Oxnard Subbasin Groundwater Sustainability Plan 2023 Annual Report: Covering Water Year 2022

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Fox Canyon Groundwater Management Agency

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Executive Summary

The Fox Canyon Groundwater Management Agency (FCGMA), the Groundwater Sustainability Agency (GSA) for the portions of the Oxnard Subbasin (Subbasin) within its jurisdictional boundaries, in coordination with the other two GSAs in the Subbasin, has prepared this fourth annual report for the Oxnard Subbasin Groundwater Sustainability Plan (GSP) in compliance with the 2014 Sustainable Groundwater Management Act (SGMA) (California Water Code, Section 10720 et seq.). This annual report covers the entire Subbasin. The GSP for the Oxnard Subbasin was submitted to the Department of Water Resources (DWR) on January 13, 2020 and approved by DWR on November 18, 2021. SGMA regulations require that an annual report be submitted to the DWR by April 1 of each year following the adoption of the GSP. This annual report provides an update on the groundwater conditions for water year 2022 (October 1, 2021 through September 30, 2022).

Water year 2021 was a below normal water year, in which precipitation was approximately 86% of the historical average precipitation within the Subbasin. In response to the lower-than-average precipitation received in the 2022 water year, groundwater elevations measured in spring 2022 were lower than spring 2021 in the majority of representative monitoring points, or key wells, in the Oxnard, Mugu, Hueneme, Fox Canyon, and Grimes Canyon aquifers. Since 2015, spring groundwater elevation changes have varied geographically across the Subbasin. In the Oxnard aquifer, near Port Hueneme and in the West Oxnard Plain Management Area, spring 2022 groundwater elevations were approximately 0.5 to 3 feet lower than they were in 2015; closer to Point Mugu, the spring 2022 groundwater elevations were 0.25 to 0.5 feet higher than they were in spring 2015. In the Mugu, Hueneme, and Fox Canyon aquifers, spring 2022 groundwater elevations were lower than spring 2015 across the Subbasin, with the exception of the Forebay Management Area, where spring 2022 groundwater elevations were 1 to 15 feet higher than spring 2015.

In the Upper Aquifer System (UAS), the decline in groundwater elevations across the Subbasin between spring 2021 and 2022 resulted in a net decrease in groundwater storage of approximately 5,800 acre-feet (AF). In the Lower Aquifer System (LAS), there was a net decrease in groundwater storage of approximately 1,100 AF between spring 2021 and 2022. Since 2015, groundwater in storage in the UAS has increased by a cumulative volume of approximately 4,600 AF; this increase in storage largely reflects groundwater elevation changes in the Forebay Management Area that have resulted from UWCD's recharge operations. Since 2015, groundwater storage in the LAS has declined by approximately 50 AF.

Implementation of the GSP has begun to fill data gaps identified in the GSP. Some of the critical data gaps include the timing and number of groundwater elevation measurements available for preparing spring and fall contour maps, and the availability of data on surface water diversions from agencies reporting to FCGMA. Spatial data gaps are being filled with groundwater elevation measurements collected from newly installed nested groundwater monitoring wells located adjacent to Revolon Slough, within the Oxnard Pumping Depression Management Area. The first data from these wells was collected during the 2021 water year. The data gaps identified in the GSP will continue to be addressed as implementation of the GSP progresses.

FCGMA has undertaken several steps toward implementing the GSP. FCGMA is currently preparing the technical specifications for new dedicated monitoring wells that were funded as a component of DWR's Sustainable Groundwater Management Grant Program's SGMA Implementation Round 1 funding opportunity. FCGMA is continuing to coordinate between partner agencies that submitted project components that were included in the funded grant. These projects were selected because of their capacity to improve the long-term sustainable use of groundwater resources in the Oxnard Subbasin.

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1 Background and Plan Area

1.1 Background

FCGMA, the GSA for the portions of the Subbasin within its jurisdictional boundaries, in coordination with the other two GSAs in the Subbasin, has prepared this annual report for the Oxnard Subbasin GSP in compliance with SGMA (California Water Code, Section 10720 et seq.). SGMA requires that an annual report be submitted to DWR by April 1 of each year following the adoption of the GSP. FCGMA adopted a GSP for the Oxnard Subbasin in December 2019 and submitted the GSP to DWR on January 13, 2020 for the entire Subbasin. DWR approved the GSP on November 18, 2021. The 2023 annual report is the fourth annual report for the Subbasin since the GSP was submitted.

FCGMA is one of three Groundwater Sustainability Agencies (GSAs) in the Subbasin. The other two GSAs are the Camrosa Water District (CWD)–Oxnard GSA and the Oxnard Outlying Areas GSA (County of Ventura). This annual report applies to the entirety of the Subbasin, including those portions of the Subbasin that lie outside FCGMA's boundary. To coordinate management and reporting in the Subbasin, FCGMA and CWD have executed a Memorandum of Understanding, and FCGMA and the County have formed a Joint Powers Authority.

1.1.1 Fox Canyon Groundwater Management Agency

FCGMA is an independent special district formed by the California Legislature in 1982 to manage and protect the aquifers within its jurisdiction for the common benefit of the public and all agricultural and M&I users (FCGMA et al. 2007). FCGMA's boundaries include all land overlying the Fox Canyon aquifer (FCA). The FCA underlies the Oxnard Subbasin (DWR Basin No. 4-004.02), the Las Posas Valley Basin (LPVB) (DWR Basin No. 4-008), the Pleasant Valley Basin (PVB) (DWR Basin No. 4-006), and the Arroyo Santa Rosa Valley Basin (ASRVB) (DWR Basin No. 4-007).

FCGMA is governed by a Board of Directors (Board) with five members who represent: (1) the County of Ventura (County), (2) the United Water Conservation District (UWCD), (3) seven mutual water companies and water districts within the Agency[1], (4) five incorporated cities which are all or a portion of each is within the FCGMA jurisdictional area[2], and (5) a farmer representative. The Board members representing the County, UWCD, the mutual water companies and water districts, and the incorporated cities are appointed by their respective organizations or groups. The representative for the farmers is appointed by the other four seated Board members from a list of candidates jointly supplied by the Ventura County Farm Bureau and the Ventura County Agricultural Association. An alternate Board member is selected by each appointing agency or group in the same manner as the regular member and acts in place of the regular member in case of absence or inability to act. All members and alternates serve for a 2-year term of office, or until the member or alternate is no longer an eligible official of the member agency. Information regarding current FCGMA Board representatives can be found on the FCGMA website.

[1] The seven mutual water companies and water districts are: Alta Mutual Water Company, Pleasant Valley County Water District (PVCWD), Berylwood Mutual Water Company, Calleguas Municipal Water District (CMWD), CWD, Zone Mutual Water Company, and Del Norte Mutual Water Company.

[2] The five incorporated cities which are all or in part within the FCGMA jurisdictional area are: Ventura, Oxnard, Camarillo, Port Hueneme, and Moorpark.

1.1.2 Oxnard Subbasin Groundwater Sustainability Plan

The GSP for the Oxnard Subbasin defined the conditions under which the groundwater resources of the entire Oxnard Subbasin will be managed sustainably in the future (FCGMA 2019a), with periodic evaluation of GSP to assess changing conditions (California Water Code, Section 10728.2). Groundwater conditions were evaluated in five primary aquifers in the Subbasin. These aquifers are commonly grouped into an upper and lower aquifer system. The Oxnard and Mugu aquifers compose the Upper Aquifer System (UAS), and the Hueneme, Fox Canyon, and Grimes Canyon aquifers compose the Lower Aquifer System (LAS). The primary sustainability goal for the Oxnard Subbasin, set forth in the GSP, is "to increase groundwater elevations inland of the Pacific coast in the aquifers that compose the Upper Aquifer System and the Lower Aquifer System to elevations that will prevent the long-term, or climatic cycle net (net), landward migration of the 2015 saline water impact front; prevent net seawater intrusion in the UAS; and prevent net seawater intrusion in the LAS." (FCGMA 2019a). This goal was established based on both historical and potential future undesirable results to the groundwater resources of the Subbasin from six sustainability indicators: chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depletions of interconnected surface water.

The GSP established minimum threshold groundwater elevations, defined for the Oxnard Subbasin, as groundwater levels that: (1) limit seawater intrusion, and (2) allow declines in groundwater elevations during periods of future drought to be offset by recoveries during future periods of above-average rainfall (FCGMA 2019a). The GSP also established measurable objective groundwater elevations, which were defined as "the groundwater levels throughout the Subbasin at which there is neither seawater flow into, nor freshwater flow out of the UAS or LAS." (FCGMA 2019a). Minimum threshold and measurable objective groundwater elevations were established at 34 representative monitoring points (or "key wells") in the Oxnard Subbasin (Table 1). Collectively, these wells are screened in each of the five primary aquifers and are located in four of the five management areas established for the Subbasin (FCGMA 2019a).

The GSP documented conditions throughout the Oxnard Subbasin through the fall of 2015. The first, second, and third annual reports evaluated progress toward sustainability based on a review of groundwater elevation data, groundwater extraction data, surface water supply used, or surface water supply available for use, total water used, and change in groundwater storage between the fall of 2015 and the end of water year 2021[3]. This annual report documents the conditions in the Oxnard Subbasin and the progress toward sustainability for water year 2022.

1.2 Plan Area

The Oxnard Subbasin of the Santa Clara River Valley Groundwater Basin (DWR Bulletin 118 Groundwater Basin 4-004.02) is a coastal alluvial groundwater subbasin, underlying the Oxnard Plain in Ventura County, California (Figure 1-1 Vicinity Map for the Oxnard Subbasin). The Oxnard Subbasin is in hydrologic communication, to varying degrees with, the LPVB and PVB to the east, the Mound and Santa Paula Groundwater Subbasins of the Santa Clara River Valley Basin to the north, and with the Pacific Ocean to the west and southwest (FCGMA 2019a). The contact between permeable alluvium and semi-permeable rocks of the Santa Monica Mountains defines the southeastern boundary of the Oxnard Subbasin, and the Oak Ridge and McGrath faults form the northern boundary of the Oxnard Subbasin (DWR 2018). A facies change between the predominantly coarser-grained sand

[3] A water year begins on October 1 and ends on September 30 of the following year. The convention for naming the water year is to name the water year based on the year in which it ends. For example, the 2022 water year begins on October 1, 2021, and ends on September 30, 2022.

and gravel deposits that compose the UAS to the west and the finer-grained clay and silt-rich deposits of the UAS to the east defines the boundary between the Oxnard Subbasin and PVB. The boundary between the Las Posas Valley Basin to the northeast and Oxnard Subbasin to the southwest is a jurisdictional boundary that follows parcel lines (DWR 2018).

The Oxnard Subbasin is divided into five management areas in anticipation of future management strategies and to reflect the current understanding of the hydrogeologic characteristics of the Subbasin (FCGMA 2019a). These management areas are the Forebay Management Area, the West Oxnard Plain Management Area, the Oxnard Pumping Depression Management Area, the Saline Intrusion Management Area, and the East Oxnard Plain Management Area (Figure 1-2). These management areas are separated by hydrogeologic and water quality characteristics (FCGMA 2019a).

1.2.1 Climate

The climate of the Oxnard Subbasin is typical of coastal Southern California, with average daily temperatures ranging generally from 50°F to 78°F in summer and from 40°F to 75°F in the winter (FCGMA 2019a). The majority of the precipitation in the Ventura County region falls between November and April. Precipitation is measured at several stations in the Oxnard Subbasin (Figure 1-2; Precipitation and Stream Gauges in the Oxnard Subbasin). Water year precipitation, measured at Station 168, in the northwestern portion of the Subbasin is highly variable, ranging from 2.8 inches in 2021 to 38.1 inches in 1998 (Figure 1-3; Oxnard Subbasin Historical Water Year Precipitation). On average, the Subbasin received approximately 13.9 inches of precipitation per water year between 1957 and 2022.

The GSP for the Oxnard Subbasin included precipitation through the 2015 water year (FCGMA 2019a). Since 2015, the Subbasin experienced two above normal[4] water years (2017 and 2019), two below normal water years (2020 and 2022), and three critical water years (2016, 2018, and 2021). In water year 2022, the Subbasin received 12.27 inches of rainfall, which is approximately 86% of the long-term historical average. Since 2015, average annual water year precipitation has been approximately 24% lower than the average annual water year precipitation measured between 1957 and 2015, indicating that the Subbasin has been experiencing drier than average conditions.

1.2.2 Surface Water Bodies and Gauging Stations

The Santa Clara River, Revolon Slough, and Calleguas Creek are the predominant surface water bodies in the Oxnard Subbasin (FCGMA 2019a). All three surface water bodies drain watersheds that extend beyond the boundaries of the Subbasin. Neither the Revolon Slough nor Calleguas Creek are in direct contact with the primary aquifers in the Subbasin. These surface water bodies are separated from the underlying groundwater aquifers by extensive clay layers. In contrast, flow in the Santa Clara River, which generally parallels the northern boundary of the Subbasin, infiltrates into sediments overlying the Forebay Management Area (Figure 1-2) and is a critical source of recharge to the primary groundwater aquifers in the Subbasin. In addition to recharge provided by flow in the river channel, UWCD, under permit, diverts surface water from the Santa Clara River at the Freeman Diversion and discharges the diverted Santa Clara River flows to infiltration basins overlying the Forebay Management Area (Figure

[4] Water years have been classified into five types based on their relationship to the mean water year precipitation. The five types are: critical, dry, below normal, above normal, and wet. Critical water years are < 50% of the mean annual precipitation. Dry water years are ≥ 50% and <75% of the mean annual precipitation. Below normal water years are ≥ 75% and <100% of the mean annual precipitation. Above normal water years are ≥ 100% and <150% of the mean annual precipitation. Wet water years are ≥ 150% of the mean annual precipitation.

1-2). West of the Forebay Management Area, the Santa Clara River channel overlies a confining clay layer and does not communicate directly with the confined aquifers of the UAS and the LAS.

Streamflow on the Santa Clara River has been measured at gauge 723, maintained by the Ventura County Public Works Agency - Watershed Protection District (VCWPD), between water years 2010 and 2022 (Table 1-1; Figure 1-4). Average daily flows for water years 2018 through 2020 were not available during preparation of the water year 2023 Annual Report. In addition, flow on the Revolon Slough has been measured at VCWPD gauge 776 (Table 1-1; Figure 1-4). Average daily flows measured at gauge 776 for water year 2021 were not available during preparation of the 2023 Annual Report.

Table 1-1. Cumulative Daily Average Flows at VCWPD Gauges 723 and 776 in the Oxnard Subbasin

Water Year	Average Flow (cfs) at Gauge 723	Average Flow (cfs) at Gauge 776
2010	102.5	12.6
2011	167.5	19.3
2012	13.0	10.1
2013	0.6	11.2
2014	40.3	6.1
2015	5.0	7.0
2016	97.5	5.5
2017	1,049.5	5.7
2018	-Data Not Available-	12.2
2019	-Data Not Available-	9.0
2020	-Data Not Available-	11.9
2021	0.0*	-Data Not Available-
2022	9.03*	9.21*

Notes: cfs = cubic feet per second
*VCWPD notes that these data are preliminary and subject to revision

1.3 Annual Report Organization

This is the fourth Annual Report prepared since the GSP for the Oxnard Subbasin was submitted to DWR. This report is organized according to the GSP Emergency Regulations. Chapter 1 provides the background information regarding the GSP, the Oxnard Subbasin, and the Fox Canyon Groundwater Management Agency. Chapter 2 provides information on the groundwater conditions in the Subbasin since 2015, including groundwater elevations, groundwater extractions, surface water supply, total water availability, and change in groundwater storage. Chapter 3 provides an update on the GSP implementation process.

2 Groundwater Conditions

This chapter presents the change in groundwater conditions in the Subbasin from water year 2021. Comparison of water year 2022 conditions to water year 2021 conditions characterizes the impact that water year type, groundwater production, surface and recycled water availability, and surface water spreading in water year 2022 have had on groundwater conditions in the Subbasin. Additionally, data from water years 2016 through 2020 are provided as context. These data were discussed in detail in the first three annual reports (FCGMA 2020a, FCGMA 2021, FCGMA 2022).

2.1 Groundwater Elevations

2.1.1 Groundwater Elevation Contour Maps

Groundwater elevation contour maps for each aquifer in the Oxnard Subbasin are presented in Figures 2-1 through 2-10: the Oxnard aquifer in Figures 2-1 and 2-2, the Mugu aquifer in Figures 2-3 and 2-4, the Hueneme aquifer in Figures 2-5 and 2-6, the Fox Canyon aquifer in Figures 2-7 and 2-8, and the Grimes Canyon aquifer in Figures 2-9 and 2-10. These maps show the seasonal low (fall 2021) and high (spring 2022) groundwater elevations. Spring groundwater elevations were defined as any groundwater elevation measured within a four-week window between March 2 to March 29 of 2022. Fall groundwater elevations were defined as any groundwater elevation measured between October 2 and October 31 of each year.

The groundwater elevation contour maps are based on the groundwater elevations measured at wells screened solely within an individual aquifer. The intent of using groundwater elevations from wells screened within a single aquifer is to accurately represent groundwater flow directions within an aquifer, as well as vertical gradients between aquifers. It is important to note, however, that throughout the Oxnard Subbasin, production wells are typically screened across multiple aquifers. Therefore, using wells only screened within an individual aquifer limits the spatial coverage for each contour map. This limitation is particularly apparent in an area of high groundwater production in the Oxnard Subbasin and adjoining PVB that extends south from Highway 101 (FCGMA 2019a). This area was identified as being impacted by groundwater production based on groundwater elevations measured in wells screened in multiple aquifers and was identified in the GSP as the Oxnard Pumping Depression Management Area (FCGMA 2019a). By using wells screened only within an individual aquifer, the lateral extent of the pumping depression is not well characterized.

In 2019, DWR installed a nested monitoring well cluster through its Technical Support Services (TSS) program. The nested well cluster, which has two separate completions, is located adjacent to the Revolon Slough within the Pumping Depression Management Area. The shallow well cluster, which was completed on November 22, 2019, contains three monitoring wells individually screened in the Oxnard, Mugu, and Hueneme aquifers. The deep well cluster, which was completed on March 19, 2020, contains three monitoring wells individually screened within the Fox Canyon-Upper, Fox Canyon-Basal, and Grimes Canyon aquifers. Groundwater elevations measured at the shallow and deep well clusters were used to help constrain groundwater conditions in the Oxnard Pumping Depression Management Area in the 2021 and 2022 water year.

2.1.1.1 Oxnard Aquifer

Seasonal low groundwater elevations in the Forebay Management Area of the Oxnard aquifer ranged from approximately -26 feet (ft.) mean sea level (msl) to approximately 36 ft. msl (measured at wells 02N22W23B08S and 02N21W12A02S, respectively; Figure 2-1). These groundwater elevations were approximately 6 to 28 feet lower than fall 2020. Downgradient of the Forebay Management Area, and within the Oxnard Pumping Depression Management Area, fall 2021 groundwater elevations ranged from approximately -27 ft. msl to approximately -5 ft. msl (measured at wells 01N21W19C01S and 01N21W16P07S, respectively; Figure 2-1). In this part of the Subbasin, groundwater elevations were approximately 3 to 6 feet lower than fall 2020 (measured at wells 01N22W17D02S and 01N21W19C01S, respectively).

Near the northern coastal boundary of the Subbasin, fall 2021 groundwater elevations ranged from a low of approximately -25 ft. msl to a high of approximately -2 ft msl (measured at wells 02N23W36C04S and 01N23W01C05S, respectively; Figure 2-1). Groundwater elevation changes between fall 2020 and 2021 in this part of the Subbasin ranged from declines of approximately 8 feet to increases of approximately 1 foot (measured at wells 02N22W30K01S and 01N2101C05S, respectively). South of these wells, and within the Saline Intrusion Management Area, groundwater elevations ranged from approximately -20 ft. msl to approximately -11 ft. msl (measured at wells 01N22W26J04S and 01S2108L04S; Figure 2-1). Groundwater elevation changes between fall 2021 and 2020 in the Saline Intrusion Management Area ranged from declines of approximately 5 feet to recoveries of approximately 3 feet (measured at wells 01N22W35E05S and 01N22W26J04S, respectively).

Fall 2021 groundwater elevations across the Subbasin (Figure 2-1) were similar to fall 2015. In the Forebay Management Area, groundwater elevation changes between fall 2015 and 2021 ranged from net declines of approximately 1 foot to net recoveries of approximately 3 feet (measured at wells 02N21W12A02S and 02N22W13N06S, respectively). Along the coastline, fall 2020 groundwater elevations ranged from 2 feet lower than fall 2015 to 6 feet higher than fall 2015 (measured at wells 01N23W01C05S and 01N22W36K09S, respectively). In the Oxnard Pumping Depression Management Area, fall 2021 groundwater elevations ranged from approximately 4 feet lower than fall 2015 to 5 feet higher than fall 2015 (measured at wells 01N21W19C01S and 01N21W07H01S, respectively).

Spring 2022 groundwater elevations in the Forebay Management Area of the Oxnard aquifer ranged from approximately -22 ft. msl to approximately 51 ft. msl (measured at wells 02N22W15R02S and 02N21W12A02S, respectively; Figure 2-2). Groundwater elevation changes in this part of the Subbasin between spring 2021 and 2022 ranged from recoveries of up to approximately 7 feet at well 02N21W12J02S to declines of up to approximately 15 feet at well 02N22W23B08S. Downgradient of the Forebay Management Area, and within the Oxnard Pumping Depression Management Area, groundwater elevations ranged from approximately -17 ft msl to approximately -11 ft msl (measured at wells 01N21W19L12S and 01N21W17D02S, respectively) and were approximately 1 to 4 feet lower than spring 2021.

Along the coast, and within the Saline Intrusion Management Area, spring 2022 groundwater elevations ranged from approximately -13 ft. msl to approximately -3 ft. msl (measured at wells 01N22W31A08S and 01N22W27R05S, respectively; Figure 2-2). Spring groundwater elevations changes from 2021 in this part of the Subbasin ranged from declines of up to approximately 4 feet (measured at well 01N22W35E05S) to recoveries of up to approximately 4 feet (measured at well 01N22W27R0S). Since 2015, spring groundwater elevations in this region have ranged from declines of up to approximately 3 feet (measured at well 02N21W20J08S) to recoveries of up to approximately 0.5 feet (measured at well 01S21W01H04S).

2.1.1.2 Mugu Aquifer

Seasonal low groundwater elevations decreased across the majority of the Mugu aquifer between fall 2020 and fall 2021. Along the coast, near Port Hueneme, fall 2021 groundwater elevations were approximately 2 to 3 feet lower than 2020 conditions and ranged from approximately -13 ft. msl to -10. ft msl (measured at wells 01N22W20J07S and 01N22W29D04S, respectively; Figure 2-3). In the southwestern part of the Subbasin, near Point Mugu, groundwater elevations declined between 4 and 15 feet (measured at wells 01N22W35E04S and 01N21W31A07S, respectively) and ranged from a low of approximately -83 ft msl (measured at well 01N21W31A07S) to a high of approximately -34 ft msl (measured at well 01N22W35E04S). Fall 2021 groundwater elevations were approximately 1 to 6 feet higher than those measured in fall 2015.

Groundwater elevations in the Mugu aquifer declined between spring 2021 and spring 2022. During this period, groundwater elevations near Port Hueneme declined by approximately 2 to 4 feet and ranged from approximately -11 ft msl to -7 ft. msl (measured at wells 01N22W20J07S and 01N22W29D04S, respectively; Figure 2-2). Near Point Mugu, groundwater elevations ranged from a low of approximately -44 ft msl (measured at well 01N21W32Q07S) to a high of approximately -10 ft msl (measured at well 01N22W35E04S). These groundwater levels are approximately 3 to 6 feet lower than those measured in spring 2021.

In the Forebay Management Area, spring 2022 groundwater elevations ranged from a high of approximately 23 ft msl (measured at well 02N22W07L06S) to a low of approximately -24 ft msl (measured at well 02N22W23B07S). In the most northern portion of the Forebay Management Area, groundwater levels measured at well 02N22W07L06S were approximately 10 feet higher than spring 2021 and 15 feet higher than spring 2015. Downgradient of this well, groundwater elevations declined by 10 to 15 feet between spring 2021 and 2022 and were 2 to 4 feet lower than spring 2015.

2.1.1.3 Hueneme Aquifer

Groundwater elevations measured in fall 2021 in the Hueneme Aquifer were lower than fall 2020. In the Forebay Management Area, groundwater levels ranged from approximately -80 ft msl to 6 ft msl (measured at wells 02N22W23B04S and 02N22W12N03S, respectively; Figure 2-5). The groundwater elevations measured at these wells were 11 to 15 feet lower than the corresponding fall 2020 measurements. Along the coastline, groundwater elevations ranged from a low of approximately -29 ft msl at well 01N22W01C03S to a high -20 ft msl at 01N22W20M03S (near Port Hueneme), which corresponds to groundwater elevation declines that range from approximately 5 to 9 feet between fall 2020 and fall 2021.

Fall 2021 groundwater elevations were consistently higher than those measured in fall 2015. In the Forebay Management Area, fall 2021 groundwater levels were between 3 and 50 feet higher than fall 2015 (measured at wells 02N22W12N03S and 02N22W26B03S, respectively). Downgradient of the Forebay Management Area, within the Oxnard Pumping Depression Management Area and along the coastline, the fall 2021 groundwater elevations were approximately 0.5 to 4 feet higher than fall 2015.

In the Forebay Management Area, spring 2022 groundwater elevations were lower than spring 2021 at all wells except well 02N22W12N03S (Figure 2-6). At this well, groundwater was measured at an elevation of approximately 21 ft msl, which is 2 feet higher than spring 2021. Downgradient of this well, spring 2022 groundwater elevations ranged from a low of approximately -75 ft msl at well 02N22W23B04S to a high of approximately -25 ft msl at well 02N22W22Q05S. These groundwater elevations are approximately 11 to 16 feet lower than spring 2021.

In the Oxnard Pumping Depression Management Area, spring 2022 groundwater elevations ranged from a low of approximately -90 ft msl at 01N21W16P05S to a high of approximately -77 ft msl at well 02N21W31P06S. These spring 2022 groundwater elevations were approximately 16 to 25 feet lower than spring 2021. Along the coastline, and within the Saline Intrusion Management Area, groundwater elevations ranged from a low of approximately -55 ft msl at well 02N21W16P05S to a high of approximately -15 ft msl at well 02N22W29D03S (Figure 2-6). At these wells, the spring 2022 groundwater elevation was approximately 4 feet below spring 2021.

Spring 2022 groundwater elevations in the Forebay Management Area and the northern part of the Oxnard Pumping Depression Management Area were consistently higher than those measured in spring 2015. In the Forebay Management Area, spring 2022 groundwater elevations ranged from 1 to 10 feet higher than spring 2015. In the Oxnard Pumping Depression Management Area, spring 2022 groundwater elevations were approximately 2 to 12 feet higher than spring 2015.

Along the coastline, spring 2022 groundwater elevations in the Hueneme aquifer were consistently lower than spring 2015. At wells 01N23W01C03S and 01N23W01C04S, the spring 2022 groundwater elevation was approximately 1 foot lower than spring 2015. Farther south, near Port Hueneme, spring 2022 groundwater elevations were approximately 0.25 ft to 4 feet lower than spring 2015.

2.1.1.4 Fox Canyon Aquifer

Seasonal low groundwater elevations in the Fox Canyon aquifer decreased across the Subbasin between fall 2020 and 2021. In the Forebay Management Area, groundwater elevations ranged from a low of approximately -80 ft msl at well 02N22W23B03S to a high of approximately -26 ft msl at well 02N21W07L03S (Figure 2-7). These fall 2021 groundwater elevations are approximately 11 to 17 feet lower than fall 2020. In the Oxnard Pumping Depression Management Area, fall 2021 groundwater elevations were approximately 15 to 36 feet lower than fall 2020 and ranged from a low of approximately -131 ft msl at 01N21W06J05S to a high of approximately -90 ft msl at well 01N21W19L10S (Figure 2-7). Along the coastline, and within the West Oxnard Plain Management Area, the groundwater elevation measured at 01N23W01C02S was approximately -32 ft msl, which is approximately 15 feet lower than fall 2020. Farther south, within the Saline Intrusion Management Area, groundwater elevations ranged from a low of approximately -95 ft msl at well 01N21W3204S to a high of approximately -24 ft msl at well 01N22W29D01S (Figure 2-7). Groundwater elevations in this part of the Subbasin were approximately 7 to 14 feet lower than fall 2020.

Fall 2021 groundwater elevations in the Fox Canyon aquifer were consistently higher than fall 2015 conditions. For example, in the Forebay Management Area, groundwater elevations were approximately 3 to 5 feet higher than fall 2015 and in the Oxnard Pumping Depression Management Area, fall 2021 groundwater elevations were approximately 5 to 49 feet higher than fall 2015. Along the coast, near and north of Port Hueneme, the fall 2021 groundwater elevations were approximately 2 feet higher than fall 2020. In the Saline Intrusion Management Area, near Point Mugu, the fall 2021 groundwater elevations were 6 to 15 feet higher than fall 2015.

The largest groundwater elevation recoveries between fall 2015 and 2021 in the Fox Canyon aquifer occurred in the Oxnard Pumping Depression Management Area. Over this period, groundwater elevations recovered by as little as 5 feet (measured at well 02N21W32E01S) and as much as 49 feet (measured at well 01N21W09C04S).

Spring 2022 groundwater elevations in the Forebay Management Area of the Fox Canyon aquifer ranged from approximately -72 ft. msl (measured at well 02N22W23B08S) to approximately -9 ft. msl (measured at well 02N22W07L04S; Figure 2-8). The groundwater elevation low within the Forebay Management Area, measured at well

02N22W23B08S, was approximately 14 feet lower than the spring 2021 measurement and 6 feet higher than spring 2015. In the northern region of the Forebay Management Area, and adjacent to the West Las Posas Management Area of the Las Posas Valley Basin, groundwater elevations declined by approximately 5 feet compared to spring 2021 conditions (Figure 2-8). In this same area, spring 2022 groundwater elevations were approximately 10 feet lower than spring 2015 conditions.

Near Port Hueneme, spring 2022 groundwater elevations ranged from approximately -30 ft msl at well 01N22W20J04S to approximately -20 ft msl at well 01N22W29D01S. The spring 2022 groundwater elevations measured at these wells were approximately 5 to 6 feet lower than spring 2021. Farther south, near Point Mugu, groundwater elevations ranged from approximately -73 ft msl at well 02N21W32Q04S to approximately -40 ft msl at well 01N22W35E03S (Figure 2-7). In this part of the Subbasin, the spring 2022 groundwater elevations were approximately 1 to 9 feet lower than spring 2021. Within the Saline Intrusion Management Area, spring 2022 groundwater elevations were approximately 1 to 8 feet lower than spring 2015.

Spring 2022 groundwater elevations in the Oxnard Pumping Depression Management Area ranged from approximately -102 ft. msl to -55 ft. msl (measured at wells 01N21W06J05S and 01N21W09C04S, respectively; Figure 2-8). Groundwater elevation changes within the Oxnard Pumping Depression Management Area varied geographically. Between spring 2021 and spring 2022, groundwater elevations at well 01N21W16P10S declined by approximately 30 feet (Figure 2-8). Farther north, near the boundary with PVB, groundwater elevations increased by 5 feet. The largest groundwater elevation recovery between spring 2021 and spring 2022 occurred at well 01N21W09C04S, which is located adjacent to PVB (Figure 2-8). Groundwater elevations changes since 2015 in the Oxnard Pumping Depression varied and ranged from declines of approximately 25 feet (measured at 02N21W32E01S) to recoveries of approximately 5 feet (measured at 01N21W09C04S).

2.1.1.5 Grimes Canyon Aquifer

There are seven wells screened solely in the Grimes Canyon aquifer in the Oxnard Subbasin. Six of these wells are located in the southwestern part of the Subbasin, within the Saline Intrusion Management Area (Figure 2-9 and 2-10). In March 2020, DWR installed a nested monitoring well cluster through its TSS Program. The construction of this well cluster provides additional characterization of groundwater elevations in the Grimes Canyon aquifer north of the Saline Intrusion Management Area, within the Oxnard Pumping Depression Management Area (Figure 2-9 and 2-10).

Fall 2021 groundwater elevations in the Grimes Canyon aquifer ranged from approximately -121 ft. msl to approximately -30 ft. msl (measured at wells 01N21W16P08S and 01N22W28G01S, respectively; Figure 2-9). The groundwater elevation measured at well 01N21W16P08S indicates that groundwater elevations in the Grimes Canyon aquifer generally decline from Port Hueneme south and southeast towards Point Mugu and into the Oxnard Pumping Depression Management Area. The fall 2021 groundwater elevations were approximately 14 to 34 feet lower than fall 2020.

Spring 2022 groundwater elevations in the Grimes Canyon aquifer ranged from approximately -90 ft. msl to -32 ft. msl (measured at wells 01N21W16P08S and 01N22W28G01S, respectively; Figure 2-10). Groundwater elevations consistently declined in the Grimes Canyon aquifer between spring 2021 and spring 2022. During this period, groundwater elevations declined between 3 and 14 feet (measured at 01N22W28G01S and 01N21W16P08S, respectively). Spring 2022 groundwater elevations were 1 to 10 feet lower than spring 2015 conditions.

2.1.2 Groundwater Elevation Hydrographs

Groundwater elevation hydrographs for each of the key wells identified in the GSP are presented in Figures 2-11 through 2-15. These key wells are the designated representative monitoring sites for the Subbasin (FCGMA 2019a). The fall 2021 and spring 2022 water levels measured at each of these representative monitoring sites are presented in Table 2-1, which also provides a comparison to: (i) water year 2021 and 2015 conditions, (ii) the established minimum threshold groundwater elevations, (iii) the established measurable objective groundwater elevations, and (iv) the interim milestones for dry climate conditions. The dry climate interim milestone is used for comparison in this annual report because the precipitation measured in the Subbasin between water years 2016 and 2022 is below average. However, it should also be noted that the first interim milestone is set for 2025, and the groundwater elevations in the representative wells have three years to reach this first interim milestone.

Oxnard Aquifer

The fall 2021 the groundwater elevations in the key wells screened in the Oxnard aquifer were approximately 10 to 22 feet below the minimum thresholds and 4 to 7 feet below the interim milestones described in the GSP for dry climate conditions (Table 2-1; Figure 2-11; FCGMA, 2019a). In the spring of 2022, groundwater elevations in the representative wells screened in the Oxnard aquifer were approximately 6 to 17 feet below the minimum threshold for each well (Table 2-1; Figure 2-11). During this period, the groundwater elevation measured at well 01N22W26J04S was approximately equal to the 2025 interim milestones described in the GSP for dry climate conditions; groundwater elevations at the other Oxnard aquifer key wells were lower than the interim milestones (Table 2-1; FCGMA 2019a).

As described in Section 2.1.1.1 of this report, groundwater elevations in the Oxnard Aquifer generally declined between water year 2021 and 2022 (Table 2-1). Despite the single-year decline, fall 2021 groundwater levels were higher than fall 2015 conditions at all wells except well 01N23C01C05S (Table 2-1). Change in spring groundwater elevations between 2022 and 2015 was more variable and ranged from declines of approximately 1 foot at well 01N23W01C05S to increases of approximately 0.5 feet at well 01N21W32Q06S.

Mugu Aquifer

In fall 2021, groundwater elevations were approximately 20 to 90 feet below the minimum threshold groundwater elevations in all representative monitoring wells screened in the Mugu aquifer (Table 2-1; Figure 2-12). In spring 2022 groundwater elevations ranged from approximately 25 to 71 feet below the minimum threshold groundwater elevations (Table 2-1; Figure 2-12). The spring 2022 groundwater elevation measured at 02N21W07L06S was approximately 14 feet above the 2025 interim milestones (Table 2-1); all other fall and spring groundwater elevation measurements were below the interim milestones (Table 2-1).

Similar to groundwater elevation trends in the Oxnard aquifer, the fall 2021 groundwater elevations measured at key wells in the Mugu aquifer were generally higher fall 2015. The one exception to this is at well 02N22W23B07S, where the fall 2021 groundwater elevation was approximately 0.25 feet lower than fall 2015. Spring groundwater elevations measured at the key wells in the Mugu aquifer decreased between 2015 and 2022 at all key wells except 02N21W07L06S (Table 2-1), which is located in the northern part of the Forebay Management Area.

Hueneme Aquifer

In the Hueneme aquifer, fall 2021 groundwater elevations measured at the representative monitoring sites were approximately 27 to 80 feet below the established minimum threshold groundwater elevations (Table 2-1; Figure 2-13). Groundwater elevations were 7 to 20 feet below the established minimum thresholds in spring 2022. Groundwater elevations remained below the 2025 interim milestones in all representative monitoring sites screened in the Hueneme aquifer (Table 2-1; Figure 2-13).

Fox Canyon Aquifer

In the fall of 2021, groundwater elevations in the representative monitoring points screened in the Fox Canyon aquifer (FCA) were approximately 35 to 67 feet lower than the minimum threshold groundwater elevations (Table 2-1; Figure 2-14). In spring 2022, groundwater elevations in the representative monitoring points screened in the FCA were approximately 26 to 60 feet lower than the minimum threshold groundwater elevations (Table 2-1; Figure 2-14). Fall and spring groundwater elevations were lower than the 2025 Interim Milestone at all wells except 01N21W32Q04S. At this well, the spring 2022 groundwater elevation was 0.72 feet higher than the interim milestone.

Like the Oxnard, Mugu, and Hueneme aquifers, groundwater elevations measured at the key wells in the Fox Canyon aquifer declined between water years 2021 and 2022 (Table 2-1; Figure 2-14). Despite the single year decline, fall 2021 groundwater levels at the representative monitoring wells were approximately 2 to 11 feet higher than fall 2015. The change in seasonal high groundwater levels between spring 2015 and 2022 was more variable (Table 2-1).

Grimes Canyon Aquifer

Groundwater elevations measured at wells 01N21W32Q02 and 01N21W32Q03 in the Grimes Canyon aquifer were approximately 69 to 81 feet lower than the minimum threshold groundwater elevation in the fall of 2021 (Table 2-1). In the spring of 2022, groundwater elevations in these wells were approximately 49 to 59 feet lower than the minimum threshold groundwater elevations (Table 2-1; Figure 2-15). The spring 2022 groundwater elevation was approximately 9 feet lower than the interim milestone at well 01N21W32Q02S and 7 feet higher than the interim milestone at well 01N21W32Q03S (Table 2-1).

Table 2-1. Water Year 2022 Groundwater Elevations, Minimum Thresholds, Measurable Objectives, and Interim Milestones for Representative Monitoring Points in the Oxnard Subbasin

Well Number	Aquifer	Fall Groundwater Conditions			Spring Groundwater Conditions			Minimum Threshold (ft MSL)	Measurable Objective (ft MSL)	2025 Interim Milestone Dry Climate (ft MSL)
		2021 Groundwater Elevation (ft MSL)	Change from 2020 to 2021 (feet)[a]	Change from 2015 to 2021 (feet)[b]	2022 Groundwater Elevation (ft MSL)	Change from 2021 to 2022 (feet)[a]	Change from 2015 to 2022 (feet)[b]			
01N21W32Q06S	Oxnard	-17.87	-3.00	2.37	-12.26	-1.08	0.47	2	17	-12
01N22W20J08S	Oxnard	-12.59	-2.51	1.60	-10.28	-4.02	-2.68	7	17	-6
01N22W26J04S	Oxnard	-19.97	2.71	3.34	-14.10	-2.45	0.24	2	17	-15
01N22W27C03S	Oxnard	-11.58	-0.97	3.25	-10.18	-3.84	-1.15	7	17	-8
01N23W01C05S	Oxnard	-2.64	-3.51	-1.72	0.76	-0.07	-0.42	7	17	2
02N22W36E06S	Oxnard	NM	-	-	NM	-	-	12	37	-9
01N21W32Q05S	Mugu	-88.73	-18.09	9.01	-67.10	-5.70	-6.37	2	17	-63
01N21W32Q07S	Mugu	-59.23	-11.17	5.79	-45.08	-4.29	-3.87	2	17	-41
01N22W20J07S	Mugu	-13.37	-2.96	1.59	-11.12	-4.09	-2.03	7	17	-8
01N22W26J03S	Mugu	NM	-	-	NM	-	-	2	17	1
01N22W27C02S	Mugu	-18.21	-1.33	4.36	-15.43	-3.50	-1.11	7	17	-13
02N21W07L06S	Mugu	NM	-	-	23.98	10.63	15.78	27	62	10
02N22W23B07S	Mugu	-31.06	-25.36	-0.25	-23.90	-15.62	-3.18	17	47	-14
02N22W36E05S	Mugu	NM	-	-	NM	-	-	12	37	-9
01N22W20J05S	Hueneme	-25.73	-6.32	1.95	-22.36	-6.27	-2.45	2	17	-18
01N23W01C03S	Hueneme	-29.15	-8.23	0.80	-24.84	-4.79	-1.60	7	22	-19
01N23W01C04S	Hueneme	-26.34	-7.83	0.18	-21.70	-5.77	-1.67	7	22	-16
02N22W23B04S	Hueneme	-82.22	-13.74	4.55	-74.41	-16.39	1.18	-3	17	-63
02N22W23B05S	Hueneme	-62.94	-16.06	12.90	-59.13	-13.66	6.40	-3	17	-56
02N22W23B06S	Hueneme	-29.34	-20.94	7.09	-25.47	-15.88	-2.27	17	47	-18
02N22W36E03S	Hueneme	NM	-	-	NM	-	-	12	37	3
02N22W36E04S	Hueneme	NM	-	-	NM	-	-	12	37	-11
01N21W32Q04S	Fox Canyon	-95.54	-20.66	9.84	-73.28	-5.68	-6.98	-23	2	-74

Table 2-1. Water Year 2022 Groundwater Elevations, Minimum Thresholds, Measurable Objectives, and Interim Milestones for Representative Monitoring Points in the Oxnard Subbasin

Well Number	Aquifer	Fall Groundwater Conditions			Spring Groundwater Conditions			Minimum Threshold (ft MSL)	Measurable Objective (ft MSL)	2025 Interim Milestone Dry Climate (ft MSL)
		2021 Groundwater Elevation (ft MSL)	Change from 2020 to 2021 (feet)[a]	Change from 2015 to 2021 (feet)[b]	2022 Groundwater Elevation (ft MSL)	Change from 2021 to 2022 (feet)[a]	Change from 2015 to 2022 (feet)[b]			
01N22W20J04S	Fox Canyon	-35.59	**-8.15**	1.53	-30.60	**-6.54**	**-2.48**	2	17	-25
01N22W26K03S	Fox Canyon	-85.14	-	-	-72.2	**-18.72**	**-6.57**	-18	2	-54
01N23W01C02S	Fox Canyon	-32.73	**-14.94**	1.61	-29.73	**-4.93**	**-0.42**	7	22	-22
02N21W07L04S	Fox Canyon	-29.18	**-14.14**	2.84	-9.16	**-5.05**	**-13.04**	17	42	-3
02N22W23B03S	Fox Canyon	-79.38	**-16.72**	4.17	-71.68	**-14.30**	5.32	-3	17	-62
01N21W32Q02S	Grimes Canyon	-92.63	**-18.24**	10.57	-82.30	**-16.00**	**-17.60**	-23	2	-73
01N21W32Q03S	Grimes Canyon	-104.21	**-19.11**	9.96	-72.30	**-11.57**	3.46	-23	2	-80
01N21W07J02S	Multiple	-111.87	-	24.39	-87.64	**-15.76**	4.49	-38	2	-92
01N21W21H02S	Multiple	NM	-	-	NM	-	-	-68	-8	-111
02N21W07L03S	Multiple	-26.48	**-11.06**	**-1.89**	-11.22	**-2.82**	**-13.06**	17	37	-3
02N21W07L05S	Multiple	-1.31	**-23.74**	0.09	24.58	2.40	3.95	27	57	18

Notes: NM = Not Measured

[a]Data in this column shows the difference between water year 2022 and water year 2021 groundwater elevations measured at each representative monitoring site. Positive (+) values indicate that seasonal high or low groundwater elevations have increased from water year 2021 conditions. Negative (-) values indicate that seasonal high or low groundwater elevations have decreased from water year 2021 conditions.

[b]Data in this column shows the difference between water year 2022 and water year 2015 groundwater elevations measured at each representative monitoring site. Positive (+) values indicate that seasonal high or low groundwater elevations have increased from water year 2015 conditions. Negative (-) values indicate that seasonal high or low groundwater elevations have decreased from water year 2015 conditions.

2.2 Groundwater Extraction

On October 23, 2019, the FCGMA Board of Directors adopted an Ordinance to Establish an Allocation System for the Oxnard and Pleasant Valley Groundwater Basins. The new allocation system went into effect on October 1, 2020 and is designed to "facilitate adoption and implementation of the groundwater sustainability plan and to ensure that the Basins are operated within their sustainable yields" (FCGMA, 2019c). To facilitate implementation and assessment of the new allocation system, FCGMA transitioned the groundwater extraction reporting period from a calendar year to a water year basis. The new reporting period went into effect on October 1, 2020 and requires local groundwater producers to report production from October 1 through March 31, and April 1 through September 30.

Historically, groundwater extractions in the FCGMA have been reported in two periods over the course of a single calendar year. Because groundwater extractions are not reported monthly, groundwater production prior to 2020 cannot be reported on a water year basis. Therefore, the groundwater extractions for 2016 through 2019 reported in Table 2-2, and shown on Figures 2-23 and 2-24, follow the historical precedent and represent calendar year extractions. Due to the transition from calendar year to water year reporting in 2020, groundwater extractions reported for 2020 represent extractions for the nine-month period from January 1, 2020 through September 30, 2020 (Table 2-2).

Water year 2022 groundwater extractions reported in Table 2-2 represent a combination of reported and estimated extractions. FCGMA has experienced some delay in reporting for the second reporting period of the 2022 water year (April 1, 2022 through September 30, 2022). To estimate groundwater extraction for this period, FCGMA multiplied the groundwater extractions reported during the first half of the water year by the average ratio of validated AMI data for agricultural production wells and assumed that production rates remained constant for domestic and municipal and industrial users. Groundwater extraction values for water year 2022 are preliminary and will be updated as additional data becomes available.

Table 2-2. Groundwater Extractions in the Oxnard Subbasin by Aquifer System and Water Use Sector

Year	Upper Aquifer System (Acre-Feet)				Lower Aquifer System (Acre-Feet)				Wells in multiple or unassigned aquifer systems (Acre-Feet)				TOTAL (Acre-Feet)
	AG	*Dom*	*M&I*	*Sub-Total*	*AG*	*Dom*	*M&I*	*Sub-Total*	*AG*	*Dom*	*M&I*	*Sub-Total*	
CY 2016	16,045	166	12,654	28,865	31,801	24	10,655	42,480	6,863	5	125	6,993	78,342[a]
CY 2017	16,167	91	14,826	31,084	29,204	27	8,612	37,843	7,722	4	165	7,891	76,818
CY 2018	14,746	70	17,040	31,857	26,191	24	6,596	32,811	7,489	2	184	7,675	72,343
CY 2019	13,238	57	17,540	30,835	22,447	26	6,564	28,128	7,146	36	580	7,761	66,724
2020[b]	7,348	40	14,724	22,112	13,040	8	4,629	17,677	5,327	17	675	6,019	45,808
WY 2021	13,874	41	20,163	34,436	21,513	10	6,621	27,703	7,494	17	514	8,109	70,248
WY 2022[c]	10,298	42	17,825	28,166	25,185	6	5,906	31,097	9,971	12	2,686	12,669	71,932

Notes: CY = Calendar Year; WY = Water Year; AG = Agriculture; Dom = domestic; M&I = Municipal and Industrial

[a] Total pumping in 2016 includes 4 acre-feet of groundwater production from the semi-perched aquifer that were used by the M&I sector.

[b] Groundwater extraction reporting is from January 1, 2020 through September 30, 2020, due to transition to water year reporting.

[c] Groundwater extractions in the second half of the water year (April 1 through September 30, 2022) are estimated values; extraction reporting was not available at the time of preparation of the 2022 Annual Report.

The available data characterizing groundwater extractions between 2016 and 2022 indicate that groundwater extractions from the UAS increased in the Oxnard Subbasin while extractions from the LAS decreased (Table 2-2). This change in UAS and LAS extractions largely reflects a transition of M&I production to the UAS (Table 2-2). Based on the available data, the total groundwater production in the Subbasin has decreased since 2016 (Table 2-2). However, as previously noted, the water year 2022 groundwater extraction values are preliminary and will be updated upon receipt of additional extraction data.

2.3 Surface Water Supply

The primary source of surface water in the Oxnard Subbasin is the Santa Clara River. UWCD operates the Freeman Diversion, which allows UWCD to divert surface water from the Santa Clara River for delivery to agricultural users in the Oxnard Subbasin and PVB. Diverted surface water is also used to recharge groundwater aquifers in the Oxnard Subbasin via the UWCD spreading basins located in the Forebay Management Area. In addition to diversions from the Santa Clara River, a portion of the surface water diverted from Conejo Creek by CWD is supplied to Pleasant Valley County Water District (PVCWD) for

agricultural irrigation in the Oxnard Subbasin[5]. Surface water deliveries to the Oxnard Subbasin for water years 2016 through 2022 are reported in Table 2-3.

Table 2-3. Summary of Surface Water Deliveries to the Oxnard Subbasin

Water Year	PVCWD	United Water Conservation District			TOTAL (acre-Feet)
		Diversions of Santa Clara River Water			
	Conejo Creek Flows Delivered by CWD to PVCWD for Agriculture (acre-feet)	*PTP (Oxnard Subbasin Only) (acre-feet)*	*Used in Oxnard Subbasin (acre-feet)*	*Recharge to UWCD Spreading Basins (acre-feet)*	
		Total PTP Surface Water	*Total PVP Water for Agriculture*		
2016	1,038	0	0	2,209	3,247
2017	1,774	0	0	10,297	12,071
2018	1,854	0	0	3,126	4,980
2019	2,795	1,059	309	36,768	40,931
2020	2,310	2,494	944	28,327	34,097
2021	2,035	3,823	1,049	12,820	19,727
2022	2,392	1,905	425	11,448	16,170

Notes: PVCWD = Pleasant Valley County Water District; CWD = Camrosa Water District; PTP = Pumping Trough Pipeline; PVP = Pleasant Valley Pipeline

[5] 56% of the total CWD deliveries to PVCWD, and 56% of the total PVP surface water deliveries from UWCD, were assigned to the Oxnard Subbasin based on an analysis of the size of PVCWD's service area (FCGMA 2019a).

2.4 Total Water Available

Total water available was tabulated from the groundwater extractions reported in Table 2-2, the surface water supply reported in Table 2-3, and imported water, and recycled water used in the Subbasin. The total water available is reported in Table 2-4 by water year. In order to convert the reported groundwater production from calendar year to water year prior to water year 2020, 25% of the groundwater production from a given calendar year was assigned to the following water year, and the 75% of the calendar year production was assigned to the current water year. This division, while approximate, is based on the monthly split between water year and calendar year, with January through September (75% of the calendar year) belonging to the current water year, and October through December (25% of the calendar year) belonging to the following water year. Because the reported 2020 groundwater extractions covered the period from January 1 through September 30, total water year extractions for 2020 were estimated by adding 25% of the 2019 calendar year extractions to the reported 2020 water year extractions.

Similar to Table 2-2, the groundwater extractions for water years 2022 presented in Table 2-3 represent reported and estimated extractions for the period from October 1, 2021 through September 30, 2022.

Table 2-4. Total Water Available in the Oxnard Subbasin

	Groundwater[a] (acre-feet)			Surface Water (acre-feet)				Imported Water (acre-feet)	Recycled Water[b] (acre-feet)	TOTAL
Water Year	*Ag*	*Dom*	*M&I*	*Ag*	*Dom*	*M&I*	*Recharge*	*M&I*	*Ag*	(acre-feet)
2016	55,025	195	23,741	1,038	0	0	2,209	11,313	136	93,657
2017	53,479	141	23,562	1,774	0	0	10,297	10,740	1,135	101,128
2018	49,593	103	23,766	1,854	0	0	3,126	12,171	2,194	92,807
2019	44,230	13	23,786	4,163	0	0	36,768	9,998	0	119,675
2020	36,424	94	25,971	5,770	0	0	28,327	9,712	0	106,297
2021[c]	42,881	68	27,298	6,907	0	0	12,820	10,089	1,206	101,269
2022[d]	45,455	60	26,417	4,722	0	0	11,448	8,505	404	97,011

Notes: NR – not reported

a) Groundwater production by water year is estimated from groundwater production by calendar year for 2016 through 2020. Water Year 2021 extractions represent reported and estimated extractions for the period from October 1, 2020 through September 30, 2021.

b) Recycled water is from reported GREAT program deliveries to SSF, DRIS-2, and DAVIS

c) Water year 2021 groundwater extractions were updated based on additional reporting received subsequent to the submittal of the 2022 GSP Annual Report.

d) Groundwater extraction reporting for 2022 is preliminary and expected to change. Additional extraction reporting is anticipated.

2.5 Change in Groundwater Storage

Change in storage estimates were calculated for each principal aquifer in the Subbasin by comparing seasonal high groundwater elevations between 2015 and 2022. Annual and cumulative change in storage for water years 2016 through 2022 are presented in Tables 2-5a and 2-5b. The change in storage for each principal aquifer between spring 2021 and spring 2022 is shown on Figures 2-18 through 2-22. Annual and cumulative change in storage for the UAS and LAS are shown in Figures 2-23 and 2-24.

Change in groundwater in storage was calculated using a series of linear regression models that correlate measured groundwater elevations to simulated storage change values extracted from the Ventura Regional Groundwater Flow Model (UWCD, 2018). These regression models were computed using seasonal high elevations and corresponding model-calculated storage change values for water years 1986 through 2015 (FCGMA 2022).

2.5.1 Oxnard Aquifer

Groundwater in storage decreased between spring 2021 and spring 2022 by approximately 5,300 AF (Table 2-5a). This decrease in storage reflects the widespread decline in groundwater elevations in the Oxnard aquifer across the Subbasin (Figure 2-18). Since spring 2015, groundwater in storage within the Oxnard aquifer has increased by a cumulative volume of approximately 4,800 AF (Table 2-5a).

2.5.2 Mugu Aquifer

Groundwater in storage within the Mugu aquifer decreased by approximately 520 AF between spring 2021 and spring 2022 (Table 2-5a). Groundwater in storage declined across the majority of the Subbasin, except for the northernmost part of the Forebay Management Area (Figure 2-19). In this part of the Subbasin, groundwater elevations at 02N21W07L06S increased by approximately 10 feet between spring 2021 and 2022, which resulted in a local increase in storage of approximately 30 AF (Figure 2-19).

Since spring 2015, groundwater in storage within the Mugu aquifer has decreased by a cumulative volume of approximately 150 AF (Table 2-5a).

2.5.3 Hueneme Aquifer

The volume of groundwater in storage in the Hueneme aquifer decreased by approximately 270 AF between spring 2021 and spring 2022 (Table 2-5a). Figure 2-20 illustrates that groundwater in storage increased relatively uniformly across the Subbasin in the Hueneme aquifer as a result of groundwater elevation declines that ranged from approximately 5 to 22 feet.

Since spring 2015, groundwater in storage within the Hueneme aquifer has decreased by a cumulative volume of approximately 20 AF (Table 2-5a).

2.5.4 Fox Canyon Aquifer

Between spring 2021 and spring 2022, groundwater in storage in the Fox Canyon aquifer declined by approximately 630 AF (Table 2-5a). Within the Forebay Management Area, groundwater in storage declined by approximately 200

AF; this reduction reflects the 5 to 16-foot decline in groundwater elevation measured at 02N21W07L04S and 02N22W23B03S (Figure 2-21). Downgradient of the Forebay Management Area, adjacent to the coast, and north of Port Hueneme, groundwater in storage decreased by approximately 270 AF. Groundwater in storage declined across the Saline Intrusion Management Area. In the Oxnard Pumping Depression Management Area, groundwater in storage declined by a total of approximately 100 AF (Figure 2-21).

Since the spring of 2015, groundwater in storage within the FCA has increased by approximately 220 AF (Table 2-5a).

2.5.5 Grimes Canyon Aquifer

The Grimes Canyon aquifer is limited to the southern and eastern parts of the Oxnard Subbasin (Turner 1975). Between spring 2021 and spring 2022, groundwater in storage in the Grimes Canyon aquifer decreased by approximately 210 AF. This groundwater in storage decline was estimated using a single well, 01N21W32Q02S, located in the southeastern part of the Subbasin (Figure 2-23).

Since the spring of 2015, groundwater in storage within the Grimes Canyon aquifer has declined by approximately 240 AF (Table 2-5a).

Table 2-5a. Annual Change in Groundwater Storage in the Oxnard Subbasin

Water Year	Water Year Type	Oxnard Subbasin							
		Oxnard Aquifer (acre-feet)	*Mugu Aquifer (acre-feet)*	*UAS Annual (acre-feet)*	*Hueneme Aquifer (acre-feet)*	*Fox Canyon Aquifer (acre-feet)*	*Grimes Canyon Aquifer (acre-feet)*	*LAS Annual (acre-feet)*	*Combined Annual (acre-feet)*
2016	Critical	-9,391	-480	**-9,871**	-277	-687	-301	**-1,266**	**-11,136**
2017	Above Normal	-1,565	170	**-1,395**	269	710	432	**1,411**	**16**
2018	Critical	-4,737	-401	**-5,138**	-310	-965	-183	**-1,457**	**-6,596**
2019	Above Normal	9,282	802	**10,084**	243	1,639	256	**2,138**	**12,222**
2020	Below Normal	9,704	467	**10,170**	159	214	-155	**218**	**10,388**
2021	Critical	6,752	-185	**6,657**	170	-63	-70	**38**	**6,605**
2022	Below Normal	-5,263	-520	**-5,783**	-272	-632	-214	**-1,118**	**-6,901**

Table 2-5b. Cumulative Change in Groundwater Storage in the Oxnard Subbasin

Water Year	Water Year Type	Oxnard Subbasin		
		UAS Cumulative (acre-feet)	*LAS Cumulative (acre-feet)*	*Combined Cumulative Change in Storage (acre-feet)*
2016	Critical	-9,871	-1,266	**-11,136**
2017	Above Normal	-11,266	146	**-11,120**
2018	Critical	-16,404	-1,312	**-17,716**
2019	Above Normal	-6,319	826	**-5,493**
2020	Below Normal	3,851	1,044	**4,895**
2021	Critical	10,418	1,081	**11,500**
2022	Below Normal	4,635	-37	**4,599**

2.5.6 Total Change in Storage in the Subbasin

The change in groundwater in storage was calculated for each aquifer in the Subbasin and summed by aquifer system (Tables 2-5a and 2-5b; Figures 2-23 and 2-24). Between spring 2021 and spring 2022, groundwater in storage decreased by approximately 6,900 AF, which resulted in a cumulative increase in storage in the Subbasin since spring 2015 of approximately 4,600 AF (Table 2-5b). However, it should be noted that the change in storage volumes reported in Tables 2-5a and 2-5b are an approximate change in storage estimated using groundwater elevations measured at wells screened only in single aquifers.

Annual and cumulative change in storage from 1985 through 2015 were reported in the GSP (FCGMA 2019a). The change in storage volumes reported in the GSP were extracted from the UWCD model and incorporated local responses to changing recharge and pumping conditions. The results presented here provide an estimate of storage change based on a subset of wells screened solely within individual aquifers across the Subbasin, and therefore do not capture local variations in storage change simulated by the UWCD model. In general, however, the trends shown in the GSP and Annual Report are in good agreement (FCGMA 2022).

Additionally, the change in storage reported for this annual report does not account for seawater intrusion that is known to occur in the Subbasin when groundwater elevations are below the minimum thresholds described in the GSP (FCGMA 2019). As groundwater elevations decline, seawater intrudes the Subbasin, which slows the decline of the groundwater elevations, but replaces fresh water in storage with saltwater. Therefore, the change in storage calculated for this annual report using groundwater elevations that are influenced by potential seawater intrusion may be an underestimate of the total change of fresh water in storage experienced by the Subbasin between water years 2016 and 2022.

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3 GSP Implementation Progress

The GSP for the Oxnard Subbasin was submitted to DWR in January 2020. This is the fourth annual report prepared since the GSP was submitted. The GSP implementation progress reported in this report covers work that began during development of the GSP as well as development of projects and management actions over the 3 years since the GSP was submitted.

Project Implementation Progress

During development of the GSP, FCGMA identified the Oxnard Pumping Depression Management Area, adjacent to the boundary between the Oxnard Subbasin and the PVB, as a critical area in which aquifer specific groundwater elevations were not available due to a lack of monitoring wells. This is an area of known groundwater production, with wells in the area typically screened in multiple aquifers in the LAS. At the FCGMA's request, DWR, under its Technical Services Support program, installed two nested monitoring well clusters to monitor water levels in the individual principal aquifers in the Oxnard Subbasin Pumping Depression Management Area based on FCGMA's design. These nested monitoring wells were installed specifically to address the spatial data gap identified in the GSP. Groundwater elevation data from these wells was included in the 2022 and 2023 GSP Annual Reports to better represent groundwater conditions in the Oxnard Subbasin and adjacent PVB.

Since completing the GSP, FCGMA was awarded grant funds through DWR's Sustainable Groundwater Management Grant Program to support implementation of projects developed during the GSP and subsequent stakeholder discussions. The final contract agreement between DWR and FCGMA was signed on September 23, 2022 and FCGMA, acting as the grant administrator, has coordinated activities with the various agencies that are overseeing project component implementation. FCGMA is currently preparing bid specifications to construct additional multi-depth and shallow monitoring wells in the Subbasin. These wells will be used to fill data gaps identified in the GSP.

As demonstrated by the efforts undertaken to identify and solicit grant funding for projects, the FCGMA Board of Directors continues to prioritize stakeholder feedback in the implementation phase of the GSP and recognizes the vital role stakeholders play in ensuring the long-term sustainable use of groundwater resources in the Oxnard Subbasin. In addition to the projects added to the GSP list for consideration last year, the Agency has been developing a process and criteria for evaluating and prioritizing water-supply and infrastructure projects for consideration of funding and inclusion in GSP future sustainable yield projections. The Board Operations Committee conducted four meetings with active stakeholder participation to develop the process and criteria. The Board of Directors will consider adoption of the Operation Committee's recommendations at its March 22, 2023, meeting.

Management Action Implementation Progress

FCGMA has made progress on several management actions since adoption of the GSP. FCGMA completed the transition from calendar year to water year reporting of groundwater extractions in 2021. Consequently, the 2022 water year is the first water year in which groundwater extractions can be directly compared to the previous water year's extractions, consistent with SGMA. This allows for a better understanding of the impacts of climate and extraction on groundwater elevations and change in groundwater storage in the Subbasin.

Second, in anticipation of the additional reporting associated with implementing the allocation ordinance adopted in 2021, FCGMA is continuing to conduct an analysis of its data management system needs. The updated data management system will incorporate the new AMI data and will be structured to allow for land-based extraction assignments. Changes to the data management system will target the specific needs of the FCGMA moving toward sustainable management of the Oxnard Subbasin and PVB by 2040.

Third, FCGMA has continued to evaluate implementing a replenishment fee that could be used to purchase water for recharge in the Oxnard Subbasin or to help fund a voluntary temporary fallowing program to reduce groundwater demand. These management actions can be implemented over a shorter time period than large capital projects and, while not sufficient on their own to achieve sustainability, play an important role in progressing toward sustainable use of the groundwater resources in the Oxnard Subbasin.

Lastly, FCGMA has begun planning, scoping, and budgeting for the first periodic evaluation of the GSP, which is due to DWR in January 2025. This evaluation will provide an assessment of the basin setting and groundwater conditions based on new data collected since submittal of the GSP; an evaluation of the established sustainable management criteria, monitoring network, and data gaps; and a comprehensive description of GSP implementation activities in the Subbasin. FCGMA has initiated discussions with other agencies in the Subbasin to coordinate planning and modeling efforts. FCGMA anticipates beginning preparation of the first periodic evaluation of the Oxnard Subbasin GSP in summer 2023.

The progress made over the past year on projects and management actions applicable to the Oxnard Subbasin demonstrates FCGMA's commitment to allocating the necessary time and resources to achieve long-term sustainable management of the groundwater resources of the Oxnard Subbasin.

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4 References

DWR (California Department of Water Resources). 2018. *California's Groundwater, Bulletin 118*. 2018 Groundwater Basin Boundaries – 4-004.02 Santa Clara River Valley- Oxnard. Published https://water.ca.gov/SearchResults?sort=asc&search=B118%20Basin%20Boundary%20Description%202016&primaryFilters=&secondaryFilters=&tab=documents. Accessed February 17,2020.

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FCGMA (Fox Canyon Groundwater Management Agency). 2019a. Groundwater Sustainability Plan for the Oxnard Subbasin.

FCGMA (Fox Canyon Groundwater Management Agency). 2019b. Groundwater Sustainability Plan for the Las Posas Valley Basin – Appendix K.

FCGMA (Fox Canyon Groundwater Management Agency). 2019c. Ordinance to Establish a New Pumping Allocation System for the Oxnard and Pleasant Valley Basins.

FCGMA (Fox Canyon Groundwater Management Agency). 2020a. Oxnard Subbasin Groundwater Sustainability Plan 2020 Annual Report: Covering Water Years 2016 through 2019.

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FCGMA (Fox Canyon Groundwater Management Agency). 2022. Oxnard Subbasin Groundwater Sustainability Plan 2022 Annual Report: Covering Water Year 2021.

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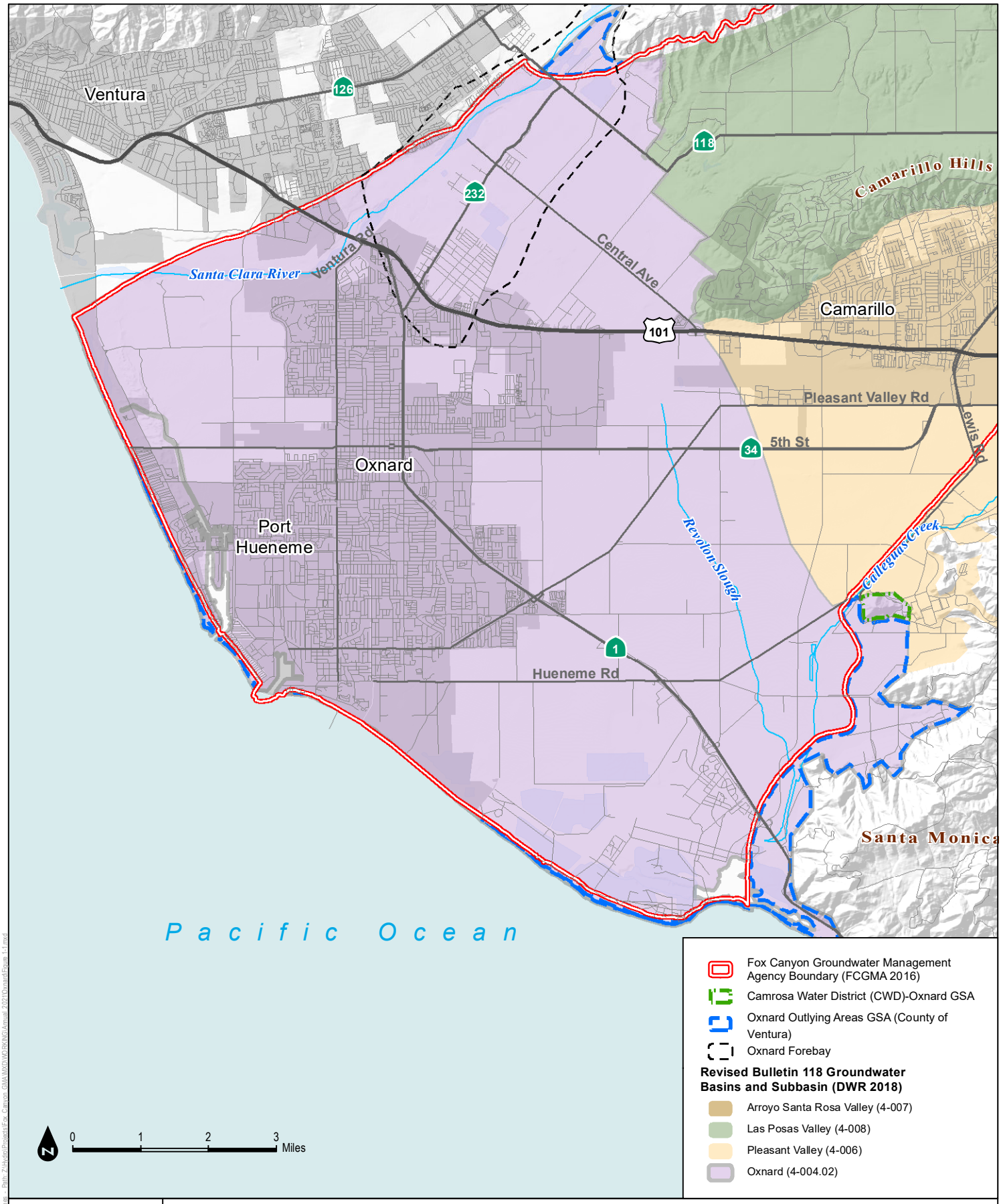
5 Figures

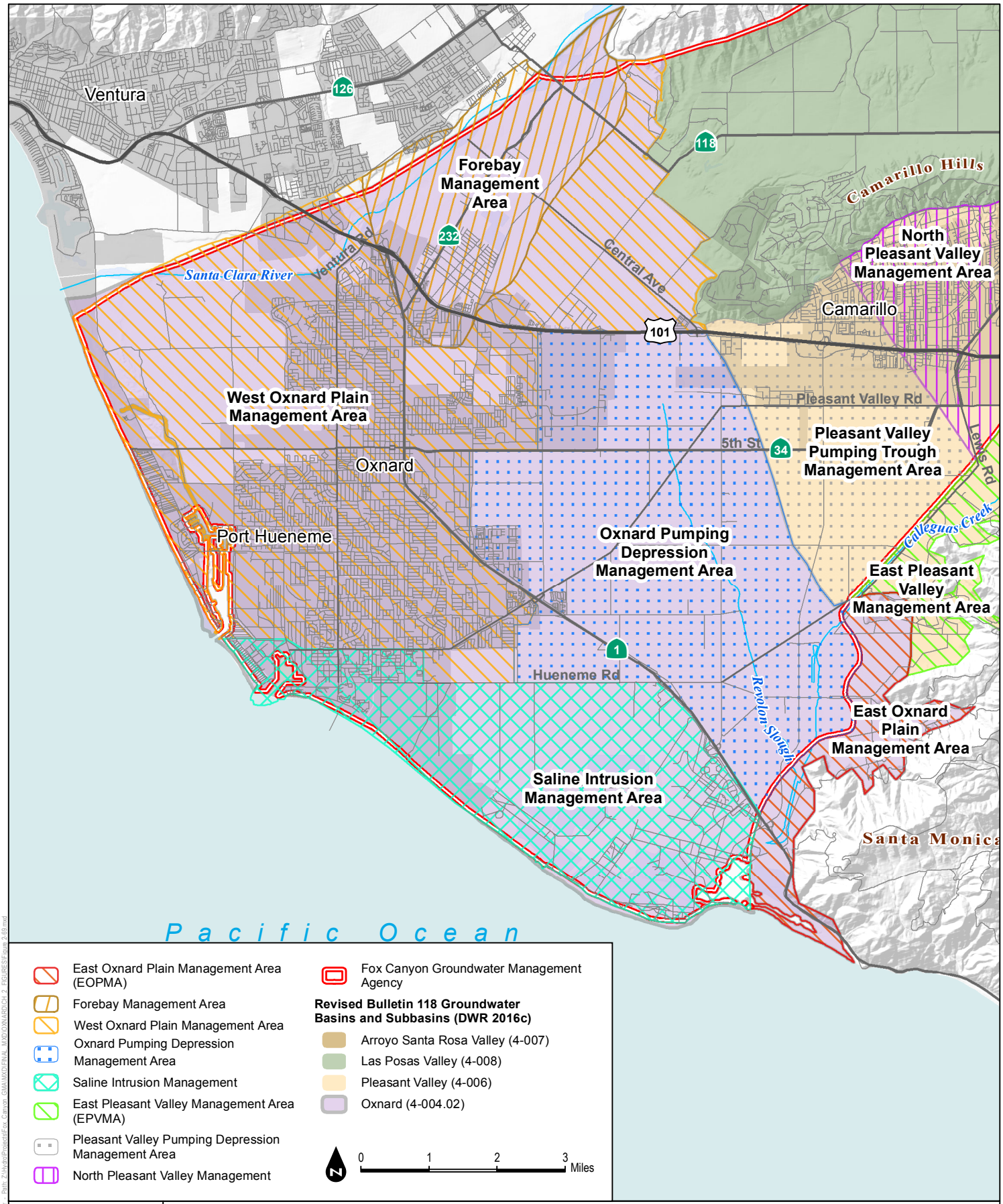


DUDEK

SOURCE: DWR; Santa Barbara County; FCGMA

FIGURE 1-1

Vicinity Map for the Oxnard Subbasin



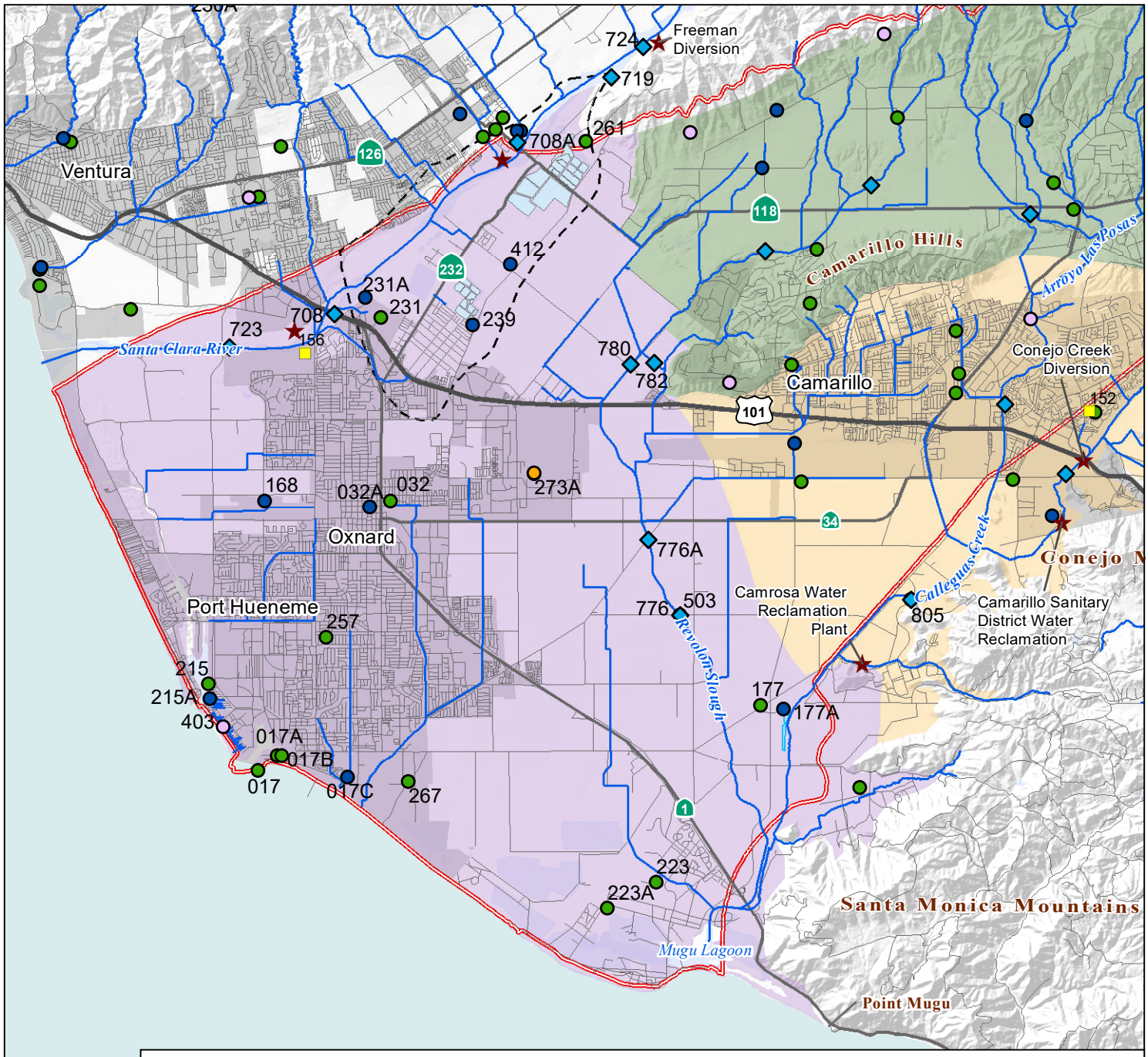
DUDEK

SOURCE: DWR; County of Ventura; FCGMA

FIGURE 1-2

Oxnard Subbasin Management Areas

Oxnard Subbasin Groundwater Sustainability Plan 2023 Annual Report



Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)

Diversions and Reclamation Sites

United Water Conservation District (UWCD) Recharge Basins

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

Arroyo Santa Rosa Valley (4-007)

Las Posas Valley (4-008)

Pleasant Valley (4-006)

Oxnard (4-004.02)

N 0 0.5 1 2 3 4 Miles

Forebay Management Area

Ventura County Rivers, Streams and Channels (VCWPD 2016)

CIMIS Stations

Ventura County Gauge Locations (VCWPD 2016; labeled by station number)

National Weather Service Station

Recording Precipitation Gauge

Standard Precipitation

Storage Precipitation

Non-Standard Precipitation Recorder

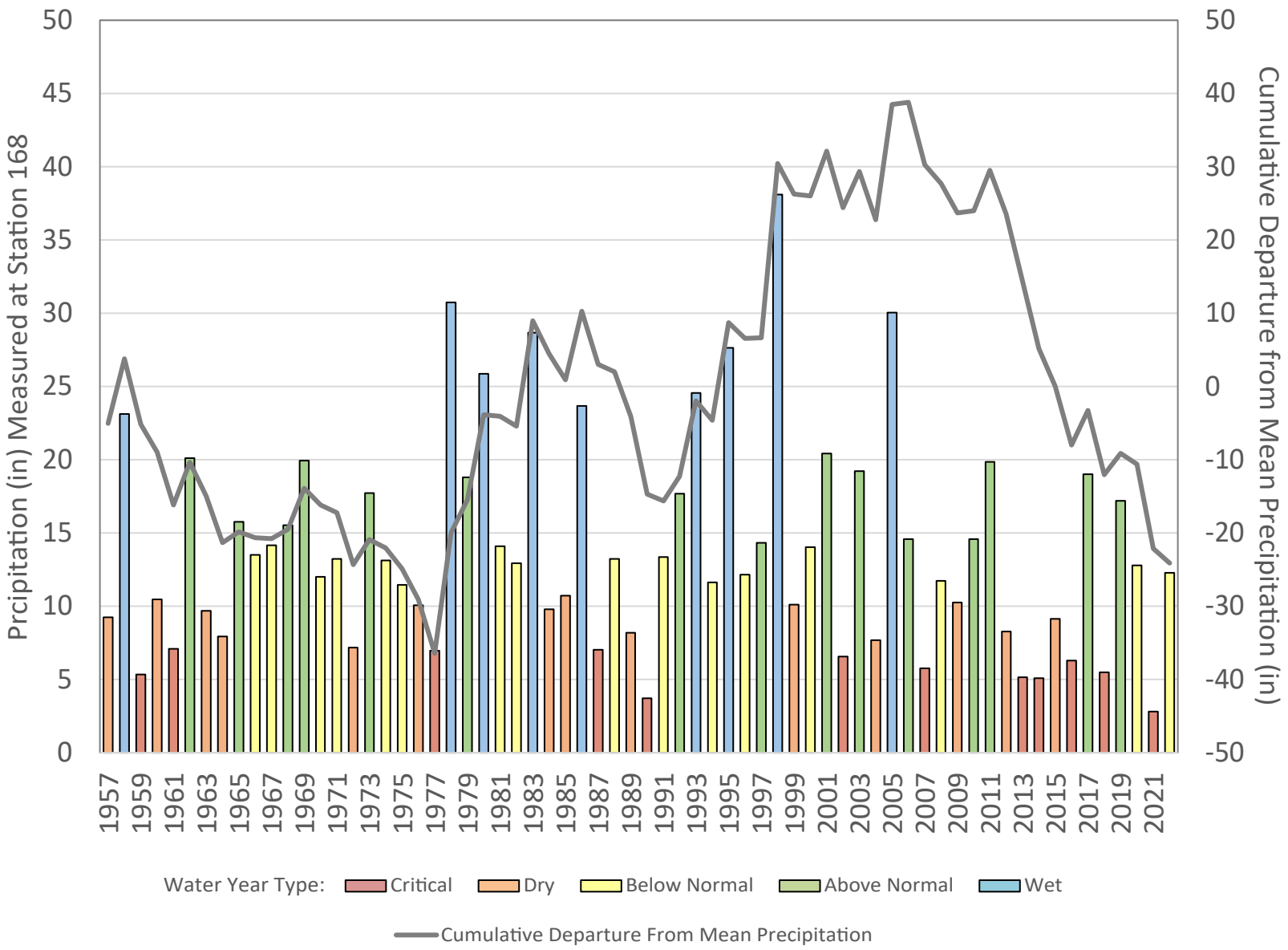
Recording Stream Gauge

SOURCE: DWR; Santa Barbara County; VCWPD; USGS NHD

FIGURE 1-3

Weather Station and Stream Gauge Locations

DUDEK



Note: Water year is from October 1 through September 30. Water year type is based on the percentage of the water year precipitation compared to the mean precipitation. Types are defined as: Wet (≥150% of mean), Above Normal (≥100% to <150% of mean), Below Normal (≥75% to <100% of mean), Dry (≥50% to <75% of average), and Critical (<50% of mean)

FIGURE 1-4

Oxnard Subbasin Historical Water Year Precipitation

Oxnard Subbasin Groundwater Sustainability Plan 2023 Annual Report

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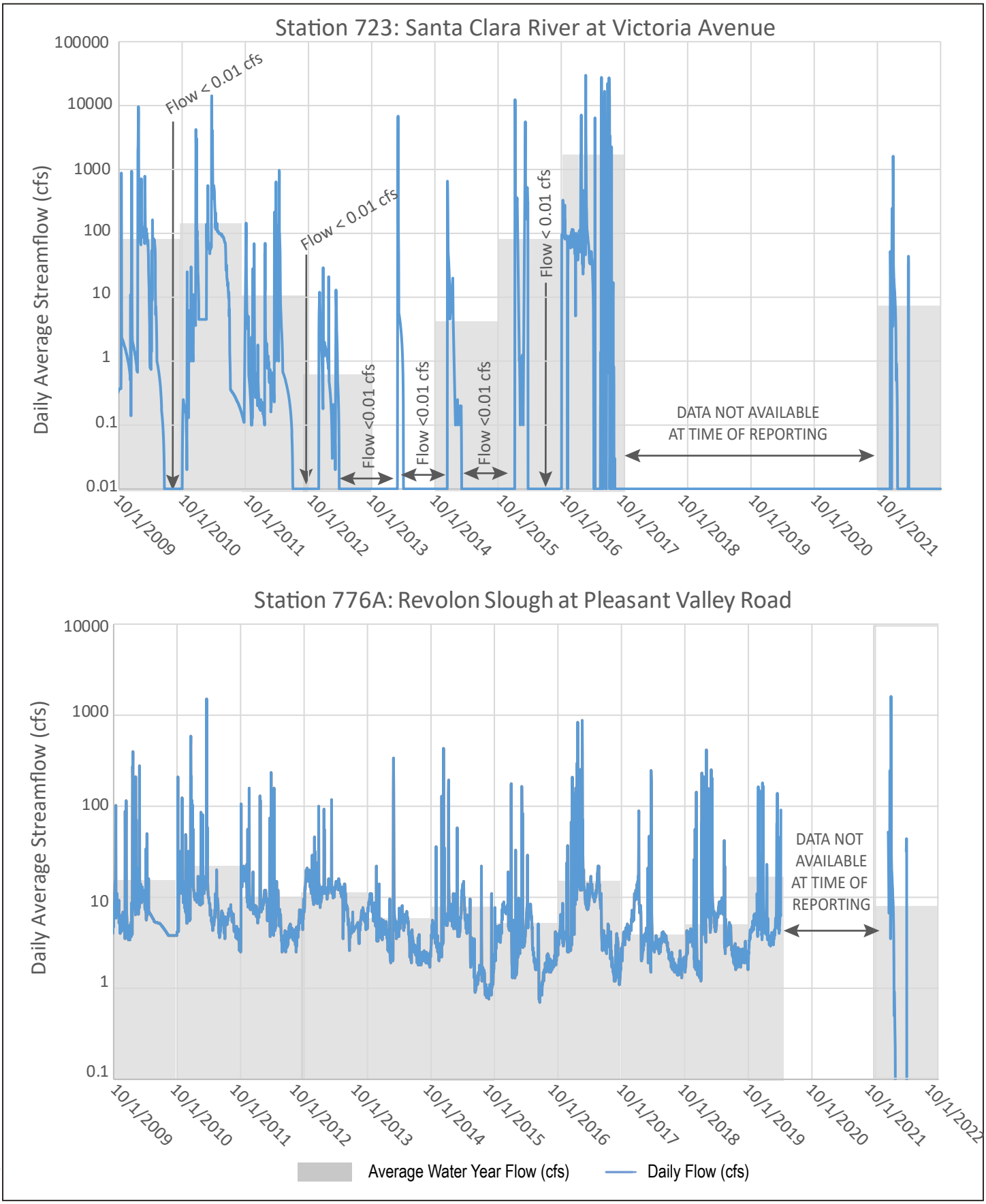
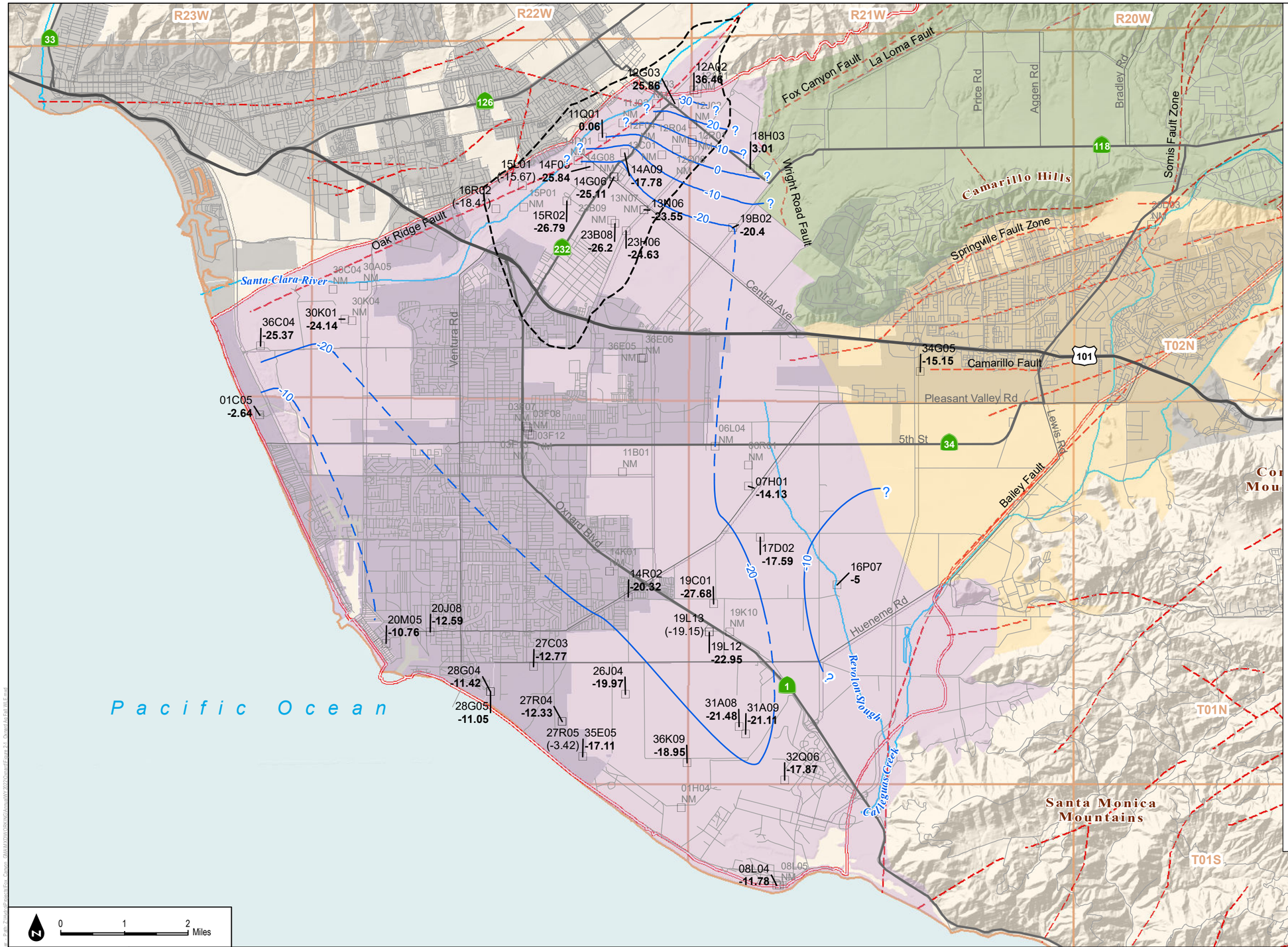


SOURCE: Ventura County Watershed Protection District (VCWPD) Hydrologic Data Server (https://www.vcwatershed.net/hydrodata/)

FIGURE 1-5

Oxnard Subbasin Stream Gauge Data



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells screened in the Oxnard Aquifer
- Forebay Management Area
- *15P01* Abbreviated State Well Number (see notes)
- (-14.7) Groundwater elevations are not used to create contours (see notes)
- **-14.7** Groundwater elevation feet AMSL
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

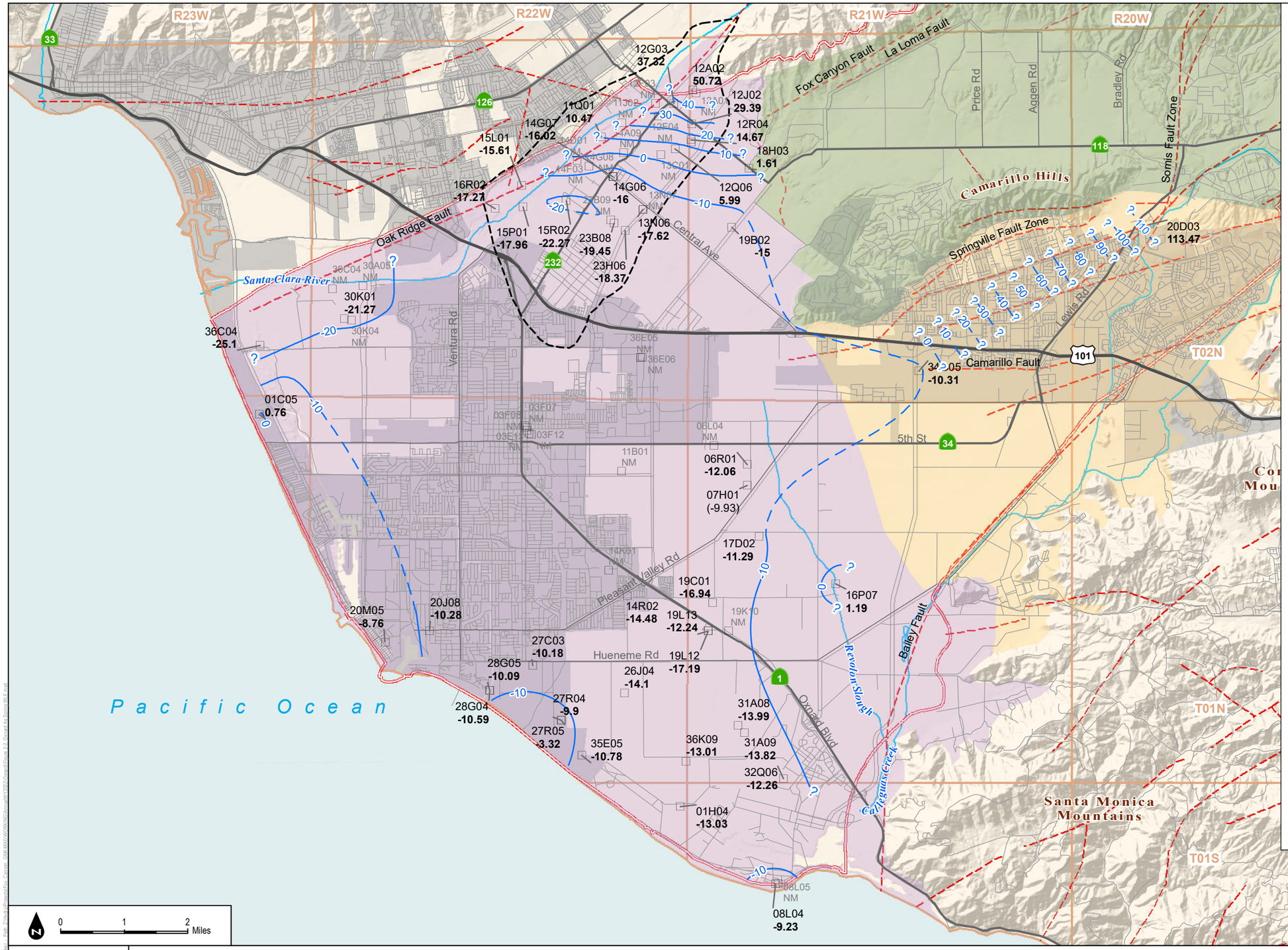
Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-1

Groundwater Elevation Contours in the Oxnard Aquifer, October 2 to October 31, 2021



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells screened in the Oxnard Aquifer
- Forebay Management Area
- *15P01* Abbreviated State Well Number (see notes)
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- **-14.7** Groundwater elevation feet AMSL
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Notes:

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2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

0 1 2 Miles

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-2

Groundwater Elevation Contours in the Oxnard Aquifer, March 2 to March 31, 2022

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- ◊ Wells screened in the Mugu Aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- (-14.7) Groundwater elevation not used for contouring
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)
- Forebay Management

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
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3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

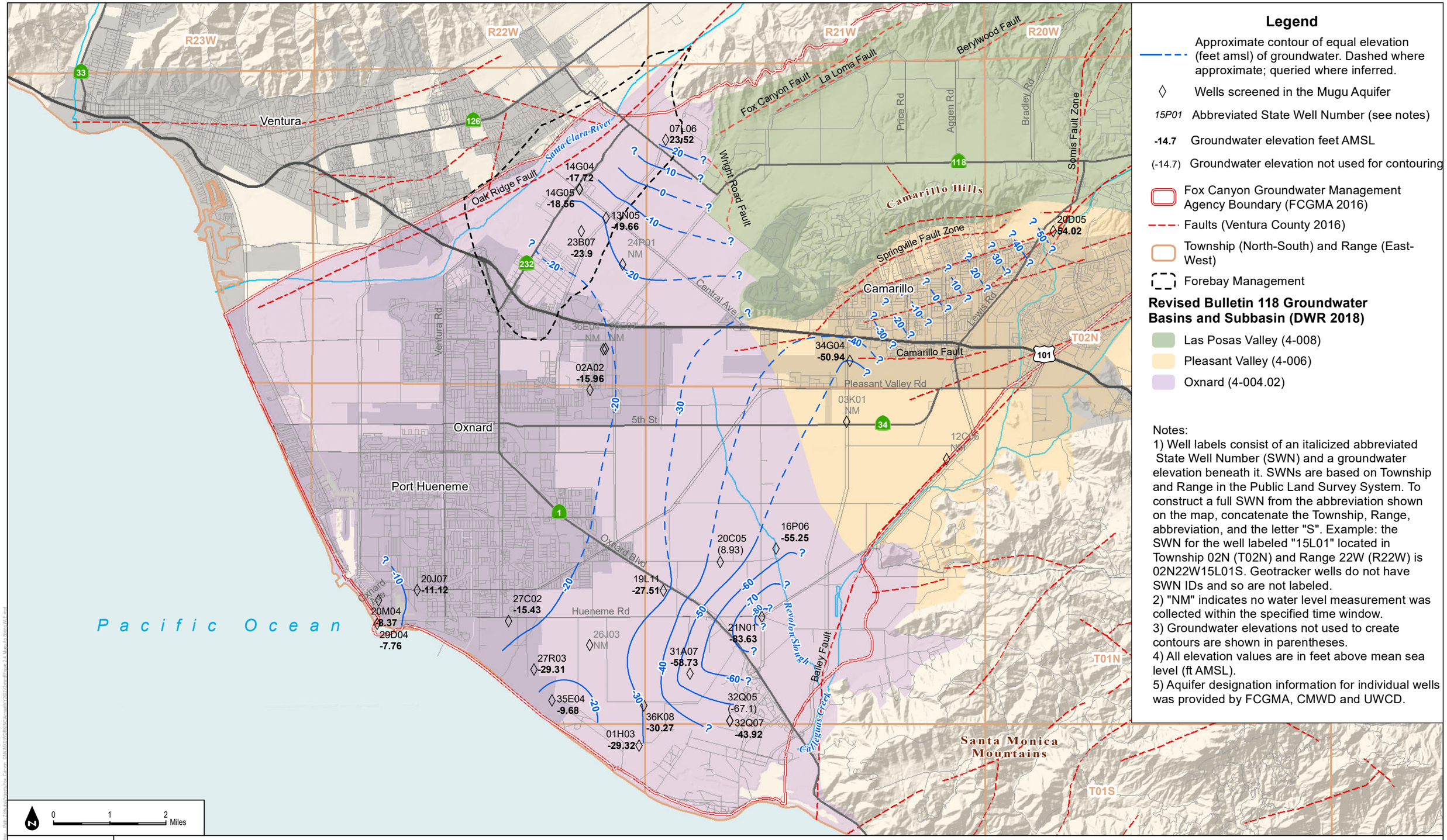
0 1 2 Miles

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-3

Groundwater Elevation Contours in the Mugu Aquifer, October 2 to October 31, 2021



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- ◊ Wells screened in the Mugu Aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- (-14.7) Groundwater elevation not used for contouring
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)
- Forebay Management

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- Las Posas Valley (4-008)
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Notes:

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2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-4

Groundwater Elevation Contours in the Mugu Aquifer, March 2 to March 31, 2022

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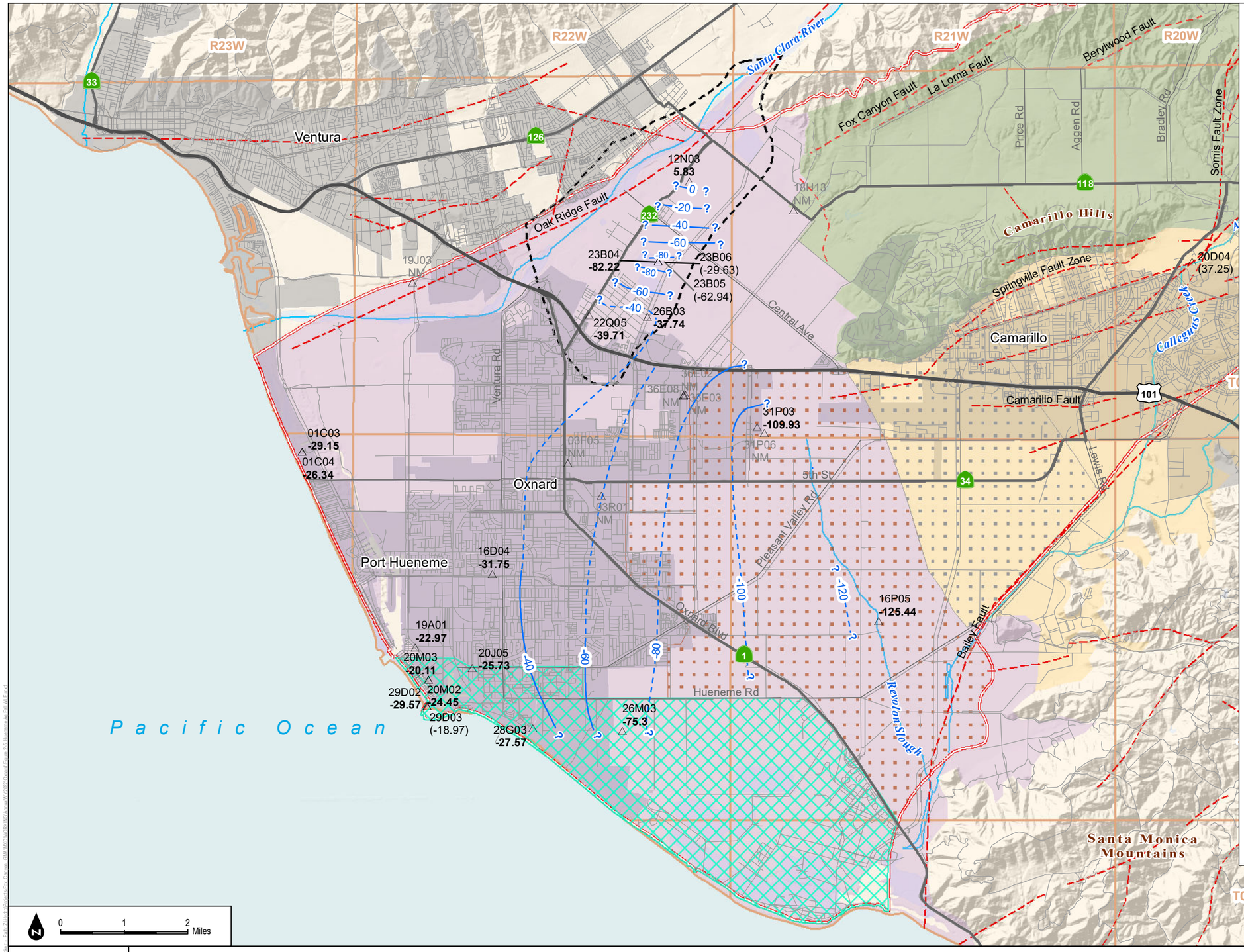

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- △ Wells screened in the Hueneme Aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- (-14.7) Groundwater elevations are not used to create contours (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)
- Pleasant Valley Pumping trough Management Area
- Oxnard Pumping Depression Management
- Saline Intrusion Management
- Forebay Management

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
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2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

0 1 2 Miles

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-5

Groundwater Elevation Contours in the Hueneme Aquifer, October 2 to October 31, 2021

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- △ Wells screened in the Hueneme Aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- (-14.7) Groundwater elevations are not used to create contours (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)
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- Saline Intrusion Management
- Forebay Management

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:
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2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

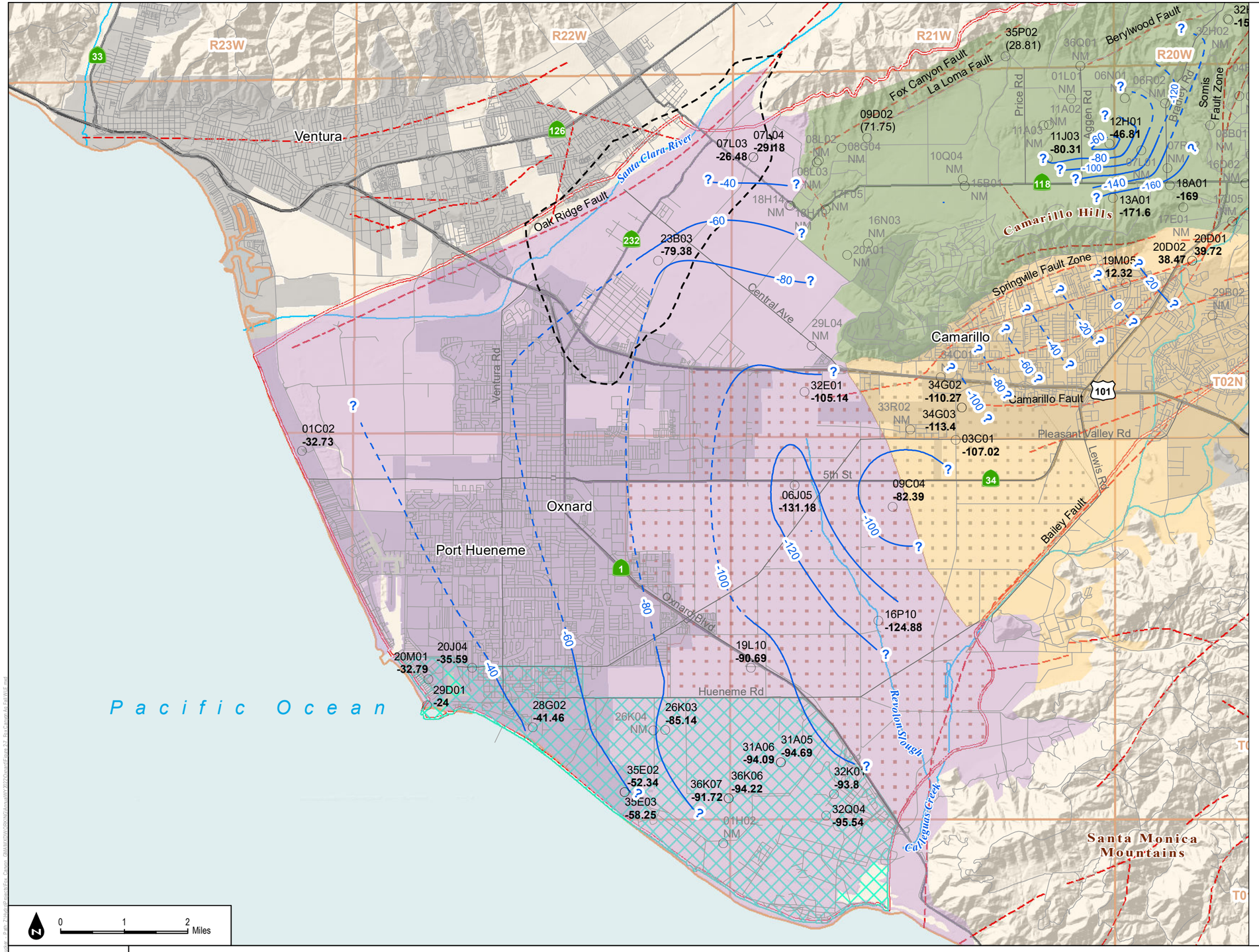
0 1 2 Miles

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-6

Groundwater Elevation Contours in the Hueneme Aquifer, March 2 to March 31, 2022

DUDEK



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells Screened in the Fox Canyon Aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- (-14.7) Groundwater elevations are not used to create contours (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Forebay Management
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- Pleasant Valley Pumping trough Management Area
- Saline Intrusion Management
- Township (North-South) and Range (East-West)

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- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Notes:

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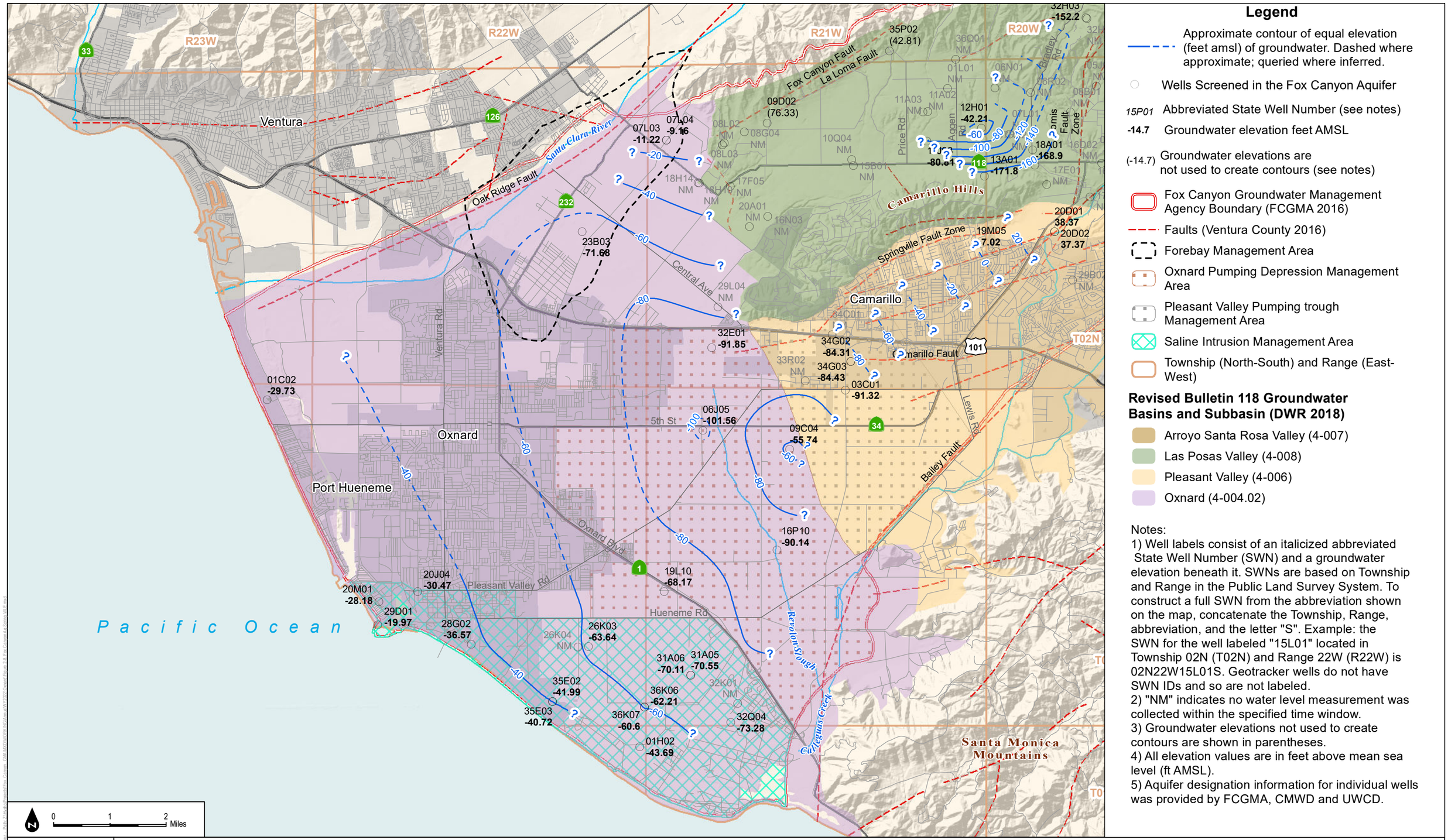
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-7

Groundwater Elevation Contours in the Fox Canyon Aquifer, October 2 to October 31, 2021



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells Screened in the Fox Canyon Aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- (-14.7) Groundwater elevations are not used to create contours (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Forebay Management Area
- Oxnard Pumping Depression Management Area
- Pleasant Valley Pumping trough Management Area
- Saline Intrusion Management Area
- Township (North-South) and Range (East-West)

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- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

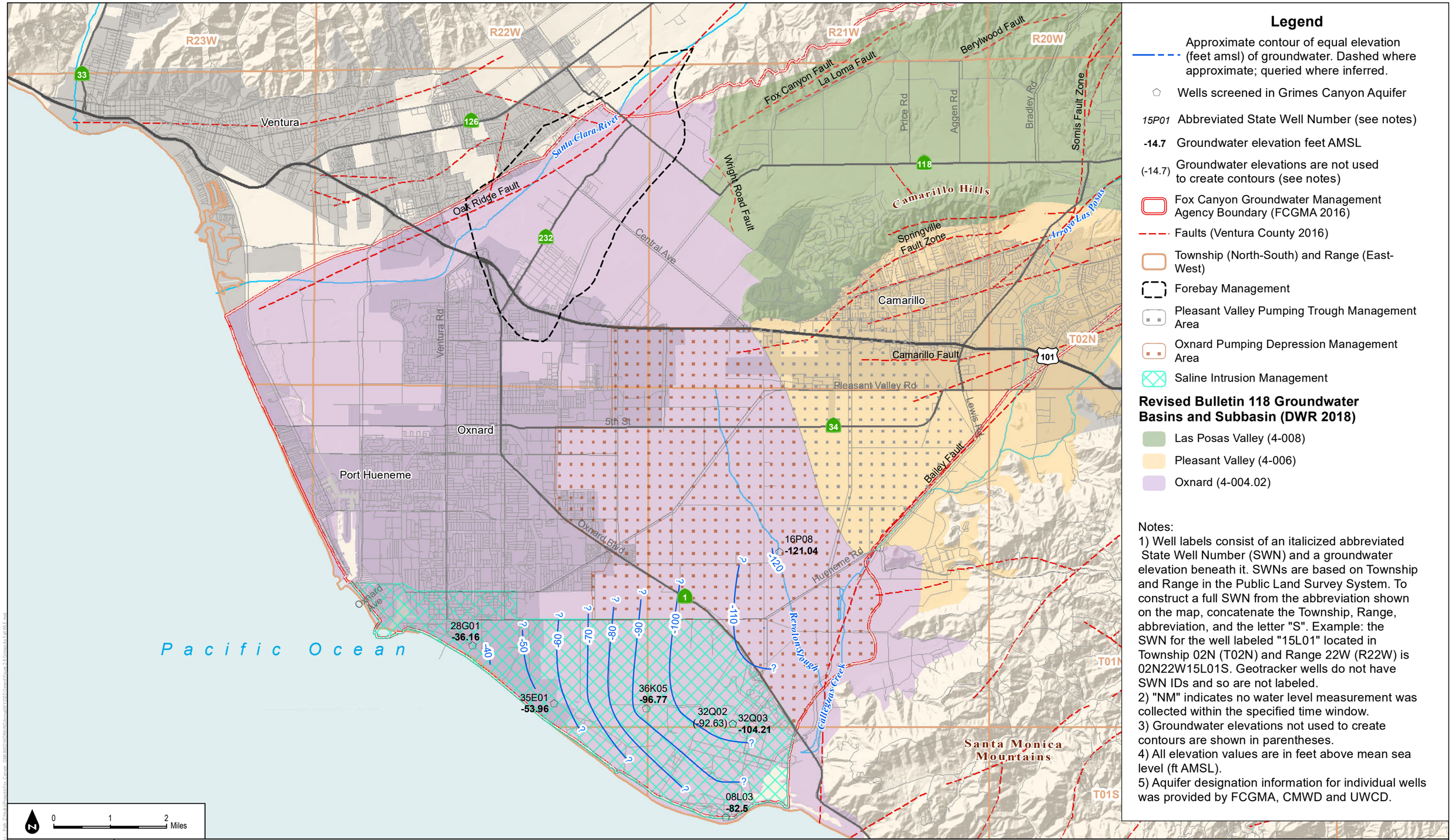
Notes:

1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-8

Groundwater Elevation Contours in the Fox Canyon Aquifer, March 2 to March 31, 2022



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells screened in Grimes Canyon Aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- (-14.7) Groundwater elevations are not used to create contours (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)
- Forebay Management
- Pleasant Valley Pumping Trough Management Area
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

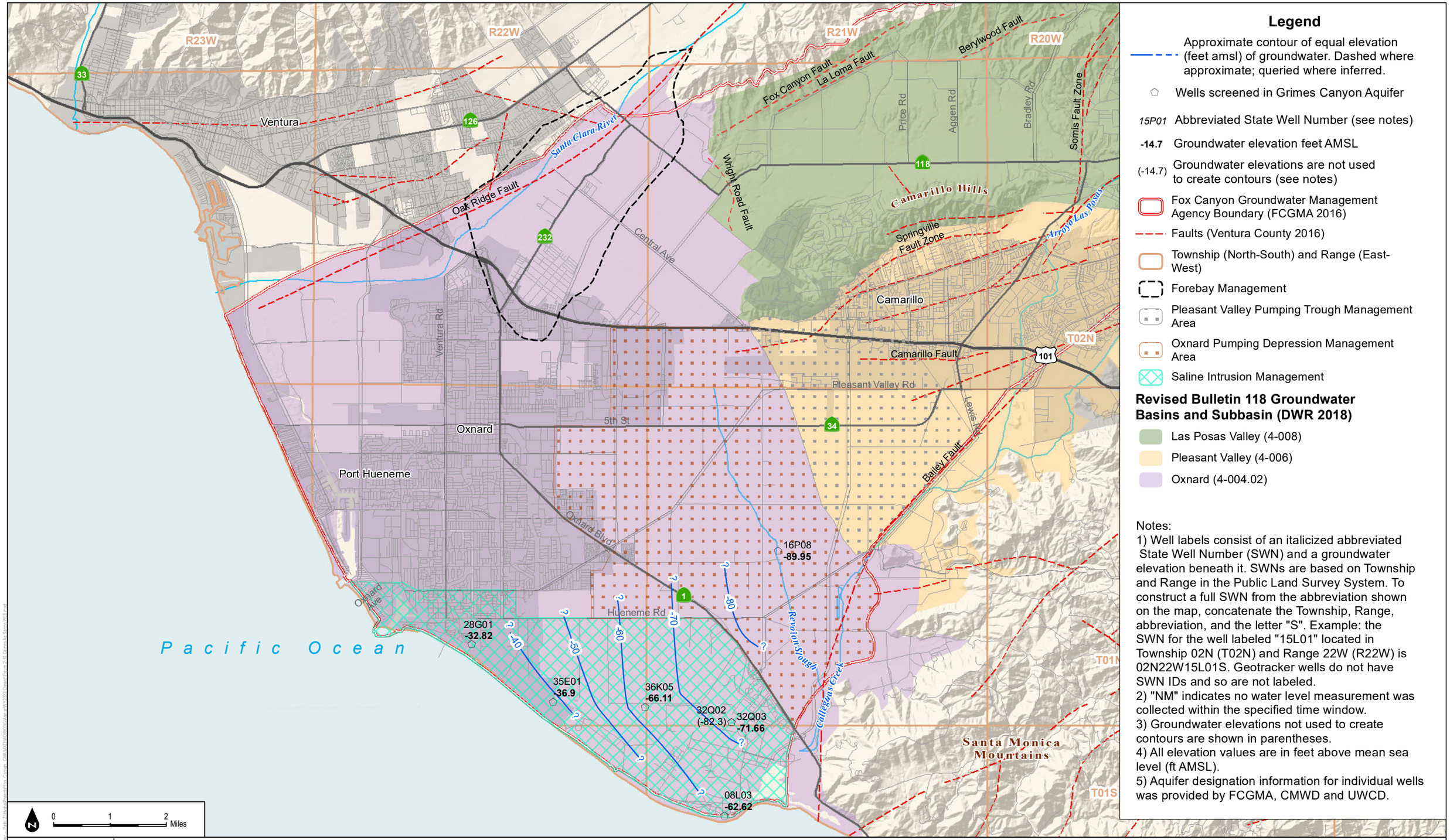
Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-9

Groundwater Elevation Contours in the Grimes Canyon Aquifer, October 2 to October 31, 2021

DUDEK



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells screened in Grimes Canyon Aquifer
- *15P01* Abbreviated State Well Number (see notes)
- **-14.7** Groundwater elevation feet AMSL
- (-14.7) Groundwater elevations are not used to create contours (see notes)
- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Faults (Ventura County 2016)
- Township (North-South) and Range (East-West)
- Forebay Management
- Pleasant Valley Pumping Trough Management Area
- Oxnard Pumping Depression Management Area
- Saline Intrusion Management

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

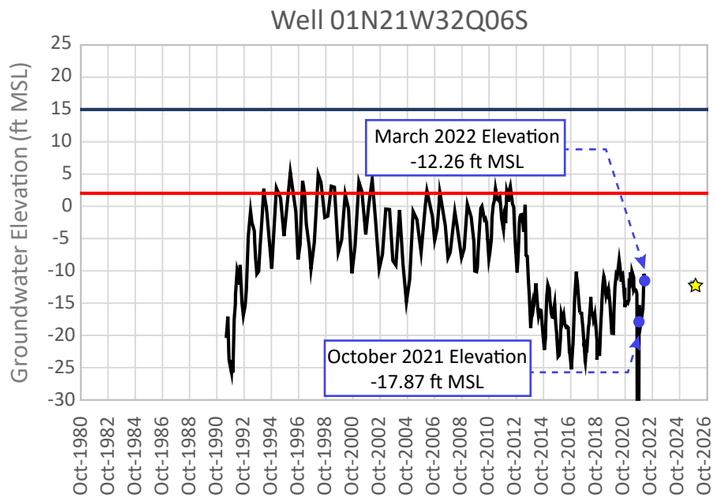
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

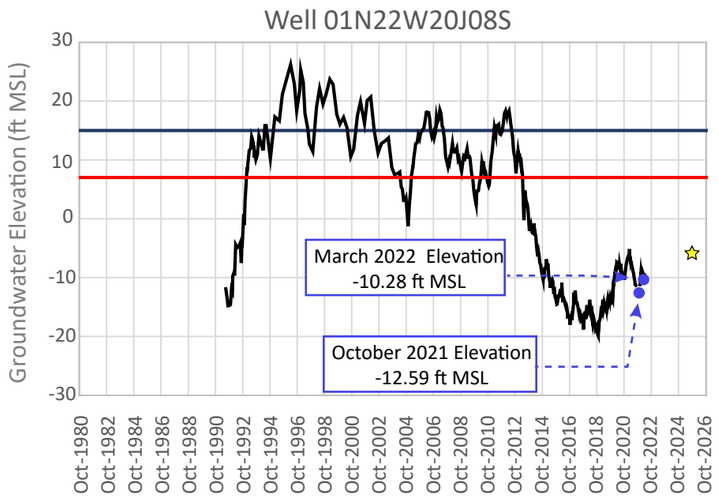
Notes:
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and the letter "S". Example: the SWN for the well labeled "15L01" located in Township 02N (T02N) and Range 22W (R22W) is 02N22W15L01S. Geotracker wells do not have SWN IDs and so are not labeled.
2) "NM" indicates no water level measurement was collected within the specified time window.
3) Groundwater elevations not used to create contours are shown in parentheses.
4) All elevation values are in feet above mean sea level (ft AMSL).
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

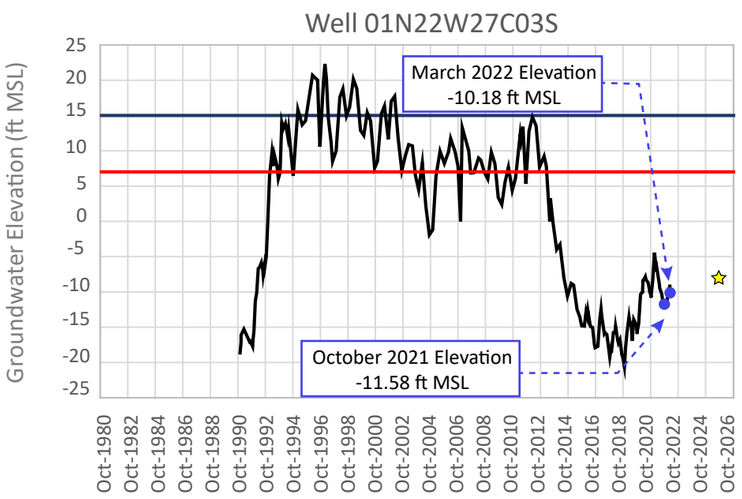
SOURCE: DWR; Ventura County; UWCD; CMWD

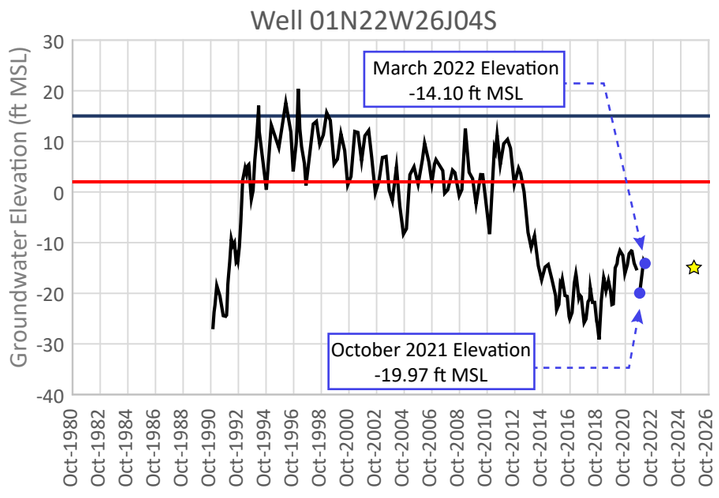
FIGURE 2-10

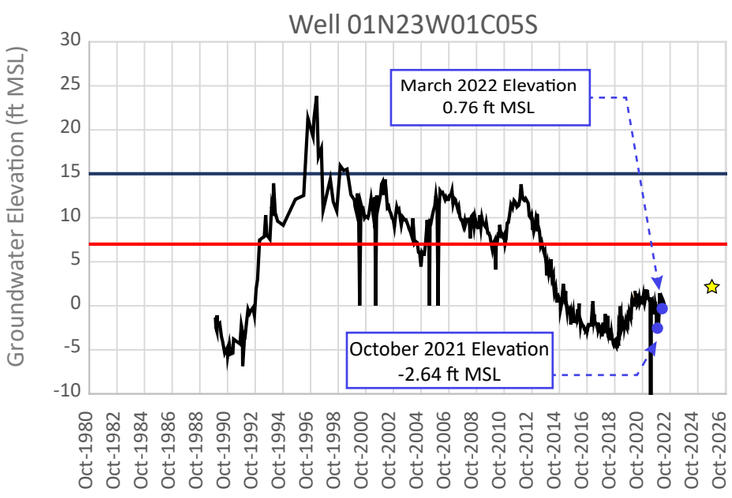
Groundwater Elevation Contours in the Grimes Canyon Aquifer, March 2 to March 31, 2022

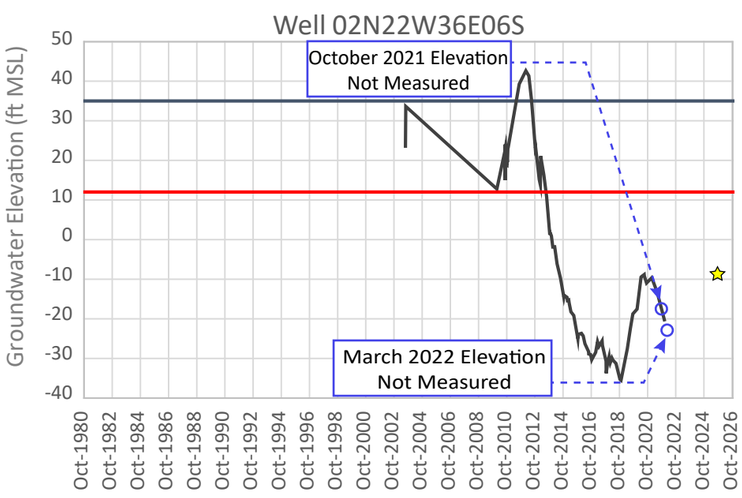












Groundwater Elevation — Minimum Threshold — Measurable Objective — ☆ 2025 Interim Milestone for dry climate conditions

○ Measurement not collected between October 2 and October 31, 2020 or March 2 and March 29, 2021

FIGURE 2-11

Groundwater Elevation Hydrographs for Representative Wells Screened in the Oxnard Aquifer

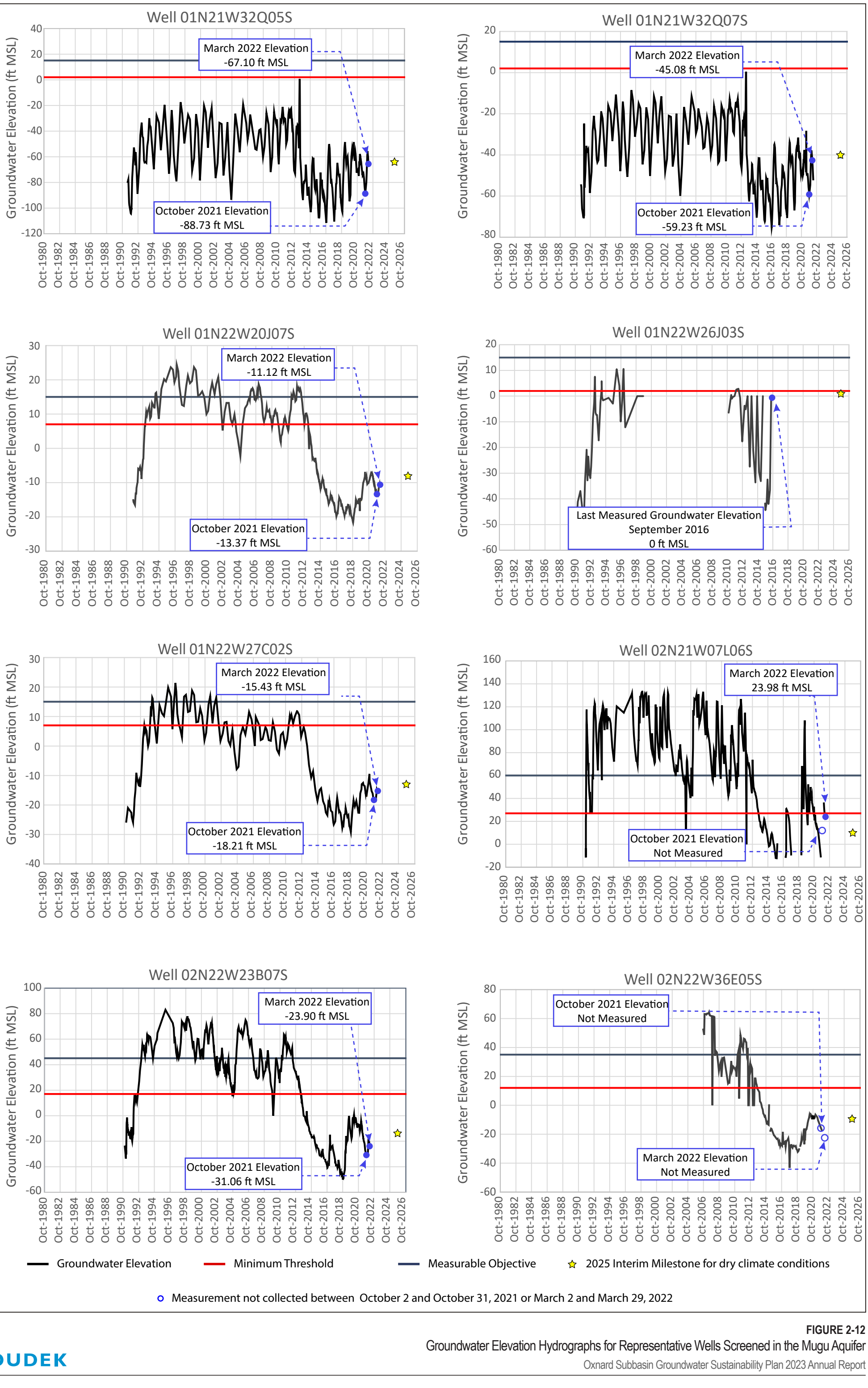


FIGURE 2-12

Groundwater Elevation Hydrographs for Representative Wells Screened in the Mugu Aquifer

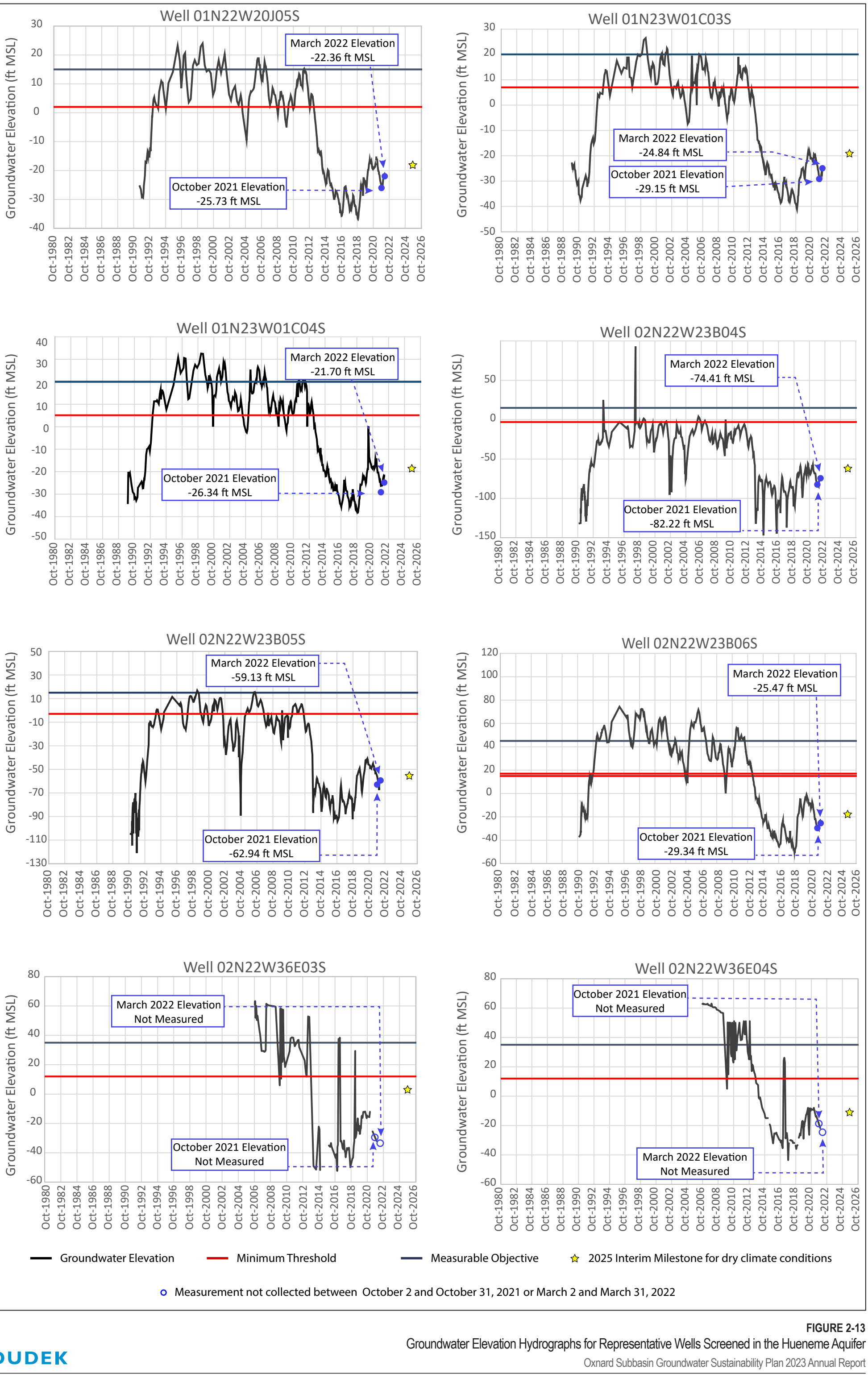


FIGURE 2-13

Groundwater Elevation Hydrographs for Representative Wells Screened in the Hueneme Aquifer

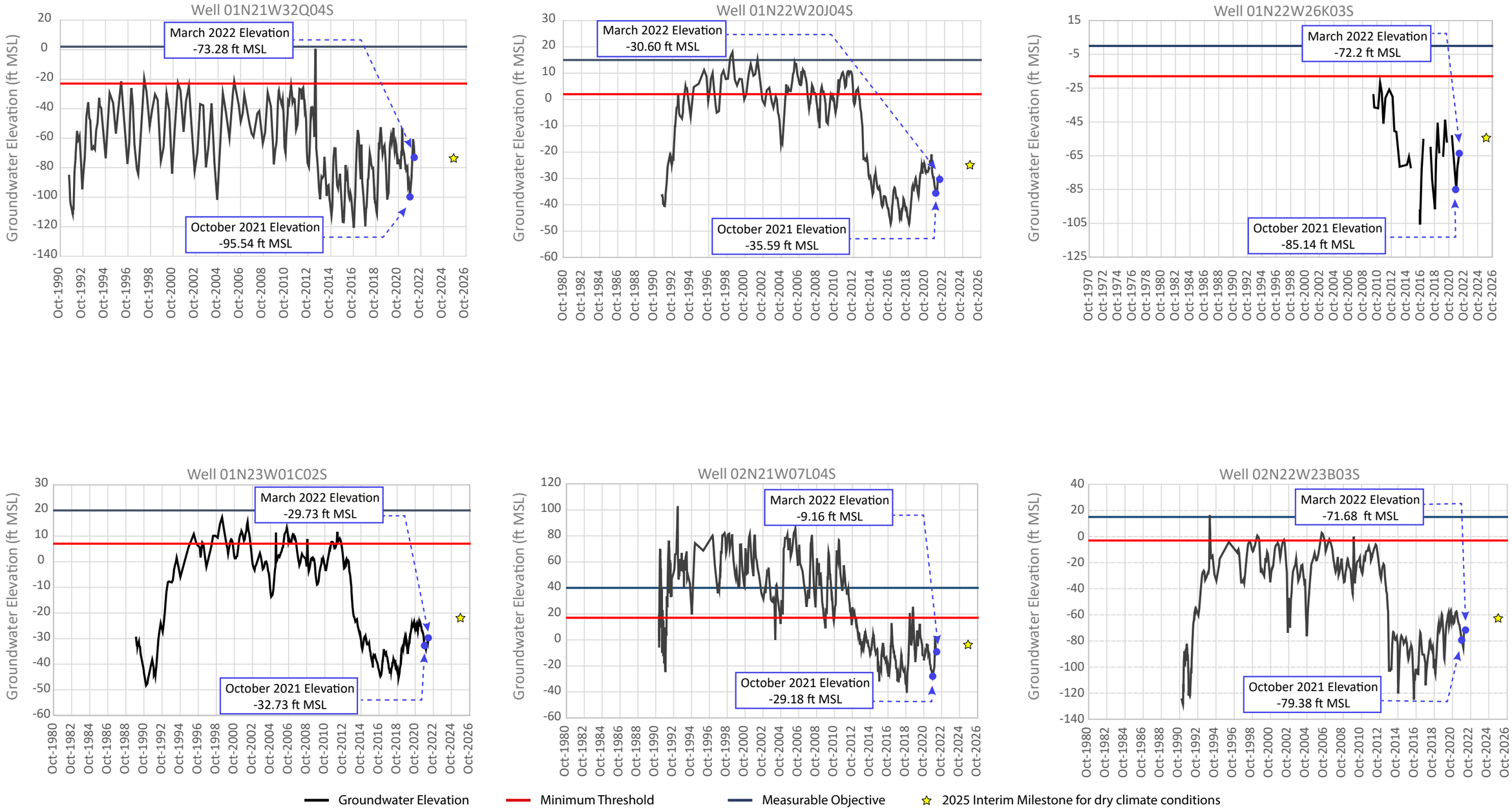
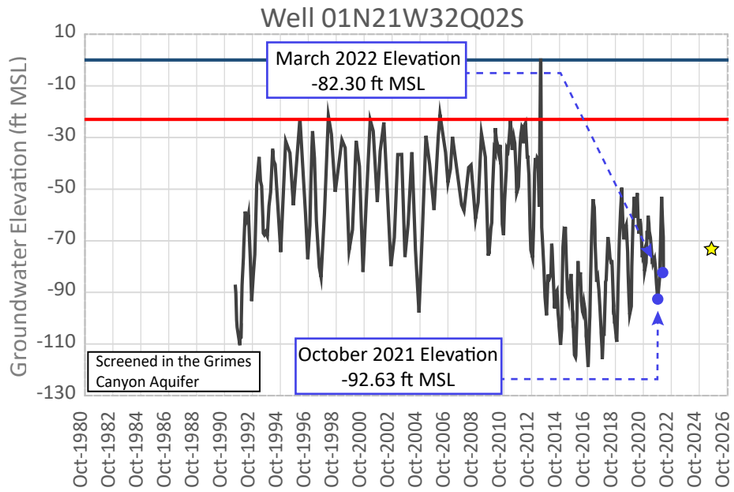
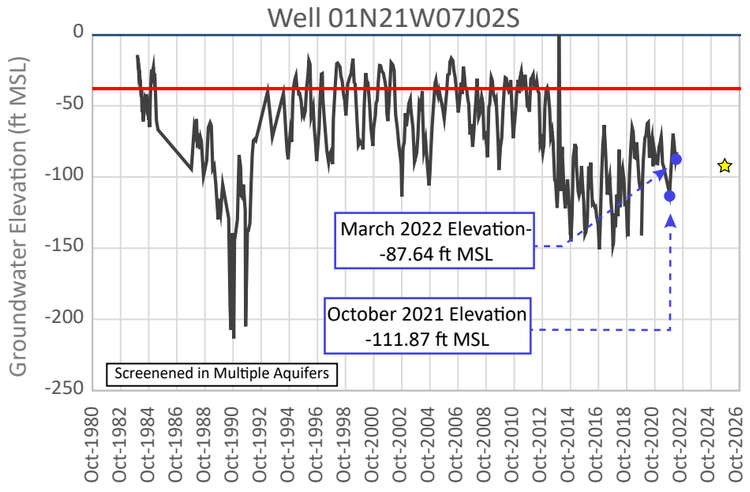
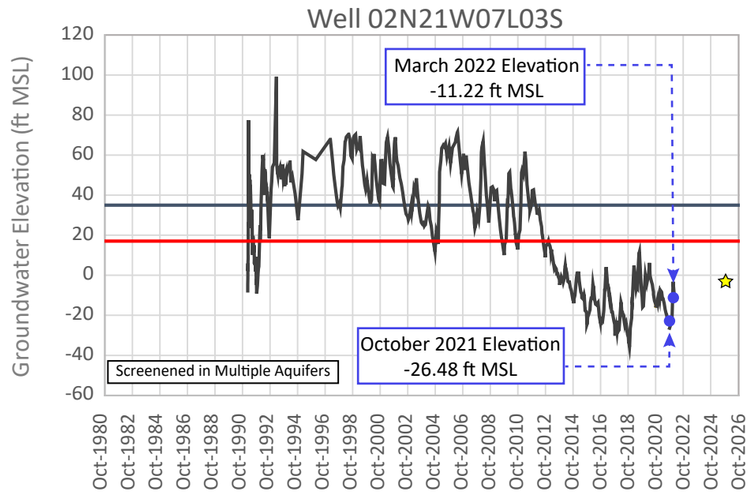


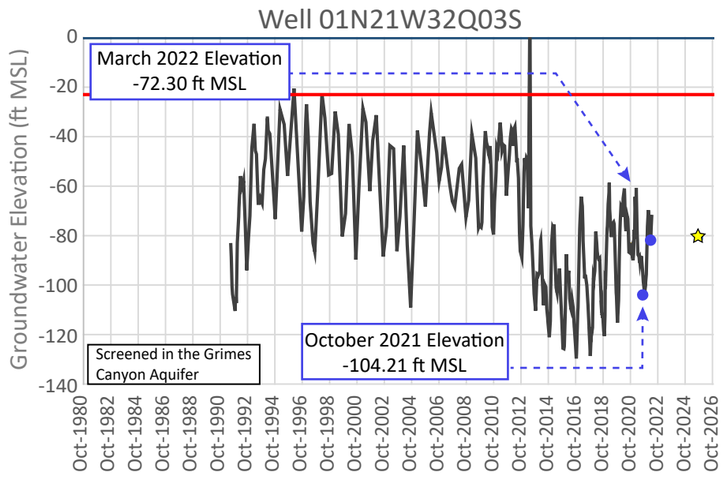
FIGURE 2-14

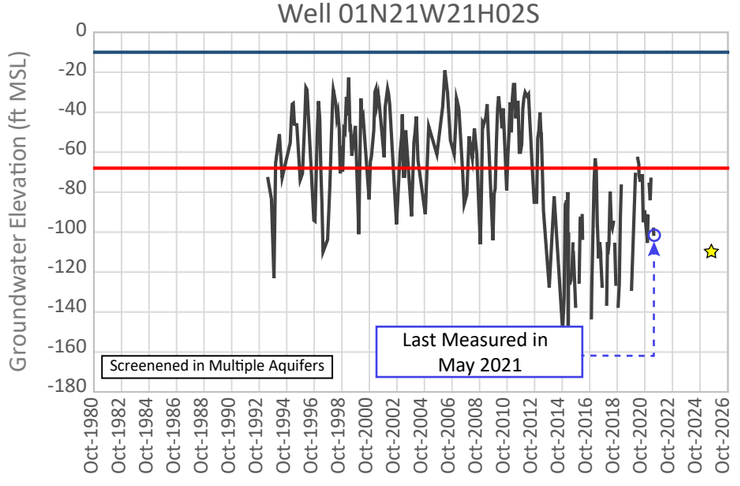
Groundwater Elevation Hydrographs for Representative Wells Screened in the Fox Canyon Aquifer

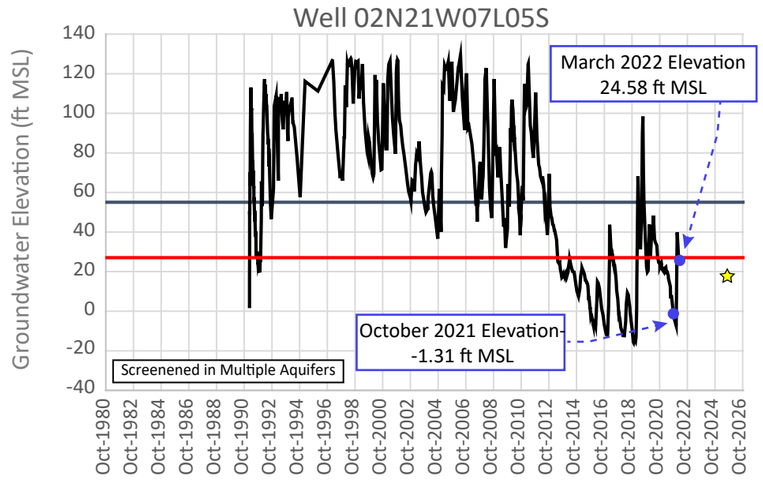










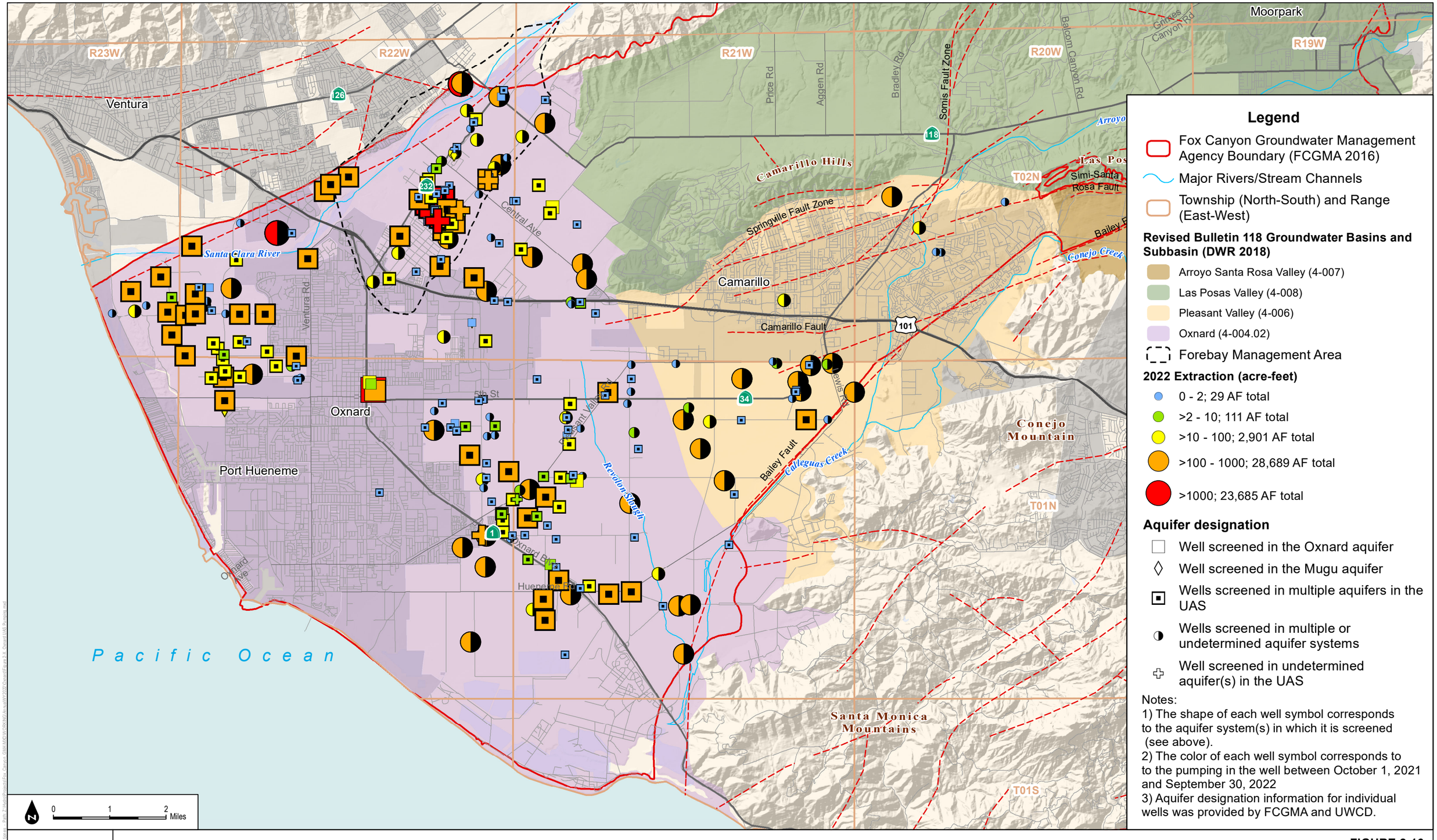


Groundwater Elevation — Minimum Threshold — Measurable Objective — ☆ 2025 Interim Milestone for dry climate conditions

○ Measurement not collected between October 2 and October 31, 2021 or March 2 and March 31, 2022

FIGURE 2-15

Groundwater Elevation Hydrographs for Representative Wells Screened in the Grimes Canyon Aquifer and Multiple Aquifers



Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Forebay Management Area

2022 Extraction (acre-feet)

- 0 - 2; 29 AF total
- >2 - 10; 111 AF total
- >10 - 100; 2,901 AF total
- >100 - 1000; 28,689 AF total
- >1000; 23,685 AF total

Aquifer designation

- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS
- Wells screened in multiple or undetermined aquifer systems
- Well screened in undetermined aquifer(s) in the UAS

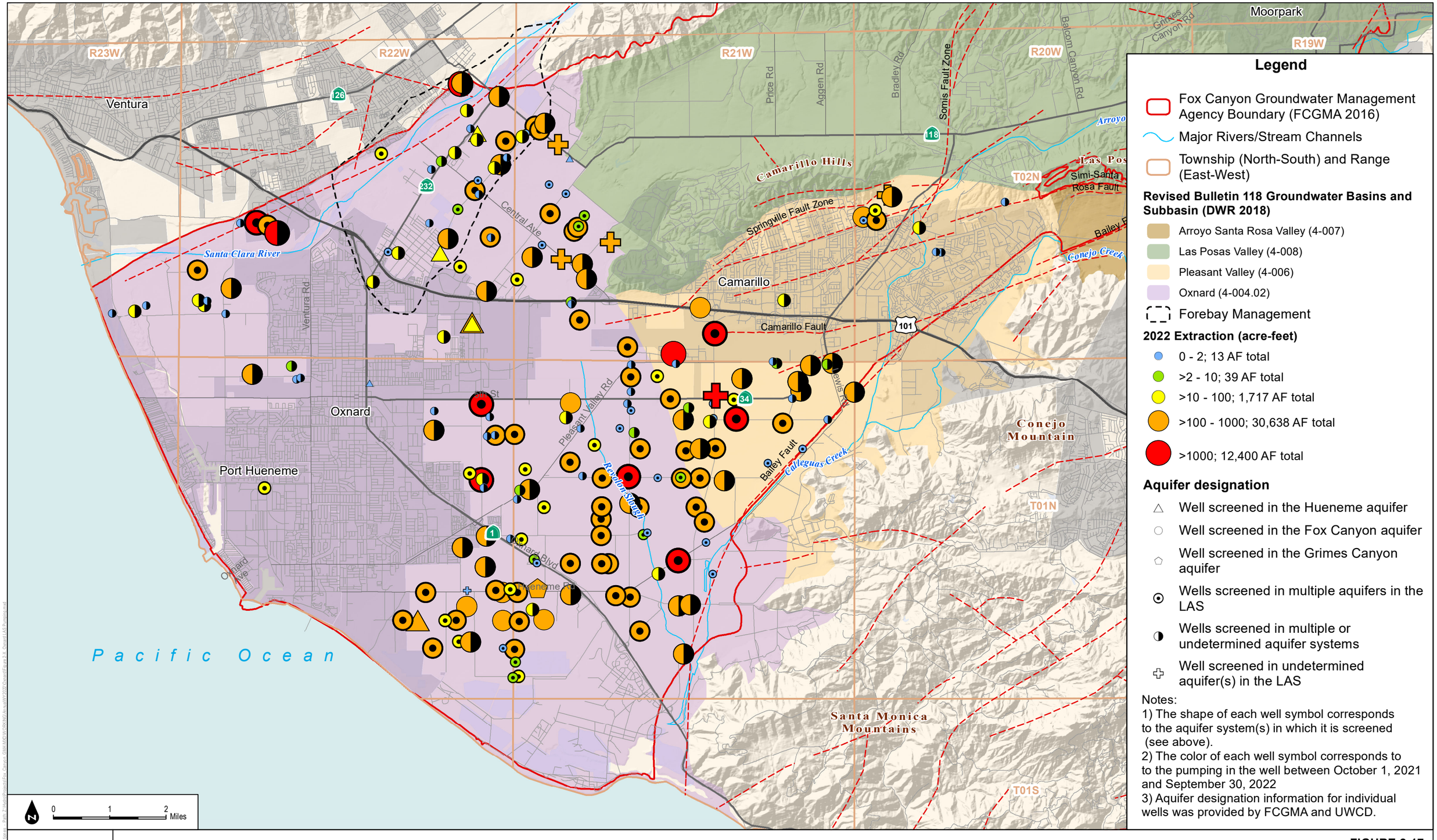
Notes:
1) The shape of each well symbol corresponds to the aquifer system(s) in which it is screened (see above).
2) The color of each well symbol corresponds to to the pumping in the well between October 1, 2021 and September 30, 2022
3) Aquifer designation information for individual wells was provided by FCGMA and UWCD.

SOURCE: DWR, FCGMA, VCWPD, UWCD

FIGURE 2-16

Groundwater Production from the UAS between October 1, 2021 and September 30, 2022

DUDEK



Legend

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)
- Forebay Management

2022 Extraction (acre-feet)

- 0 - 2; 13 AF total
- >2 - 10; 39 AF total
- >10 - 100; 1,717 AF total
- >100 - 1000; 30,638 AF total
- >1000; 12,400 AF total

Aquifer designation

- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS
- Wells screened in multiple or undetermined aquifer systems
- Well screened in undetermined aquifer(s) in the LAS

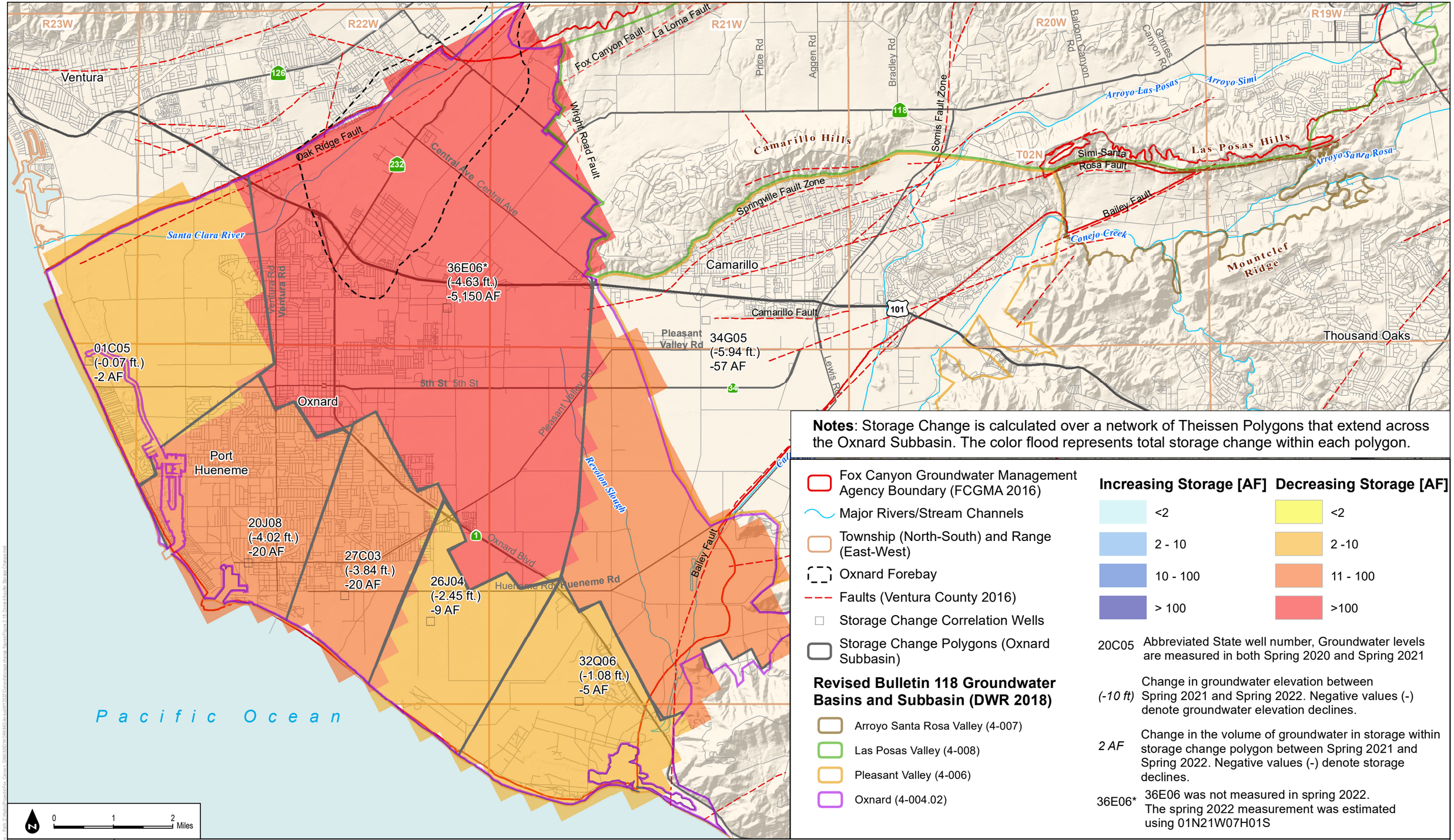
Notes:
1) The shape of each well symbol corresponds to the aquifer system(s) in which it is screened (see above).
2) The color of each well symbol corresponds to to the pumping in the well between October 1, 2021 and September 30, 2022
3) Aquifer designation information for individual wells was provided by FCGMA and UWCD.

SOURCE: DWR, FCGMA, VCWPD, UWCD

FIGURE 2-17

Groundwater Production from the LAS between October 1, 2021 and September 30, 2022

DUDEK



Notes: Storage Change is calculated over a network of Theissen Polygons that extend across the Oxnard Subbasin. The color flood represents total storage change within each polygon.

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)
- Oxnard Forebay
- Faults (Ventura County 2016)
- Storage Change Correlation Wells
- Storage Change Polygons (Oxnard Subbasin)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

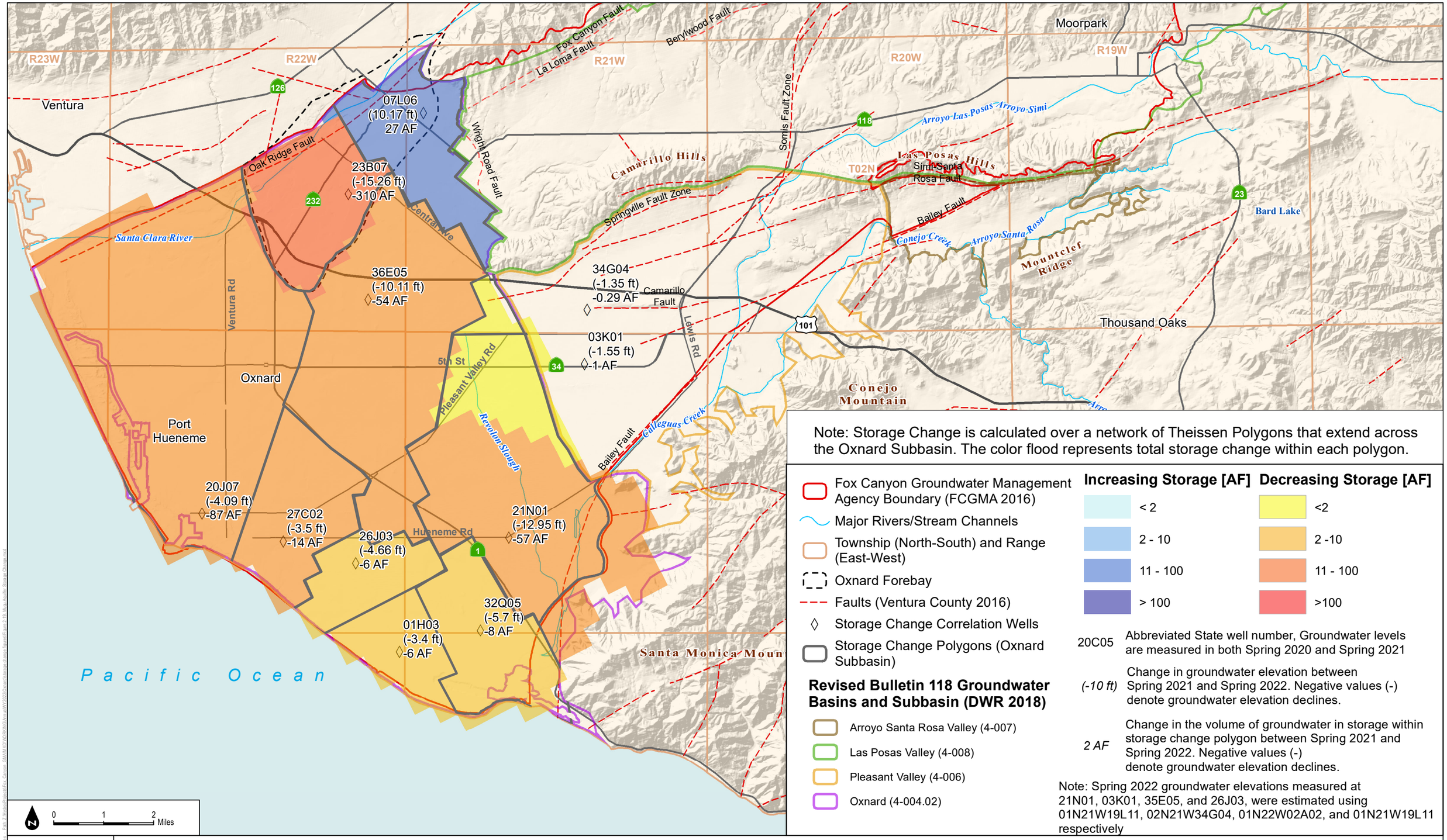
Increasing Storage [AF]	Decreasing Storage [AF]
<2	<2
2 - 10	2 -10
10 - 100	11 - 100
> 100	>100

20C05	Abbreviated State well number, Groundwater levels are measured in both Spring 2020 and Spring 2021
(-10 ft)	Change in groundwater elevation between Spring 2021 and Spring 2022. Negative values (-) denote groundwater elevation declines.
2 AF	Change in the volume of groundwater in storage within storage change polygon between Spring 2021 and Spring 2022. Negative values (-) denote storage declines.
36E06*	36E06 was not measured in spring 2022. The spring 2022 measurement was estimated using 01N21W07H01S

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-18

Change in Storage in the Oxnard Aquifer: Spring 2021 to Spring 2022



Note: Storage Change is calculated over a network of Theissen Polygons that extend across the Oxnard Subbasin. The color flood represents total storage change within each polygon.

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)
- Oxnard Forebay
- Faults (Ventura County 2016)
- Storage Change Correlation Wells
- Storage Change Polygons (Oxnard Subbasin)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Increasing Storage [AF]	Decreasing Storage [AF]
< 2	<2
2 - 10	2 -10
11 - 100	11 - 100
> 100	>100

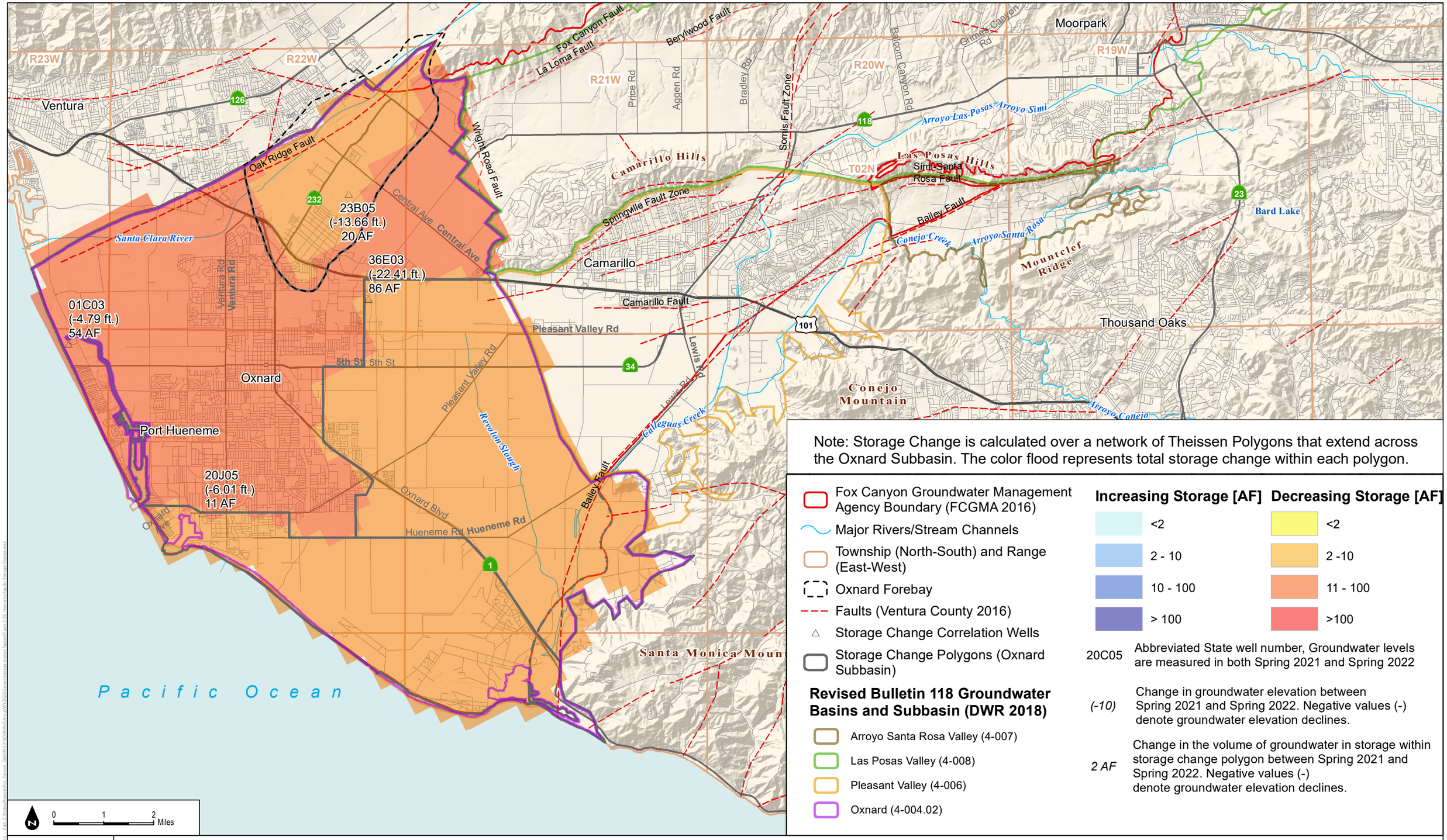
20C05	Abbreviated State well number, Groundwater levels are measured in both Spring 2020 and Spring 2021
(-10 ft)	Change in groundwater elevation between Spring 2021 and Spring 2022. Negative values (-) denote groundwater elevation declines.
2 AF	Change in the volume of groundwater in storage within storage change polygon between Spring 2021 and Spring 2022. Negative values (-) denote groundwater elevation declines.

Note: Spring 2022 groundwater elevations measured at 21N01, 03K01, 35E05, and 26J03, were estimated using 01N21W19L11, 02N21W34G04, 01N22W02A02, and 01N21W19L11 respectively

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-19

Change in Storage in the Mugu Aquifer: Spring 2021 to Spring 2022



Note: Storage Change is calculated over a network of Theissen Polygons that extend across the Oxnard Subbasin. The color flood represents total storage change within each polygon.

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)
- Oxnard Forebay
- Faults (Ventura County 2016)
- Storage Change Correlation Wells
- Storage Change Polygons (Oxnard Subbasin)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Increasing Storage [AF]	Decreasing Storage [AF]
<2	<2
2 - 10	2 -10
10 - 100	11 - 100
> 100	>100

20C05 — Abbreviated State well number, Groundwater levels are measured in both Spring 2021 and Spring 2022

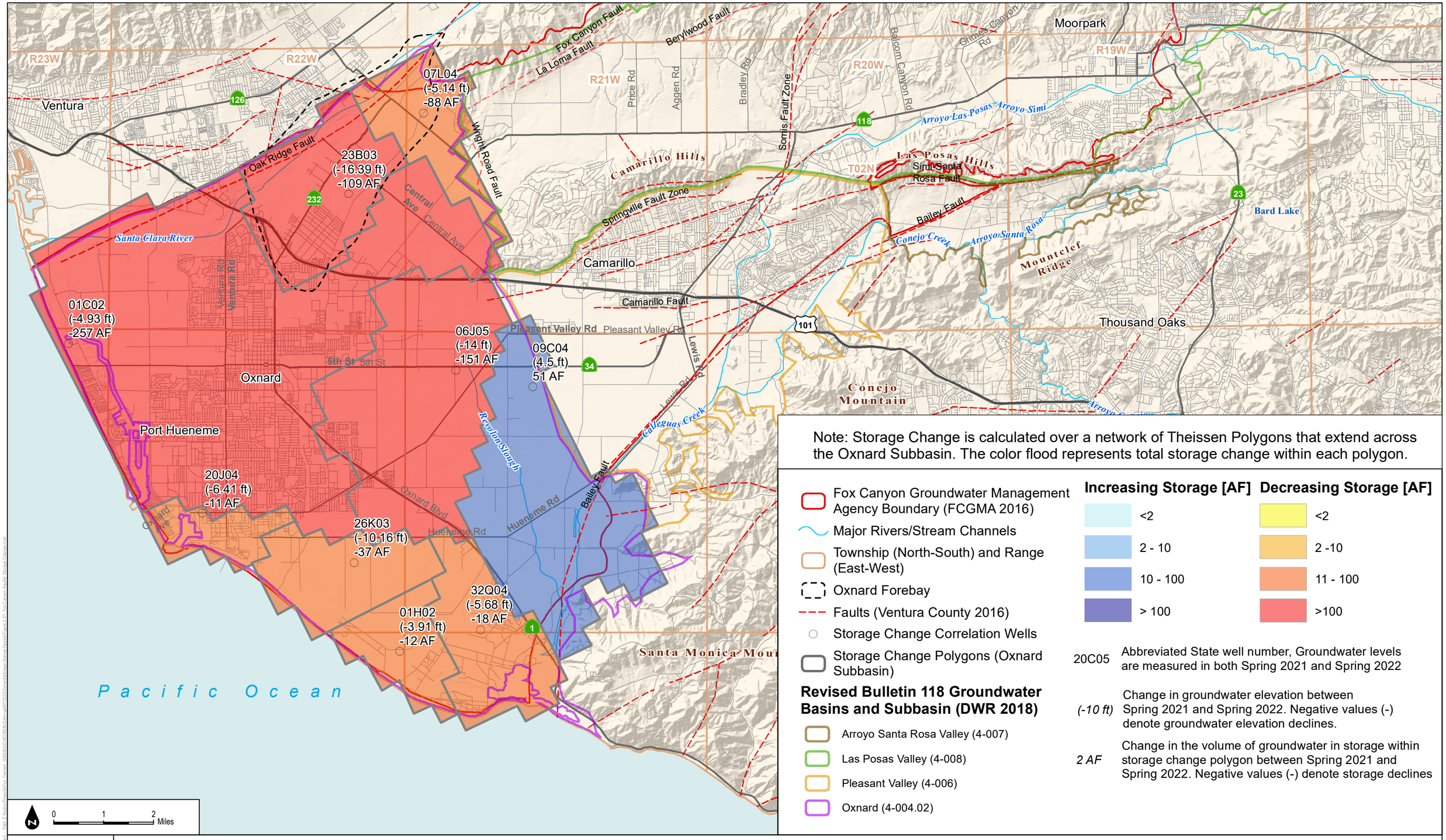
(-10) — Change in groundwater elevation between Spring 2021 and Spring 2022. Negative values (-) denote groundwater elevation declines.

2 AF — Change in the volume of groundwater in storage within storage change polygon between Spring 2021 and Spring 2022. Negative values (-) denote groundwater elevation declines.

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-20

Change in Storage in the Hueneme Aquifer: Spring 2021 to Spring 2022



Note: Storage Change is calculated over a network of Theissen Polygons that extend across the Oxnard Subbasin. The color flood represents total storage change within each polygon.

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)
- Oxnard Forebay
- Faults (Ventura County 2016)
- Storage Change Correlation Wells
- Storage Change Polygons (Oxnard Subbasin)

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Increasing Storage [AF]	Decreasing Storage [AF]
<2	<2
2 - 10	2 -10
10 - 100	11 - 100
> 100	>100

20C05	Abbreviated State well number, Groundwater levels are measured in both Spring 2021 and Spring 2022
(-10 ft)	Change in groundwater elevation between Spring 2021 and Spring 2022. Negative values (-) denote groundwater elevation declines.
2 AF	Change in the volume of groundwater in storage within storage change polygon between Spring 2021 and Spring 2022. Negative values (-) denote storage declines

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-21

Change in Storage in the Fox Canyon Aquifer: Spring 2021 to Spring 2022

Note: Storage Change is calculated over a network of Theissen Polygons that extend across the Oxnard Subbasin. The color flood represents total storage change within each polygon.

- Fox Canyon Groundwater Management Agency Boundary (FCGMA 2016)
- Major Rivers/Stream Channels
- Township (North-South) and Range (East-West)
- US Highway
- State Route
- Oxnard Forebay
- Faults (Ventura County 2016)
- Storage Change Correlation Wells

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

- Arroyo Santa Rosa Valley (4-007)
- Las Posas Valley (4-008)
- Pleasant Valley (4-006)
- Oxnard (4-004.02)

Increasing Storage [AF]	Decreasing Storage [AF]
<2	<2
2 - 10	2 -10
10 - 100	11 - 100
> 100	>100

20C05 — Abbreviated State well number, Groundwater levels are measured in both Spring 2021 and Spring 2022

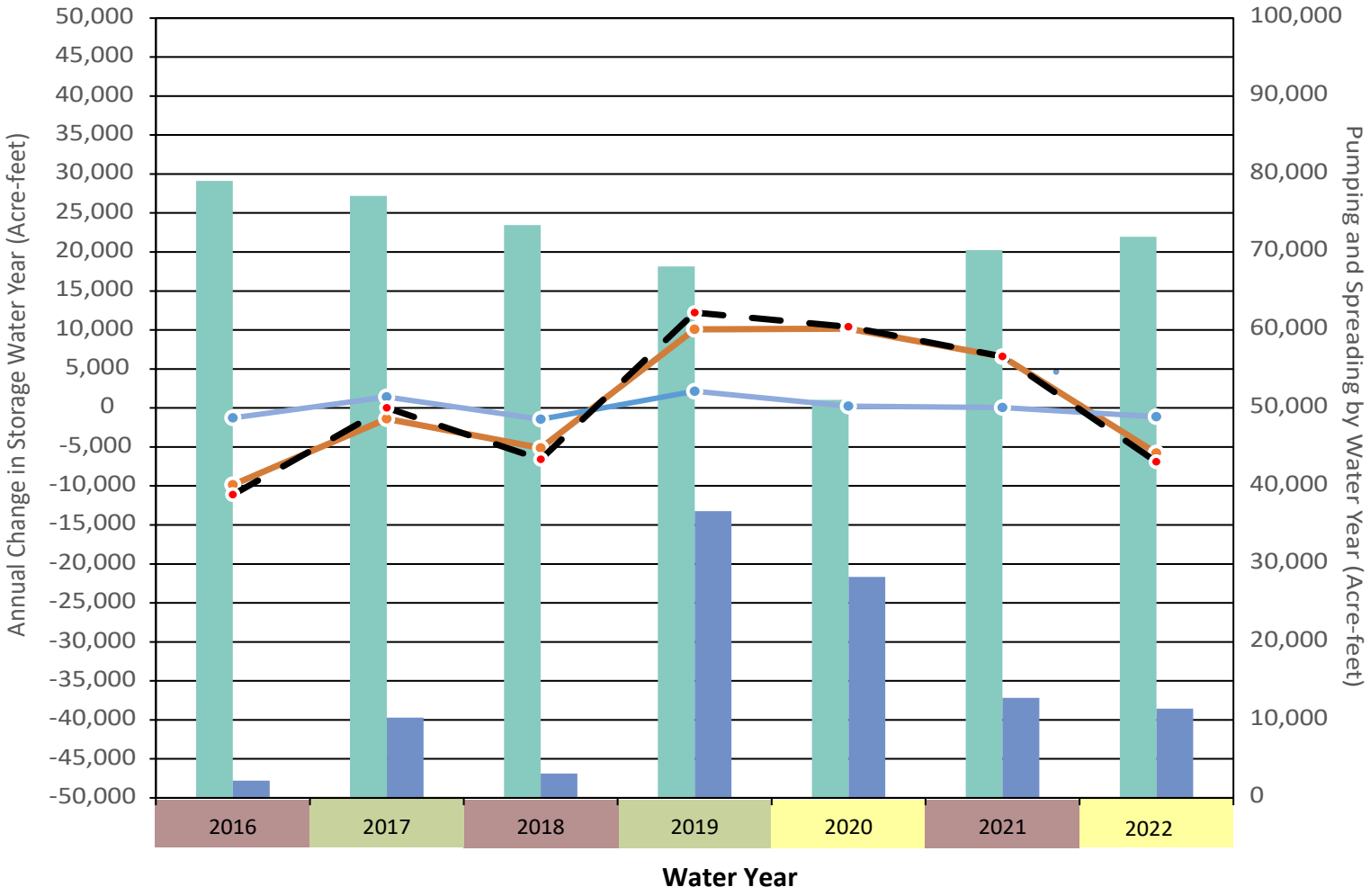
(-10 ft) — Change in groundwater elevation between Spring 2021 and Spring 2022. Negative values (-) denote groundwater elevation declines.

2 AF — Change in the volume of groundwater in storage within storage change polygon between Spring 2021 and Spring 2022. Negative values (-) denote storage declines

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-22

Change in Storage in the Grimes Canyon Aquifer: Spring 2021 to Spring 2022



Notes:

1) Total change in storage is the sum of the change in storage from each aquifer system.

2) Water year is from October 1 through September 30 (EX: water year 2015 is from Oxctober 1, 2014 through September 30, 2015).

3) Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined as Wet (≥150% of average), Above Normal (≥100% to <150% of average), Below Normal (≥75% to <100% of average), Dry (≥50% to <75% of average), and Critical (<50% of average).

Change in Storage

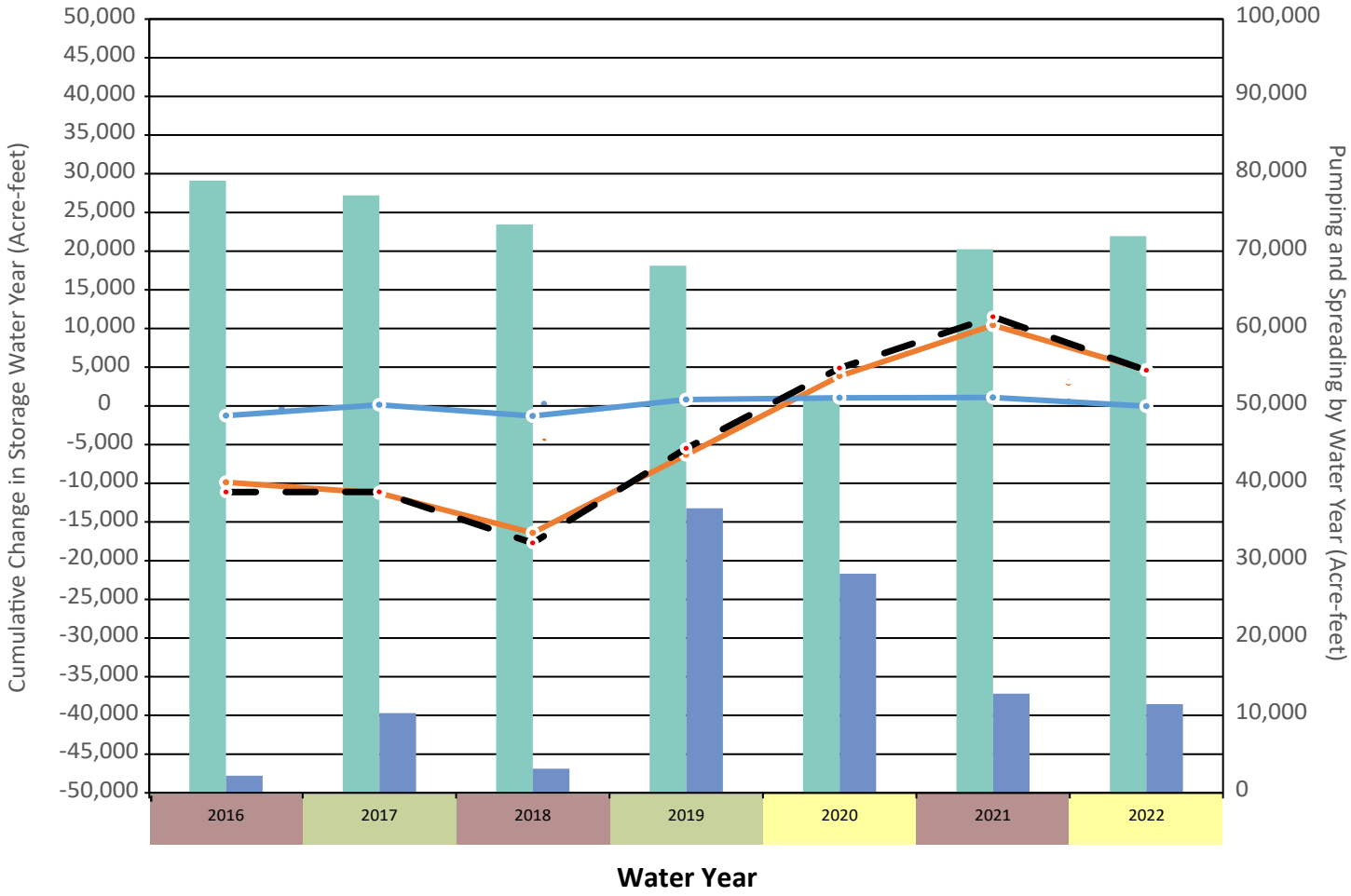
Pumping Spreading UAS LAS Total

Water Year Type

Wet Above Normal Below Normal Dry Critical

FIGURE 2-23

Water Year Type, Groundwater Use, and Annual Change in Storage in the Oxnard Subbasin



Notes:

1) Total change in storage is the sum of the change in storage from each aquifer system.

2) Water year is from October 1 through September 30 (EX: water year 2015 is from Oxctober 1, 2014 through September 30, 2015).

3) Water year type is based on the percentage of the water year precipitation compared to the 30-year precipitation average. Types are defined as Wet (≥150% of average), Above Normal (≥100% to <150% of average), Below Normal (≥75% to <100% of average), Dry (≥50% to <75% of average), and Critical (<50% of average).

Change in Storage

Pumping Spreading UAS LAS Total

Water Year Type

Wet Above Normal Below Normal Dry Critical

FIGURE 2-24

Water Year Type, Groundwater Use, and Cumulative Change in Storage in the Oxnard Subbasin