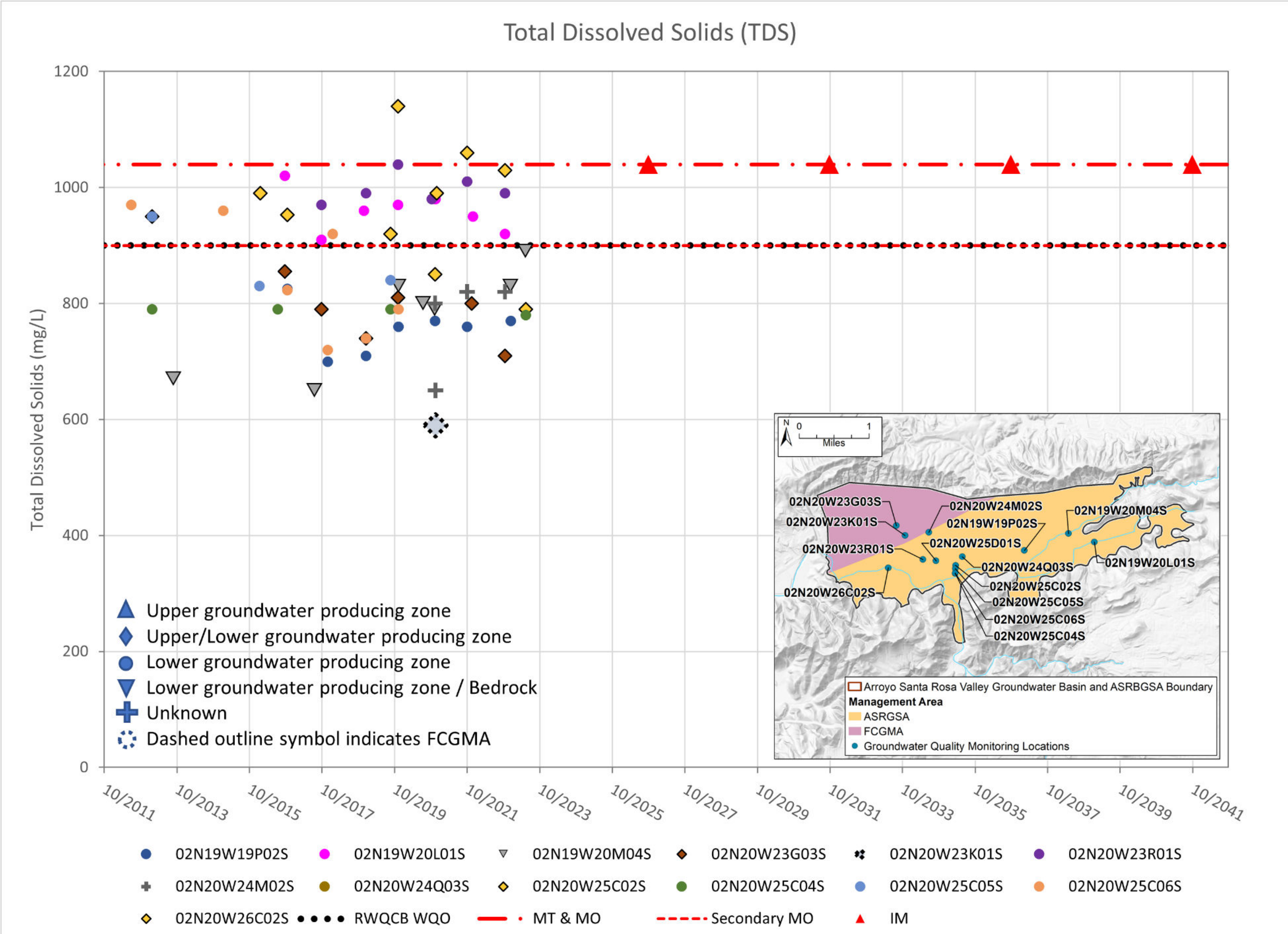

Figure 3.5b Total Dissolved Solids Chemograph with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

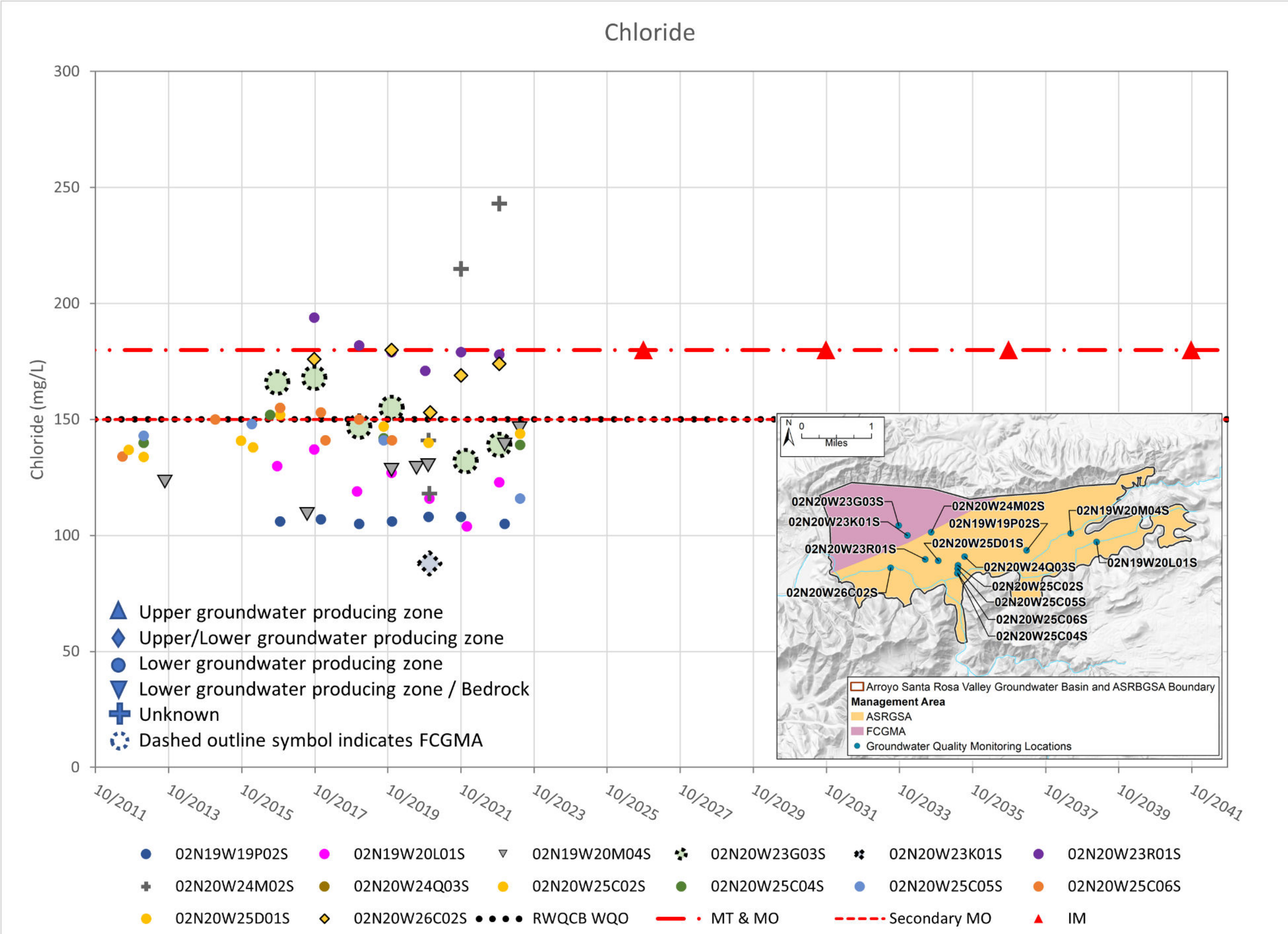

Figure 3.5c Chloride Chemograph with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

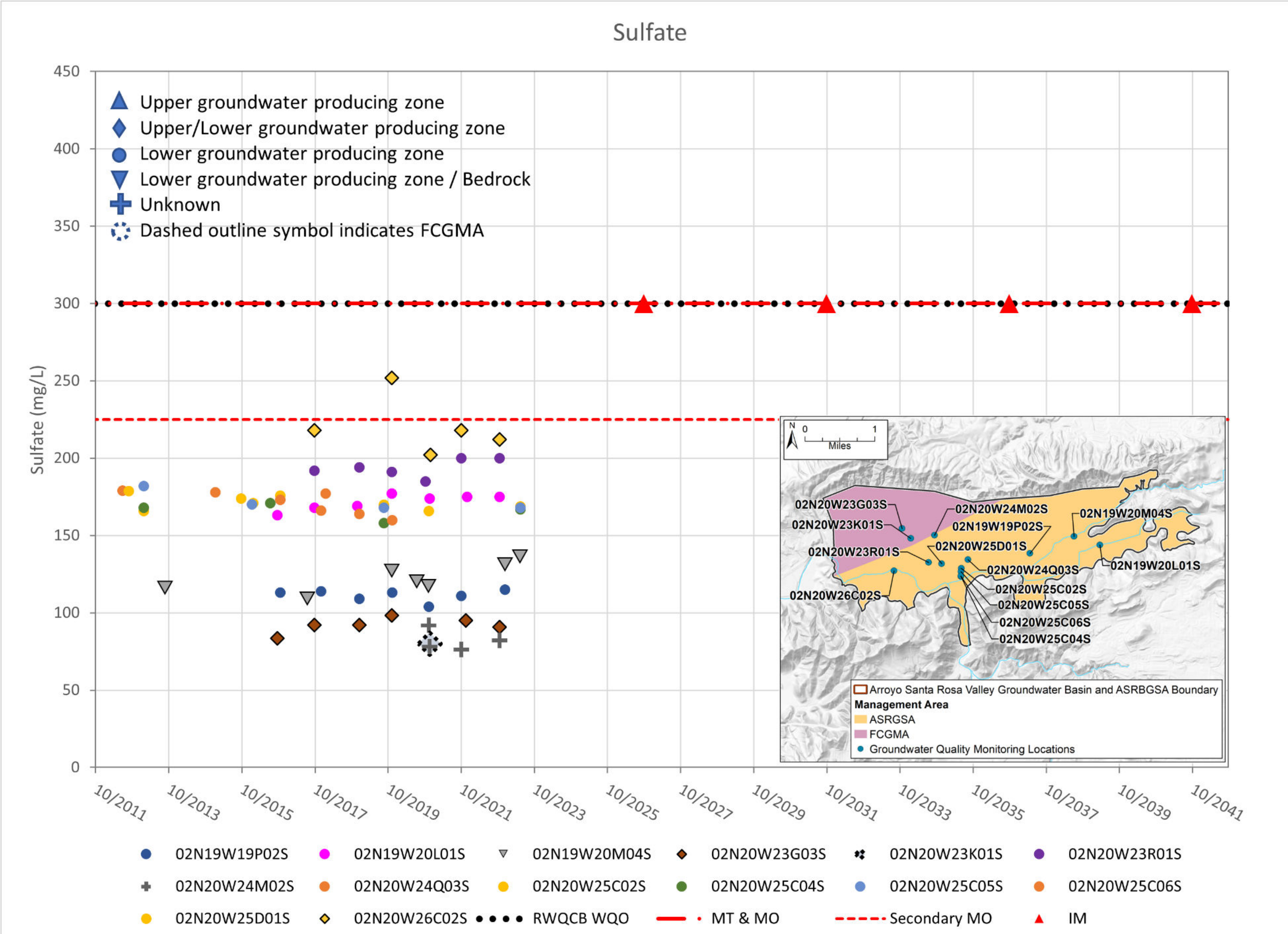

Figure 3.5d Sulfate Chemograph with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

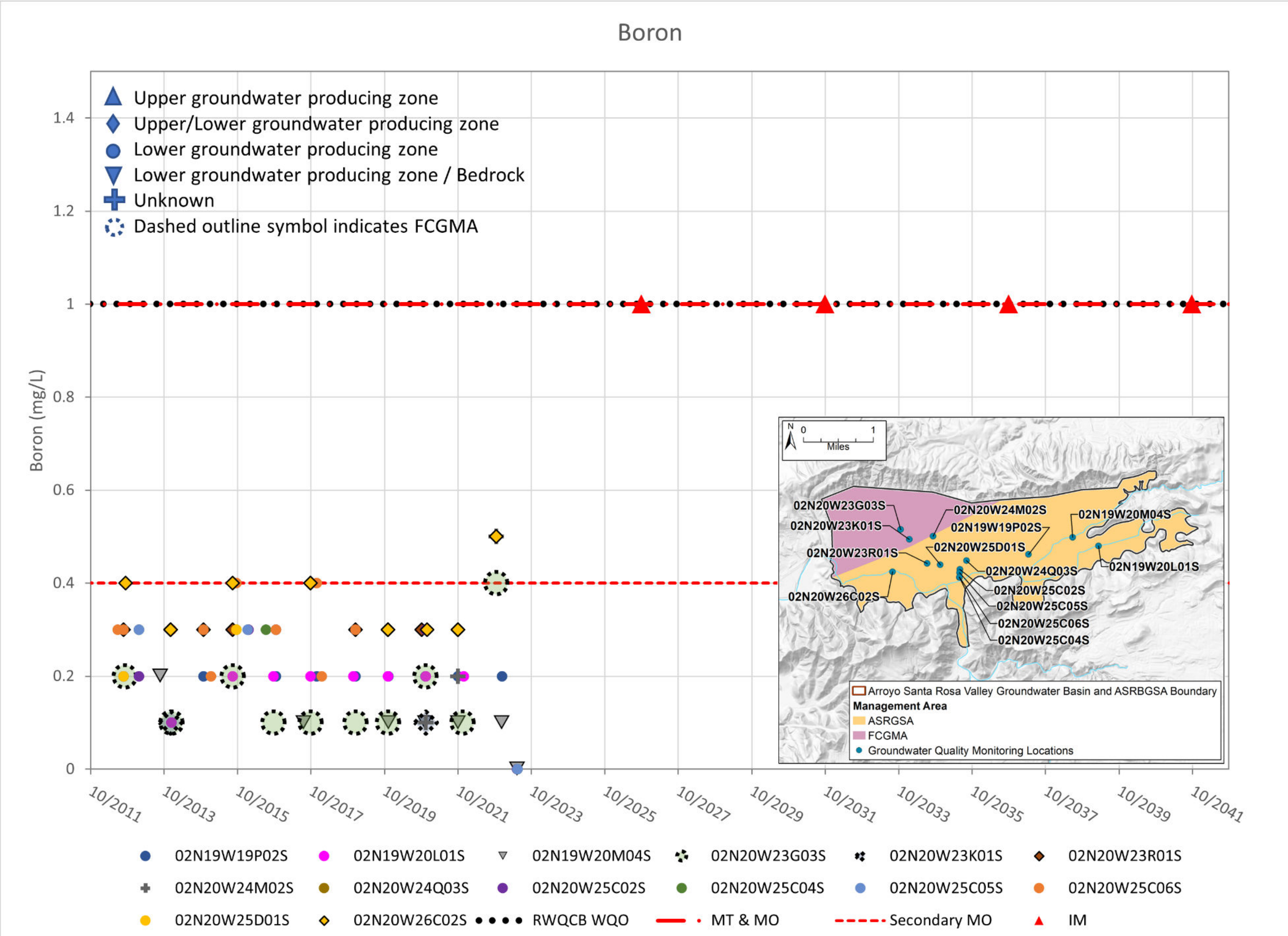

Figure 3.5e Boron Chemograph with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

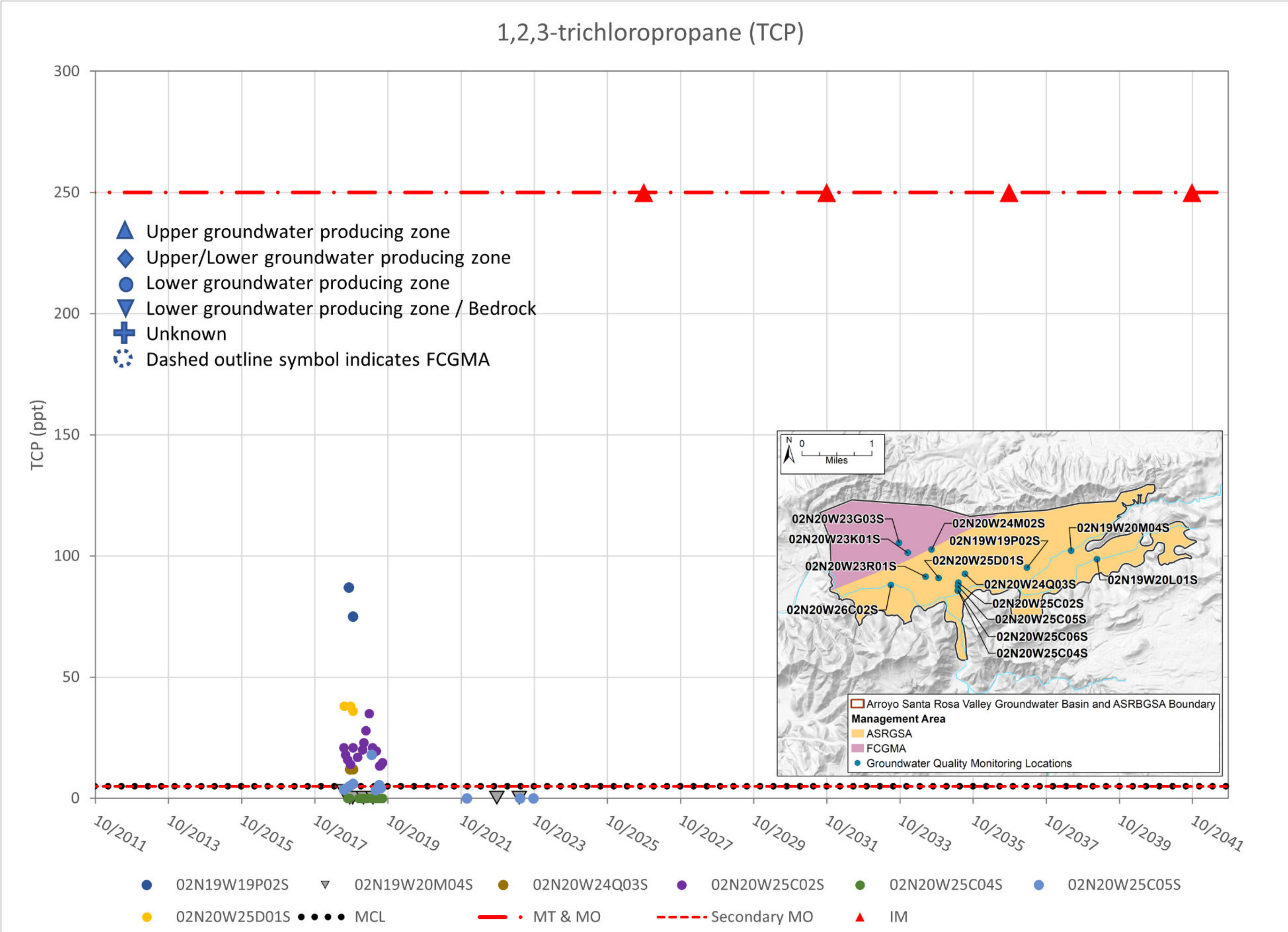

Figure 3.5f 1,2,3-Trichloropropane Chemograph with Minimum Thresholds, Measurable Objectives, and Interim Milestones, Water Years 2022-2023.

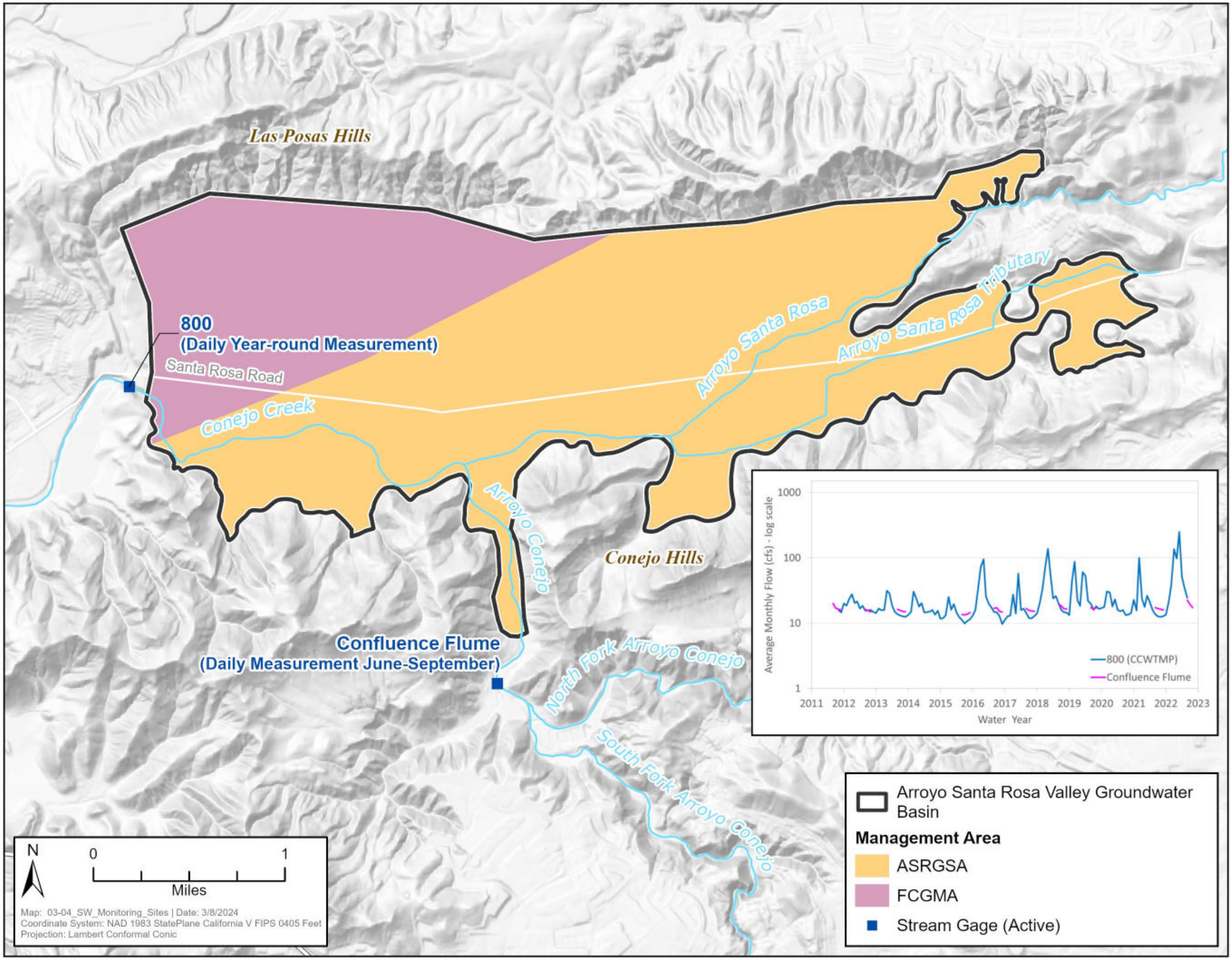

Figure 3.6 Surface Water Monitoring Network Gages.

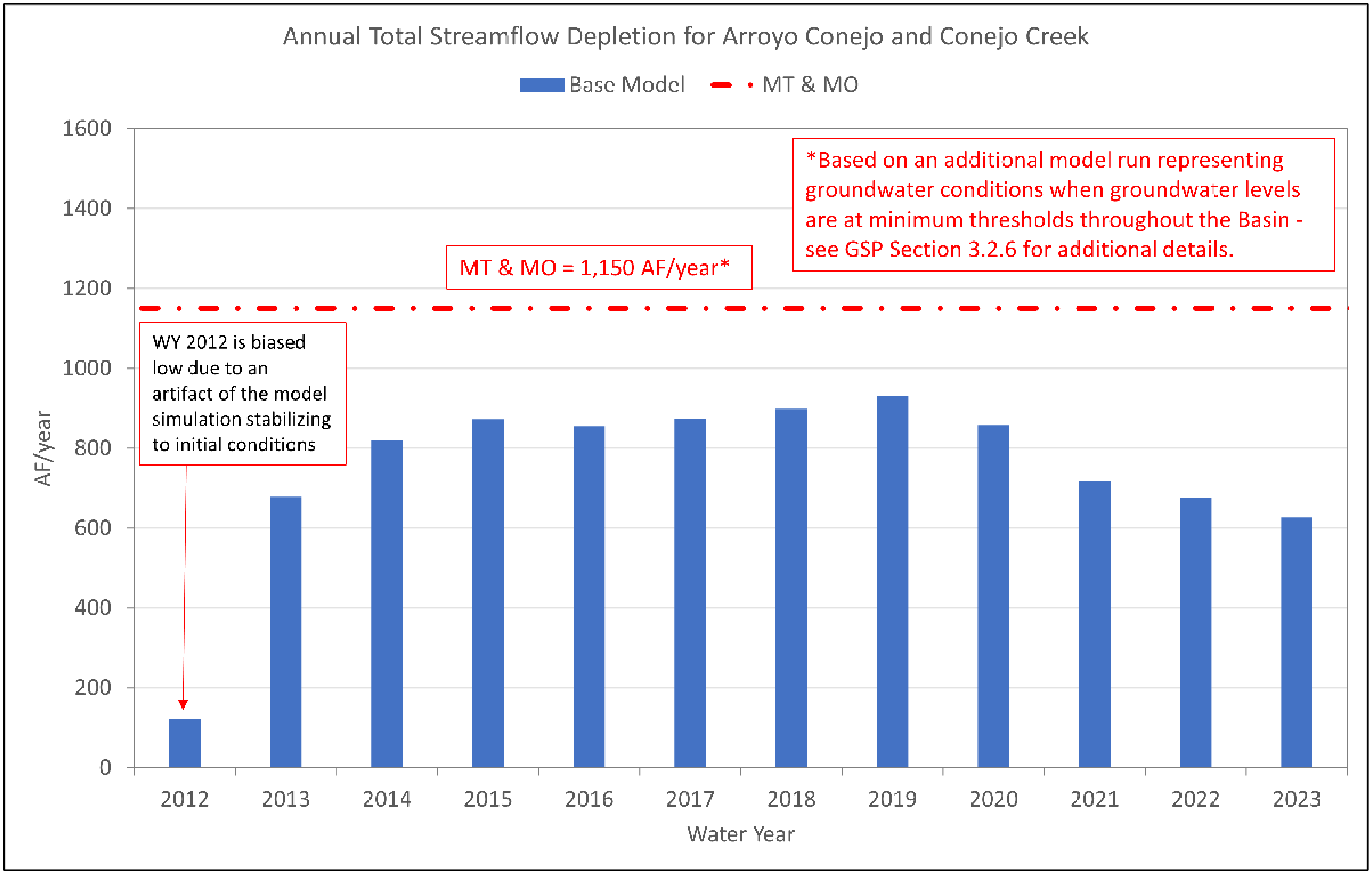

Figure 3.7 Annual Streamflow Depletion for Arroyo Conejo and Conejo Creek.

Tables

Table 2.1 Groundwater Extraction from ASRVGB by Water Use Sector During Water Years 2022 and 2023.

Water Use Sector	Water Year 2022	Water Year 2023	Method of Measurement	Accuracy of Measurement
	AF/yr	AF/yr		
Agricultural[a]	2,672	2,596	Direct and Estimated[b]	Medium
Municpal and Industrial	209	167	Direct[c]	High
Domestic	3	3	Estimated[b]	Medium
TOTAL	**2,884**	**2,766**		

Notes:

- Totals may not match sum of values due to rounding

a Agricultural water use includes groundwater extractions sourced from the Camrosa distribution system (see Section 2.5)

b See Appendix G in the GSP (ASRGSA and FCGMA, 2023) for details on estimation methods.

c Based on reported values from Camrosa.

Table 2.2 Total Water Use Within ASRVGB During Water Years 2022 and 2023.

Water Year 2022					
Water Use Sector	Water Source Type		Total (AF)	Method of Measurement	Accuracy of Measurement
	Groundwater[a] (from inside and outside Basin) (AF)	Surface Water (from outside Basin) (AF)			
Agricultural[a]	2,458	716	3,174	Direct and estimated[b]	Medium
Municpal and Industrial[c]	503	1,165	1,668	Direct and estimated[b]	High
Domestic	3	0	3	Estimated	Medium
TOTALS (AF)	2,964	1,881	4,845		

Water Year 2023					
Water Use Sector	Water Source Type		Total (AF)	Method of Measurement	Accuracy of Measurement
	Groundwater[a] (from inside and outside Basin) (AF)	Surface Water (from outside Basin) (AF)			
Agricultural[a]	2,263	612	2,875	Direct and estimated[b]	Medium
Municpal and Industrial[c]	385	862	1,247	Direct and estimated[b]	High
Domestic	3	0	3	Estimated	Medium
TOTALS (AF)	2,651	1,474	4,125		

Notes:

- Totals may not match sum of values due to rounding

a Ag demands are met by measured and estimated extraction rates from numerical model inputs (procedures detailed in the GSP Appendix G; ASRGSA and FCGMA, 2023) and ratios of Ag to M&I groundwater and surface water deliveries.

b The ratio of groundwater to surface water used in the basin is estimated based on non-potable and potable deliveries.

c M&I demands are met by ratios of Ag to M&I non-potable and potable deliveries sourced from local groundwater extraction and imported surface water. Imported groundwater supplies the remainder of potable M&I deliveries when not met by the former.

Table 3.1 **Sustainable Management Criteria for the Chronic Lowering of Groundwater Levels, Reduction of Groundwater Storage, and Land Subsidence Sustainability Indicators.**

State Well Identification Number	Groundwater Producing Zones Monitored	Frequency of Groundwater Elevation Measurement 2015-2020	Management Area	Chronic Lowering of GW Levels MT (feet amsl)	Chronic Lowering of GW Levels MO (feet amsl)	IM 5-year (feet amsl)	IM 10-year (feet amsl)	IM 15-year (feet amsl)	IM 20-year (feet amsl)	WY 2022 Spring High GW Level (feet amsl)	WY 2023 Spring High GW Level (feet amsl)
02N20W23G01S	Upper	Manual quarterly	FCGMA	70.8	92.8	76.3	81.8	87.3	92.8	73.8	76.8
02N20W23G02S	Upper	Manual monthly	FCGMA	17.3	36.5	24.1	28.3	32.4	36.5	76.0	77.0
02N20W23K01S	Upper/Lower	Manual monthly	FCGMA	47	81.3	66.2	71.2	76.3	81.3	76.6	82.6
02N19W19P02S	Lower	Manual monthly	ASRGSA	108	179.3	150.6	160.1	169.7	179.3	171.0	180.0
02N19W20L01S	Lower	Manual quarterly	ASRGSA	119.7	259.1	216	230.3	244.7	259.1	194.7	196.8
02N19W20M04S	Lower/Bedrock	Manual monthly	ASRGSA	138.2	236.4	227.3	230.4	233.4	236.4	224.0	211.0
02N20W23Q02S†	Unknown	Manual monthly	ASRGSA	--	--	--	--	--	--	185.0	200.0
02N20W23R01S	Upper/Lower	Manual quarterly	ASRGSA	74.9	151.8	149.8	150.4	151.1	151.8	--	179.7
02N20W24Q03S	Lower	Manual monthly	ASRGSA	80.7	148.5	124	132.2	140.3	148.5	146.0	167.0
02N20W25C02S	Lower	Manual monthly	ASRGSA	79.2	145.4	127.1	133.2	139.3	145.4	163.0	185.0
02N20W25C05S	Lower	Manual monthly	ASRGSA	79.2	143.3	131	135.1	139.2	143.3	165.5	189.5
02N20W25C07S	Lower	Manual monthly	ASRGSA	79.2	145.4	127.5	133.5	139.4	145.4	161.5	185.5
02N20W25D01S	Unknown	Manual monthly	ASRGSA	84.6	150.9	133.8	139.5	145.2	150.9	168.0	174.0
02N20W26B03S	Unknown	Manual quarterly	ASRGSA	96.4	157.8	154.6	155.7	156.7	157.8	163.6	177.4

Notes:

GW = Groundwater
MT = Minimum Threshold
MO = Measurable Objective
IM = Interim Measure

† Well currently not used to define or monitor sustainable management criteria due to lack of reliable information.

Color Key:
MO met
5-year IM met
Between MT and 5-year IM
MT exceeded

Table 3.2 Water Quality Constituent Minimum Thresholds and Measurable Objectives.

Constituent	MCL (mg/L)	Sec. MCL (R/U/ST)[1] (mg/L)	RWQCB WQO (mg/L)	MT[2] (mg/L)	MT Rationale	MO[3] (mg/L)	MO Rationale	Secondary MO[4] (mg/L)	FCGMA Average Conc. Representative Monitoring Wells WY 2022 (mg/L)	FCGMA Average Conc. Representative Monitoring Wells WY 2023 (mg/L)	ASRGSA Average Conc. Representative Monitoring Wells WY 2022 (mg/L)	ASRGSA Average Conc. Representative Monitoring Wells WY 2023 (mg/L)
Nitrate (as N)	10	N/A	10	23.4	Preserve ability to blend with imported water for potable uses. Reduce reliance on imported water for blending.	23.4	Preserve ability to blend with imported water for potable uses. Reduce reliance on imported water for blending.	10	19.8	18.5	12.2	9.6
TCP	5 (ng/L)	N/A	5 (ng/L)	250 (ng/L)	Practical limit of concentration for economical carbon change-out frequency of the GAC system.	250 (ng/L)	Practical limit of concentration for economical carbon change-out frequency of the GAC system.	5 (ng/L)	--	--	ND	ND
TDS	N/A	500/1,000/1,500	900	1,040	Prevent further degradation of water quality for all beneficial uses.	1,040	Prevent further degradation of water quality for all beneficial uses consistent with RWQCB WQO.	900	800	710	900	859
Sulfate	N/A	250/500/600	300	300	Preserve existing water quality consistent with RWQCB WQO.	300	Preserve existing water quality.	225	95.0	90.7	151.4	158.0
Chloride	N/A	250/500/600	150	180	Prevent further degradation of water quality for agricultural beneficial use.	180	Prevent further degradation of water quality for agricultural beneficial use consistent with RWQCB WQO.	150	132	139	152	152
Boron	N/A	N/A	1	1	Preserve existing water quality for agricultural beneficial use.	1	Preserve existing water quality for agricultural beneficial use.	0.4	0.10	0.10	0.38	0.22

Notes:

1 Consumer Acceptance Levels, where R = Recommended, U = Upper, and ST = Short Term.
2 Undesirable results are considered to occur when all representative monitoring wells in a principal aquifer exceed the minimum threshold concentration for a constituent for two consecutive years.
3 Sustainability Goal for degraded water quality for a given constituent is considered to be met when the two-year running average concentration for at least one representative monitoring well is below the measurable objective.
4 Secondary MO set as an aspirational goal for the Basin for the purpose of improving overall conditions in the Basin per 354.30(g).

MCL = Maximum Concentration Limit
mg/L = milligrams per liter
MO = Measurable Objective
MT = Minimum Threshold

Color Key:
MO met
5-year IM met
Between MT and 5-year IM
MT exceeded