Mound Basin Annual Report
Water Year 2023

Mound Basin
GROUNDWATER SUSTAINABILITY AGENCY

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Mound Basin Annual Report Water Year 2023

Prepared for

Mound Basin Groundwater Sustainability Agency

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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 Mound Basin Groundwater Sustainability Agency (MBGSA) adopted its Groundwater Sustainability Plan (GSP) on November 18, 2021, and this is the third Annual Report in compliance with the California Code of Regulations §356.2 groundwater conditions and GSP implementation for water year 2023 (i.e., October 1, 2022, through September 30, 2023).

The water year type for 2023 was classified as "wet", based on precipitation data. Basin-wide groundwater levels remained generally stable in 2023 in comparison to recent water years. The groundwater quality also remained generally stable for water year 2023.

Groundwater is extracted from two principal aquifers (Mugu and Hueneme) in the Mound Basin (Basin) for agricultural, municipal, and industrial uses. Extraction rates for water year 2023 were generally lower than reported for the historical and current periods (1986-2019) in the GSP. The change in storage for each principal aquifer was estimated for water year 2023. The Mugu groundwater storage for water year 2023 increased by 1 acre feet (AF) and the Hueneme groundwater storage decreased by 84 AF. The change in storage for the entire Basin was estimated to increase by 3,090 AF for water year 2023.

Total water use within the Basin for agricultural, municipal, and industrial demands is sourced from groundwater extractions, imported surface water, and imported groundwater. Imported water volumes decreased in water year 2023 due to a decrease in municipal and industrial water use. An important factor in the sustainable management of the Mound Basin is that most of the water demands are met using water imported from outside of the Basin. Total water use in the Basin during water year 2023 was 12,574 AF per year (AF/yr), which was approximately 1,000 AF less than the prior water year.

Sustainability is evaluated by comparing monitoring data to the Sustainable Management Criteria (SMC) for each applicable sustainability indicator: chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, and land subsidence. The groundwater levels measured in water year 2023 were compared to the SMC established for the chronic lowering of groundwater levels sustainability indicator, and none of the groundwater level measurements exceeded the minimum thresholds for any of the monitoring wells. All analyzed water quality data met the measurable objectives for the degraded water quality sustainability indicator in water year 2023. Chloride isocontours were evaluated for the seawater intrusion sustainability indicator and the measurable objective was met for water year 2023. The land subsidence sustainability indicator is also meeting the measurable objectives.

GSP implementation activities completed during the reporting period included:

- Submittal of the Second Annual Report;
- Submittal of Fall and Spring groundwater levels to DWR;

- Implementation of the Seawater Intrusion Monitoring Wells for Sustainable Management Criteria Implementation Project: groundwater level and quality monitoring was initiated at the clustered monitoring well (Site A) constructed in spring 2022 near the Santa Clara River Estuary (i.e., wells 02N23W23Q01-3S). Initial groundwater quality results from the monitoring well cluster did not indicate seawater in the principal aquifers at this coastal location; and

- Implementation of the Interim Shallow Groundwater Data Collection and Analysis Project – shallow groundwater monitoring continued.

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GROUNDWATER SUSTAINABILITY AGENCY

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Acronyms and Abbreviations

AF	acre-foot/acre-feet
AF/yr	acre-feet per year
Alta MWC	Alta Mutual Water Company
Basin	Mound Basin
bgs	below ground surface
DDW	Department of Drinking Water, State of California
DMS	Data Management System
DWR	Department of Water Resources, State of California
FICO	Farmers Irrigation Company
ft	foot/feet
ft/yr	feet per year
GIS	geographic information system
GPS	Ground Positioning System
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
InSAR	interferometric synthetic aperture radar
LAS	Lower Aquifer System
M&I	Municipal and Industrial
MBAWG	Mound Basin Agricultural Water Group
MBGSA	Mound Basin Groundwater Sustainability Agency
MCL	maximum contaminant level
MCLR	maximum contaminant level range
mg/L	milligrams per liter
msl	above mean sea level
MWD	Municipal Water District
RWQCB	Regional Water Quality Control Board
RWQCB-LA	Regional Water Quality Control Board, Los Angeles region
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
UAS	Upper Aquifer System
United	United Water Conservation District
UWCD	United Water Conservation District
Ventura Water	The City of Ventura's water and wastewater department
WQO	Water Quality Objective

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.

Mound Basin Groundwater Sustainability Agency (MBGSA), formed in 2017, is the exclusive Groundwater Sustainability Agency (GSA) for Mound Basin. MBGSA adopted its Groundwater Sustainability Plan (GSP) on November 18, 2021, and this is the third Annual Report in compliance with the California Code of Regulations §356.2. This Annual Report presents data and information for water year 2023 (i.e., October 1, 2022, through September 30, 2023). To track the progress of the GSP implementation, monitoring network data are compared against the Sustainable Management Criteria (SMC) established in the adopted GSP (MBGSA, 2021). This report also provides updates to the status of GSP implementation, including projects and management actions described in the adopted GSP.

1.1 Background

The Mound Basin is a high-priority groundwater subbasin in western Ventura County along the Pacific coastline, including the City of Ventura (officially San Buenaventura) (Figure 1.1). The Basin is within the Santa Clara River Valley watershed and includes the Santa Clara River estuary and floodplain at the southwestern corner of the Basin boundary, where the river discharges into the Pacific Ocean (Figure 1.1). Adjacent basins include the Oxnard Subbasin (No. 4-004.02) to the south, Santa Paula Subbasin (No. 4-004.04) to the east, and Lower Ventura River Subbasin (4-003.02) to the west (Figure 1.1).

Groundwater supplies municipal and industrial (M&I) and agricultural beneficial uses within the Mound Basin from approximately 25 active extraction wells. Water demands in the Basin are met by groundwater extractions from these Basin extractions, plus groundwater imported from adjacent basins (Upper Ventura River Valley, Oxnard, and Santa Paula Basins) and surface water imported from the Ventura River Watershed to the north. There are no active domestic wells within the Basin; drinking water is exclusively provided by the City of Ventura (i.e., Ventura Water).

Four water-bearing Hydrostratigraphic Units (HSUs) have been identified within the Mound Basin (United, 2018), and two of them are identified as principal aquifers: the Mugu Aquifer and the Hueneme Aquifer. Extraction wells within the Basin extract water from the principal Mugu and Hueneme Aquifers and a very minor amount from the Fox Canyon Aquifer. The other HSUs (Shallow Alluvial Deposits and Fox Canyon Aquifer) are not considered principal aquifers and are therefore not managed under the GSP. The Shallow Alluvial Deposits aquifer does not meet the SGMA definition of a principal aquifer to "store, transmit, and yield significant or economic quantities of groundwater…", and the Fox Canyon Aquifer does not have a material amount of groundwater extractions due to its depth. The Shallow Alluvial Deposits do not have a material hydraulic connection with the principal aquifers and have no groundwater extraction. Owing to the lack of a material hydraulic connection between principal aquifers and the Shallow Alluvial Deposits and surface water, the GSP deemed the depletions of interconnected surface water sustainability indicator inapplicable to the Basin. MBGSA is collecting shallow groundwater level data near the Santa Clara River Estuary to provide additional data to validate the

GSP's hydrogeologic conceptual model conclusion that pumping in the principal aquifers does not have material effect on shallow groundwater levels and surface water. This shallow groundwater level data collection program is called the "Interim Shallow Groundwater Data Collection and Analysis Project" and is one of the implementation projects included in the GSP. The GSP concluded that the five other sustainability indicators are applicable to the Basin.

2.0 Groundwater Conditions [§356.2(b)]

United Water Conservation District (UWCD, or United) and other local agencies have been collecting groundwater elevation and groundwater quality data from wells in Mound Basin and adjacent basins since the 1920s. United maintains a comprehensive database of groundwater elevations in Mound Basin, incorporating data collected by others, including the Ventura County Watershed Protection District (VCWPD) and the City of Ventura. All the above-described data have been uploaded to the DWR website and incorporated into the MBGSA Data Management System (DMS), which is described in the GSP (MBGSA, 2021).

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 the change in storage for the principal aquifers in the Basin and the Basin as a whole.

2.1 Precipitation and Water Year Types

Precipitation data were provided by the Ventura County Public Works Agency from gages 066E (Downtown Ventura), 167 (Hall Canyon), and 222A (County Government Center), and were updated for water year 2023 (Figure 2.1). Total precipitation for water year 2023 was 29.05 inches, compared to the average of 15.46 inches at gage 222A for 1986-2019 (MBGSA, 2021). Precipitation on the valley floor contributes to recharge to the Shallow Alluvial Deposits, or runoff, and does not directly recharge the principal aquifers. Most infiltration of precipitation recharges the Shallow Alluvial Deposits aquifer, although some infiltration of precipitation occurs at the outcrops of the Hueneme and Fox Canyon aquifers in the foothills in the northern part of Mound Basin.

The water year type for 2023 was classified as "wet" using the alternative water year type classification system developed by MBGSA, as described in the GSP (Figure 2.2) (MBGSA, 2021). The bulk of the precipitation was received during January and February 2023, accounting for approximately 63% of the annual precipitation.

2.2 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 using the available data for the wells in the monitoring network for each principal aquifer, i.e., Mugu and Hueneme (Figures 2.3 and 2.4).

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

Groundwater elevation contours were prepared for water year 2023 seasonal lows and highs in each principal aquifer. The United numerical groundwater model output (United, 2021) and supplemental monitoring well data outside of the Basin were used to assist the interpretation of the gradient and flow directions near the edges of the Basin.

As discussed in the GSP (MBGSA, 2021), Mound Basin is structurally complex. The regional groundwater flow pattern is generally from east-northeast to the southwest, generally towards the Pacific Ocean; however, localized flow patterns exist in the vicinity of extraction wells depending on their activity and flow directions are observed toward the south and east at times . Available historical information indicates that Mound Basin receives groundwater underflow from both the Santa Paula Basin to the east and the Oxnard Forebay/Oxnard Plain to the south (United, 2018). However, this Annual Report shows areas of groundwater underflow out of Mound Basin to the Oxnard Forebay/Oxnard Plain during the reporting period, which is based on observed groundwater levels inside and outside of the Basin.

DWR Technical Support Services constructed a clustered monitoring well in the spring of 2022 in the Coast Area of the Basin to monitor for seawater intrusion and was completed in both the Mugu (02N23W23Q02S) and Hueneme (02N23W23Q01S) principal aquifers (see Figures 2.3 and 2.4). Groundwater levels were not measured for the fall-low season (October of 2022) for the water year 2023; however, the spring-high (April 2023) groundwater levels were measured.

Mugu Aquifer

Groundwater levels measured for the water year 2023 fall-low season (October of 2022) were used as the basis for preparing the groundwater elevation contours shown in Figure 2.5 and indicate a radial groundwater flow pattern toward well 02N22W19M04S, which is consistent with previous water years. Fall-low groundwater levels were not measured for well 02N23W23Q02S and January 2023 measurements were used to represent fall-low levels for well 02N22W19M04S. The contours based on groundwater level measurements for the water year 2023 spring-high season (April of 2023) are generally consistent with the water year 2023 fall-low (October of 2022) contours, with levels approximately 10 feet higher, and a radial flow pattern toward well 02N22W19M04S (Figure 2.6).

Hueneme Aquifer

Groundwater levels measured for the water year 2023 fall-low season (October of 2022) were used as the basis for preparing the groundwater elevation contours shown in Figure 2.7 and indicated flow directions were generally southerly toward the Oxnard Basin. The steep gradient indicated by the closely spaced contours near well 02N22W10N03S is inferred based on model results. There are also anomalous data points for wells 02N22W09L03S/L04S and 02N22W17M02S which are not contoured, and their discrepancies are likely due to changes in pumping status, screen depth, and/or geologic structure. Fall-low groundwater levels were not measured for wells 02N23W23Q01S, 02N23W13K03S, 02N23W24G01S, and 02N22W20E01S. The groundwater level contours for the water year 2023 spring-high season (April of 2023) are generally consistent with the water year 2023 fall-low (October of 2022) contours. Significantly higher groundwater levels were measured at wells 02N22W17Q05S (-9.8 ft for spring-high compared to -43.8 ft for fall-low) and 02N22W16K01S (-15.7 ft for spring-high compared to -37.1 ft for fall-low) created a localized radial pattern around well 02N22W16K01S. Water levels are otherwise approximately 10-20 ft higher than the fall-low season (Figure 2.8). Anomalous data are noted at wells 02N22W09L03S/L04S, 02N22W17M02S, and 02N23W24G01S. Spring-high groundwater levels were not measured in well 02N23W13K03S.

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

Groundwater elevation hydrographs for the monitoring network for each principal aquifer (Mugu and Hueneme) along with the water year types are shown in Figures 2.9 and 2.10. Water year 2023 groundwater levels for the Mugu aquifer were similar to the prior water year, and for the Hueneme aquifer were generally higher than those during the prior water year with increasing trends measured in wells 02N22W09K04S, 02N22W09L03S, 02N22W09L04S, 02N22W10N03S, 02N22W16K01S, 02N22W17M02S, 02N22W17Q05S, and 02N22W20E01S.

2.3 Groundwater Quality

Figures 2.11 and 2.12 show the locations for the monitoring network for groundwater quality data for the Mugu and Hueneme aquifers, respectively. Maps of average concentrations of the key indicator constituents for water year 2023 in the Mugu and Hueneme aquifers are shown in Figures 2.13 through 2.20 and discussed in further detail below.

The new clustered monitoring well completed in both the Mugu (02N23W23Q02S) and Hueneme (02N23W23Q01S) principal aquifers (see Figures 2.11 and 2.12) was incorporated into the groundwater quality monitoring network and sampled during water year 2023.

Mugu Aquifer

Total dissolved solids (TDS), sulfate, chloride, nitrate, and boron were analyzed for water year 2023 in the 4 monitoring wells screened in the Mugu Aquifer (including well 02N22W08G01S with a screen interval extending below the Mugu Aquifer; however, nitrate results were not analyzed for this well). These 4 wells are generally located along the west-southwest to east-northeast axis of the Basin (Figures 2.13 through 2.17).

The average TDS concentration in water year 2023 in wells screened in the Mugu Aquifer ranged from 875 to 2,128 milligrams per liter (mg/L) (Figure 2.13). The highest TDS concentration was in well

02N22W08G01S and is not considered representative of Mugu Aquifer groundwater quality. The average TDS concentrations measured in the remaining wells ranged from 875 mg/L (well 02N22W07M02S) to 1,150 mg/L (well 02N23W23Q02S) (Figure 2.13).

The average sulfate concentration in water year 2023 in wells screened in the Mugu Aquifer ranged from 321 to 1,057 mg/L (Figure 2.14). Similar to TDS, the highest sulfate concentration was in well 02N22W08G01S and is not considered representative of Mugu Aquifer groundwater quality. The average sulfate concentrations measured in the remaining wells ranged from 321 to 499 mg/L (Figure 2.14).

The average chloride concentration in water year 2023 in wells screened in the Mugu Aquifer ranged from 46 to 100 mg/L (Figure 2.15). Similar to TDS and sulfate, the highest chloride concentration was in well 02N22W08G01S and is not considered representative of Mugu Aquifer groundwater quality. The average chloride concentrations measured in the remaining wells ranged from 46 to 65 mg/L (Figure 2.14).

The average nitrate concentration in water year 2023 in wells screened in the Mugu Aquifer was 0.5 mg/L for both wells 02N22W07M02S and 02N23W15J02S, and non-detect for well 02N23W23Q02S (Figure 2.16). Nitrate was not analyzed in well 02N22W08G01S during water year 2023.

The average boron concentration in water year 2023 in wells screened in the Mugu Aquifer was 0.5 mg/L in wells 02N22W07M02S, 02N23W15J02S, and 02N23W23Q02S (Figure 2.17). The sampling result for well 02N22W08G01 was non-detect.

Hueneme Aquifer

TDS, sulfate, chloride, nitrate, and boron were analyzed in water year 2023 at eight wells screened in the Hueneme Aquifer (including well 02N23W08F01S with a screened interval extending above the Hueneme Aquifer; however, this well was not analyzed for chloride, nitrate, and boron during water year 2023). Most of the sampled wells are generally located along the west-southwest to east-northeast axis of the Basin (Figures 2.18 through 2.22).

It is noted that wells 02N22W08F01S, 02N22W13K03S, and 02N22W09L04S have historically exhibited anomalously high concentrations of TDS, sulfate, and chloride and are not considered representative of Hueneme Aquifer water quality. In addition, wells 02N22W13K03S and 02N22W09L04S have historically exhibited anomalously high concentrations of nitrate suggesting an influence of shallow groundwater, possibly through a compromised well seal or well casing.

The average TDS concentration in water year 2023 in wells screened in the Hueneme Aquifer ranged from 1,040 to 6,410 mg/L (Figure 2.18). The highest TDS concentration was in well 02N22W09L04S and is not considered representative of Hueneme Aquifer groundwater quality. Excluding the wells known with anomalously high concentrations, the range of average TDS for the Hueneme aquifer in water year 2023 is 1,040 (well 02N22W09L03S) to 1,305 mg/L (well 02N23W15J01S) (Figure 2.18).

The average sulfate concentration in water year 2023 in wells screened in the Hueneme Aquifer ranged from 419 to 3,635 mg/L (Figure 2.19). The highest sulfate concentration was in well 02N22W09L04S and is not considered representative of Hueneme Aquifer groundwater quality. Excluding the wells known with anomalously high concentrations, the range of average sulfate is 419 to 554 mg/L (Figure 2.19).

The average chloride concentration in water year 2023 in wells screened in the Hueneme Aquifer ranged from 65 to 164 mg/L (Figure 2.20). The highest chloride concentration was in well 02N22W09L04S and is not considered representative of Hueneme Aquifer groundwater quality. Excluding the wells known with anomalously high concentrations, the range of average chloride is 65 to 88 mg/L (Figure 2.20). Well 02N22W08F01S was not analyzed for chloride for water year 2023.

The average nitrate concentration in water year 2023 in wells screened in the Hueneme Aquifer ranged from less than the laboratory detection limit (0.4 mg/L) to 101.2 mg/L (Figure 2.21). The highest nitrate concentration was in well 02N22W09L04S and is not considered representative of Hueneme Aquifer groundwater quality. Excluding the wells known with anomalously high concentrations, the average nitrate concentration ranged from less than the detection limit (0.4 mg/L) to 0.7 mg/L (Figure 2.21). Nitrate concentrations were either at or below the detection limit at three out of the seven wells analyzed in the Hueneme Aquifer in Mound Basin for water year 2023.

The average boron concentration in water year 2023 in wells screened in the Hueneme Aquifer ranged from 0.5 to 1.1 mg/L (Figure 2.22). The highest boron concentration was in well 02N22W09L04S and is not considered representative of Hueneme Aquifer groundwater quality. Excluding the wells known with anomalously high concentrations, the range of average boron is 0.5 to 0.6 mg/L (Figure 2.22).

2.4 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 data was provided by United, which requires reporting of groundwater extraction volumes on a semi-annual basis pursuant to its Water Code powers. In addition, the City of Ventura provides its monthly groundwater extractions for its wells in Mound Basin (currently 02N22W08G01S/Mound#1 and 02N22W08F01S/Victoria#2) to MBGSA.

The semi-annual groundwater extraction volumes are reported to United for the periods January-June and July-December. MBGSA used the semi-annual reporting to estimate extractions for water year 2023 according to the following methodology. First, the semi-annual volumes are converted to monthly volumes using the method developed for the United numerical groundwater model, which uses precipitation data to determine the monthly pumping for each extraction well (United, 2018; 2021). The available semi-annual data ends in June 2023, so data for July, August, and September 2023 (to complete water year 2023) are estimated based on prior trends for the summer season, which have very similar precipitation amounts. The estimated groundwater extraction from the United data was supplemented with the extraction data provided by the City of Ventura to calculate the total extraction for water year 2023. The estimated data for the missing months are updated for prior water years in each subsequent Annual Report (see Appendix A). Groundwater extraction due to native vegetation[1] was estimated for water year 2023 based on the numerical model (MBGSA, 2021; United, 2018; 2021) evapotranspiration results for the baseline projection (2022-2096) for similar water year types; for water year 2023, the average ET for a wet water year type was used (911 AF).

The estimated extraction volumes for water year 2023 are summarized by water use sector in Table 2.1. Agricultural and M&I groundwater use accounted for 59% and 41%, respectively, of total extraction due to pumping (excluding extractions due to native vegetation) for water year 2023. The volumes extracted from each well in the principal aquifers for water year 2023 are shown in Figure 2.23.

2.5 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.

The City of Ventura (Ventura Water) purchases surface water from the Casitas Municipal Water District (CMWD). Surface water is imported to Mound Basin via pipeline and volumes are metered monthly. The total volume for imported surface water for water year 2023 was 822 AF/yr. The surface water use within the Mound Basin portion of the overall Ventura Water service area was estimated as described in Section 2.6 and is shown in Table 2.2 and Figure 2.24.

2.6 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.

Total water use to meet agricultural and M&I demand within Mound Basin is sourced from groundwater extractions, imported surface water, and imported groundwater. Ventura Water (City of Ventura) purchases surface water from Casitas Municipal Water District (Lake Casitas) and imports groundwater from the Santa Paula, Oxnard, and Upper Ventura River Basins, and this water is used for M&I purposes. Alta Mutual Water Company (Alta) imports groundwater from the Santa Paula and Oxnard Basins, and

[1] Note the native vegetation extraction term includes the invasive species Arundo.

Farmers Irrigation Company (FICO) imports groundwater from the Santa Paula Basin, both using water for agricultural purposes. Groundwater extracted from the Mound Basin is used for agricultural and M&I purposes. There are no known domestic wells in the Basin.

Estimation of the total water use within the Mound Basin is complicated by the fact that the Mound Basin is only a portion of the Alta, FICO, and Ventura Water service areas. This annual report uses the simplifying assumptions described in GSP Section 3.1.1.3 for Alta and FICO. Estimation of water use within the Mound Basin portion of the overall Ventura Water service area and the breakdown of the associated Ventura Water supply sources that met the demands required additional analysis beyond that presented in the GSP. The estimation approach is as follows:

1. Calculate the total water supplies from all Ventura Water sources for the entire Ventura Water service area.
2. Multiply the total Ventura Water supplies by the fraction of the Ventura Water service area located within the Mound Basin (i.e., 64%) (See Figure 1.1).
3. Satisfy the demand calculated in step no. 2 by allocating Ventura Water supplies in the following priority order:
    a. Mound Basin groundwater extracted by Ventura Water.
    b. Oxnard Basin groundwater extracted by Ventura Water (after accounting for estimated Ventura Water deliveries within the Oxnard Basin portion of the overall Ventura Water service area using an approach similar to steps nos. 1 and 2).
    c. Satisfy remaining demand using equal parts Casitas MWD surface water deliveries and Upper Ventura River Valley Basin groundwater extracted by Ventura Water. If either source did not produce enough to satisfy the remaining demand it is then satisfied with the other source.
    d. Any remaining demand is satisfied using Santa Paula Basin groundwater extracted by Ventura Water.

The total estimated water use within Mound Basin for water year 2023 was 12,574 AF/yr (see Table 2.2 and Figure 2.24). The estimated volumes supplied by the various water sources to meet these demands are broken out in Table 2.2 and Figure 2.24.

2.7 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.

Groundwater levels were used to estimate the change in storage for the Mugu and Hueneme Aquifers (principal aquifers) for water year 2023. The differences in groundwater levels between spring high measurements (for water years 2022 and 2023) were averaged for each aquifer and multiplied by grids of the storativity and aquifer areas derived from the United numerical groundwater model (United, 2021). A portion of the Hueneme Aquifer near its outcrop in the north is unconfined, so the specific yield value was used to calculate the change in storage in that area. There are no groundwater level measurements available for the unconfined portion of the Hueneme Aquifer, so the average difference in spring-high groundwater levels for the confined portion was used to calculate the change in storage in this area. This methodology to calculate the change in storage for each principal aquifer is a modification of methodology used in previous annual reports to address interpolation artifacts that were found to affect the calculations during the preparation of the water year 2023 annual report.

The change in storage maps for both aquifers for water year 2023 are shown in Figures 2.25 and 2.26. The Mugu aquifer storage for 2023 increased by 6 AF and the Hueneme aquifer storage increased by 563 AF. These change in storage values are reasonable compared to the modeled values reported in the GSP (MBGSA, 2021).

Figure 2.27 shows the water year type, groundwater use, the annual change in groundwater in storage for the entire Basin, and the cumulative change in groundwater in storage for the entire Basin, starting in 1986. The change in storage between spring high water years for the Basin was calculated using the numerical model for years 1986 to 2019 (MBGSA, 2021). The change in storage values for water years 2020 through 2023 were estimated using the storage curve approach (see Appendix K in the GSP; MBGSA, 2021) and the change in storage for 2023 was calculated to be 3,090 AF (increase). Based on the historical model results, the change in storage for the Mugu and Hueneme Aquifers ranged from 2% to 45% of the total. For water year 2023, the estimated change in storage for the Mugu and Hueneme aquifers was 18% of the Basin total, which is within the expected range.

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.

Implementation of the MBGSA GSP was initiated with the submittal of the GSP to DWR in December of 2021. The progress towards implementing the Mound Basin GSP is evaluated by comparing monitoring data to the SMC for each applicable sustainability indicator for the past water year (2023). The monitoring data consists of groundwater levels, groundwater quality, and subsidence measurements. The monitoring networks are still being developed for part of the Basin, regardless, all currently available data are evaluated for this Annual Report.

3.1 Chronic Lowering of Groundwater Levels

The SMC for the chronic lowering of groundwater levels sustainability indicator is evaluated using groundwater level measurements. Groundwater levels were measured in five wells in the Mugu Aquifer and thirteen wells in the Hueneme Aquifer. The historical and current groundwater levels were plotted against the minimum thresholds, measurable objectives, and interim milestones along with water year types for each monitoring well (Figures 2.9 and 2.10).

The water level data is summarized in Table 3.1 and based on these results, the implementation of the plan for the chronic lowering of groundwater levels is in very good status. All minimum groundwater levels in the Mugu Aquifer are currently above their respective minimum thresholds. Currently, one monitoring well has groundwater levels meeting its 5-year interim milestone and one is meeting its measurable objective. The remaining three wells are currently above their minimum thresholds and are very close to meeting their 5-year interim milestones.

For the Hueneme Aquifer monitoring wells, six of the minimum groundwater levels are currently meeting their respective measurable objective and seven are meeting their respective 5-year interim milestone(Table 3.1).

Overall, current groundwater levels are still relatively low due to lingering impacts from the historic drought of the last decade.

3.2 Reduction of Groundwater Storage

Reported groundwater extractions are compared to measurable objective and minimum threshold for the reduction of groundwater storage sustainability indicator. The minimum threshold for the reduction of groundwater storage sustainability indicator is the estimated sustainable yield of 8,200 AF/yr of the Basin. The minimum threshold applies over an averaging period, so groundwater extractions exceeding the minimum threshold in any given year do not automatically indicate undesirable results are occurring in the Basin. The measurable objective is 90% of the sustainable yield (i.e., 7,400 AF/yr). For water year

2023, the total groundwater extraction was 4,257 AF/yr, which met the measurable objective (Table 3.2).

3.3 Seawater Intrusion

Seawater intrusion is monitored using the chloride concentrations from the water quality data. The chloride data is contoured and compared to the minimum threshold isocontour, which was established for the GSP (MBGSA, 2021). Figures 3.1 and 3.2 show the chloride isocontours for the Mugu and Hueneme Aquifers, respectively. The isocontours indicate the measurable objective is reached for both the Mugu and Hueneme Aquifers.

3.4 Degraded Water Quality

Groundwater quality is monitored for water year 2023 in three monitoring wells for the Mugu Aquifer and seven monitoring wells for the Hueneme Aquifer. The 2-year moving averages for concentrations of nitrate, TDS, sulfate, chloride, and boron are compared against the SMC for the degraded water quality sustainability indicator for each monitoring well in the Mugu and Hueneme Aquifers (Table 3.3). The water quality data for water year 2023 is also described in Section 2.3 above and Table 3.3 also shows the average concentrations for the water year 2023 period in the Mugu and Hueneme Aquifers, against the SMC. TDS analyzed in well 20N23W23Q02 was between the minimum threshold and the interim milestone and measurable objective. All remaining analytes met their respective measurable objectives for the two-year averaging period consisting of water years 2022-2023, and minimum thresholds were not exceeded in any monitoring wells (Table 3.3).

3.5 Land Subsidence

Land subsidence is only monitored for the Eastern Half of Mound Basin because remote sensing data coverage (InSAR) for the Western Half was determined to be unreliable (MBGSA, 2021). As a result, groundwater levels are used as a proxy for the minimum thresholds in the Western Half of the Basin and have the same minimum threshold values as the chronic lowering of groundwater levels sustainability indicator (i.e., historical lows). For the Eastern Half of the Basin, if the InSAR measured subsidence rate exceeds the minimum threshold (0.1 ft/yr) and groundwater levels are below historical low levels, the InSAR-indicated land surface elevation changes will be evaluated to determine whether they were caused by groundwater conditions.

Table 3.1 depicts the current results for groundwater levels or subsidence rates with respect to their minimum thresholds for the land subsidence sustainability indicator. The minimum thresholds for measured subsidence were not exceeded in the Eastern Half of the Basin in water year 2023. For the Western Half monitoring wells, identical to the chronic lowering of groundwater levels, all minimum groundwater levels for the land subsidence are currently above their respective minimum thresholds. Currently, sixteen of the monitoring wells have groundwater levels that meet their 5-year interim milestones. 02N22W07M02S and 02N22W07P01S were between their minimum threshold and interim milestone for water year 2023. The subsidence datasets for water year 2023 provided by DWR were downloaded, mapped, and reviewed (as presented in Figure 3.3). The DWR data includes land surface elevation changes for Mound Basin based on interferometric synthetic aperture radar (InSAR) measurements. The total estimated error is 0.1 ft (MBGSA, 2021), and the measured subsidence rate did not exceed 0.1 ft/yr in the Eastern Half of Mound Basin for water year 2023.

3.6 Projects and Management Actions

3.6.1 Seawater Intrusion Monitoring Wells

Prior to GSP submittal MBGSA applied for and was approved for DWR Technical Support Services to construct a clustered monitoring well in the Coast Area of the Basin to monitor for seawater intrusion (i.e., 02N23W23Q02S and 02N23W23Q01S depicted in Figures 3.1 and 3.2). MBGSA obtained an access agreement, completed CEQA, and obtained permits for the well in 2021 and the clustered well was constructed in the spring of 2022. This clustered well was incorporated into the groundwater level and quality monitoring networks during water year 2023..

Preliminary planning for construction of the other planned clustered monitoring well (Site B) was performed during water year 2023 (see Figures 3.1 and 3.2 for the location of Site B). Also, during water year 2023, MBGSA increased its fiscal reserve that is a set aside to fund construction of the Site B monitoring well.

3.6.2 Seawater Intrusion Contingency Plan

There was no activity on this task during the reporting period..

3.6.3 Land Subsidence Contingency Plan

There was no activity on this task during the reporting period.

3.6.4 Groundwater Quality Protection Measures

There was no activity on this task during the reporting period.

3.6.5 Interim Shallow Groundwater Data Collection and Analysis

During water year 2021, MBGSA confirmed the availability and accessibility of the shallow groundwater monitoring wells with the City of Ventura and planned for collaborative monitoring with the City of Ventura. Access agreements were obtained from the City for the monitoring activities and the shallow groundwater monitoring was initiated during water year 2022. Data collection continued during water year 2023. The shallow groundwater level data will be analyzed prior to the first 5-year GSP review to further evaluate whether groundwater extractions in the principal aquifers have a have material effect on shallow groundwater levels and surface water.

4.0 References

Mound Basin Groundwater Sustainability Agency (MBGSA). Groundwater Sustainability Plan. December, 2021.

United Water Conservation District (United). 2018. Ventura Regional Groundwater Flow Model and Updated Hydrogeologic Conceptual Model: Oxnard Plain, Oxnard Forebay, Pleasant Valley, West Las Posas, and Mound Basins, United Water Conservation District Open-File Report 2018-02, July.

______. 2021. Ventura Regional Groundwater Flow Model Expansion and Updated Hydrogeologic Conceptual Model: Santa Paula, Fillmore, and Piru Groundwater Basins, United Water Conservation District Open-File Report 2021-01.

Figures

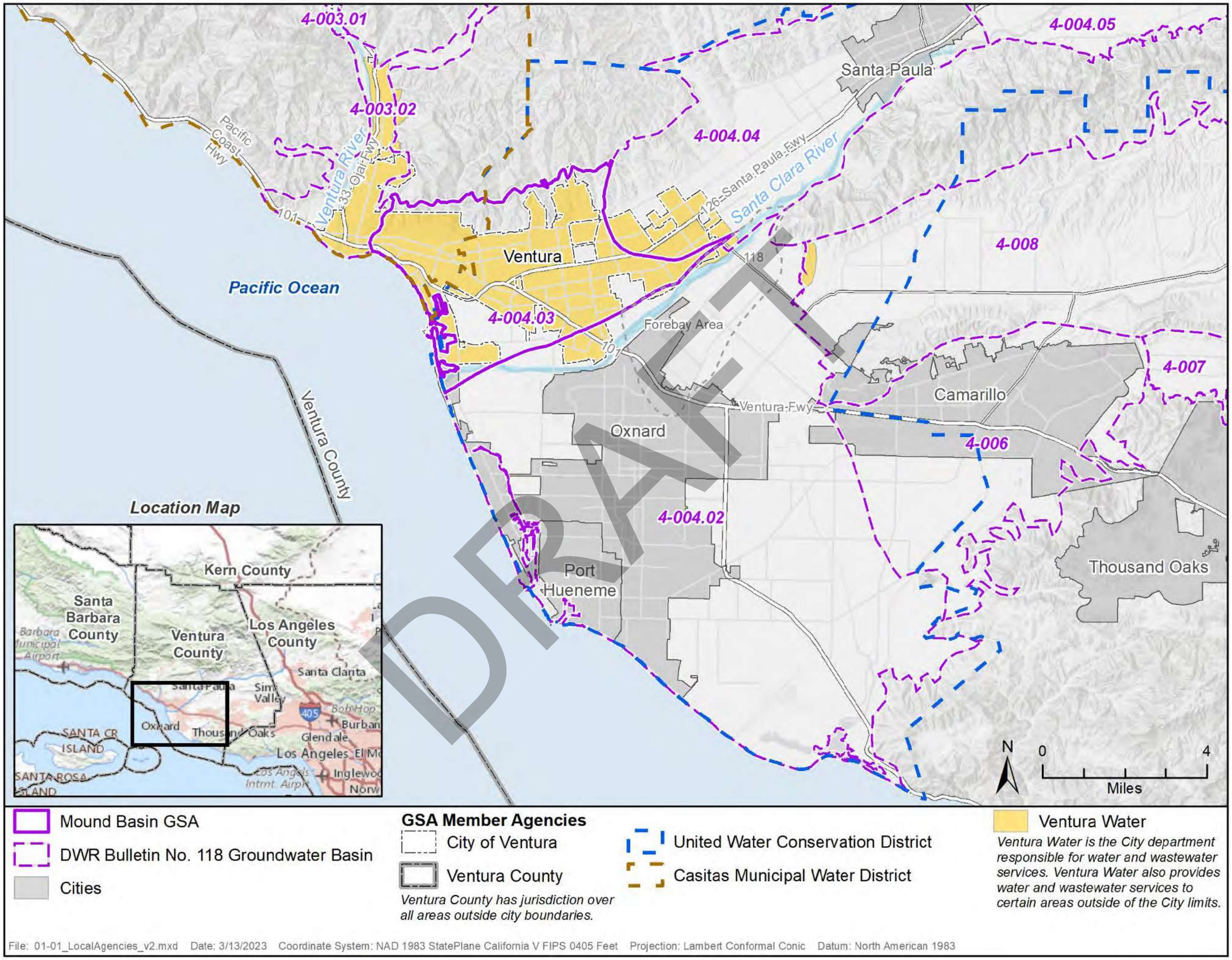


Figure 1.1 Mound Basin Groundwater Sustainability Agency Boundary Map.

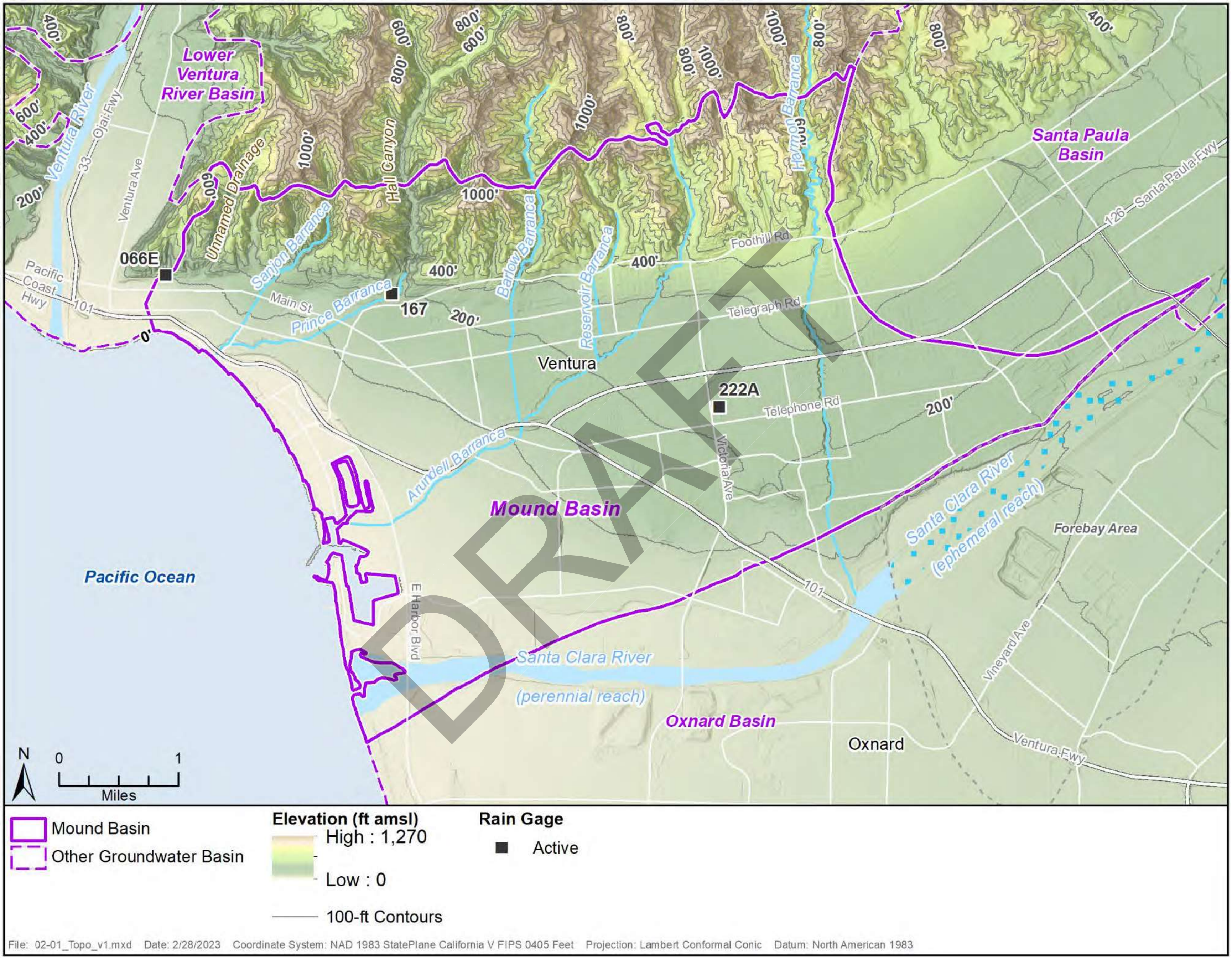


Figure 2.1 Topographic Map with Precipitation Gage Stations in Mound Basin.

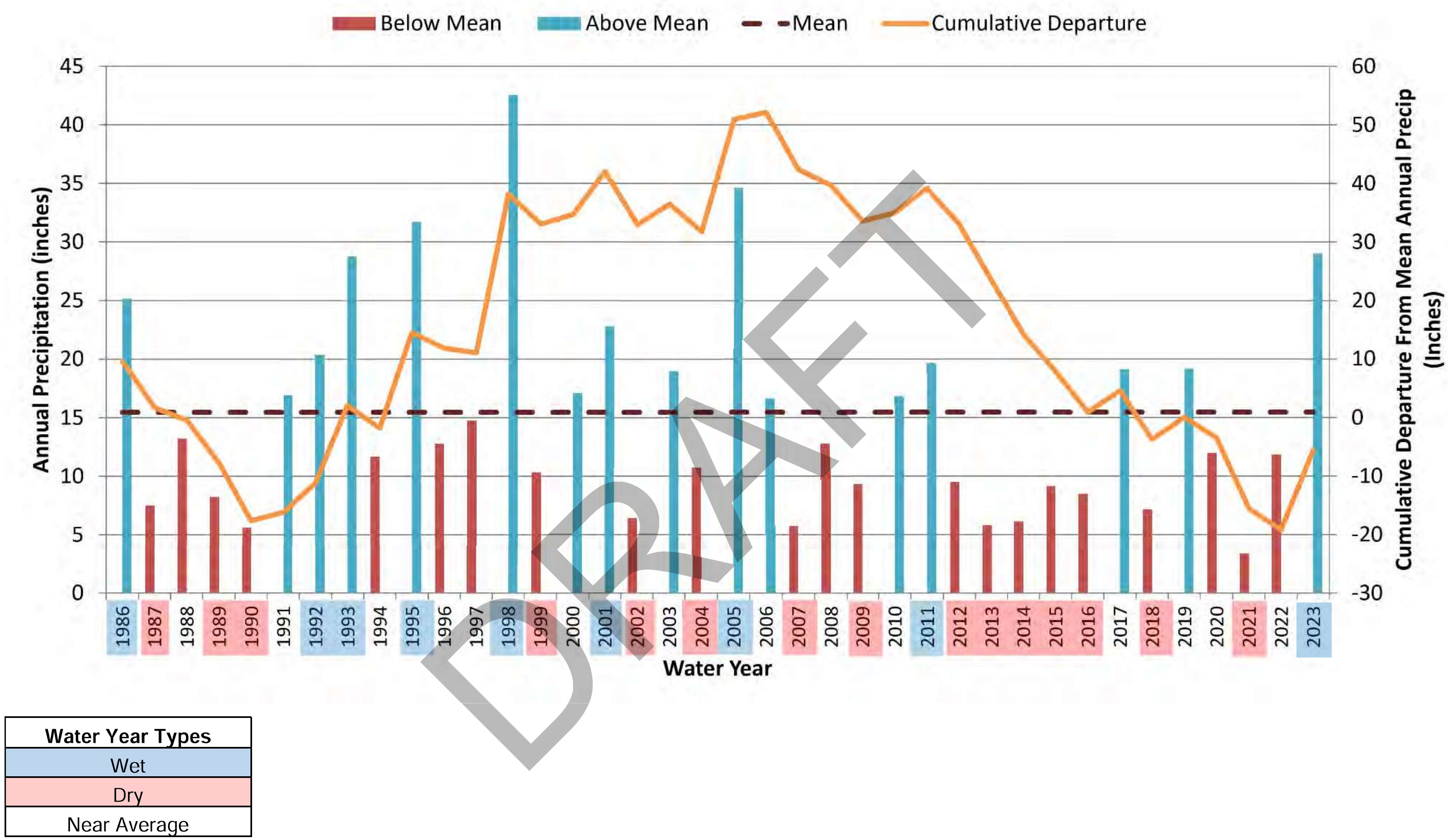


Figure 2.2 Annual Precipitation and Cumulative Departure from the Mean, with Water Year Types.

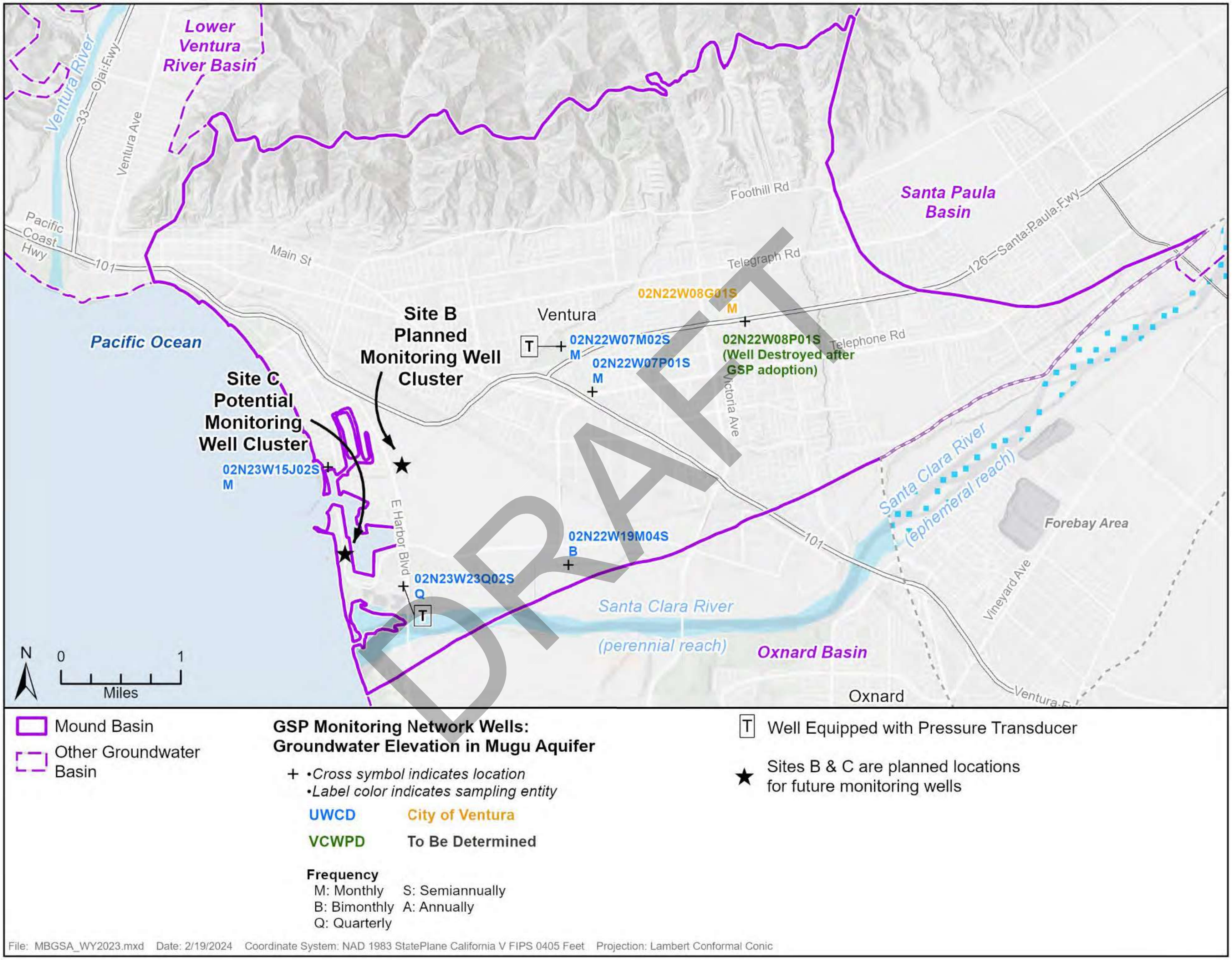


Figure 2.3 Map Showing the Groundwater Elevation Monitoring Network in the Mugu Aquifer of Mound Basin.

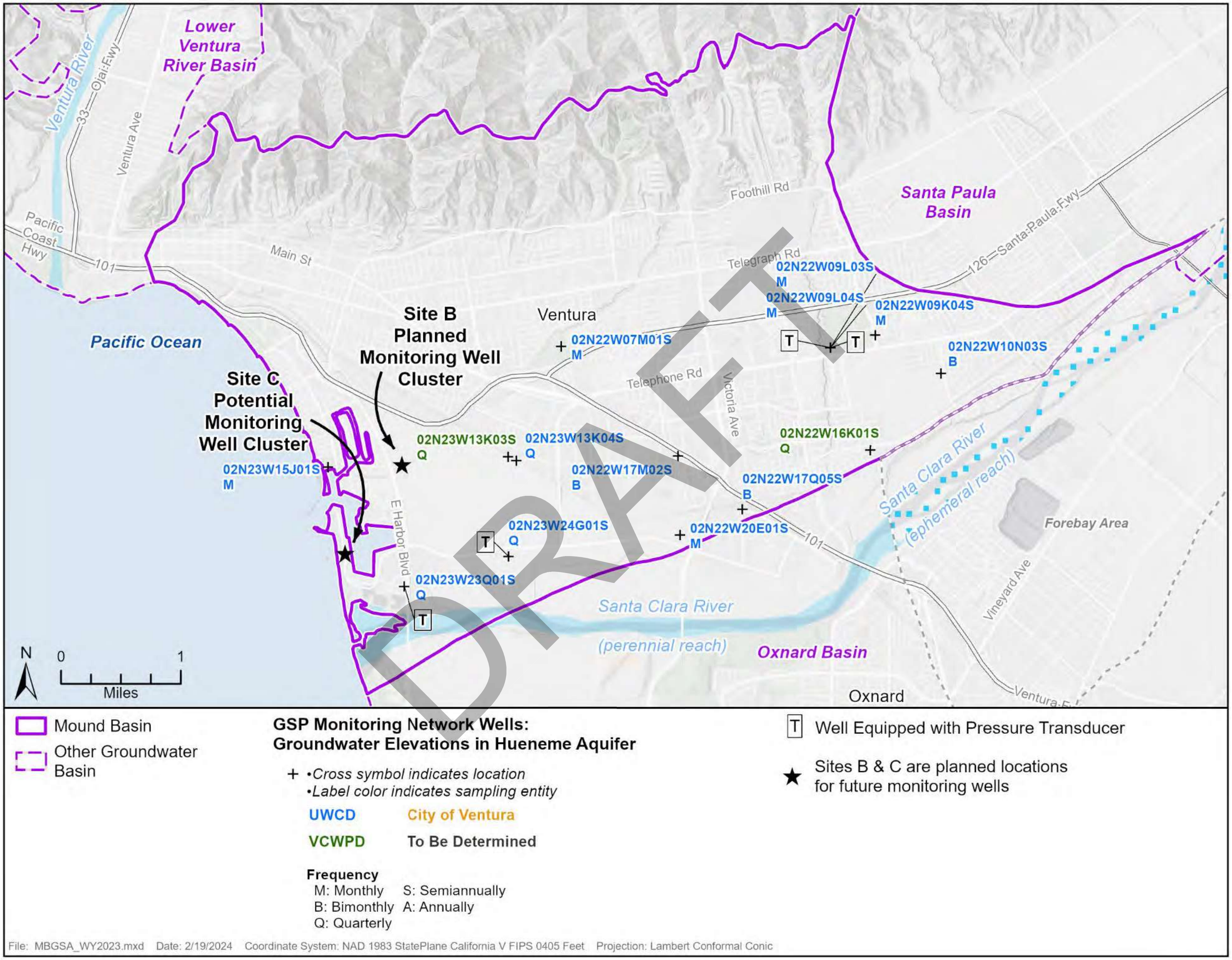


Figure 2.4 Map Showing the Groundwater Elevation Monitoring Network in the Hueneme Aquifer of Mound Basin.

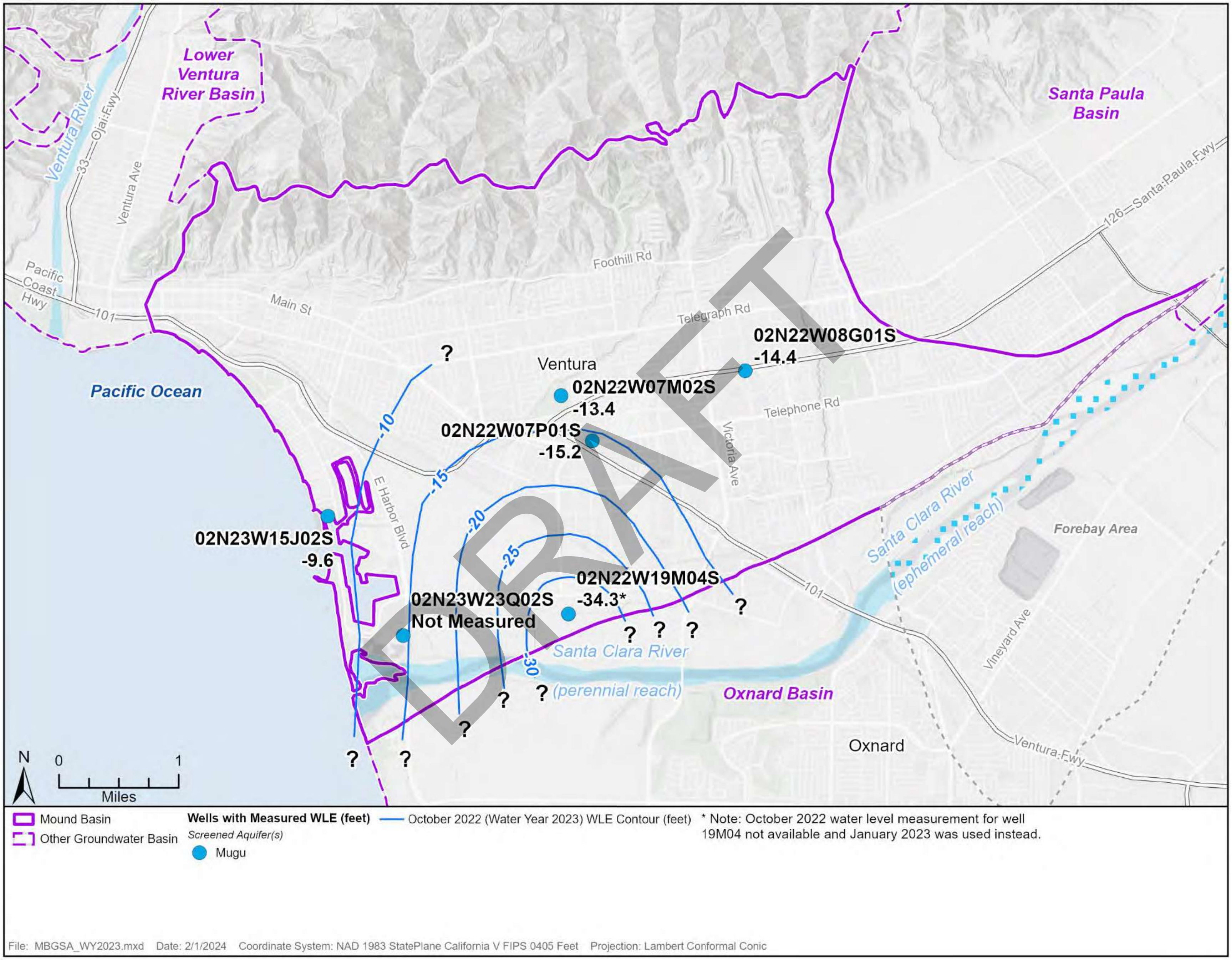


Figure 2.5 Water Level Elevation in Mugu Aquifer, October 2022 (Fall-Low Water Year 2023).

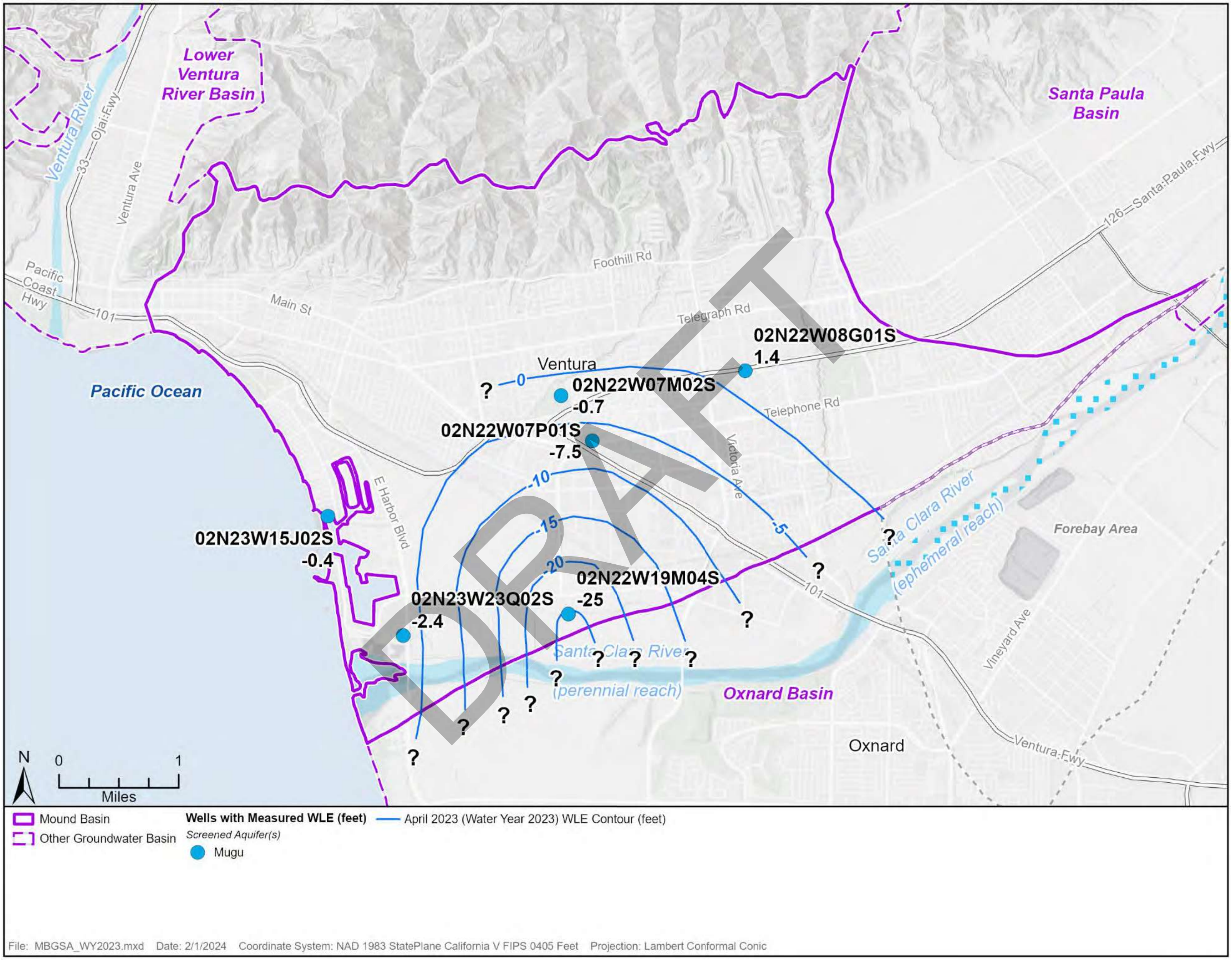


Figure 2.6 Water Level Elevation in Mugu Aquifer, April 2023 (Spring-High Water Year 2023).

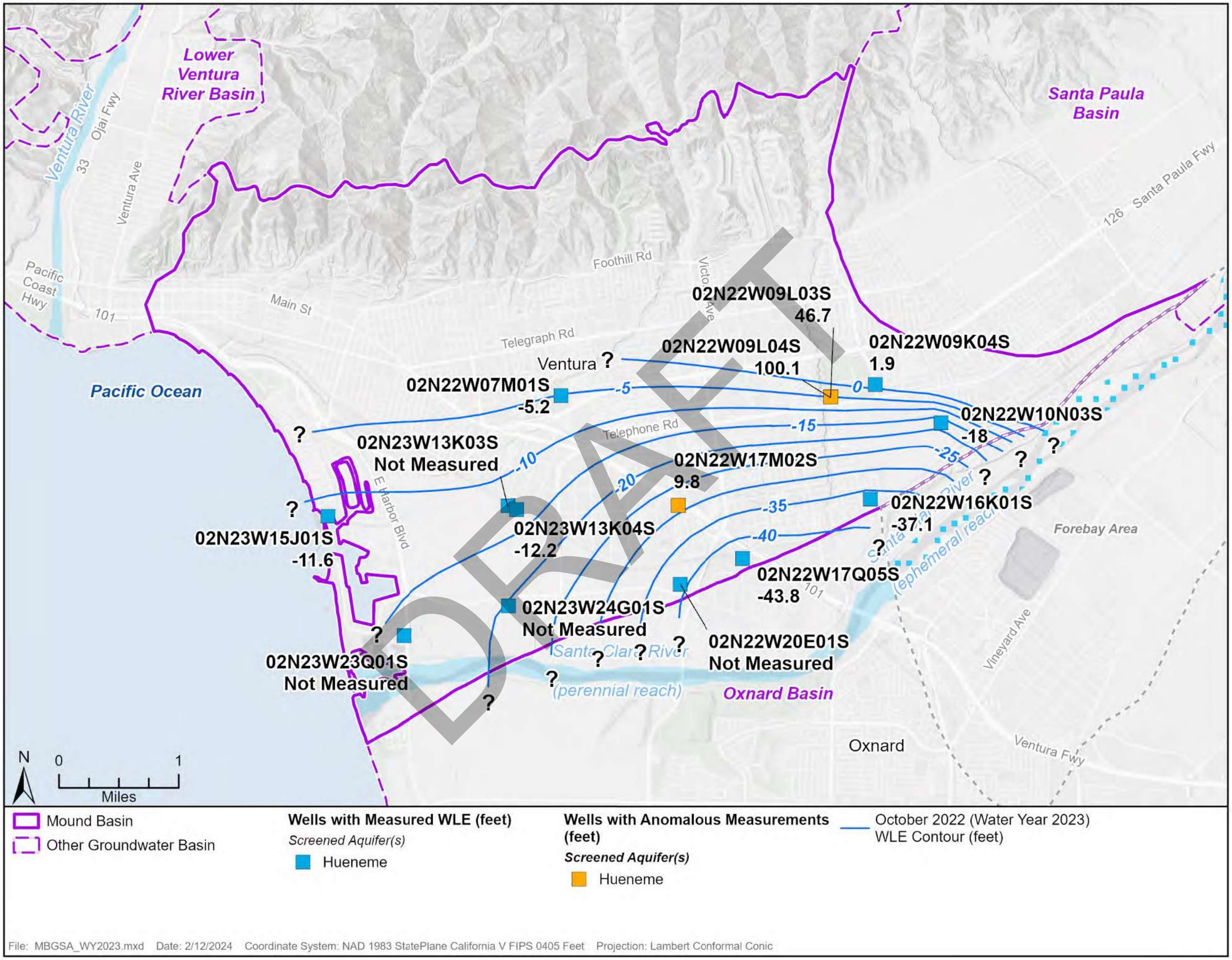


Figure 2.7 Water Level Elevation in Hueneme Aquifer, October 2022 (Fall-Low Water Year 2023).

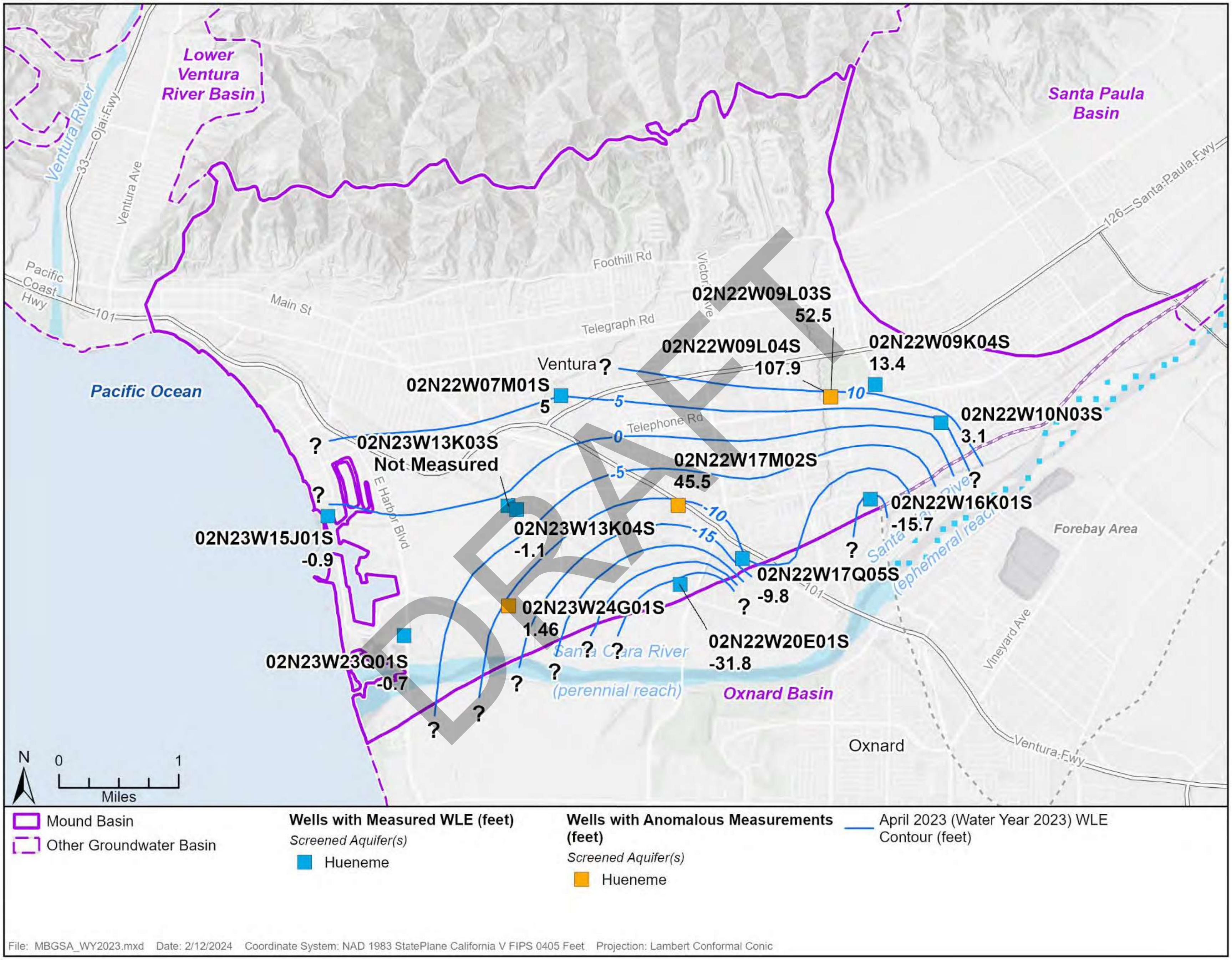


Figure 2.8 Water Level Elevation in Hueneme Aquifer, April 2023 (Spring-High Water Year 2023).

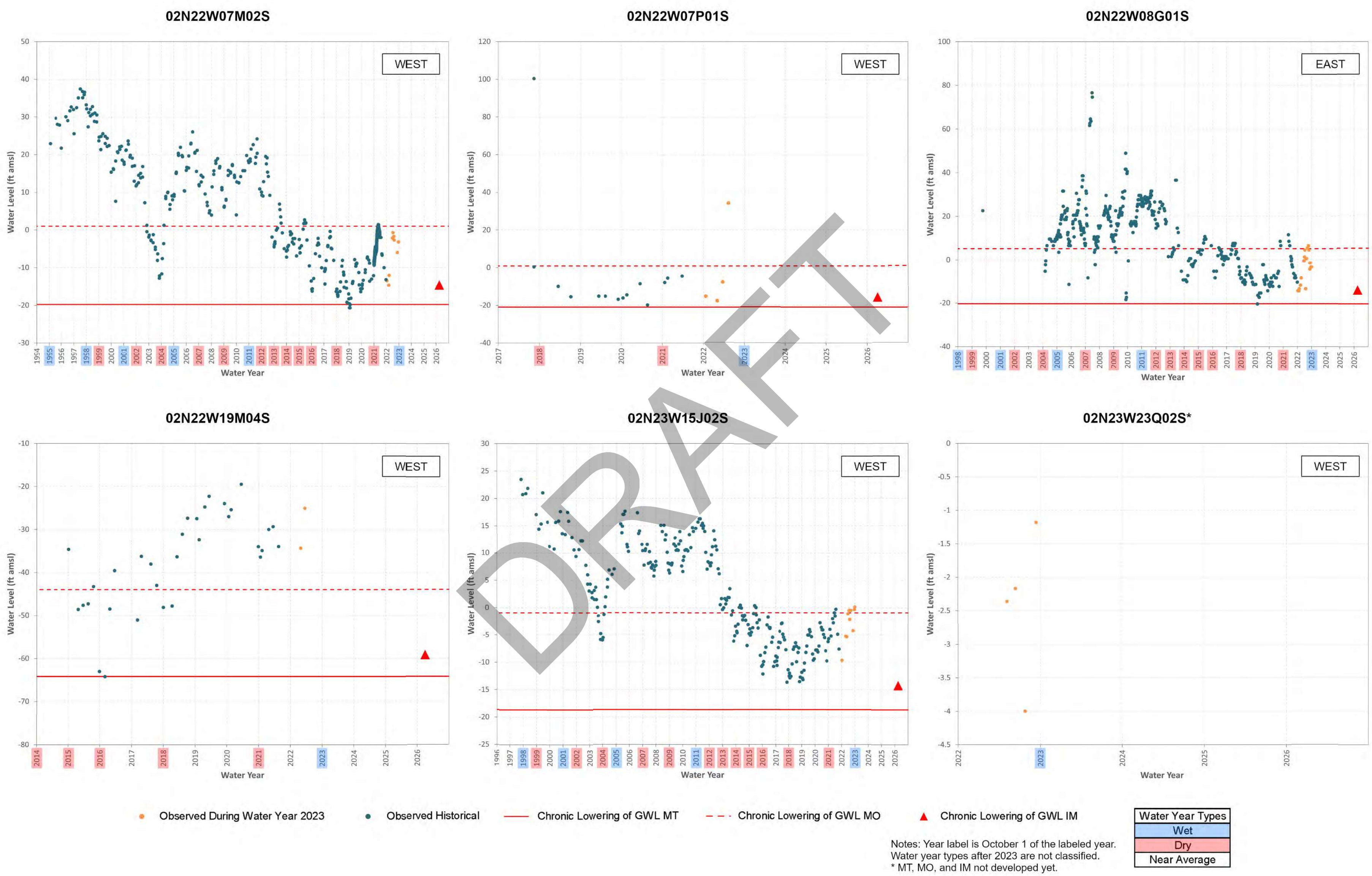


Figure 2.9 Hydrographs for the Monitoring Network in the Mugu Aquifer of Mound Basin.

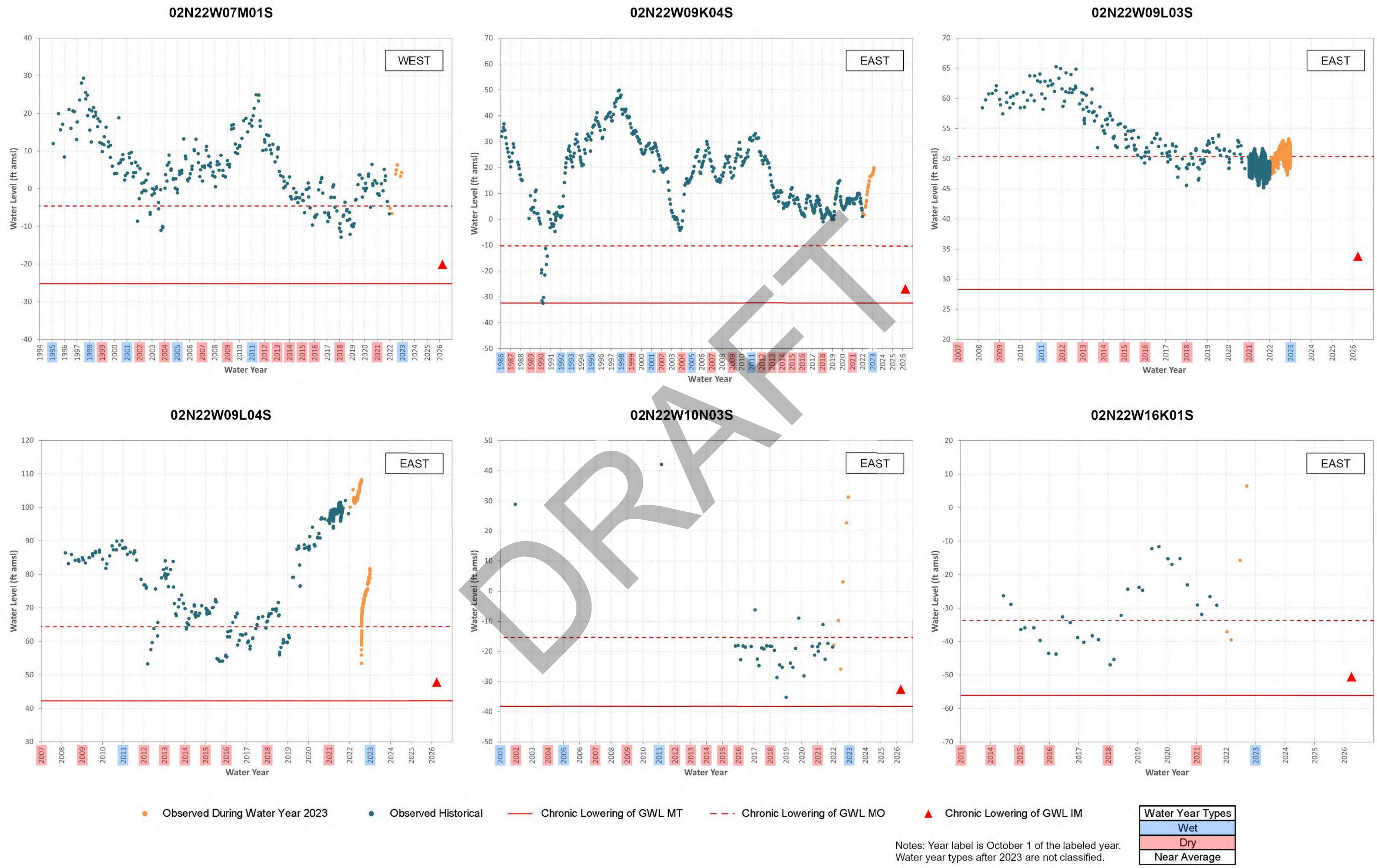


Figure 2.10 Hydrographs for the Monitoring Network in the Hueneme Aquifer of Mound Basin.

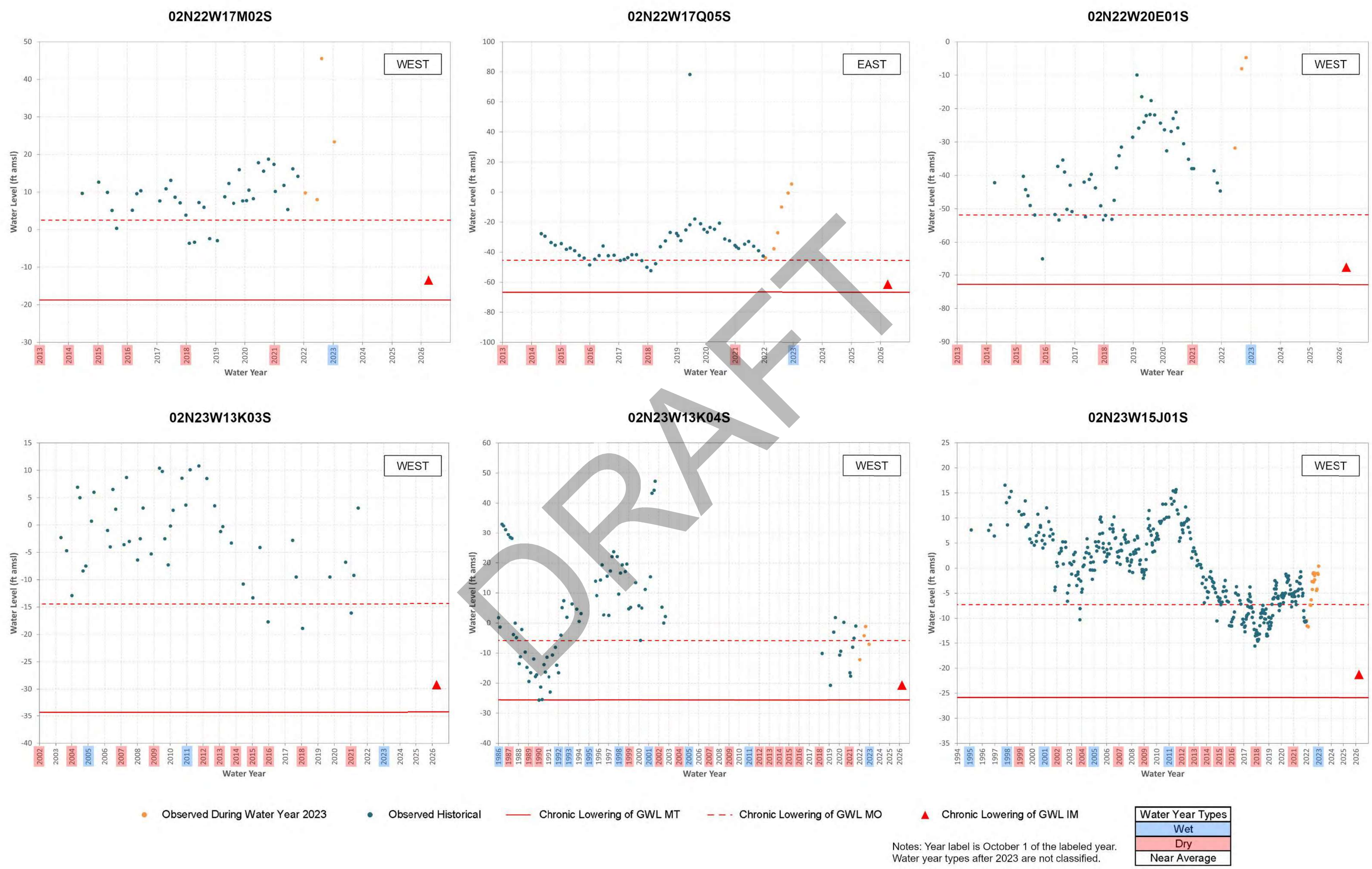


Figure 2.10 Hydrographs for the Monitoring Network in the Hueneme Aquifer of Mound Basin.

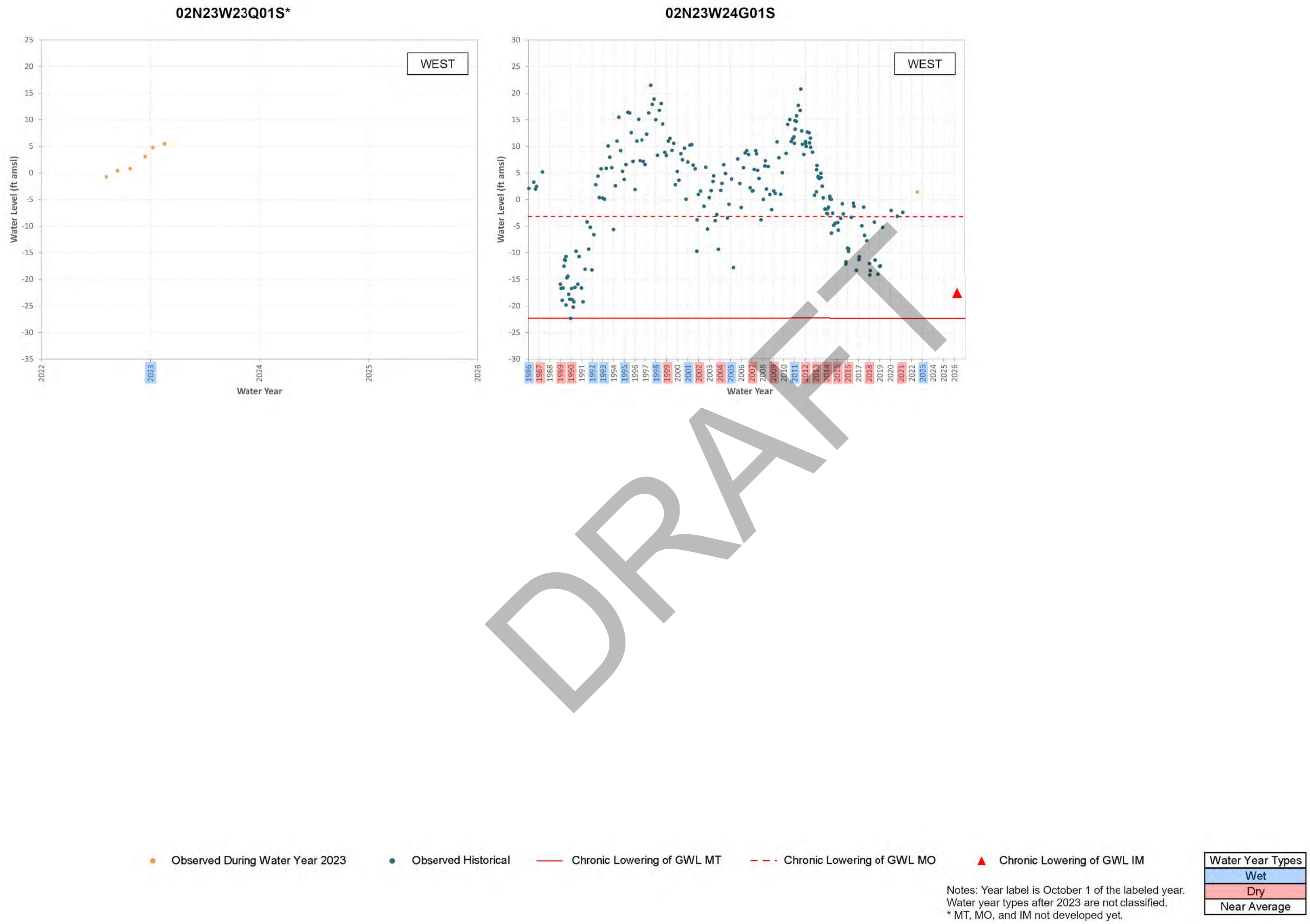


Figure 2.10 Hydrographs for the Monitoring Network in the Hueneme Aquifer of Mound Basin.

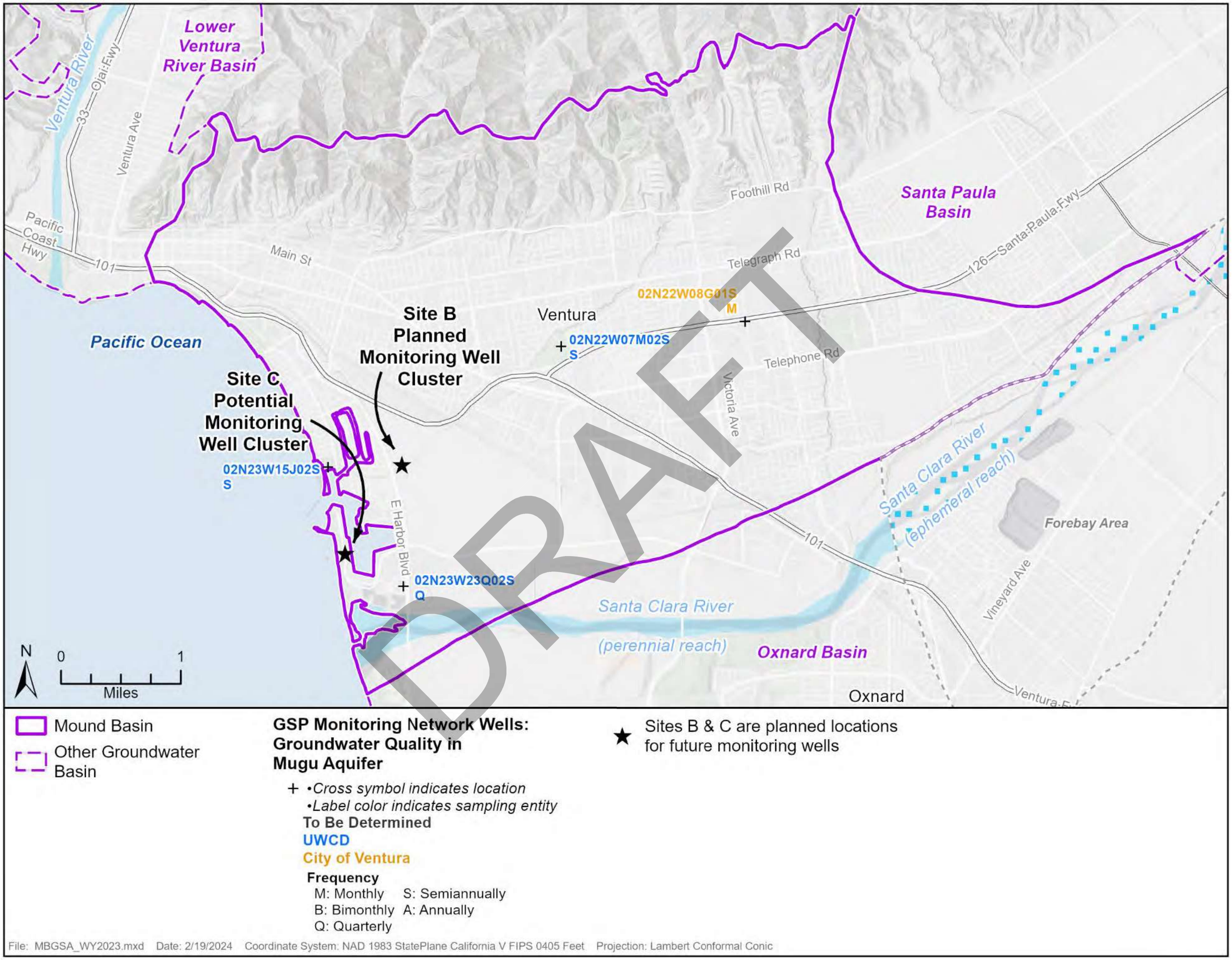


Figure 2.11 Map Showing the Groundwater Quality and Seawater Intrusion Monitoring Networks in the Mugu Aquifer of Mound Basin.

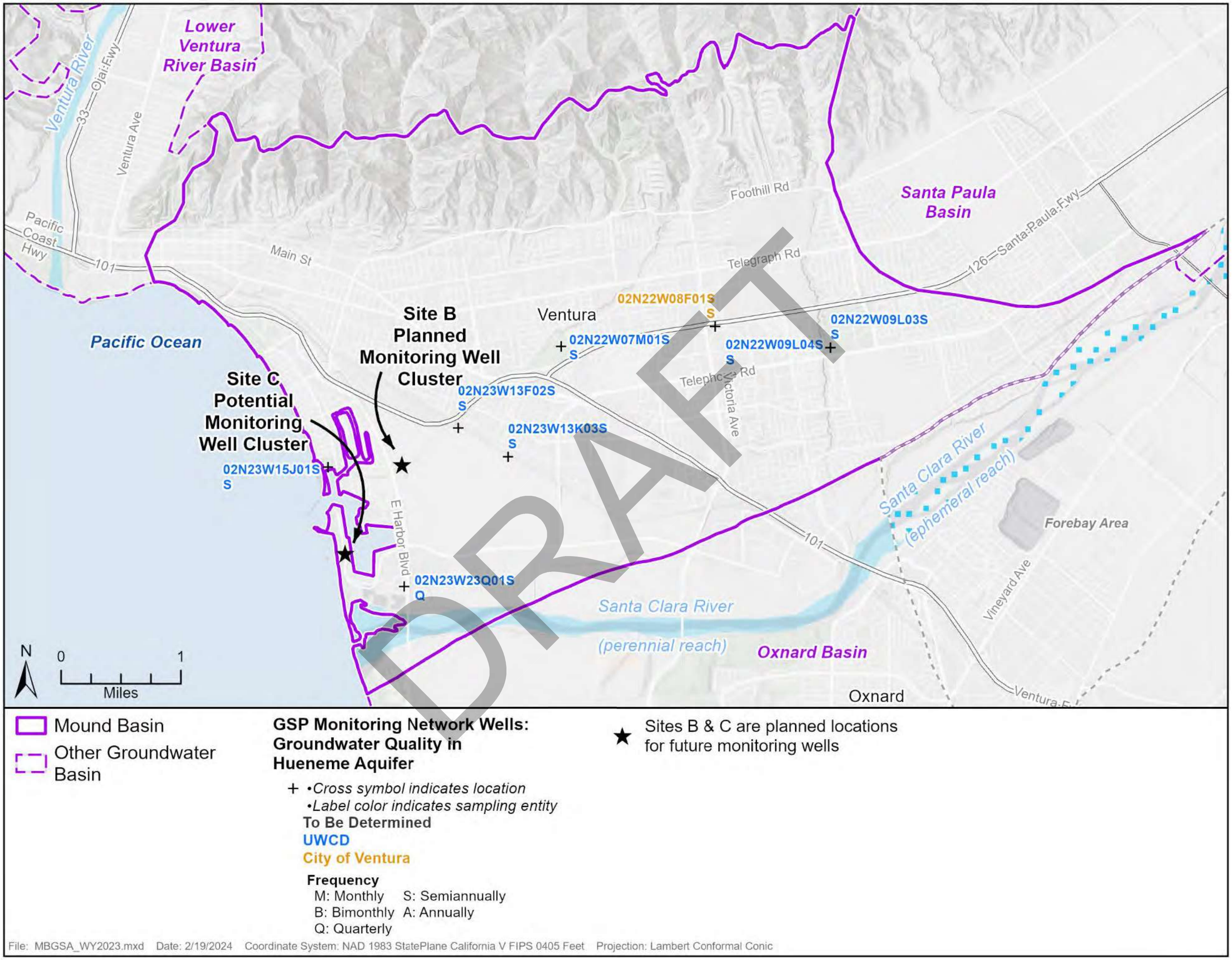


Figure 2.12 Map Showing the Groundwater Quality and Seawater Intrusion Monitoring Networks in the Hueneme Aquifer of Mound Basin.

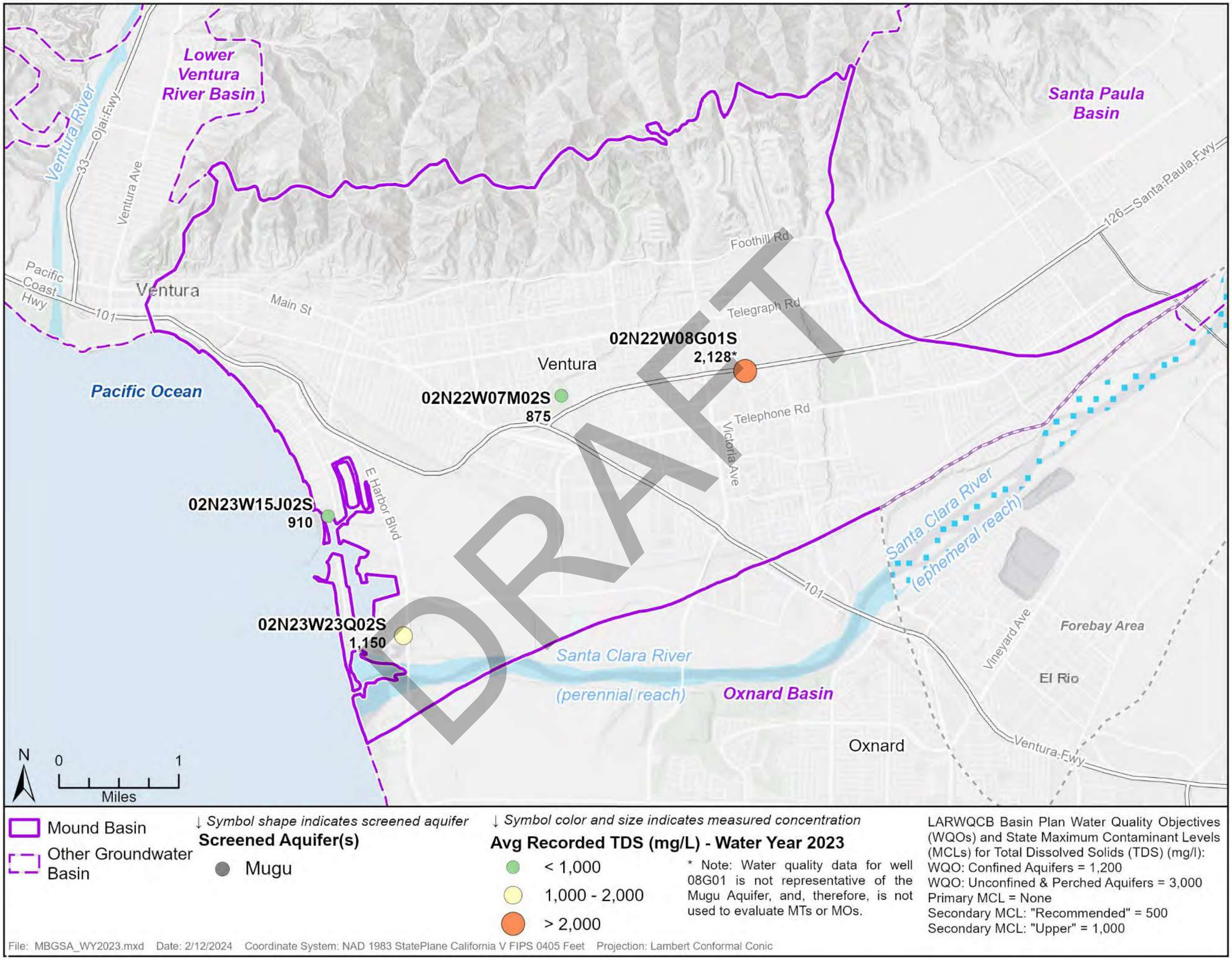


Figure 2.13 Average TDS Concentrations Detected in Mugu Aquifer During Water Year 2023.

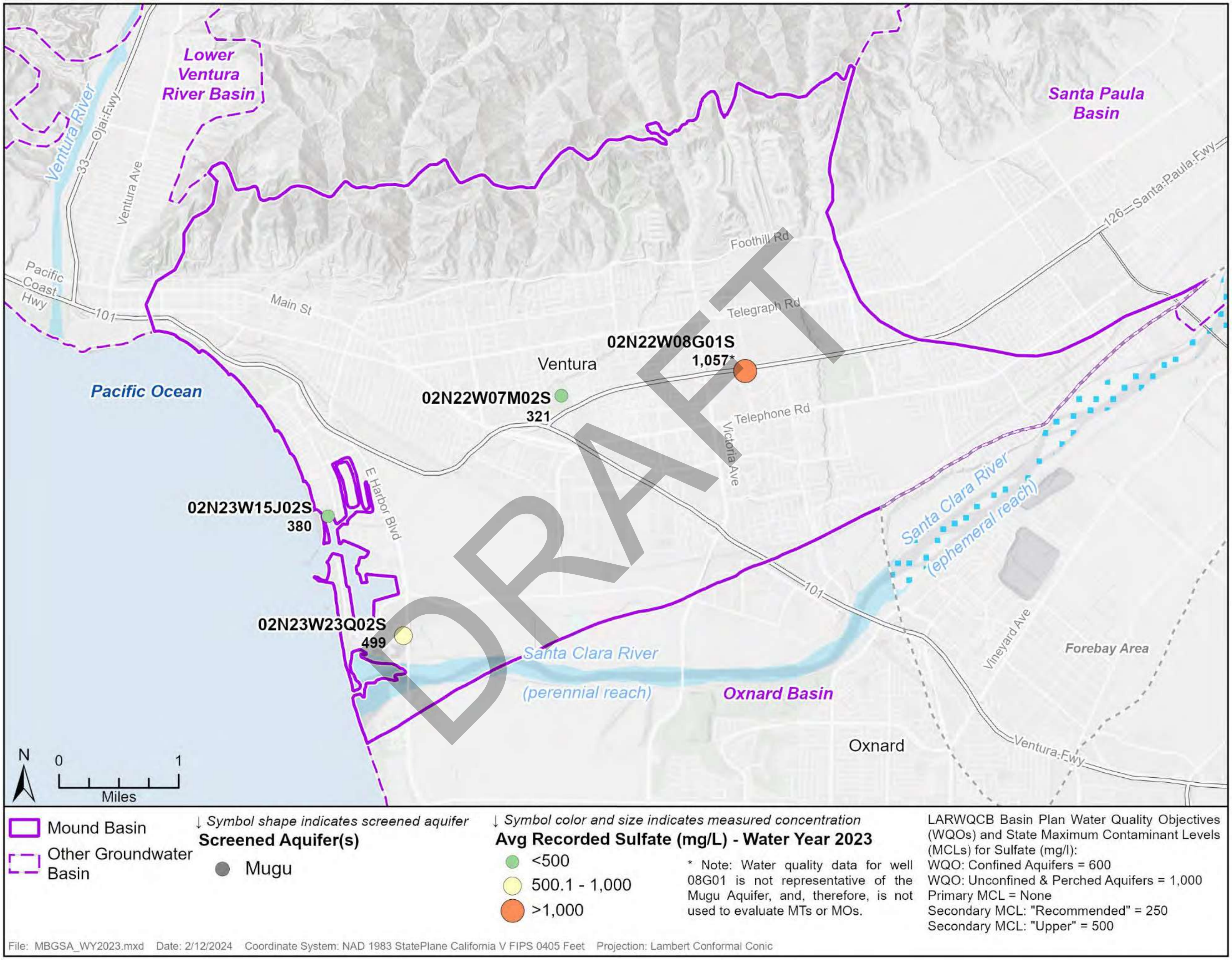


Figure 2.14 Average Sulfate Concentrations Detected in Mugu Aquifer During Water Year 2023.

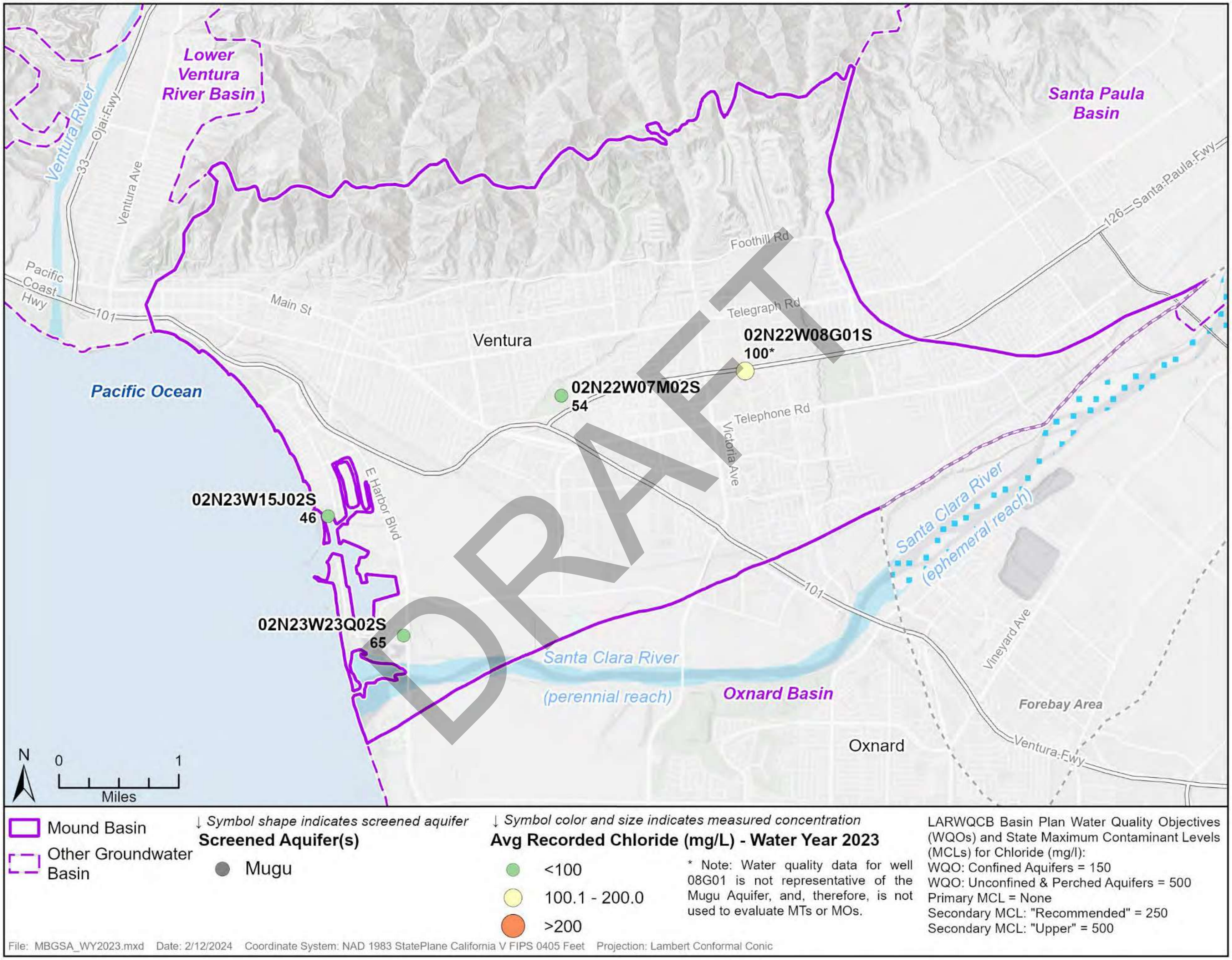


Figure 2.15 Average Chloride Concentrations Detected in Mugu Aquifer During Water Year 2023.

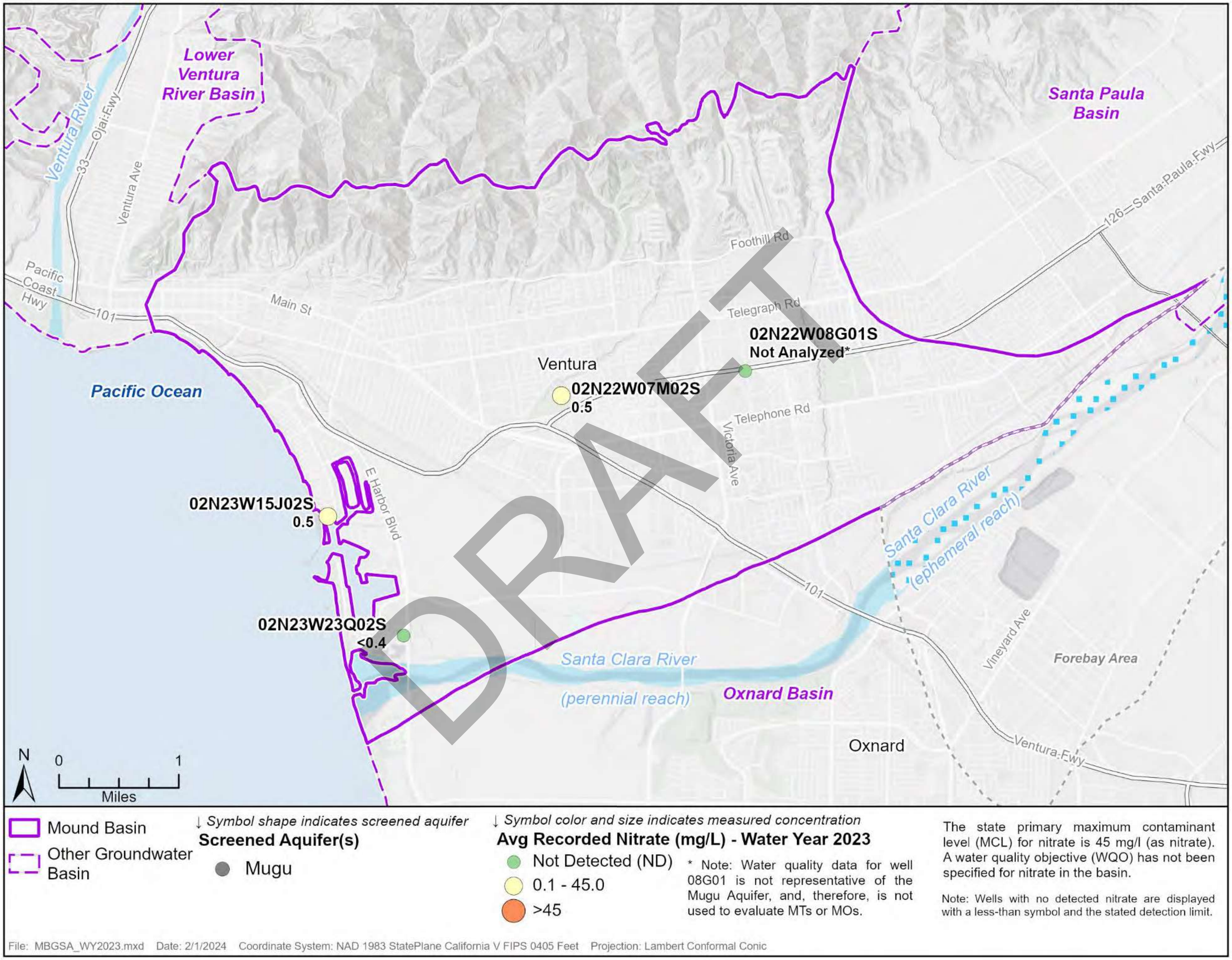


Figure 2.16 Average Nitrate Concentrations Detected in Mugu Aquifer During Water Year 2023.

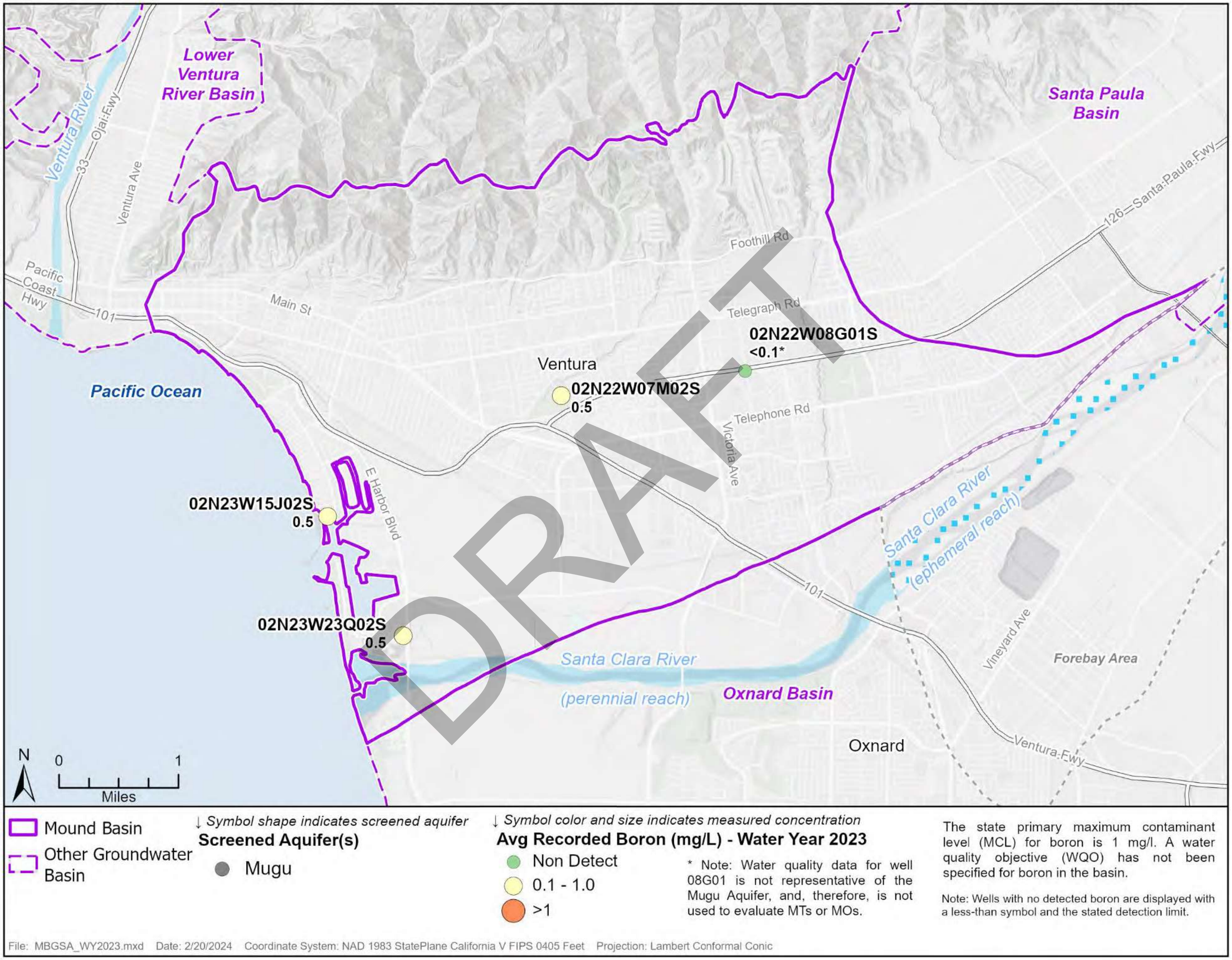


Figure 2.17 Average Boron Concentrations Detected in Mugu Aquifer During Water Year 2023.

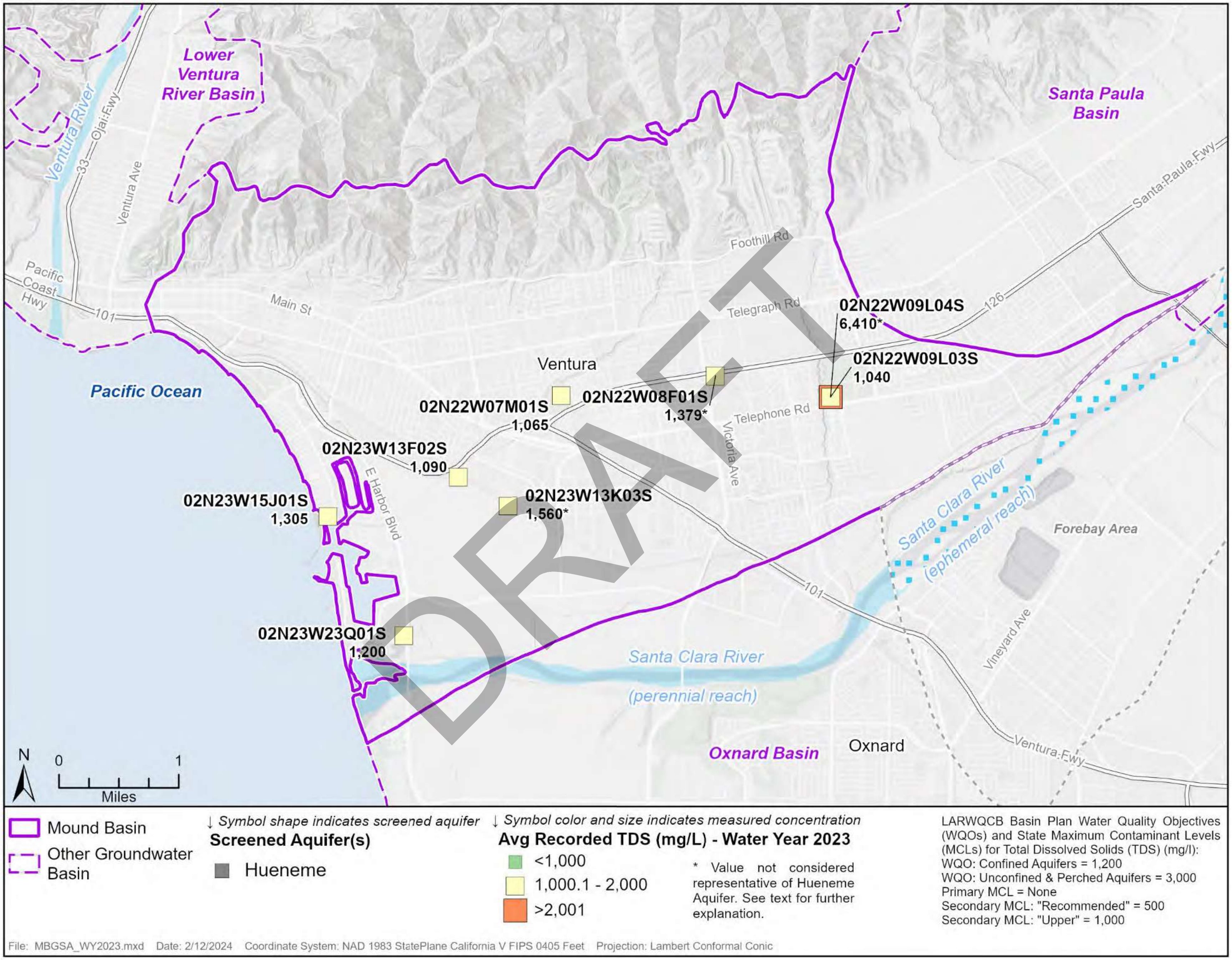


Figure 2.18 Average TDS Concentrations Detected in Hueneme Aquifer During Water Year 2023.

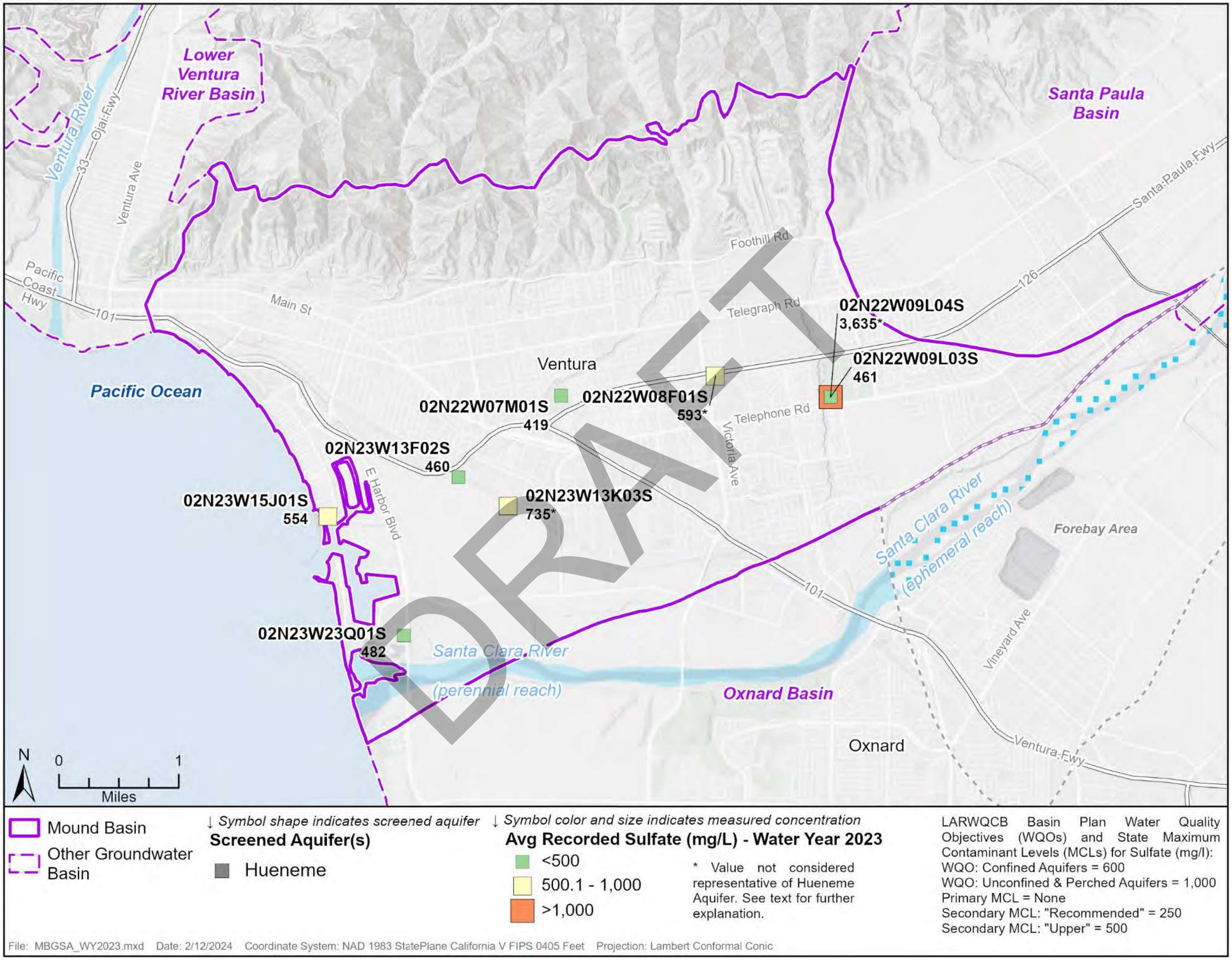


Figure 2.19 Average Sulfate Concentrations Detected in Hueneme Aquifer During Water Year 2023.

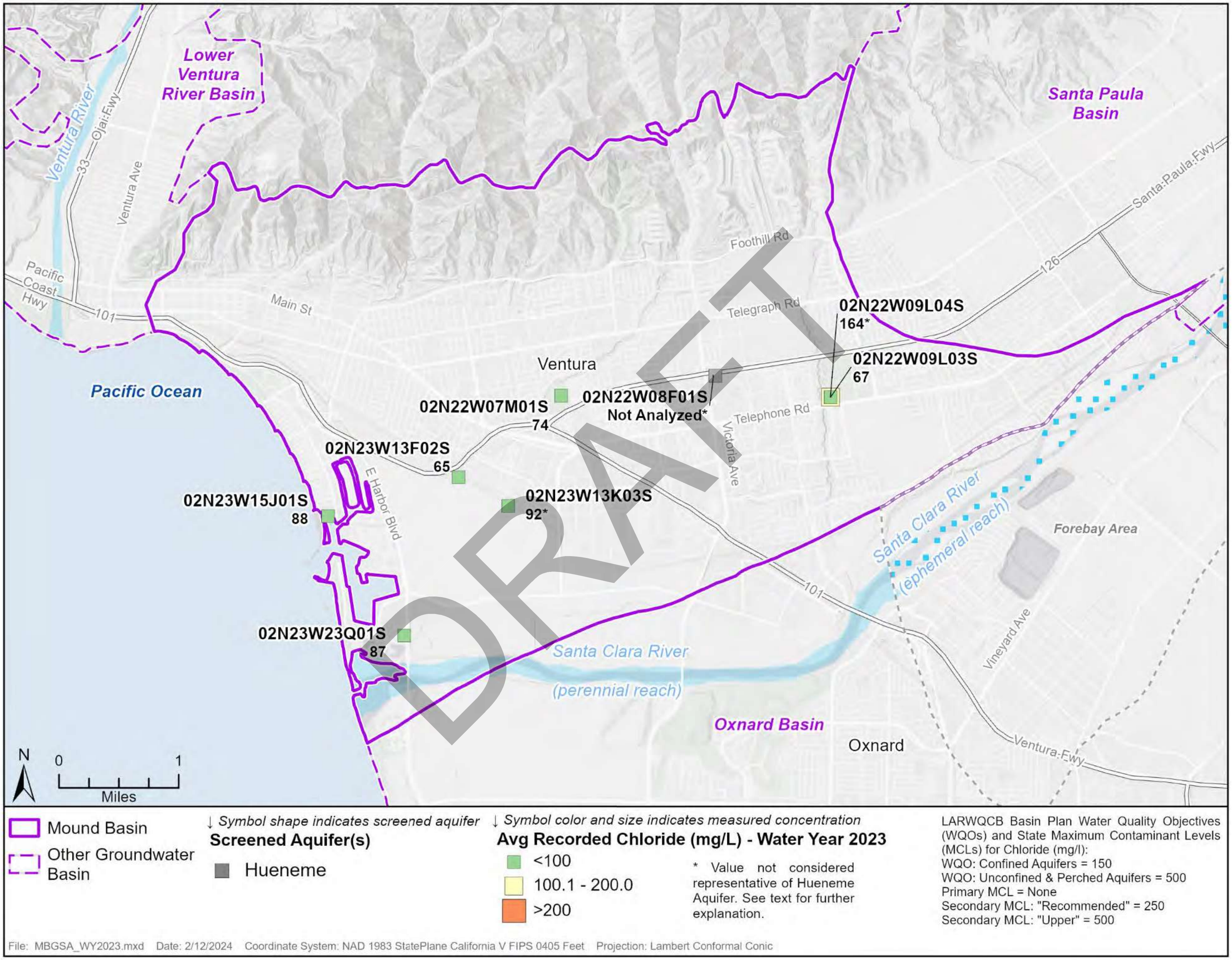


Figure 2.20 Average Chloride Concentrations Detected in Hueneme Aquifer During Water Year 2023.

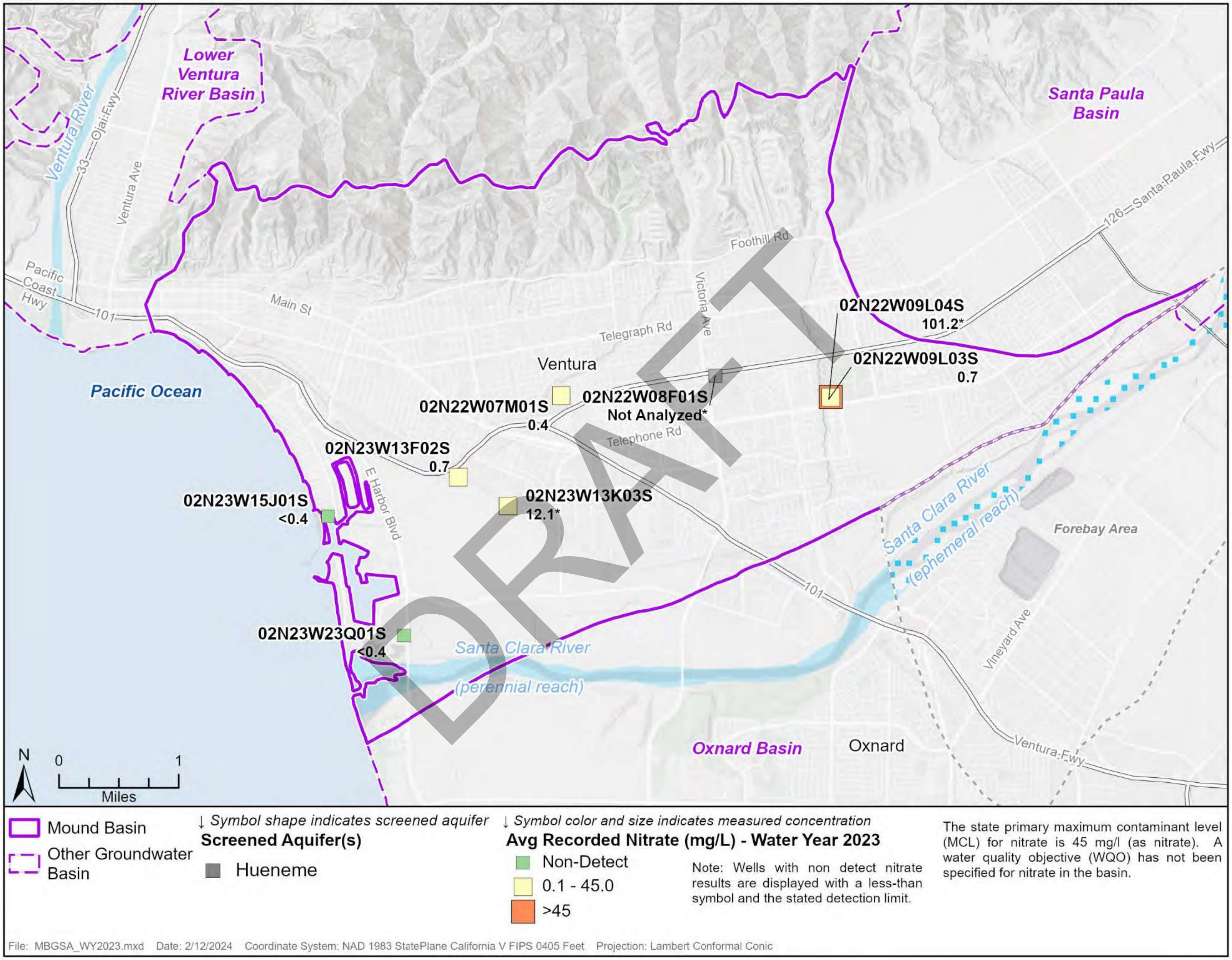


Figure 2.21 Average Nitrate Concentrations Detected in Hueneme Aquifer During Water Year 2023.

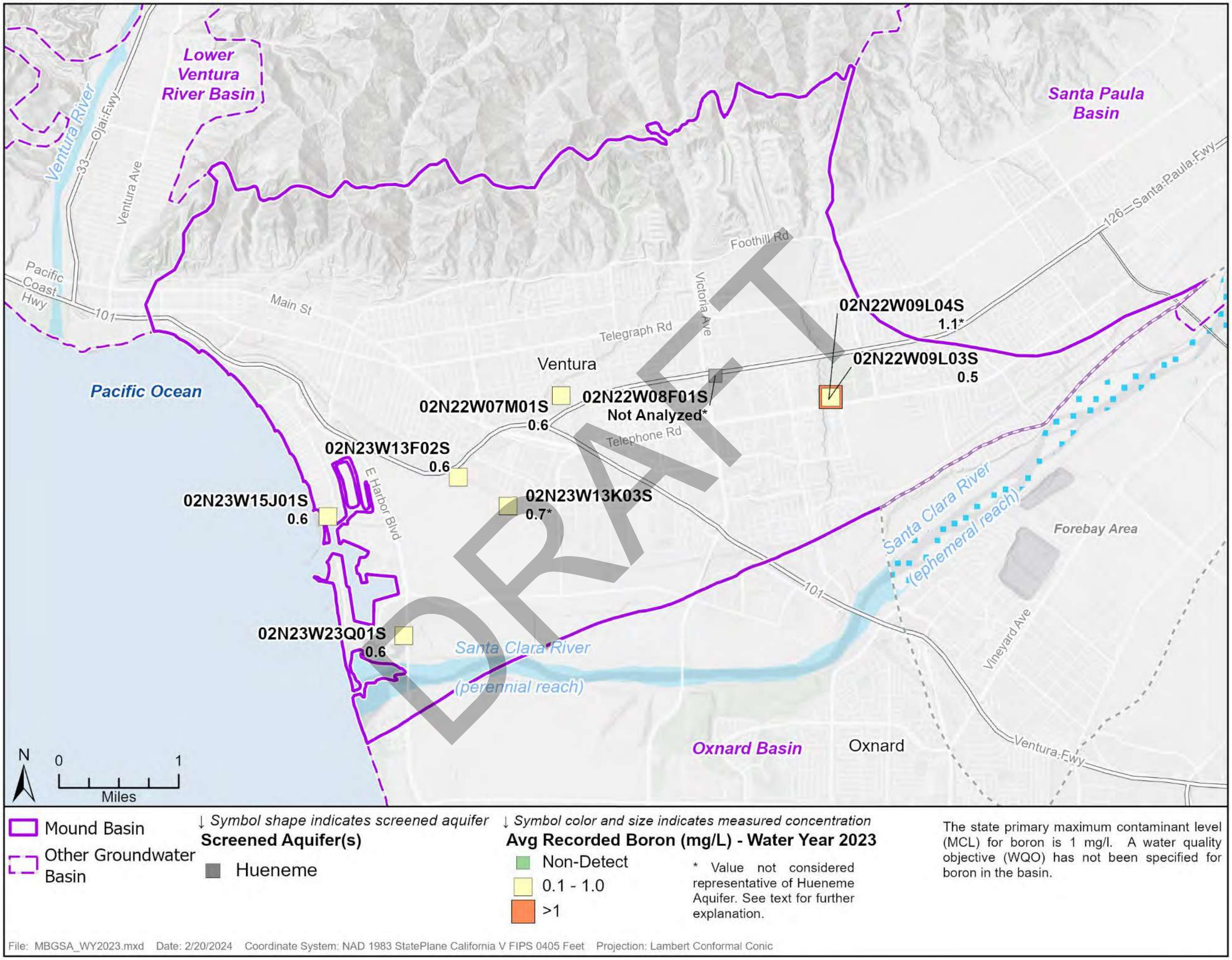


Figure 2.22 Average Boron Concentrations Detected in Hueneme Aquifer During Water Year 2023.

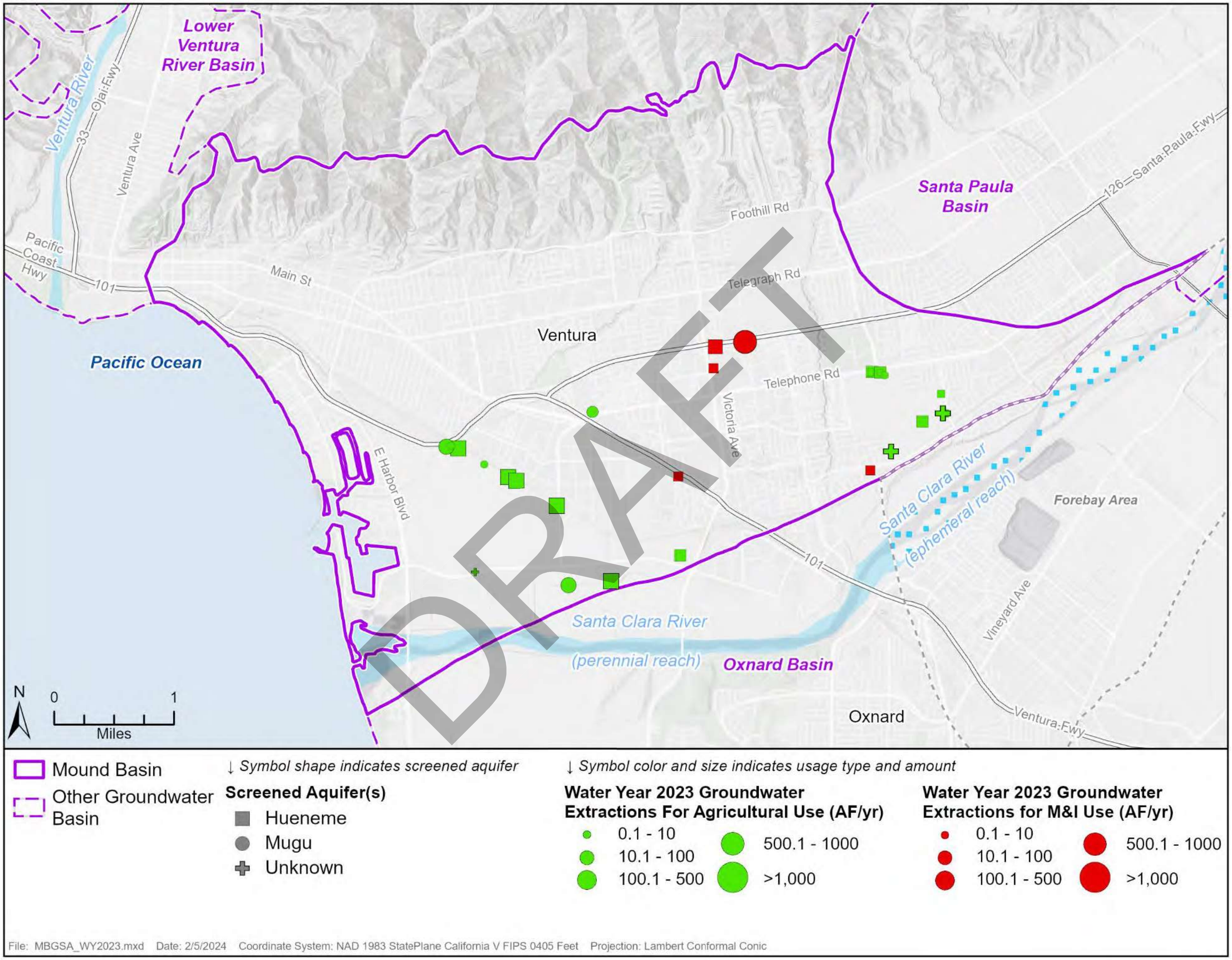


Figure 2.23 Groundwater Extraction from Mound Basin, Water Year 2023.

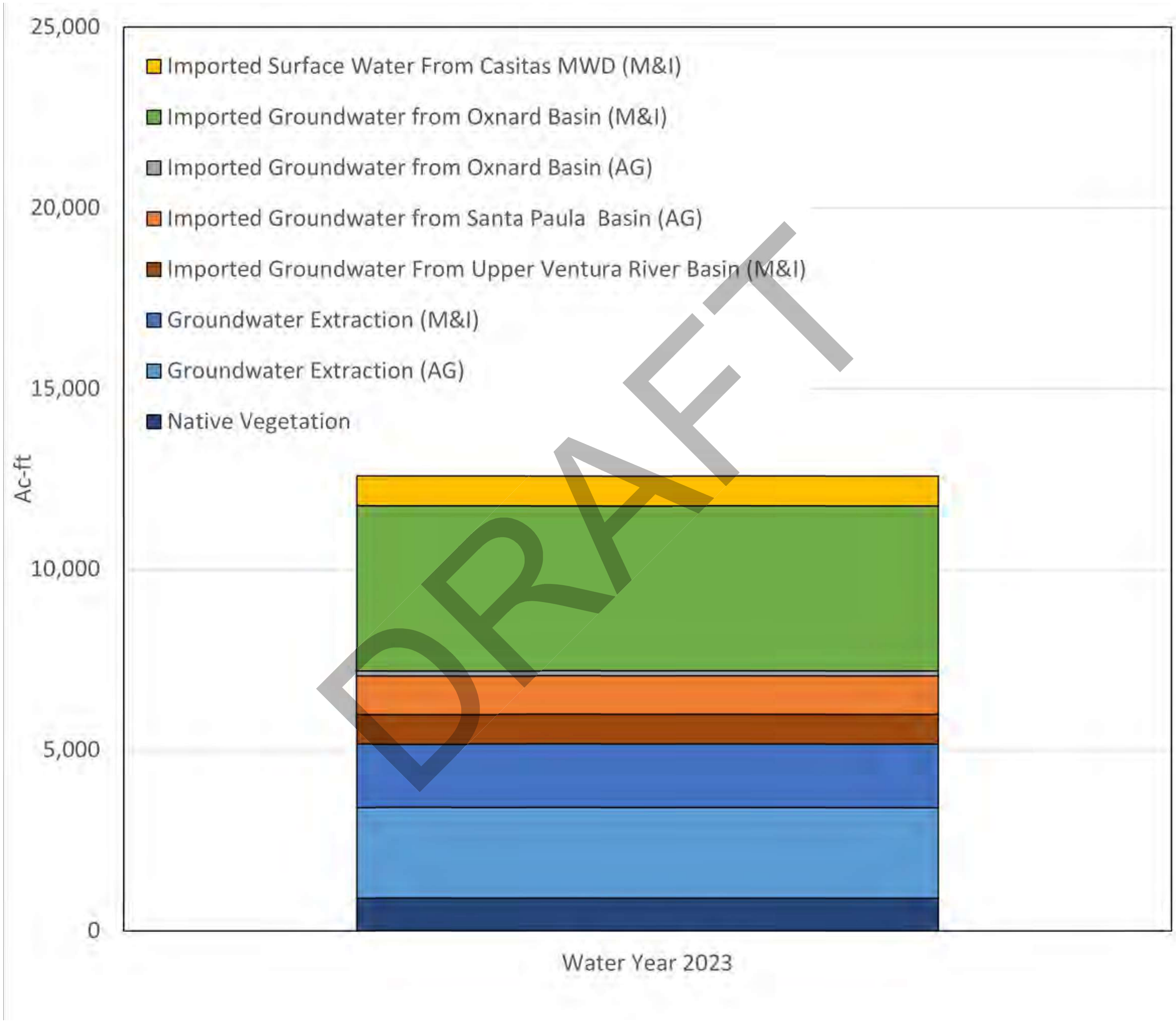


Figure 2.24 Total Water Use for Water Year 2023.

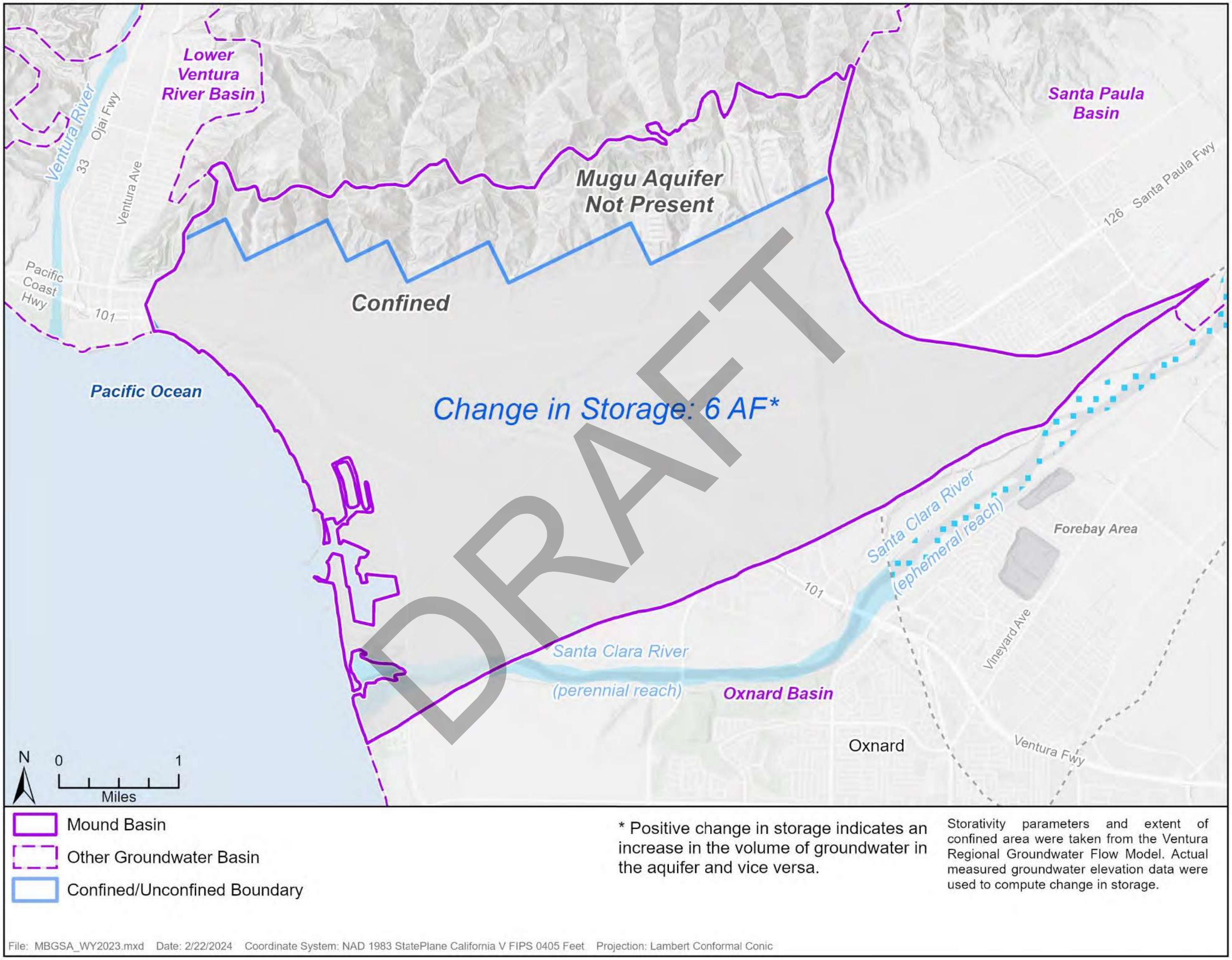


Figure 2.25 Change in Groundwater in Storage for Mugu Aquifer, Water Year 2023.

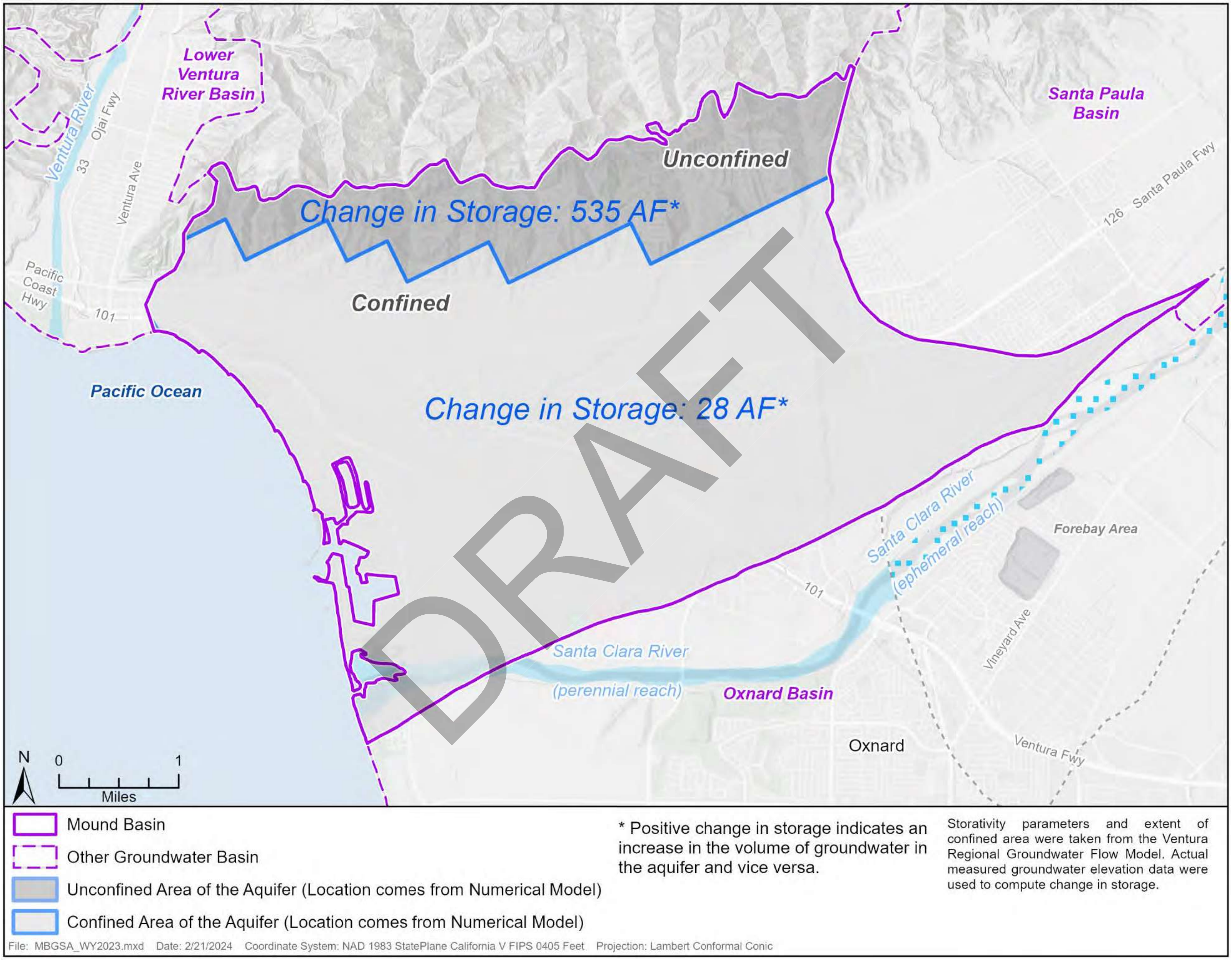
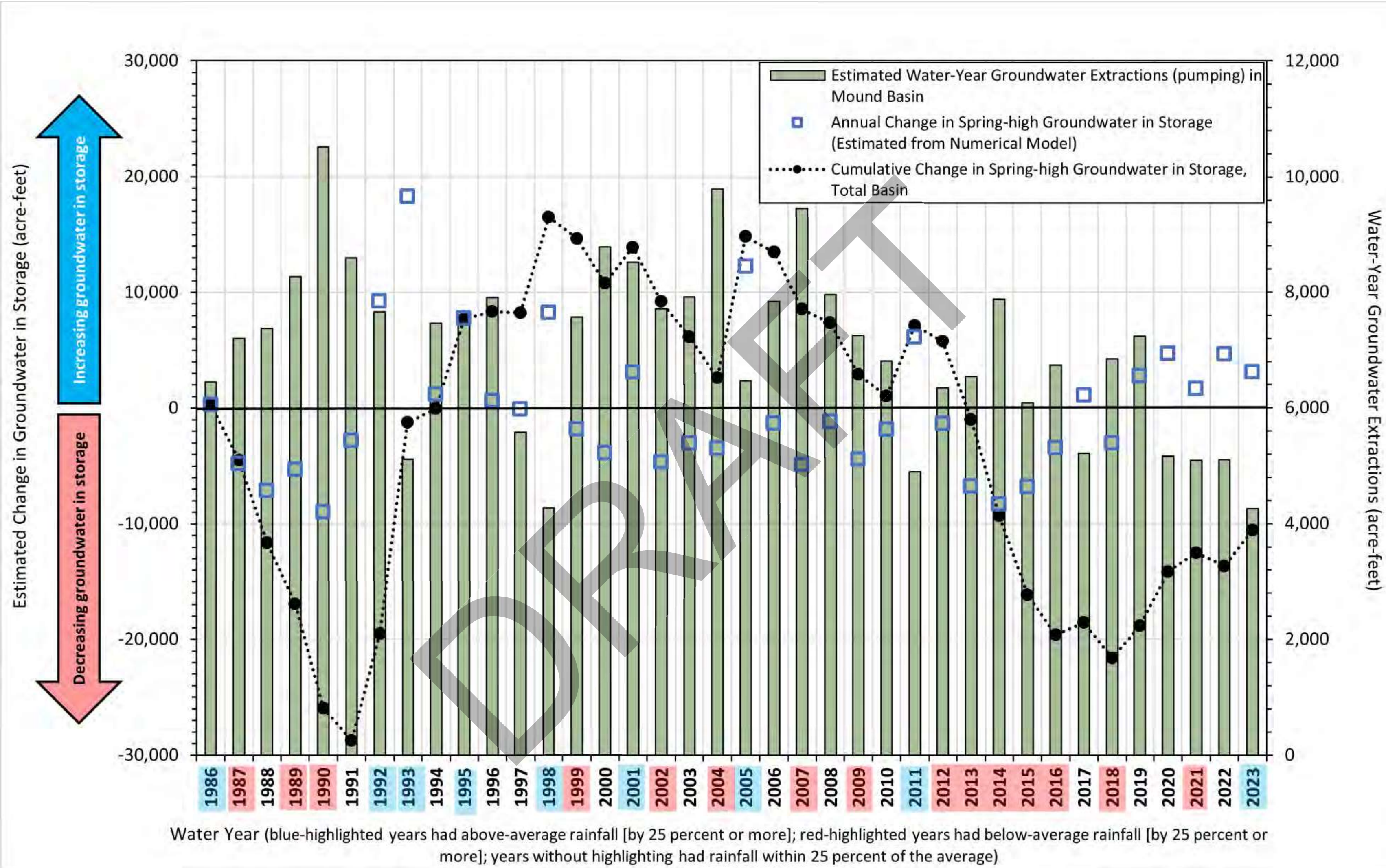


Figure 2.26 Change in Groundwater in Storage for Hueneme Aquifer, Water Year 2023.



Water Year Types
Wet
Dry
Near Average

Figure 2.27 Change in Storage for Mound Basin.

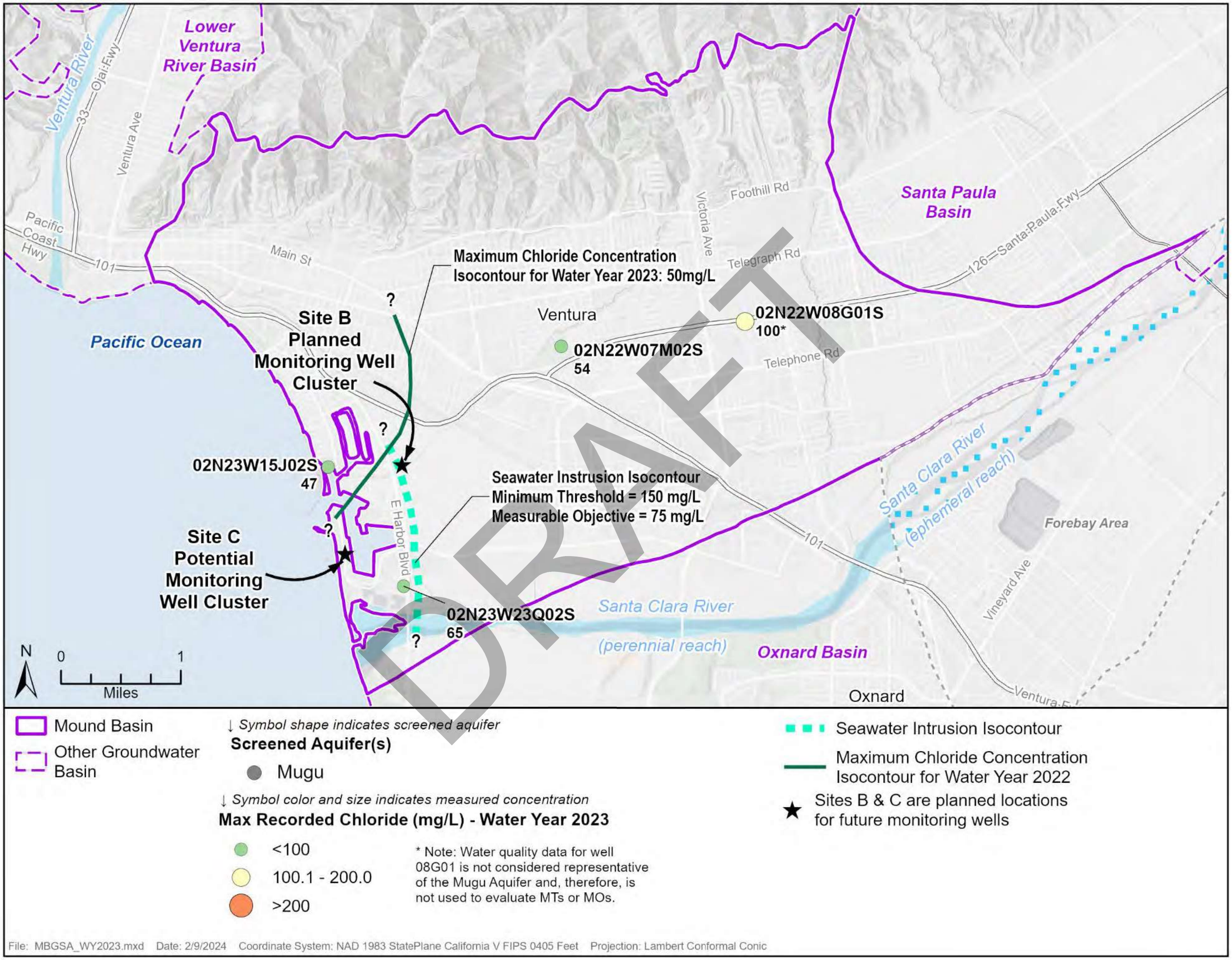
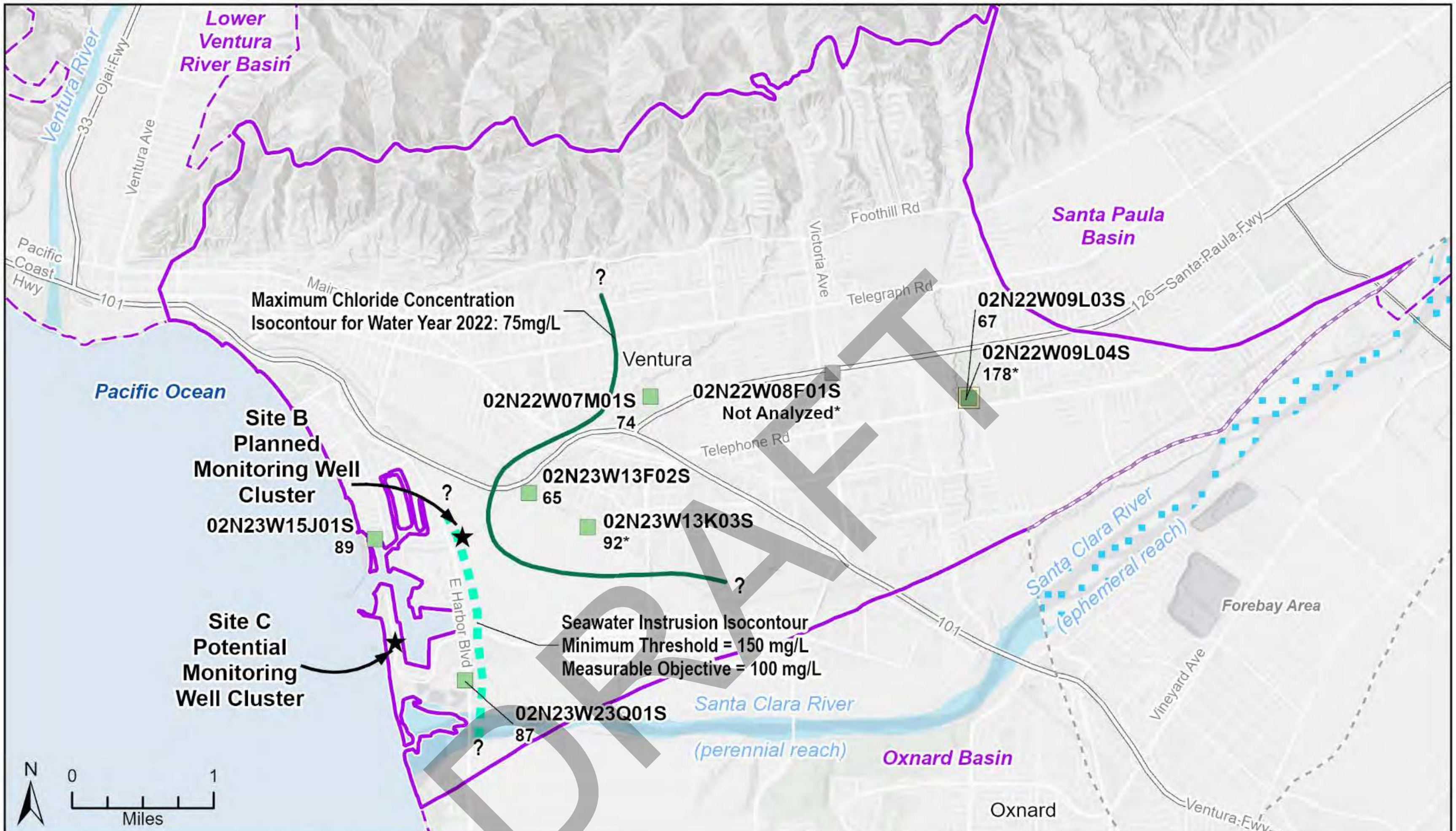


Figure 3.1 Map Showing Seawater Intrusion Minimum Threshold and Measurable Objective, Mugu Aquifer.



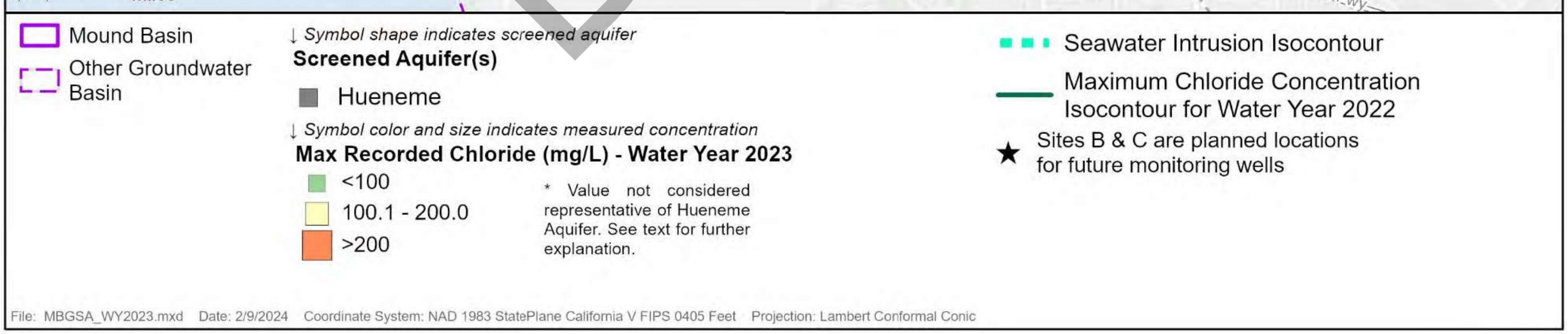
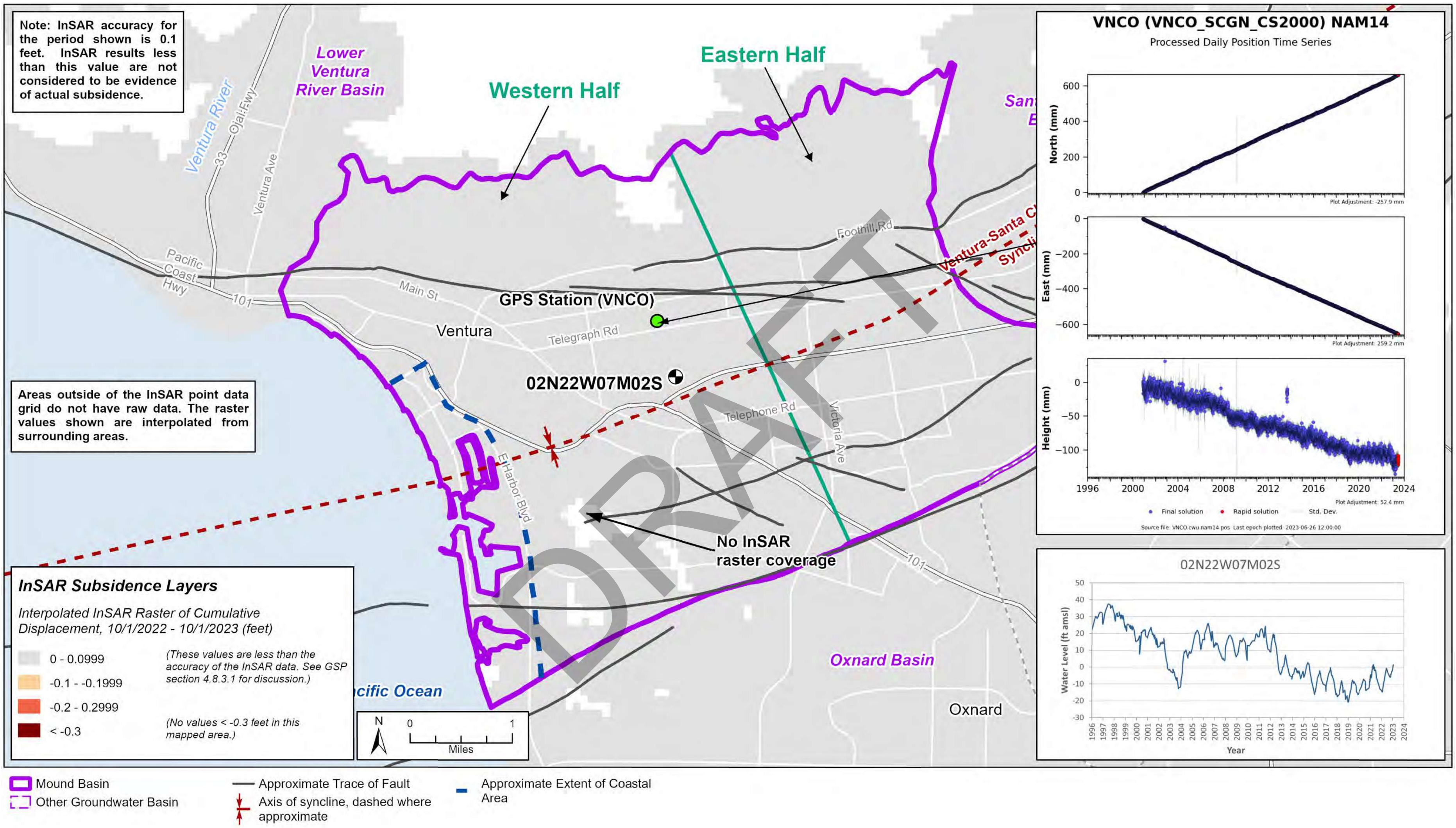


Figure 3.2 Map Showing Seawater Intrusion Minimum Threshold and Measurable Objective, Hueneme Aquifer.



File: MBGSA_WY2023.mxd Date: 2/9/2024 Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet Projection: Lambert Conformal Conic

Figure 3.3 Subsidence Map for Mound Basin Between Water Years 2022 and 2023.

Tables

Table 2.1 Groundwater Extraction by Water Use Sector During Water Year 2023.[a]

Water Use Sector	Water Year 2023 AF/yr	Method of Measurement	Accuracy of Measurement
Agricultural	2,500	Direct and Estimated[a]	Medium
Municipal and Industrial	1,757	Direct & Estimated[b]	High
Native Vegetation[c]	911	Estimated[d]	Medium
Total	**5,168**		

Notes:
- Totals may not match sum of values due to rounding.
a Water Year volumes estimated on precipitation, see text Section 2.4
b Water Year volumes for 2 non-city wells estimated based on precipitation, see text Section 2.4
c Note the extraction due to native vegetation includes the invasive species Arundo.
d Based on numerical model results for the baseline simulation, see text Section 2.4 and GSP (MBGSA, 2021)

Table 2.2 Total Water Use Within Mound Basin During Water Year 2023.

Water Use Sector	Water Year 2023							
	Water Source Type					Total	Method of Measurement	Accuracy of Measurement
	Groundwater Extraction	Imported Groundwater from Upper Ventura River Basin[a]	Imported Groundwater from Oxnard Basin[b]	Imported Groundwater from Santa Paula Basin[b]	Imported Surface Water (Casitas MWD)[a]			
Agricultural	2,500	0	133[c]	1,067[c]	0	3,700	Direct and Estimated[d]	Medium
Municipal and Industrial	1,757	822	4,562	0	822	7,963	Direct and Estimated[d,e]	High
Native Vegetation[f]	911	0	0	0	0	911	Estimated[g]	Medium
TOTALS	5,168	822	4,695	1,067	822	**12,574**		

NOTES:
- Totals may not match sum of values due to rounding

a M&I supplies from Upper Ventura River Basin and Casitas MWD are assumed to be split 50%-50% for use within Mound Basin (see text Section 2.6).
b See text Section 2.6 for estimation method.
c Groundwater imported by FICO and Alta MWC, see Section 3.1.1.3 in GSP.
d Water year volumes for extraction wells estimated based on precipitation, see text Section 2.4.
e Imported M&I volumes are metered and total use is based on the fraction of Mound Basin within Ventura Water service area (see text Section 2.6)
f Note the extraction due to native vegetation includes the invasive species Arundo.
g Based on numerical model results for the baseline simulation, see text Section 2.4 and GSP (MGBSA, 2021)

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

State Well Identification	Aquifers	Frequency of Groundwater Elevation Measurement	Basin Half	Land Subsidence MT	Land Subsidence MO	Chronic Lowering of GW Levels MT	Chronic Lowering of GW Levels MO	IM 5-year	IM 10-year	IM 15-year	IM 20-year	Water Year 2023 WL Minimum	Subsidence Sustainability Indicator - Water Year 2023
Number	Monitored	2015-2020		(ft amsl)								(ft amsl)	
02N22W08G01S	Mugu	Monthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-20.39	5.21	-13.99	-7.59	-1.19	5.21	-14.39	<0.1 ft/yr*
02N22W08P01S	Mugu	Quarterly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-16.11	7.93	-10.1	-4.09	1.92	7.93	Well Destroyed	
02N22W07M02S	Mugu	Monthly	Western	-19.77	1	-19.77	1	-14.58	-9.38	-4.19	1	-14.61	-14.61
02N22W07P01S	Mugu	Monthly	Western	-21	0.88	-21	0.88	-15.53	-10.06	-4.59	0.88	-17.53	-17.53
02N22W19M04S	Mugu	Bimonthly	Western	-64.19	-43.98	-64.19	-43.98	-59.14	-54.08	-49.03	-43.98	-34.34	-34.34
02N23W15J02S	Mugu	Monthly	Western	-18.64	-0.96	-18.64	-0.96	-14.22	-9.8	-5.38	-0.96	-9.60	-9.60
02N22W09K04S	Hueneme	Monthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-32.41	-10.31	-26.88	-21.36	-15.83	-10.31	1.80	<0.1 ft/yr*
02N22W09L03S	Hueneme	Monthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	28.27	50.37	33.8	39.32	44.85	50.37	46.71	<0.1 ft/yr*
02N22W09L04S	Hueneme	Monthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	42.28	64.39	47.81	53.34	58.86	64.39	53.51	<0.1 ft/yr*
02N22W10N03S	Hueneme	Bimonthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-38.2	-15.4	-32.5	-26.8	-21.1	-15.4	-25.87	<0.1 ft/yr*
02N22W16K01S	Hueneme	Quarterly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-56.09	-33.73	-50.5	-44.91	-39.32	-33.73	-39.48	<0.1 ft/yr*
02N22W17Q05S	Hueneme	Bimonthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-66.73	-45.48	-61.42	-56.11	-50.79	-45.48	-43.76	<0.1 ft/yr*
02N22W07M01S	Hueneme	Monthly	Western	-25.21	-4.59	-25.21	-4.59	-20.06	-14.9	-9.75	-4.59	-6.56	-6.56
02N22W17M02S	Hueneme	Bimonthly	Western	-18.76	2.51	-18.76	2.51	-13.44	-8.12	-2.81	2.51	7.99	7.99
02N22W20E01S	Hueneme	Monthly	Western	-72.79	-51.82	-72.79	-51.82	-67.55	-62.31	-57.07	-51.82	-31.78	-31.78
02N23W13K03S	Hueneme	Quarterly	Western	-34.23	-14.44	-34.23	-14.44	-29.28	-24.33	-19.39	-14.44	3.11	3.11
02N23W13K04S	Hueneme	Quarterly	Western	-25.6	-5.81	-25.6	-5.81	-20.65	-15.71	-10.76	-5.81	-12.17	-12.17
02N23W15J01S	Hueneme	Monthly	Western	-25.86	-7.3	-25.86	-7.3	-21.22	-16.58	-11.94	-7.3	-11.74	-11.74
02N23W24G01S	Hueneme	Quarterly	Western	-22.3	-3.21	-22.3	-3.21	-17.53	-12.75	-7.98	-3.21	1.46	1.46

Notes:

MT/MO based on land subsidence measurements in the Eastern Half of the Basin
* INSAR land surface elevation accuracy threshold is 0.1 ft/yr

Color Key:

MO met	5-yr IM met	Between MT and IM	MT exceeded

Table 3.2 Sustainable Management Criteria for the Reduction of Groundwater Storage Sustainability Indicator

Water Year	Groundwater Extractions	Minimum Threshold	Measurable Objective
	AF/yr	AF/yr	AF/yr
2023	4,257	8,200	7,400

Color Key:

Measurable objective met
Minimum threshold exceeded

Table 3.3 Sustainable Management Criteria for the Degraded Water Quality Sustainability Indicator.

State Well Identification Number	Local Well Identifier	Aquifers Monitored	Frequency of Groundwater Quality Sampling	Measurement or Sampling	Degraded WQ Nitrate MT	Degraded WQ Nitrate MO/IM[1,2]	Degraded WQ TDS MT	Degraded WQ TDS MO/IM[1,2]	Degraded WQ Sulfate MT	Degraded WQ Sulfate MO/IM[1,2]	Degraded WQ Chloride MT	Degraded WQ Chloride MO/IM[1,2]	Degraded WQ Boron MT	Degraded WQ Boron MO/IM[1,2]
02N22W08G01S	Mound #1	Mugu	Monthly	City of Ventura	Not used - water quality is anomalous									
02N22W07M02S	CP-780	Mugu	Semiannually	United	45	5	1200	1000	600	500	150	75	1	0.75
Average observed concentration for water year 2023					0.5		875		321		54		0.5	
Two-year running average observed concentration for water years 2022-2023					0.43		883		308		54		0.5	
02N23W15J02S	MP-660	Mugu	Semiannually	United	45	5	1200	1000	600	500	150	75	1	0.75
Average observed concentration for water year 2023					0.5		910		380		46		0.5	
Two-year running average observed concentration for water years 2022-2023					0.43		935		345		45.5		0.5	
02N23W23Q02S		Mugu	Semiannually	United	45	5	1200	1000	600	500	150	75	1	0.75
Average observed concentration for water year 2023					<0.4		1150		499		65		0.5	
Two-year running average observed concentration for water years 2022-2023[3]					<0.4		1150		499		65		0.5	
02N22W08F01S	Victoria #2	Hueneme	Monthly	City of Ventura	Not used - water quality is anomalous									
02N22W09L03S	CWP-950	Hueneme	Semiannually	United	45	5	1400	1400	600	600	150	100	1	0.75
Average observed concentration for water year 2023					0.7		1040		461		67		0.5	
Two-year running average observed concentration for water years 2022-2023					0.48		1053		439		66.8		0.5	
02N22W09L04S	CWP-510	Hueneme	Semiannually	United	Not used - water quality is anomalous									
02N23W13F02S	---	Hueneme	Annually	United	45	5	1400	1400	600	600	150	100	1	0.75
Average observed concentration for water year 2023					0.7		1090		460		65		0.6	
Two-year running average observed concentration for water years 2022-2023					0.55		1100		424		66.5		0.6	
02N22W07M01S	CP-1280	Hueneme	Semiannually	United	45	5	1400	1400	600	600	150	100	1	0.75
Average observed concentration for water year 2023					0.4		1065		419		74		0.6	
Two-year running average observed concentration for water years 2022-2023					0.4		1083		400		73.8		0.6	
02N23W13K03S	---	Hueneme	Annually	VCWPD	Not used - water quality is anomalous									

State Well Identification Number	Local Well Identifier	Aquifers Monitored	Frequency of Groundwater Quality Sampling	Measurement or Sampling	Degraded WQ Nitrate MT	Degraded WQ Nitrate MO/IM1,2	Degraded WQ TDS MT	Degraded WQ TDS MO/IM1,2	Degraded WQ Sulfate MT	Degraded WQ Sulfate MO/IM1,2	Degraded WQ Chloride MT	Degraded WQ Chloride MO/IM1,2	Degraded WQ Boron MT	Degraded WQ Boron MO/IM1,2
02N23W15J01S	MP-1070	Hueneme	Semiannually	United	45	5	1400	1400	600	600	150	100	1	0.75
Average observed concentration for water year 2023					<0.4		1305		554		88		0.6	
Two-year running average observed concentration for water years 2022-2023					<0.4		1308		518		87.8		0.65	
02N23W23Q01S	MP-1070	Hueneme	Semiannually	United	45	5	1400	1400	600	600	150	100	1	0.75
Average observed concentration for water year 2023					<0.4		1200		482		87		0.6	
Two-year running average observed concentration for water years 2022-2023[3]					<0.4		1200		482		87		0.6	

Notes:

MO = Measurable Objective.
IM = Interim Milestone.
MT = Minimum Threshold.
SMC = sustainable management criteria.
WQ = water quality.
NA = Not available.
[1]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 MO/IM.
[2]The degraded water quality MO and IM are equal and are met when the maximum 2-yr running average across all wells within each principal aquifer is below their respective MO/IM.
[3]The two-year running average for 02N23W23Q01/02S have not been established because these wells were not a part of the 2022 monitoring network.

Color Key:

MO/IM met[2]
Between MT and MO/IM
MT exceeded

Appendix

Appendix A – Updated Extraction Volume Estimation

Groundwater extraction volumes for the Mound Basin are reported semi-annually (January through June, and July through December). Each Annual Report for the Mound Basin Groundwater Sustainability Agency (MBGSA) reports pumping for the water year (October 1st through September 30th), which requires the months of July, August, and September to be estimated due to the water year extending beyond the available semi-annual reporting period. This Appendix documents the updates and comparison to the previous Annual Report water year pumping volume estimates along with the corrected figure and tables. The total monthly extraction estimated for the last 3 months of water year 2022 was approximately 14% greater than what was subsequently reported (Table 1).

	2022 Annual Report Originally Estimated Total Extraction (AF)		Updated Volumes Based on Semi-Annually Reported Extraction (AF)		% Difference		
Month-Year	Total Agricultural	Total M&I	Total Agricultural	Total M&I	Total Agricultural	Total M&I	Overall Difference
Jul-21	301	276	384	270	27%	2%	15%
Aug-21	305	302	384	296	26%	2%	14%
Sep-21	298	339	384	333	29%	2%	15%

Table 1. Summary comparison of previously reported and updated groundwater extraction volumes.

Figure 1 and Tables 2 through 4 show the updates to Figure 2.27, and Tables 2.1, 2.2, and 3.2 from the previous water year 2022 Annual Report are provided below.

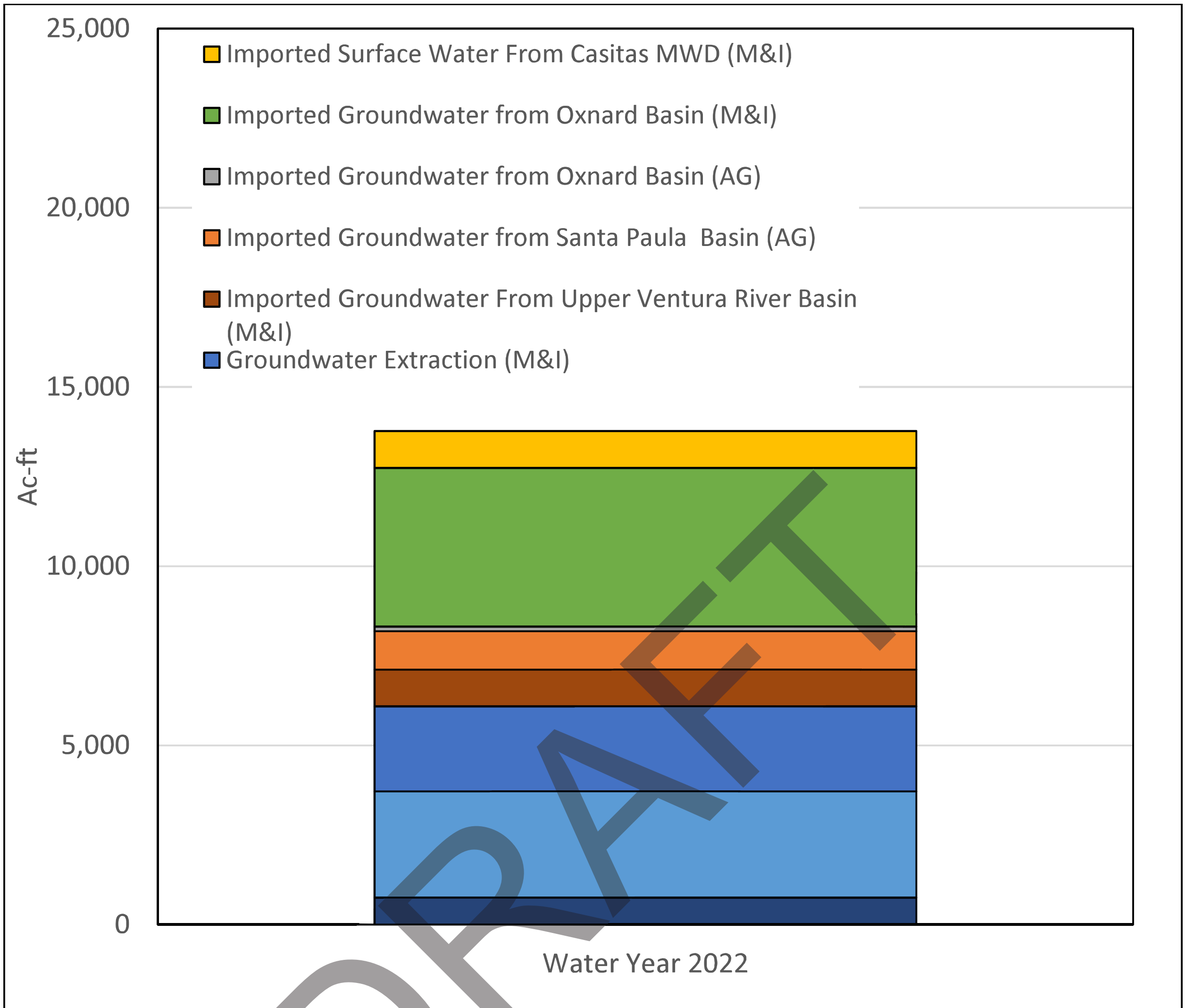


Figure 1: Updated Figure 2.27 from the water years 2022 MBGSA Annual Report. Groundwater Extraction (M&I and AG) for Water Year 2022 have been updated.

Table 2.1 Groundwater Extraction by Water Use Sector for Water Year 2022.

Water Use Sector	Water Year 2022	Method of Measurement	Accuracy of Measurement
	AF/yr		
Agricultural	~~2,715~~ 2,962	Direct and Estimated[a]	Medium
Municipal and Industrial	~~2,391~~ 2,372	Direct & Estimated[b]	High
Native Vegetation[c]	755	Estimated[d]	Medium
Total	**~~5,861~~ 6,089**		

Table 2. Updated Table 2.1 from the water year 2022 MBGSA Annual Report. Previous values are shown as strikethrough text.

Water Year 2022								
Water Use Sector	Water Source Type					Total	Method of Measurement	Accuracy of Measurement
	Groundwater Extraction	Imported Groundwater from Upper Ventura River Basin[a]	Imported Groundwater from Oxnard Basin[b]	Imported Groundwater from Santa Paula Basin[b]	Imported Surface Water (Casitas MWD)[a]			
Agricultural	~~2,715~~ 2,962	0	133[c]	1,067[c]	0	~~3,915~~ 4,162	Direct and Estimated[d]	Medium
Municipal and Industrial	~~2,391~~ 2,372	1,028	4,426	0	1,028	~~8,873~~ 8,854	Direct and Estimated[d,e]	High
Native Vegetation[f]	755	0	0	0	0	755	Estimated[g]	Medium
TOTALS	~~5,861~~ 6,089	1,028	4,559	1,067	1,028	**~~13,543~~ 13,771**		

NOTES:
- Totals may not match sum of values due to rounding
a M&I supplies from Upper Ventura River Basin and Casitas MWD are assumed to be split 50%-50% for use within Mound Basin (see text Section 2.6).
b See text Section 2.6 for estimation method.
c Groundwater imported by FICO and Alta MWC, see Section 3.1.1.3 in GSP.
d Water year volumes for extraction wells estimated based on precipitation, see text Section 2.4.
e Imported M&I volumes are metered and total use is based on the fraction of Mound Basin within Ventura Water service area (see text Section 2.6)
f Note the extraction due to native vegetation includes the invasive species Arundo.
g Based on numerical model results for the baseline simulation, see text Section 2.4 and GSP (MGBSA, 2021)

Table 3. Updated Table 2.2 from the water year 2022 MBGSA Annual Report. Previous values are shown as strikethrough text.

Water Year	Groundwater Extractions	Minimum Threshold	Measurable Objective
	AF/yr	AF/yr	AF/yr
2022	~~5,106~~ 5,334	8,200	7,400

Color Key:

Measurable objective met

Minimum threshold exceeded

Table 4. Updated Table 3.2 from the water year 2022 MBGSA Annual Report. Previous values are shown as strikethrough text.