Pleasant Valley Basin Groundwater Sustainability Plan 2020 Annual Report: Covering Water Years 2016 through 2019

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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 Pleasant Valley Basin (PVB) within its jurisdictional boundaries, in coordination with the other two GSAs in the basin, has prepared this first annual report for the Pleasant Valley Basin 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 PVB. The GSP for the PVB was submitted to the Department of Water Resources (DWR) on January 13, 2020. SGMA regulations require that an annual report be submitted to the Department of Water Resources (DWR) by April 1 of each year following the adoption of the GSP. The data presented in the PVB GSP ends in water year 2015. This annual report provides an update on the groundwater conditions in the PVB for water years 2016 through 2019 (October 1, 2015 through September 30, 2019).

Since 2015, the PVB experienced two critical water years, 2016 and 2018, in which precipitation was below 50% of the long-term average precipitation, and two above normal water years, 2017 and 2019, in which precipitation was greater than the average precipitation. The volume of precipitation received in the PVB and surrounding watershed influenced both direct recharge to the PVB and the availability of surface water in the Santa Clara River that could be diverted and delivered to the PVB via the Pleasant Valley Pipeline (PVP) and Conejo Creek. In general, groundwater elevations in the PVB responded to the water year precipitation, with spring water levels rising during the above normal water years and falling during the critical water years. Spring groundwater elevations in 2019 were higher in the older alluvium than they were in the spring of 2015. Groundwater elevations in the Fox Canyon aquifer in western PVB have varied with water year type, but have not yet begun a long-term recovery.

Calculations of change in storage in the PVB are constrained by data coverage, with insufficient data in the older alluvium and limited data in the Fox Canyon aquifer on which to base an estimate of the change in groundwater in storage. As a result of the aerial coverage of groundwater measurements and the small changes in observed groundwater elevations, the volume of groundwater in storage in the Fox Canyon aquifer in the PVB effectively remained constant between the 2016 and 2019 water years.

Data gaps identified in the GSP remain in this annual report. Some of the critical data gaps include the timing and number of groundwater elevation measurements available for creating spring and fall contour maps, the availability of data on surface water diversions from agencies reporting to FCGMA, and the current timeframe for reporting groundwater production, which facilitates reporting groundwater production on a calendar year, rather than a water year basis. These data gaps will be closed as implementation of the GSP progresses.

FCGMA has already undertaken several steps toward implementing the GSP, with implementation planning occurring concurrently with the GSP development process. Critically, through DWR's Technical Support Services (TSS) program a new nested groundwater well cluster was installed near the Arroyo Las Posas to better delineate groundwater elevations in northern PVB. Additionally, FCGMA successfully requested stakeholder facilitation services through DWR's Facilitation Support Services program to support implementation of the GSP. The FCGMA Board of Directors continues to prioritize stakeholder feedback in the implementation phase of the GSP because of the vital role stakeholders play in ensuring the long-term sustainable use of groundwater resources in the PVB.

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1 Plan Area and Background

1.1 Background

The Fox Canyon Groundwater Management Agency (FCGMA), the Groundwater Sustainability Agency (GSA) for the portions of the Pleasant Valley Basin (PVB) within its jurisdictional boundaries, in coordination with the other two GSAs in the basin, has prepared this first annual report for the Pleasant Valley Basin Groundwater Sustainability Plan (GSP) in compliance with the 2014 Sustainable Groundwater Management Act (SGMA) (California Water Code, Section 10720 et seq.). SGMA requires that an annual report be submitted to the Department of Water Resources (DWR) by April 1 of each year following the adoption of the GSP. FCGMA adopted a GSP for the PVB in December 2019, and submitted the GSP to DWR on January 13, 2020 (DWR 2020).

FCGMA is one of three Groundwater Sustainability Agencies (GSAs) in the PVB. The other two GSAs are the Camrosa Water District (CWD)–Pleasant Valley GSA and the Pleasant Valley Outlying Areas GSA (County of Ventura). This annual report applies to the entirety of the PVB. To coordinate management and reporting in the basin, FCGMA and CWD have executed an MOU, and FCGMA and the County have formed a JPA.

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) and includes portions of the Oxnard Subbasin and the Las Posas Valley Basin (LPVB), the PVB, and the Arroyo Santa Rosa Valley Basin (ASRVB).

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 (FCGMA 2020). 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 (FCGMA 2020).

[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 within the FCGMA jurisdictional area are: Ventura, Oxnard, Camarillo, Port Hueneme, and Moorpark

1.1.2 PVB Groundwater Sustainability Plan

On December 13, 2019, the FCGMA Board held a public hearing and adopted a GSP for the PVB. The purpose of the GSP was to define the conditions under which the groundwater resources of the entire PVB will be managed sustainably in the future (FCGMA 2019a). Groundwater conditions were evaluated in five hydrostratigraphic units in the PVB. These hydrostratigraphic units are similar to the five principal aquifers in the Oxnard Subbasin, which adjoins commonly grouped into an upper and lower aquifer system. In the PVB, the older alluvium is the time equivalent stratigraphic unit to the Upper Aquifer System (UAS) in the Oxnard Subbasin. The Upper San Pedro Formation, Fox Canyon aquifer, and Grimes Canyon aquifer compose the Lower Aquifer System (LAS) in the PVB. The primary sustainability goal for the PVB adopted in the GSP, is "to maintain a sufficient volume of groundwater in storage in the older alluvium and the Lower Aquifer System so that there is no net decline in groundwater elevation or storage over wet and dry climatic cycles." (FCGMA 2019a). Additionally, "groundwater levels in the PVB should be maintained at elevations that are high enough to not inhibit the ability of the Oxnard Subbasin to prevent net landward migration of the saline water impact front" in the Oxnard Subbasin after 2040 (FCGMA 2019a). These goals were established based on both historical and potential future undesirable results to the groundwater resources of the PVB 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 PVB was found not to experience direct impacts from seawater intrusion or depletion of interconnected surface water.

The GSP established minimum threshold groundwater elevations, defined for the PVB, as groundwater levels that: allow declines during periods of future drought to be offset by recovery during future periods of above-average rainfall (FCGMA 2019a). These groundwater elevations were also found to limit seawater intrusion in the Oxnard Subbasin (FCGMA 2019a). In addition to minimum threshold groundwater elevations, the GSP also established measurable objective groundwater elevations. Measurable objective groundwater elevations were defined as "the groundwater levels throughout the PVB at which there is neither seawater flow into, nor freshwater flow out of the Upper Aquifer System or Lower Aquifer System in the Oxnard Subbasin" (FCGMA 2019a). Minimum threshold and measurable objective groundwater elevations were established at nine representative monitoring points (or "key wells") in the PVB (FCGMA 2019a).

The GSP documented conditions throughout the PVB through the Fall of 2015. This annual report evaluates 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 since the Fall of 2015, through the end of water year 2019[3].

1.2 Plan Area

The PVB (DWR Groundwater Basin 4-006) is bounded to the north by the Springville fault zone and Somis Gap, to the east by the ASRVB (DWR Bulletin 118 Groundwater Basin 4-007) and Conejo Mountain, to the southeast by the Santa Monica Mountains, and to the west and southwest by the Oxnard Subbasin of the Santa Clara River Valley Groundwater Basin (DWR Groundwater Basin 4-04.02; Figure 1-1, Vicinity Map for the Pleasant Valley Basin).

[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 2019 water year begins on October 1, 2018, and ends on September 30, 2019.

On the west and southwest, the PVB is in hydrogeologic communication with the Oxnard Subbasin. The boundary between the PVB and Oxnard Subbasin is defined by a facies change between the predominantly coarser-grained sand and gravel deposits that compose the Upper Aquifer System in the Oxnard Subbasin and the finer-grained clay and silt-rich deposits of the Upper Aquifer System in the PVB. To the north, in the Camarillo Hills area, the Springville Fault Zone is believed to form a groundwater flow barrier at depth between the aquifers in the LPVB and the PVB, based on historical hydraulic head differences of up to 60 feet across the fault zone (DWR 1975). However, shallow alluvial deposits in the vicinity of Arroyo Las Posas and the Somis Gap are in hydraulic communication with the LPVB (CMWD 2017). The eastern boundary of the PVB is formed by a constriction in Arroyo Santa Rosa Valley (SWRCB 1956; DWR 2003). The southern boundary of the PVB is delineated by the contact between the alluvial deposits and surface exposures of bedrock in the Santa Monica Mountains (DWR 2003).

1.2.1 Climate

The climate of Pleasant Valley is typical of coastal Southern California, with average daily temperatures ranging generally from 43°F to 80°F in summer and from 41°F to 74°F in winter (FCGMA 2019a). Typically, the majority of the precipitation in the Ventura County region falls between November and April. Precipitation is measured at several stations in the PVB (Figure 1-2; Precipitation and Stream Gauges in the Pleasant Valley Basin). Water year precipitation, measured at Stations 003 and 259, in the central PVB is highly variable, ranging from 4.5 inches in 1990 to 34.9 inches in 1998 (Figure 1-3; Pleasant Valley Basin Historical Water Year Precipitation). On average, the PVB received approximately 13.5 inches of precipitation per water year between 1957 and 2019.

The GSP for the PVB included precipitation through the 2015 water year (FCGMA 2019a). Since 2015, the PVB has experienced two above normal[4] water years (2017 and 2019), and two critical water years (2016 and 2018). The average precipitation during this period was 11.7 inches, which is less than the long-term mean precipitation in the PVB. Overall, the PVB has continued to experience drier than average conditions since 2015.

1.2.2 Surface Water and Drainage Features

The dominant surface water bodies in Pleasant Valley are the Arroyo Las Posas, Calleguas Creek, and Conejo Creek, which drain watersheds that extend beyond the boundaries of the PVB (Figure 1-2). There is only one active streamflow gauging station in the PVB. This station, maintained by the Ventura County Watershed Protection District, is located on Calleguas Creek near California State University Channel Islands, downstream of the confluence of Arroyo Las Posas and Conejo Creeks. Streamflow measured at this gauge for the past 10 water years is presented in Table 1-1 and shown on Figure 1-4.

Flow in Calleguas Creek is directly tied to the water year type (Section 1.2.1) with the highest average daily flows over the past 10 years occurring in 2010 and 2011, which were an above normal and a wet water years, respectively. Water years 2017 and 2019 recorded the third and fourth highest average daily flow over the last 10 years. These were above normal water years. In water years 2016 and 2018, which were critical water years, the average daily flow measured at gauge 805 was less than half the cumulative daily average flow measured in 2017 and 2019 (Table 1-1).

[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.

Table 1-1. Streamflow on Calleguas Creek for Water Years 2010 through 2019

Water Year	Average Daily Flow (cfs) at Gauge 805
2010	52.5
2011	67.1
2012	19.1
2013	12.9
2014	9.2
2015	9.1
2016	6.9
2017	44.9
2018	11.4
2019	35.2

Note: cfs = cubic feet per second

1.3 Annual Report Organization

This is the first Annual Report prepared since the GSP for the PVB was submitted to DWR. This report is organized according to the GSP Emergency Regulations. Chapter 1 provides the background information on the GSP, the PVB, and the Fox Canyon Groundwater Management Agency. Chapter 2 provides information on the groundwater conditions in the PVB since 2015, including groundwater elevations, groundwater extractions, surface water supply, total water available, 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 PVB since 2015, which is the end of the data used to develop the GSP.

2.1 Groundwater Elevations

Groundwater elevation contour maps for the older alluvium, and the Fox Canyon aquifer are presented in Figures 2-1 through 2—21. These maps show the seasonal high and low groundwater elevations between the spring of 2016 and the spring of 2019. As discussed in section 1.2.1, water years 2016 and 2018 were critical water years in the PVB, and water years 2017 and 2019 were above normal water years. Spring groundwater elevations were defined as any groundwater elevation measured within a four-week window between March 2 and March 29 of each year. Fall groundwater elevations were defined as any groundwater elevation measured between October 2 and October 29 of each year. The GSP recommended collecting groundwater elevations within a two-week window in the future (FCGMA 2019a). FCGMA has begun the process of prioritizing recommendations made in the GSP, and evaluating the timeframe and feasibility of implementing these recommendations.

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, and vertical gradients between aquifers. It is important to note, however, that production wells in the PVB 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 PVB and adjoining Oxnard Subbasin 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 a separate management area in the PVB (FCGMA 2019a). By using wells screened only within an individual aquifer, the lateral extent of the pumping depression is not well characterized.

2.1.1 Groundwater Elevation Contour Maps

2.1.1.1 Older Alluvium (Oxnard and Mugu Aquifers)

There are only four wells screened solely within the Older Alluvium in the PVB. Of these four wells, only wells 02N21W34G04S and 02N21W34G05S were measured during the spring and fall of water years 2016 through 2019 (Figures 2-1 through 2-14). These wells are part of a nested well cluster in the western PVB, with well 02N21W34G04S screened in the age equivalent stratigraphic unit to the Mugu aquifer in the Oxnard Subbasin and well 02N21W34G05S screened in the age equivalent stratigraphic unit to the Oxnard aquifer in the Oxnard Subbasin. Groundwater elevations in each well reflect both the seasonal and inter-annual variations in precipitation and groundwater production in the PVB. Groundwater elevations in the spring of 2017 and 2019 were 7 to 10 feet higher than those measured in the spring of 2016 and 2018 at well 02N21W34G05S. At well 02N21W34G04S the spring groundwater elevations in 2017 and 2019 were 15 to 20 feet higher than the spring groundwater elevations in 2016 and 2018. Since the spring of 2015, the last year of data reported in the GSP, the spring groundwater elevation in well 02N21W34G04S has recovered approximately seven feet, while the spring groundwater elevation in well 02N21W34G05S has declined by approximately four feet.

Fall groundwater elevations were higher in 2017 than 2016 in wells 02N21W34G04S and 02N21W34G05S, and were stable between 2017 and 2018 in these wells. The fall 2018 groundwater elevation in well 02N21W34G05S remained approximately 8 feet lower than the fall 2015 groundwater elevation, while the fall 2018 groundwater elevation in well 02N21W34G04S was approximately 1 foot higher than the fall 2105 groundwater elevation.

2.1.1.2 Fox Canyon Aquifer

In western PVB, groundwater elevations in the Fox Canyon aquifer reflect both the seasonal and inter-annual variations in precipitation and groundwater production, consistent with the trends observed in the older alluvium in the same area (Figures 2-15 through 2-21). However, the Fox Canyon aquifer in the PVB is extensively faulted. This faulting impacts groundwater movement through the Fox Canyon aquifer. As a result the groundwater elevations in northern PVB, do not follow the same trends as those observed in western PVB. Additionally, in western PVB, the groundwater contours in the Fox Canyon aquifer are limited by the number of wells screened solely within this aquifer. This is an area of known groundwater production from wells screened across multiple aquifers.

In the spring of 2017 and 2019 groundwater elevations in the western PVB were 10 to 20 feet higher than they were in the spring of 2016 and 2018 (Figures 2-15, 2-17, 2-19, and 2-21). In northern PVB, the groundwater elevations measured at well 02N20W19M05S did not change between the spring of 2016 and the spring of 2017. The spring 2018 groundwater elevation measured at this well was approximately four feet lower than the spring 2017 groundwater elevation, and the spring 2019 groundwater elevation declined by an additional 6 feet.

Fall groundwater elevations were not measured at well 02N20W19M05S in northern PVB. In western PVB, the lowest fall groundwater elevations in 2016 and 2018 were measured in well 02N20W33R02S. Overall groundwater elevations in western PVB were 15 to 30 feet higher in the fall of 2018 than they were in the fall of 2016 (Figures 2-16 and 2-20). However, the groundwater elevation in the fall of 2018 at well 02N20W33R02S was approximately 15 feet lower than it was in the fall of 2015 (FCGMA 2019a).

2.1.2 Groundwater Elevation Hydrographs

Groundwater elevation hydrographs for each of the key wells identified in the GSP are presented in Figures 2-22 through 2-24. These key wells are the designated representative monitoring sites for the PVB (FCGMA 2019a). In the spring of 2019, the groundwater elevation in well 02N21W34G04S was approximately four feet below the minimum threshold for this well. In contrast, the groundwater elevation in well 02N21W34G05S was approximately 31 feet below the minimum threshold (Table 2-1; FCGMA 2019a). Groundwater elevations in both wells were above the 2025 interim milestone for dry climate conditions identified in the GSP (Table 2-1; FCGMA 2019a). The dry climate interim milestone is used for comparison in this annual report because the precipitation measured in the PVB between water years 2016 and 2019 is below average. However, it should also be noted that the first interim milestone is set for 2025, not 2020.

Table 2-1. Water Year 2019 Groundwater Elevations, Minimum Thresholds, Measurable Objectives, and Interim Milestones for Representative Monitoring Wells in the PVB

Well Number	Aquifer	Fall 2018 Groundwater Elevation (ft MSL)	Spring 2019 Groundwater Elevation (ft MSL)	Minimum Threshold (ft MSL)	Measurable Objective (ft MSL)	2025 Interim Milestone Dry Climate (ft MSL)
02N21W34G05S	Older Alluvium (Oxnard)	-18.96	1.31	32	40	0
01N21W03K01S	Older Alluvium (Mugu)	NM	NM	-53	5	-73
02N21W34G04S	Older Alluvium (Mugu)	-78.79	-44.13	-48	5	-72
01N21W03C01S	Fox	NM	-81.62	-48	0	-100
02N20W19M05S	Fox	NM	4.37	-135	65	-
02N21W34G02S	Fox	-111.02	-69.3	-53	0	-101
02N21W34G03S	Fox	-111.49	-70.95	-53	0	-104
01N21W02P01S	Multiple	NM	-35.52	-43	5	-80
01N21W04K01S	Multiple	NM	-62.03	-48	0	-112

Notes: NM = *Not Measured*

Groundwater elevations in the representative monitoring wells in western PVB were approximately 15 to 35 feet below the minimum thresholds in wells 01N21W03C01S, 02N21W34G02, and 02N21W34G03S (Table 2-1). Spring groundwater elevations have varied with water year type in these wells, but have not yet begun a long-term recovery trend that will be needed to reach the measurable objective or minimum threshold by 2040 (Figure 2-23).

Although groundwater elevations in well 02N20W19M05S declined between water years 2016 and 2019, the groundwater elevation in this well remains over 100 feet higher than the minimum threshold for the well (Table 2-1; Figure 2-23).

2.2 Groundwater Extraction

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 cannot be reported on a water year basis. Therefore, the groundwater extractions reported in Table 2-2 and shown on Figures 2-25 through 2-30 follow the historical precedent and are for calendar years 2016, 2017 and 2018. Table 2-2 includes the extractions reported for the first half of calendar year 2019 (Table 2-2; Figures 2-25 through 2-30).

Table 2-2. Calendar Year Groundwater Extractions in the Pleasant Valley Basin by Aquifer System and Water Use Sector

Calendar Year	Upper Aquifer System (Acre-Feet)			Lower Aquifer System (Acre-Feet)				Wells Screened in both the UAS and LAS (Acre-Feet)				Wells in Unassigned Aquifer Systems (Acre-Feet)			Total (Acre-Feet)
	AG	*Dom*	*Sub-Total*	*AG*	*Dom*	*M&I*	*Sub-Total*	*AG*	*Dom*	*M&I*	*Sub- Total*	*AG*	*Dom*	*Sub-Total*	
2016	93	4	97	4,077	2	2,852	6,931	7,268	42	1,625	8,935	-	<1	0	15,963
2017	82	5	87	3,392	2	2,548	5,942	7,668	10	2,008	9,686	-	<1	0	15,715
2018[a]	154	4	158	3,139	2	2,602	5,743	5,180	35	1,707	6,922	510	<1	510	13,333
2019[b]	5	2	7	824	1	1,039	1,864	1,096	17	737	1,850	354	<1	354	4,074

Notes: AG = Agriculture; Dom = domestic; M&I = Municipal and Industrial

[a] Groundwater extraction reporting for 2018 is preliminary and expected to change. Additional extraction reporting is anticipated.

[b] Partial year results reported. Groundwater production is through July 2019, and not all well operators have reported extractions.

It should be noted that groundwater extraction reporting for 2018 and the first half of 2019 are preliminary and expected to change. Additional extraction reporting is anticipated. Based on the available data, between calendar years 2016 and 2018, groundwater production in the UAS increased by 60 acre-feet in response to an increase in agricultural production from the UAS (Table 2-2). Groundwater production from the LAS decreased by approximately 1,200 acre-feet between calendar year 2016 and 2018 (Table 2-2). This decrease occurred in both the agricultural and M&I sectors, with agricultural production from the LAS decreasing by approximately 950 acre-feet and M&I production from the LAS decreasing by 250 acre-feet. Based on the available data groundwater production from wells screened in both the UAS and LAS decreased by approximately 2,000 acre-feet between calendar years 2016 and 2018. This decrease in production from wells screened in both aquifers is entirely associated with a decrease in agricultural groundwater production (Table 2-2). The total groundwater production in the PVB decreased by approximately 2,600 acre-feet between calendar years 2016 and 2018, with approximately 2,500 acre-feet of the reduction from a decrease in agricultural production, and approximately 200 acre-feet of the reduction from a decrease in M&I production (Table 2-2).

2.3 Surface Water Supply

The primary surface water supplies to the PVB are from the Santa Clara River, via the United Water Conservation District Freeman Diversion and the Pleasant Valley Pipeline, and Conejo Creek, via a diversion operated by CWD. Within the PVB, CWD supplies surface water to the Pleasant Valley County Water District (PVCWD), and also distributes a portion of its diversions to other agricultural water users[5] (FCGMA 2019a). Surface water deliveries to the PVB for water years 2016 through 2019 are reported in Table 2-3.

[5] 44% of the total CWD deliveries to PVCWD, and 44% of the total PVP surface water deliveries from UWCD, were assigned to the PVB based on an analysis of the size of PVCWD's service area (FCGMA 2019a).

Table 2-3. Summary of Surface Water Deliveries to the Pleasant Valley Basin

Water Year	PVCWD	United Water Conservation District		Total (acre-feet)
	Conejo Creek Flows Delivered to PVCWD for Agriculture (acre-feet)	*PVP (Pleasant Valley Basin) (acre-feet)*		
		Diversions of Santa Clara River Water Used for Agriculture (PVP)	*Recharged Spreading Water Pumped and Used for Agriculture (Saticoy Wells)*	
2016	816	0	1,344	2,160
2017	1,394	0	3,217	4,611
2018	1,456	0	1,823	3,279
2019	2,196	243	14,561	17,000

Notes: PVCWD = Pleasant Valley County Water District; PVP = Pleasant Valley Pipeline

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 PVB. The total water use is reported in Table 2-4 by water year. In order to convert the reported groundwater production from calendar year to water year, 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. FCGMA is in the process of switching reporting periods to the water year. When FCGMA groundwater extraction reporting is shifted to a water year schedule, this approximation will no longer be necessary.

Additionally, CMWD did not report imported water use by sector. Therefore, the total CMWD water use reported was divided among the water use sectors based on the average reported water use, by sector, in the PVB GSP since 2010 (FCGMA 2019a). Between 2010 and 2015 99% of the imported water supplied by CMWD was provided to the M&I sector and only 1% was used for agriculture. This ratio was applied to CMWD total imports in Table 2-4.

Lastly, CWD and CMWD did not report surface water diversions delivered to PVB in water years 2016 through 2019. Therefore the total volume of water used in the PVB may be higher than what is reported in Table 2-4.

Table 2-4. Total Water Available in the Pleasant Valley Basin

Water Year	Groundwater [a] (acre-feet)			Surface Water (acre-feet)	Recycled Water (acre-feet)		Imported Water [b] (acre-feet)		Total (acre-feet)
	Ag	Dom	M&I	Ag	Dom	M&I	Ag	M&I	
2016	12,650	88	3,698	2,160	1,426	366	92	9,637	30,117
2017	11,216	24	4,536	4,611	1,264	414	86	8,931	31,082
2018[c]	9,523	35	4,371	3,279	1,237	414	95	9,891	28,845
2019[d]	3,955	25	2,409	17,000	1,351	215	90	9,359	34,404

Notes:

[a] Groundwater production by water year is estimated from groundwater production by calendar year.

[b] Imported water was divided into AG and M&I based on the ratio of AG and M&I imported water used between 2010 and 2015. 99% of the total imported water was used for M&I over that time period.

[c] Groundwater extraction reporting for 2018 is preliminary and expected to change. Additional extraction reporting is anticipated.

[d] Groundwater production is through June for domestic and M&I extractions, and through July 2019 for agricultural extractions

2.5 Change in Groundwater Storage

Change in storage estimates were calculated for the Fox Canyon aquifer by comparing seasonal high groundwater elevations between 2015 and 2019. Annual change in storage was calculated for four water years by comparing groundwater elevations between: (1) spring 2015 and spring 2016, (2) spring 2016 and spring 2017, (3) spring 2017 and spring 2018, and (4) spring 2018 and spring 2019. Change in storage for was calculating using the change in groundwater elevation for each period and the aquifer storage properties defined by the Ventura Regional Groundwater Flow numerical model (UWCD, 2018). Storage change was only calculated for the Fox Canyon aquifer in the PVB because there are only four wells screened solely within the Older Alluvium in the PVB. Of these four wells, only two were measured during the spring and fall of water years 2016 through 2019 (Section 2.1.1; Figures 2-1 through 2-14).

Change in groundwater elevation was calculated by mapping the spring 2015 through spring 2019 groundwater elevation contours onto a uniform grid that covered the areal extent of the PVB. Each grid was assigned a groundwater elevation equal to half the elevation of the up-gradient and down-gradient contours for the area within the contours. This way the seasonal high groundwater elevation in each grid cell could be subtracted from the previous seasonal high groundwater elevation in the same cell to generate a gridded map of groundwater elevation change on the same scale as the grid used in the Ventura Regional Groundwater Flow numerical model. Change in storage was subsequently calculated for each grid cell using the Fox Canyon aquifer properties defined for each grid cell in the model and the change in elevation between sequential spring groundwater measurements (FCGMA 2019b).

Groundwater elevations were not measured over the same areal extent in each aquifer during the spring of each water year. The data coverage between consecutive water years and the common area between all the years is shown in Figures 2-31 through 2-34. Change in storage calculated within the area of overlapping data for all water years is reported in Table 2-5. This common area is denoted with the black outline in Figures 2-31 through 2-34.

Table 2-5. Annual and Cumulative Change in Groundwater Storage in the Pleasant Valley Basin

Water Year	Water Year Type	Pleasant Valley Basin	
		Fox Canyon Aquifer Annual Change in Storage (acre-feet)	*Fox Canyon Aquifer Cumulative Change in Storage (acre-feet)*
2016	Critical	-14	-14
2017	Above Normal	3	-11
2018	Critical	-10	-22
2019	Above Normal	68	46

While groundwater elevation trends and change in storage trends follow the water year type, with the groundwater in storage decreasing in water years 2016 and 2018, and increasing in water years 2017 and 2019, the magnitude of the change of groundwater in storage in the Fox Canyon aquifer is negligible (Table 2-5; Figures 2-35 and 2-36). This lack of change in groundwater in storage is related to the small area of the aquifer over which change in storage was calculated and the low specific storage value for the Fox Canyon aquifer in the PVB.

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 covered the entire lateral extend of the Older Alluvium, lower aquifer system, and semi-perched aquifer in the PVB. Therefore, the results of the long-term change in storage calculations presented in the GSP cannot be directly compared to the change in storage calculations conducted for this GSP annual update.

3 GSP Implementation Progress

The GSP for the PVB was submitted to DWR in January 2020. This is the first annual report to be prepared since the GSP was submitted. The GSP implementation progress reported in this report covers work begun during development of the GSP as well as work that has been conducted over the three months since the GSP was submitted.

During development of the GSP, FCGMA identified critical areas in which aquifer specific water levels were lacking. One of these areas is northern Pleasant Valley, adjacent to the boundary between the PVB and the East Las Posas Management Area of the Las Posas Valley Basin. This is an area where infiltrating surface water has historically influenced groundwater elevations but few wells are located to constrain groundwater elevations. DWR through the Technical Support Services Program, has installed two new nested wells in this area in 2019 (Figure 2-1). Combined, the new nested monitoring wells are screened in the Older Alluvium (one each in the Oxnard Aquifer equivalent, and Mugu Aquifer equivalent), Upper San Pedro Formation (Hueneme Aquifer equivalent, and the Fox Canyon Aquifer (one each in the upper and basal portions)Groundwater elevation data from these wells will be incorporated into future annual reports, to better represent groundwater conditions in the PVB and adjacent basins.

The GSP identified several areas in which additional work needed to be conducted over the next 20 years. These areas include filling spatial and temporal data gaps, conducting basin optimization studies, developing project feasibility studies, updating the numerical groundwater model, and revising the existing data management system. Since submittal of the GSP, FCGMA has begun to develop a post-GSP work-plan that will guide the implementation of the GSP and help ensure that the PVB is managed sustainably within the next 20 years. Critical to the success of this effort is stakeholder feedback. Additionally, FCGMA successfully requested stakeholder facilitation services through DWR's Facilitation Support Services program to support implementation of the GSP. The FCGMA Board of Directors continues to prioritize stakeholder feedback in the implementation phase of the GSP, because of the vital role stakeholders play in ensuring the long-term sustainable use of groundwater resources in the PVB.

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4 References

DWR (California Department of Water Resources). 2020. DWR SGMA Portal Website: All submitted GSPs. https://sgma.water.ca.gov/portal/gsp/all. Accessed February 17, 2020.

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.

FCGMA (Fox Canyon Groundwater Management Agency). 2019a. Groundwater Sustainability Plan for the Pleasant Valley Basin.

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

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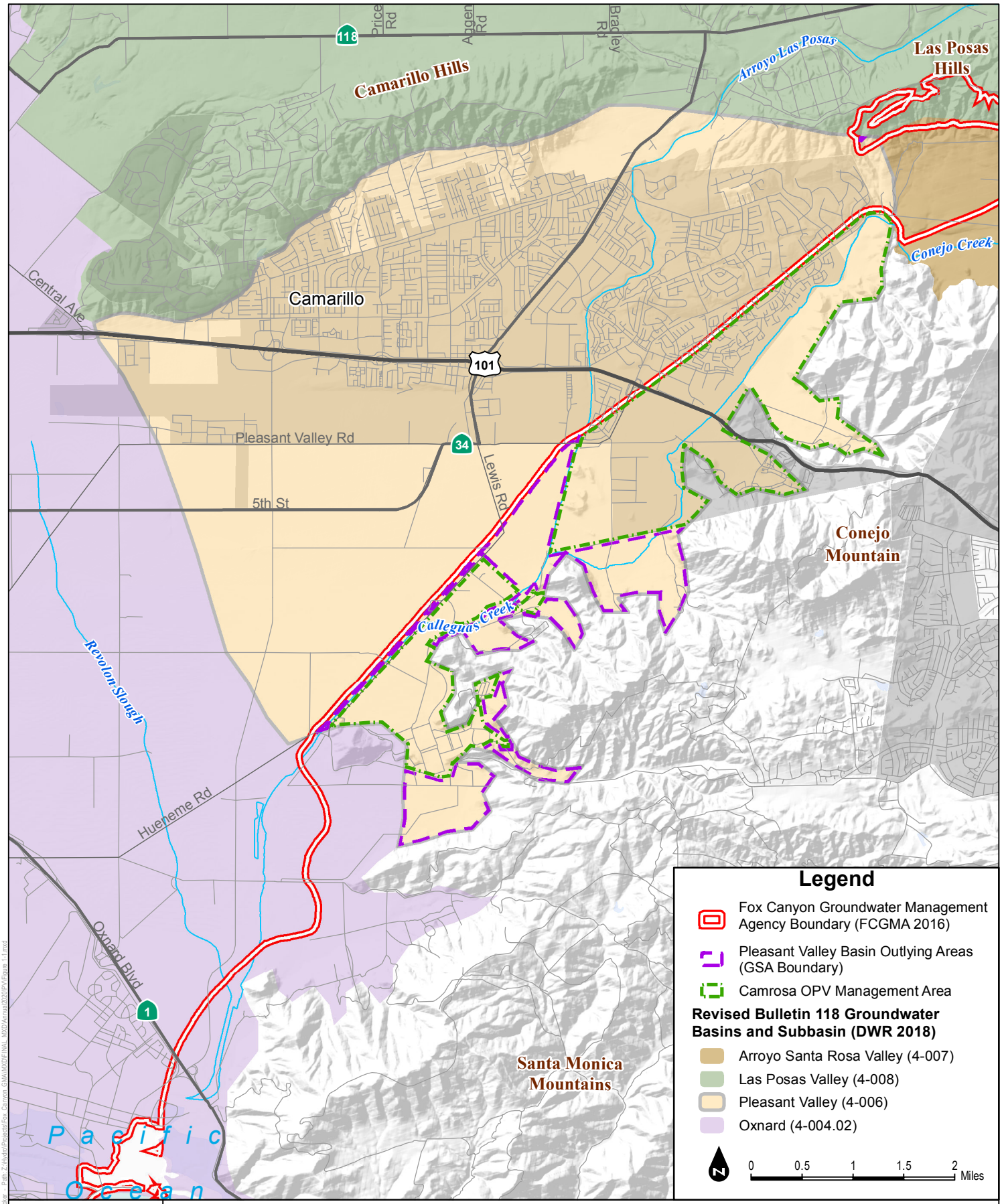
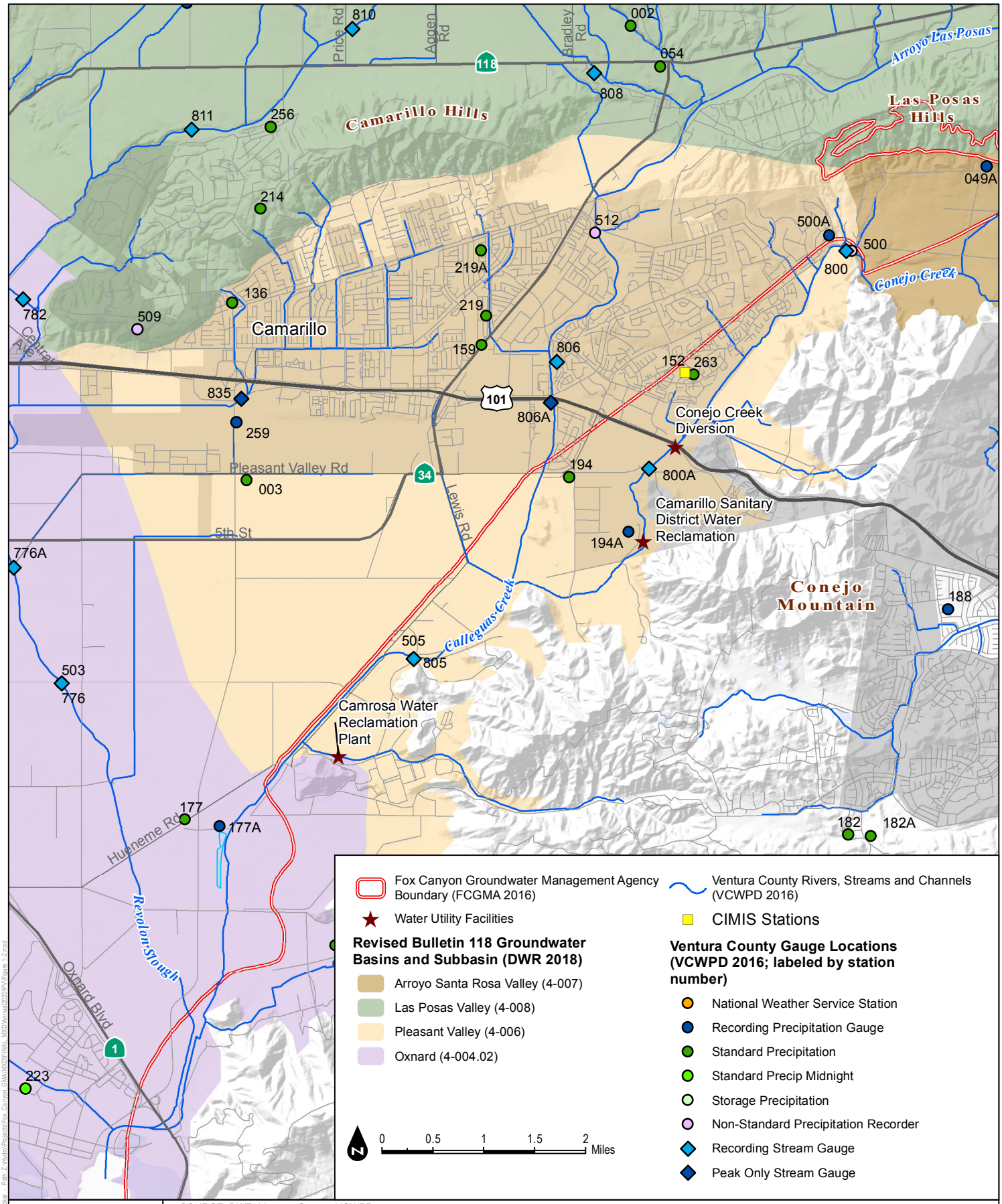


SOURCE: DWR; Ventura County; FCGMA

FIGURE 1-1

Vicinity Map for the Pleasant Valley Basin

DUDEK

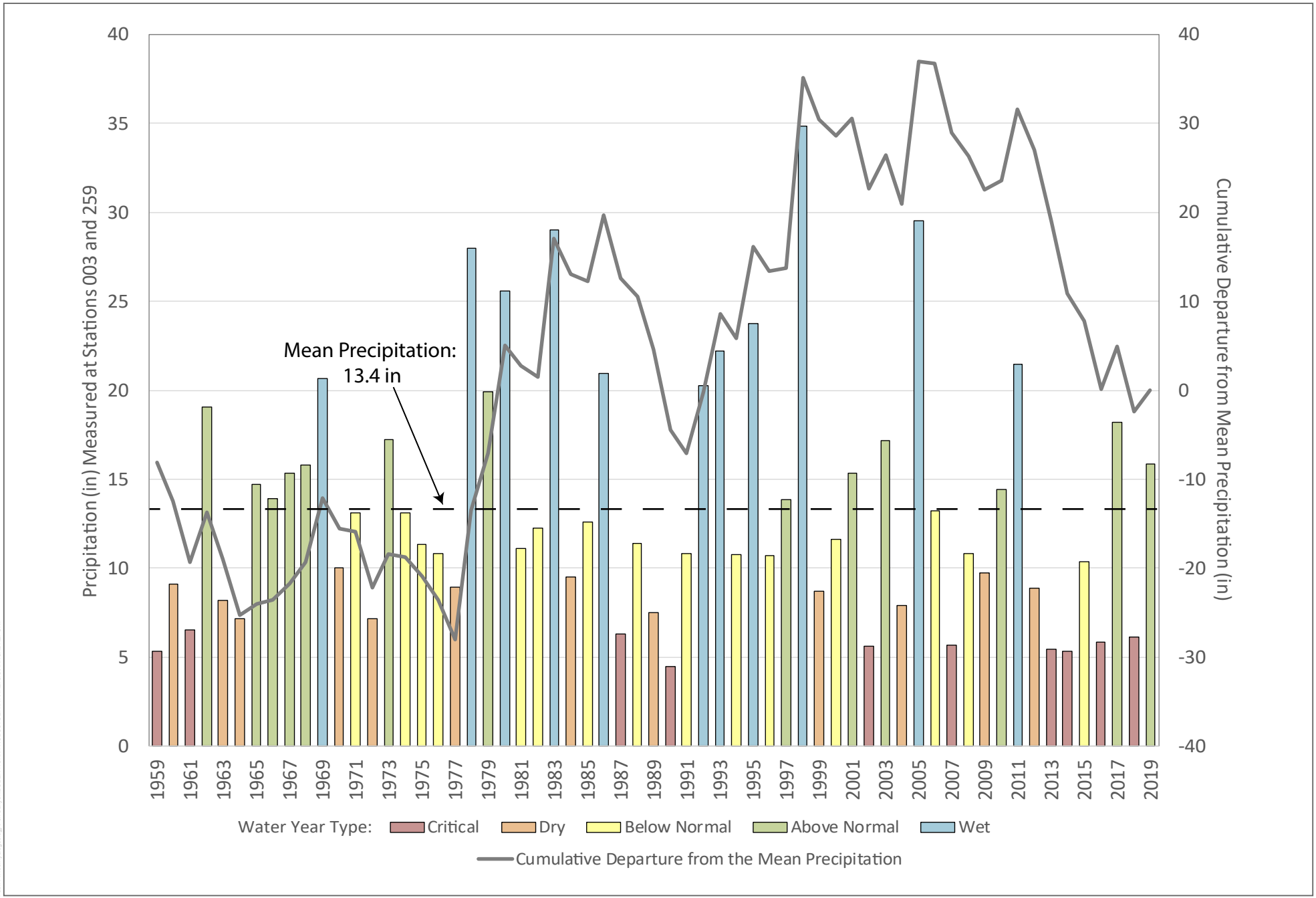


SOURCE: DWR; Ventura County; VCWPD

FIGURE 1-2

Precipitation and Stream Gauges in the Pleasant Valley

DUDEK



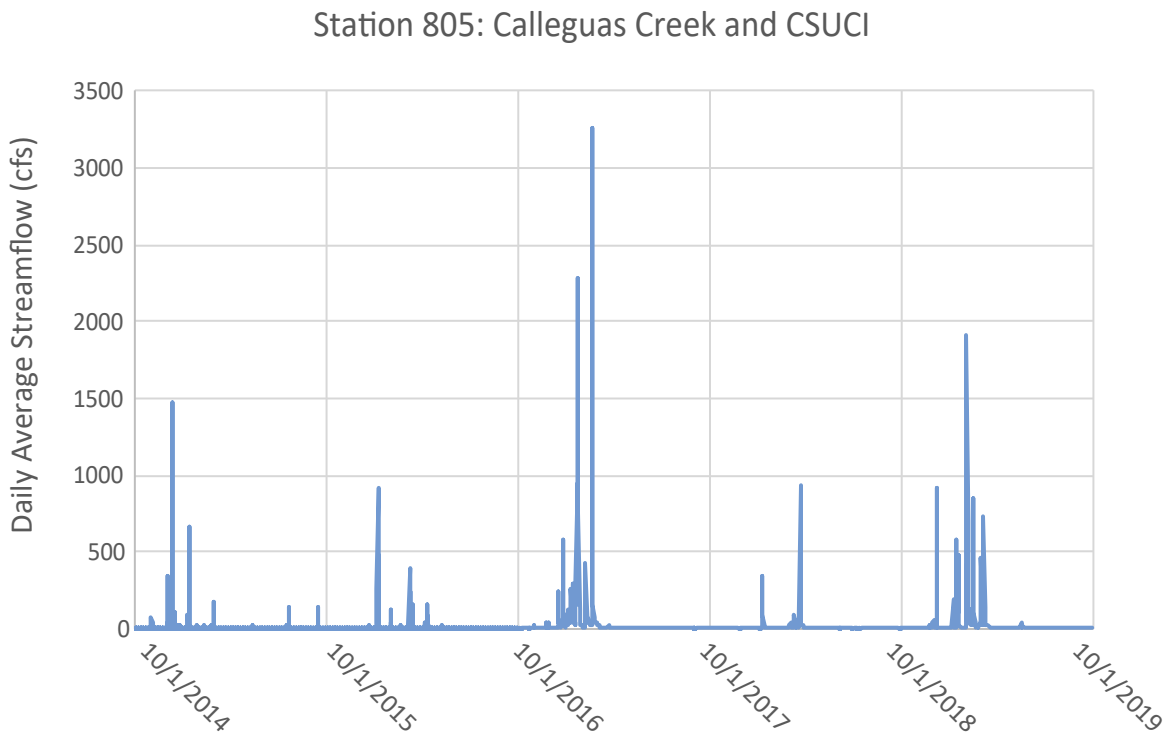
Note: Water year is from October 1 through September 30. Water year type is based on the percentage of the water year precipitation compared to the mean precipitation. Types are defined as: Wet (≥150% of mean), Above Normal (≥100% to <150% of mean), Below Normal (≥75% to <100% of mean), Dry (≥50% to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

FIGURE 1-3

Pleasant Valley Basin Historical Water Year Precipitation

Pleasant Valley Basin Groundwater Sustainability Plan 2020 Annual Report

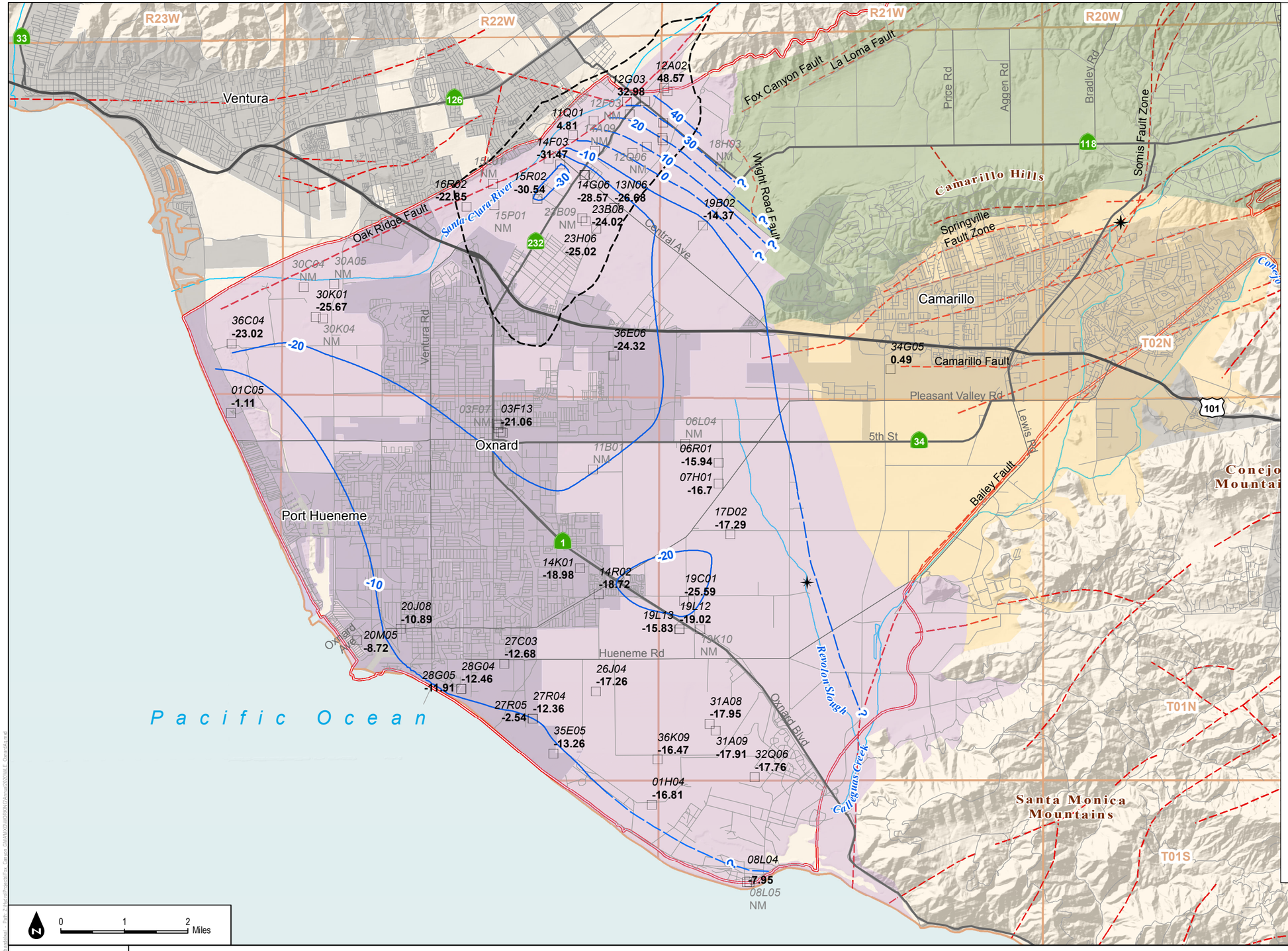
DUDEK



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

FIGURE 1-4

Pleasant Valley Basin 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
- New Nested Monitoring Well Cluster
- Oxnard Forebay
- *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)
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- Pleasant Valley (4-006)
- Oxnard (4-004.02)

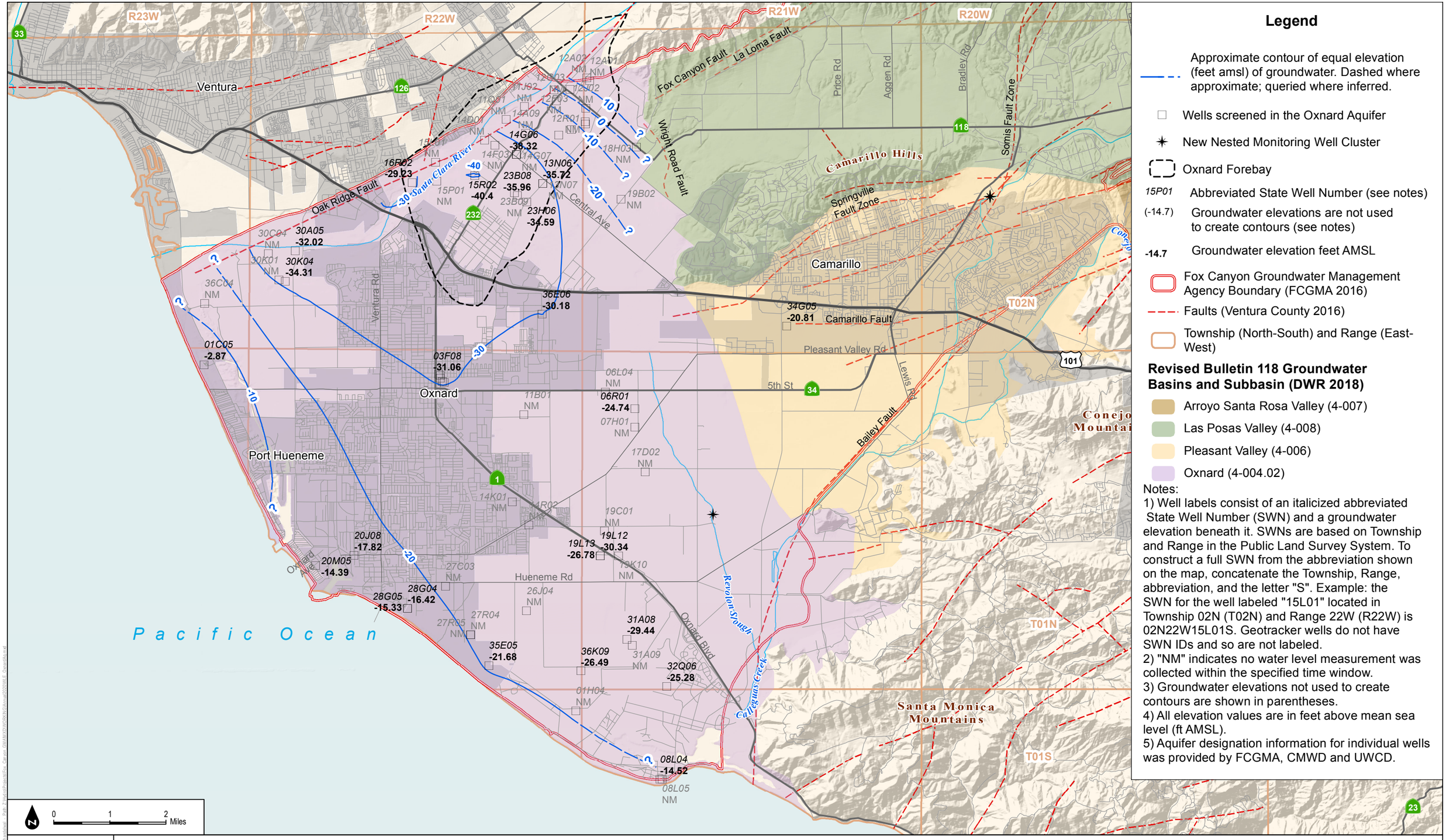
Notes:

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 Older Alluvium (Oxnard Aquifer), March 2-29, 2016



Legend

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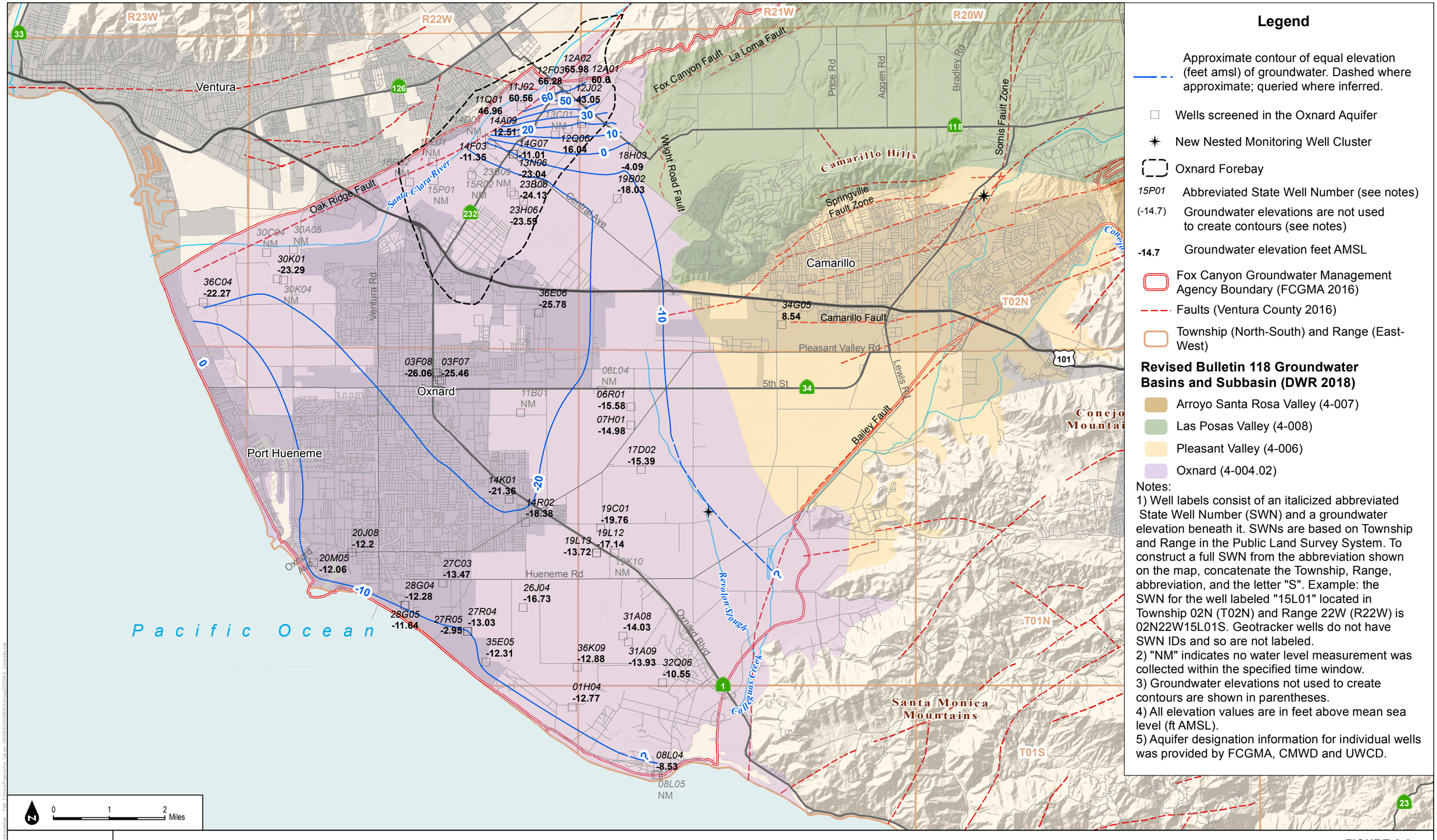
SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-2

Groundwater Elevation Contours in the Older Alluvium (Oxnard Aquifer), October 2-29, 2016



Legend

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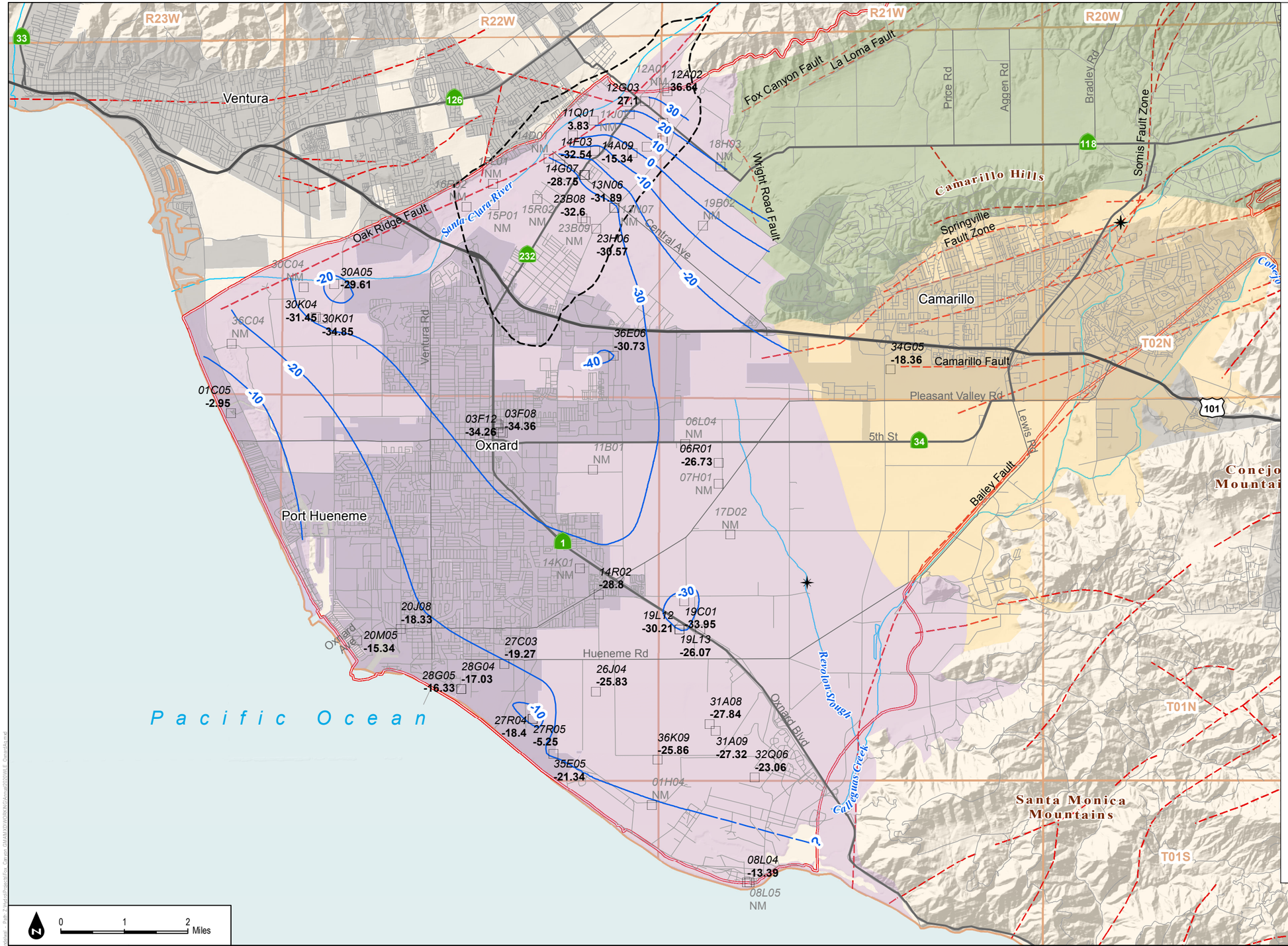
SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-3

Groundwater Elevation Contours in the Older Alluvium (Oxnard Aquifer), March 2-29, 2017



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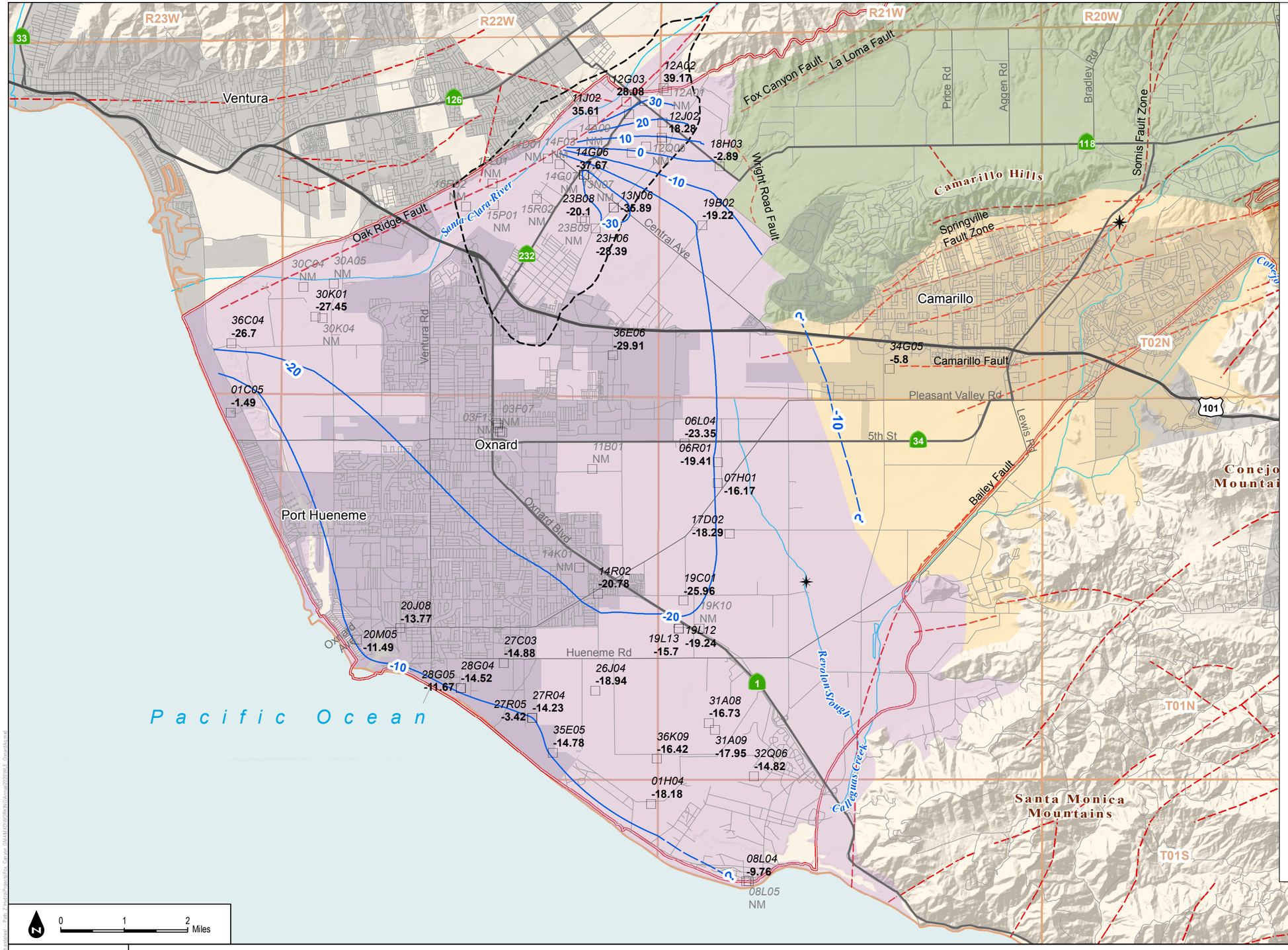
SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-4

Groundwater Elevation Contours in the Older Alluvium (Oxnard Aquifer), October 2-29, 2017



Legend

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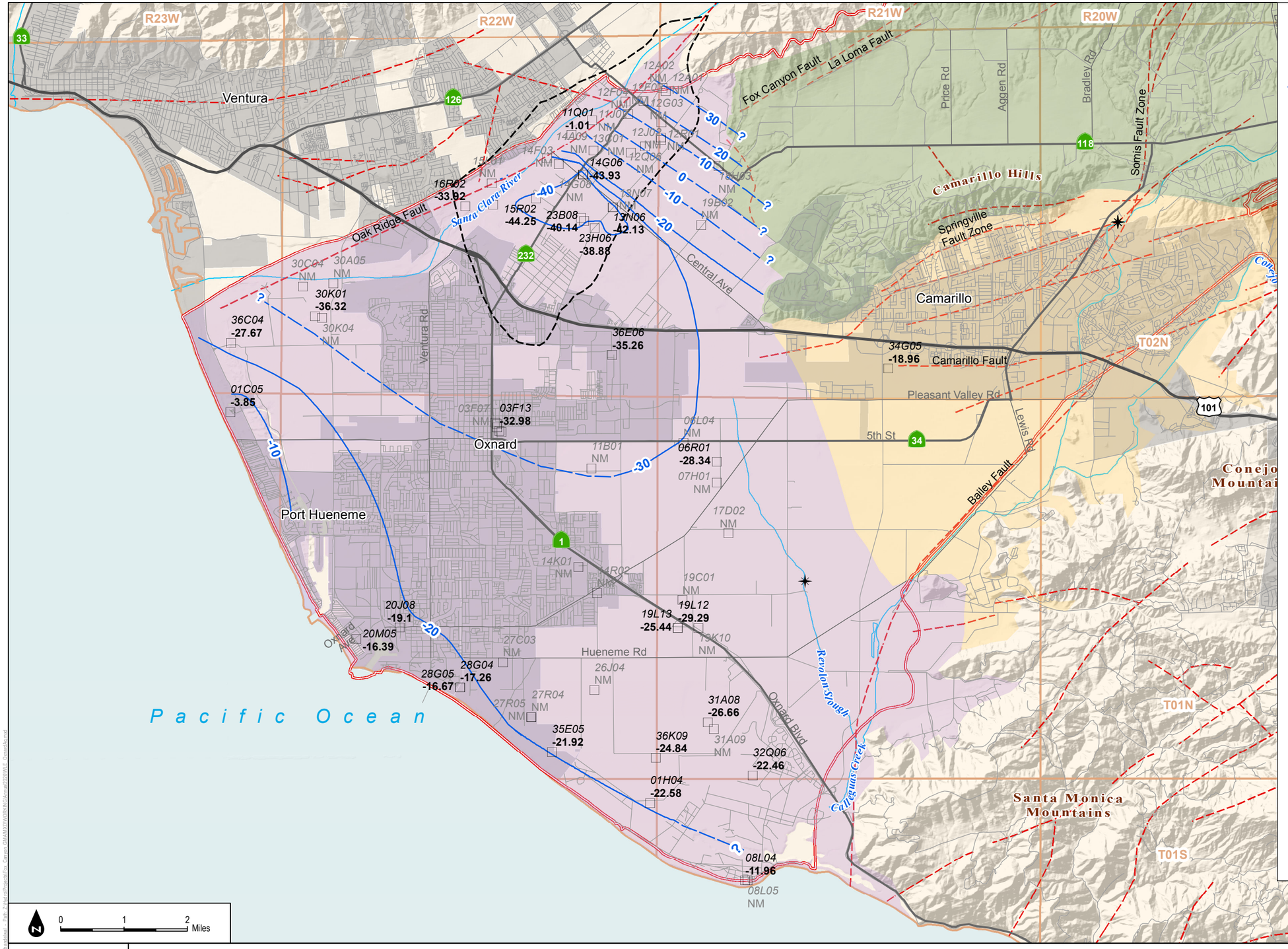
SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-5

Groundwater Elevation Contours in the Older Alluvium (Oxnard Aquifer), March 2-29, 2018



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
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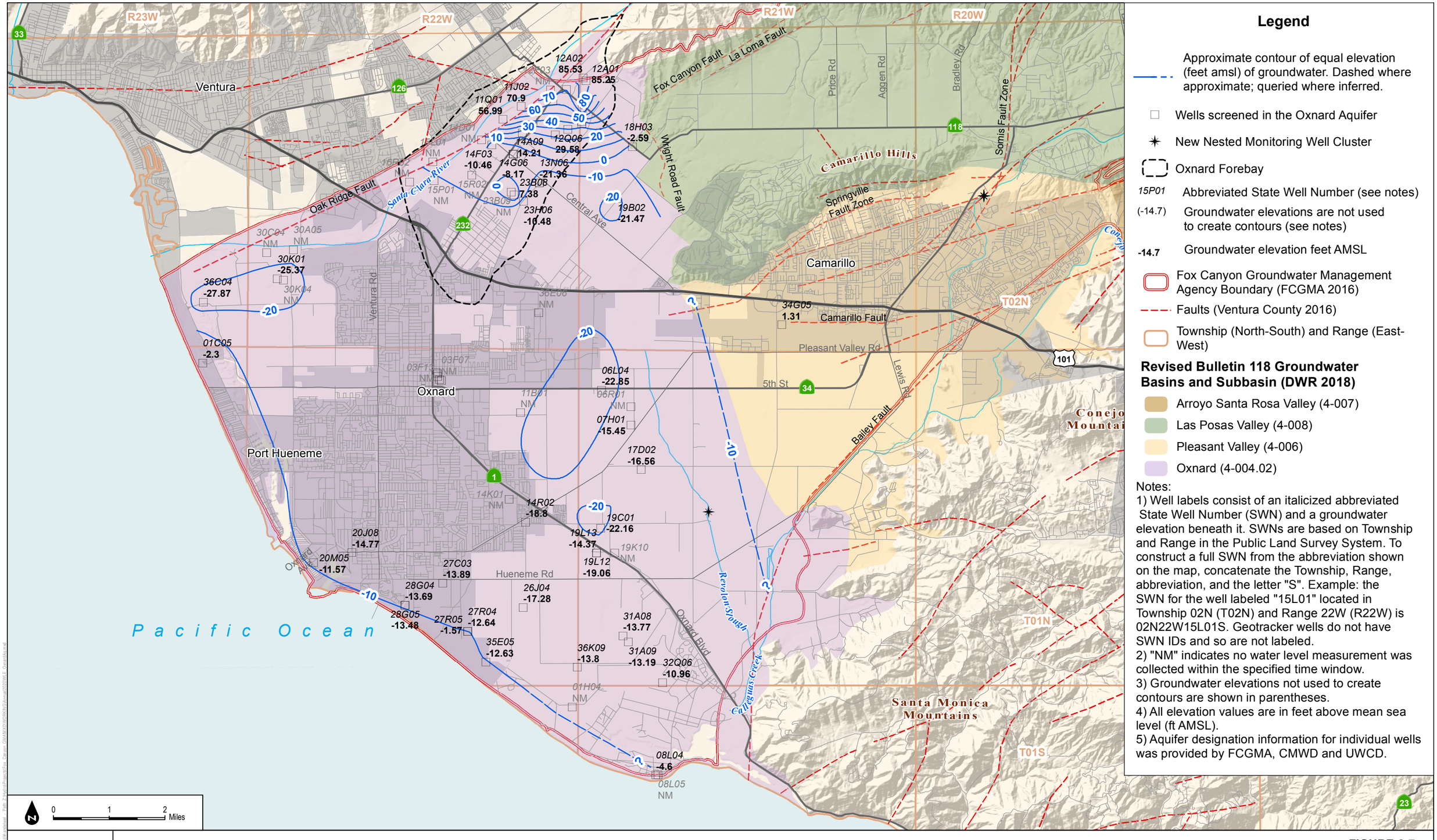
SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-6

Groundwater Elevation Contours in the Older Alluvium (Oxnard Aquifer), October 2-29, 2018



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells screened in the Oxnard Aquifer
- New Nested Monitoring Well Cluster
- Oxnard Forebay
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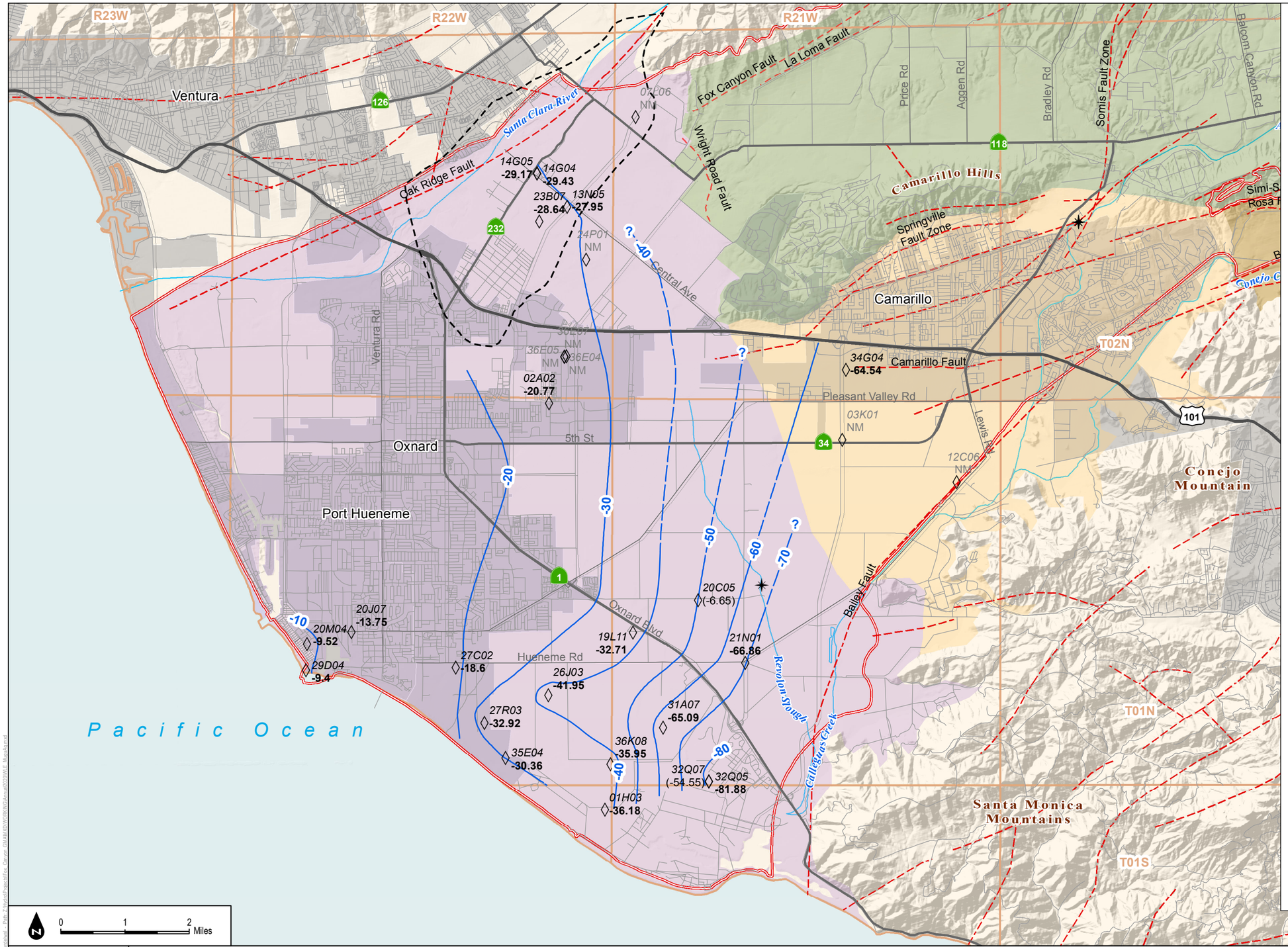
SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-7

Groundwater Elevation Contours in the Older Alluvium (Oxnard Aquifer) March 2-29, 2019



Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

◊ Wells screened in the Mugu Aquifer

✶ New Nested Monitoring Well Cluster

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)

Oxnard Forebay

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).

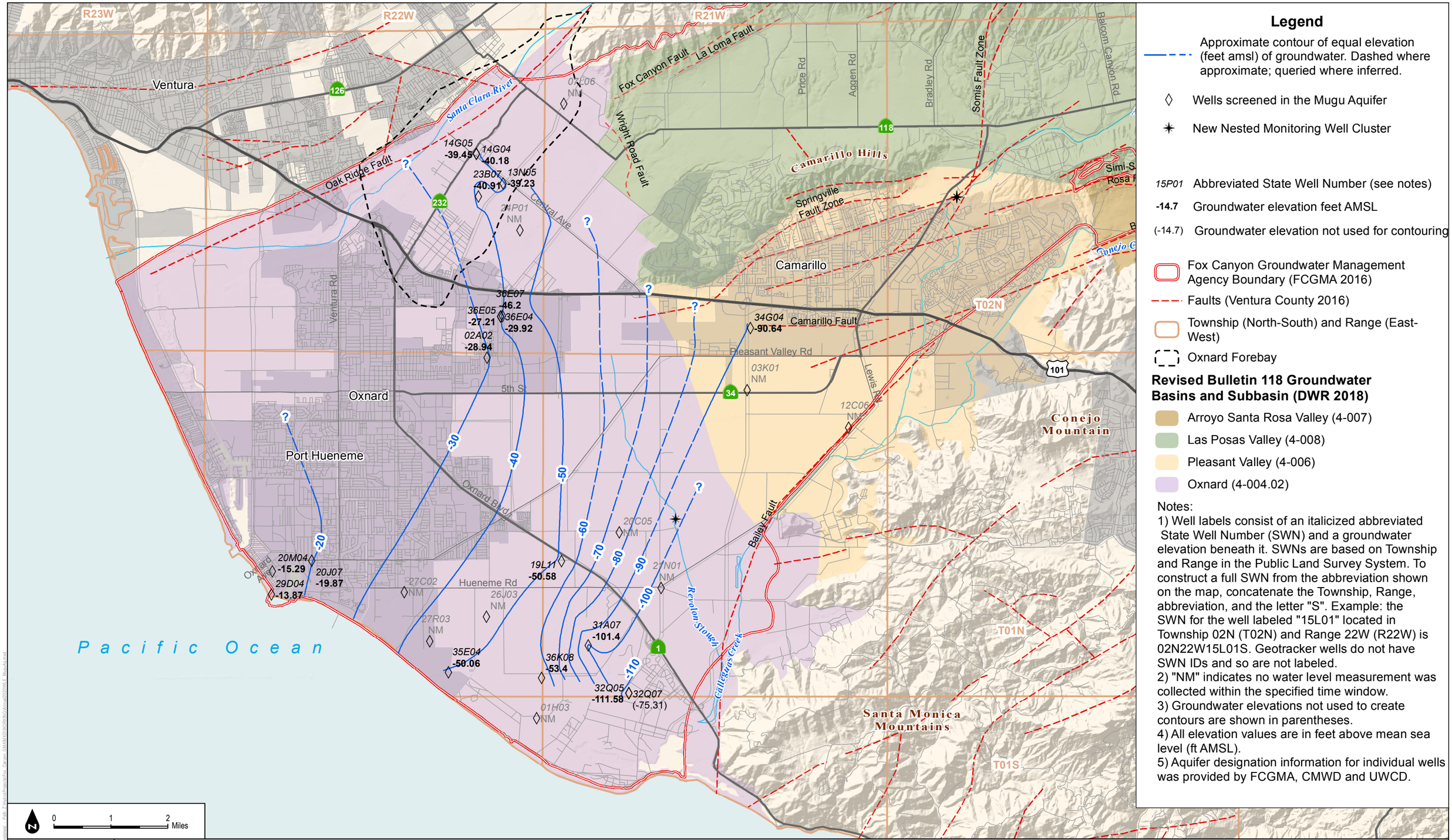
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-8

Groundwater Elevation Contours in the Older Alluvium (Mugu Aquifer), March 2-29, 2016



Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

◊ Wells screened in the Mugu Aquifer

✶ New Nested Monitoring Well Cluster

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)

Oxnard Forebay

Revised Bulletin 118 Groundwater Basins and Subbasin (DWR 2018)

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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).

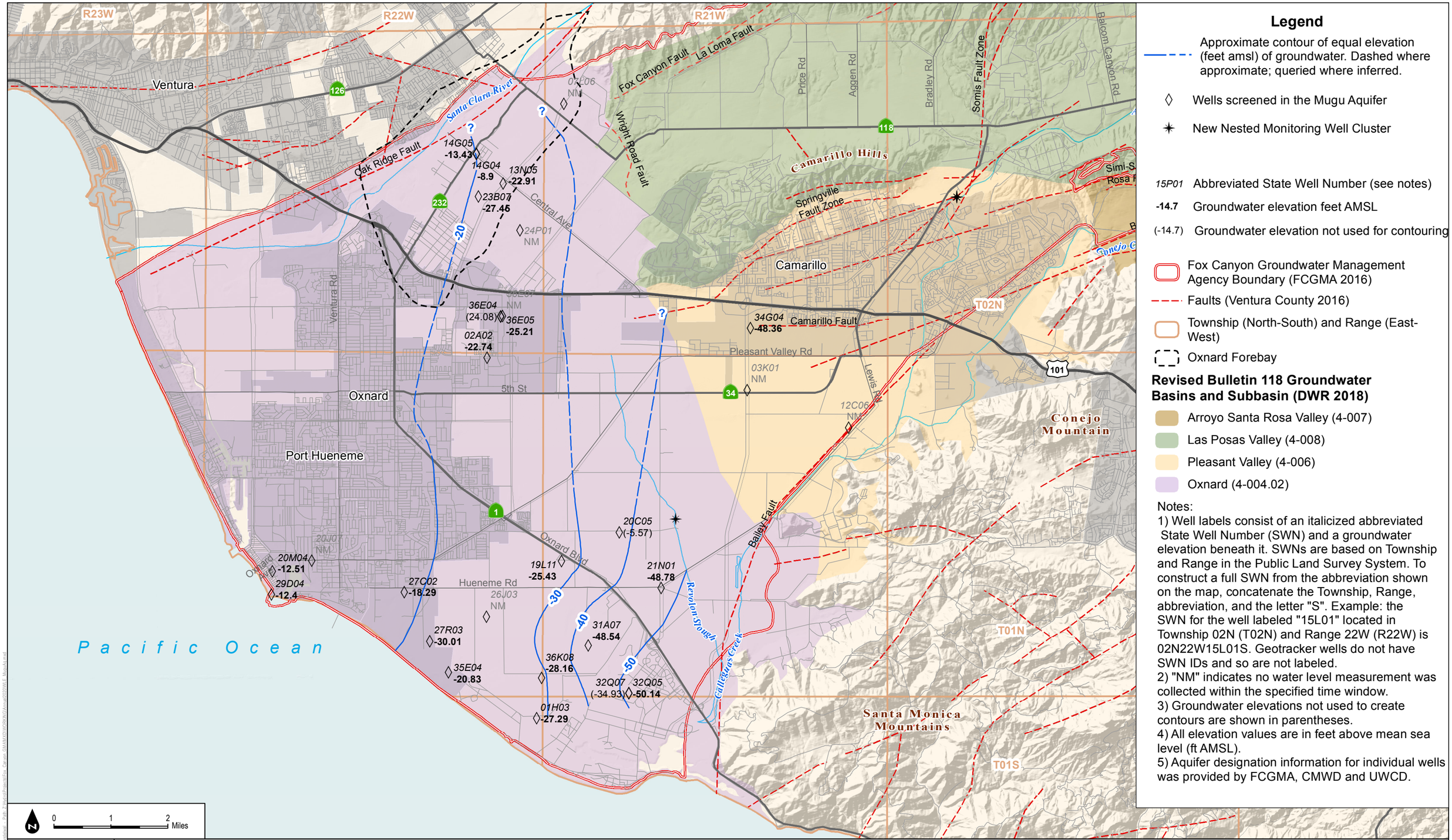
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-9

Groundwater Elevation Contours in the Older Alluvium (Mugu Aquifer), October 2-29, 2016

DUDEK



Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

Wells screened in the Mugu Aquifer

New Nested Monitoring Well Cluster

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)

Oxnard Forebay

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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).

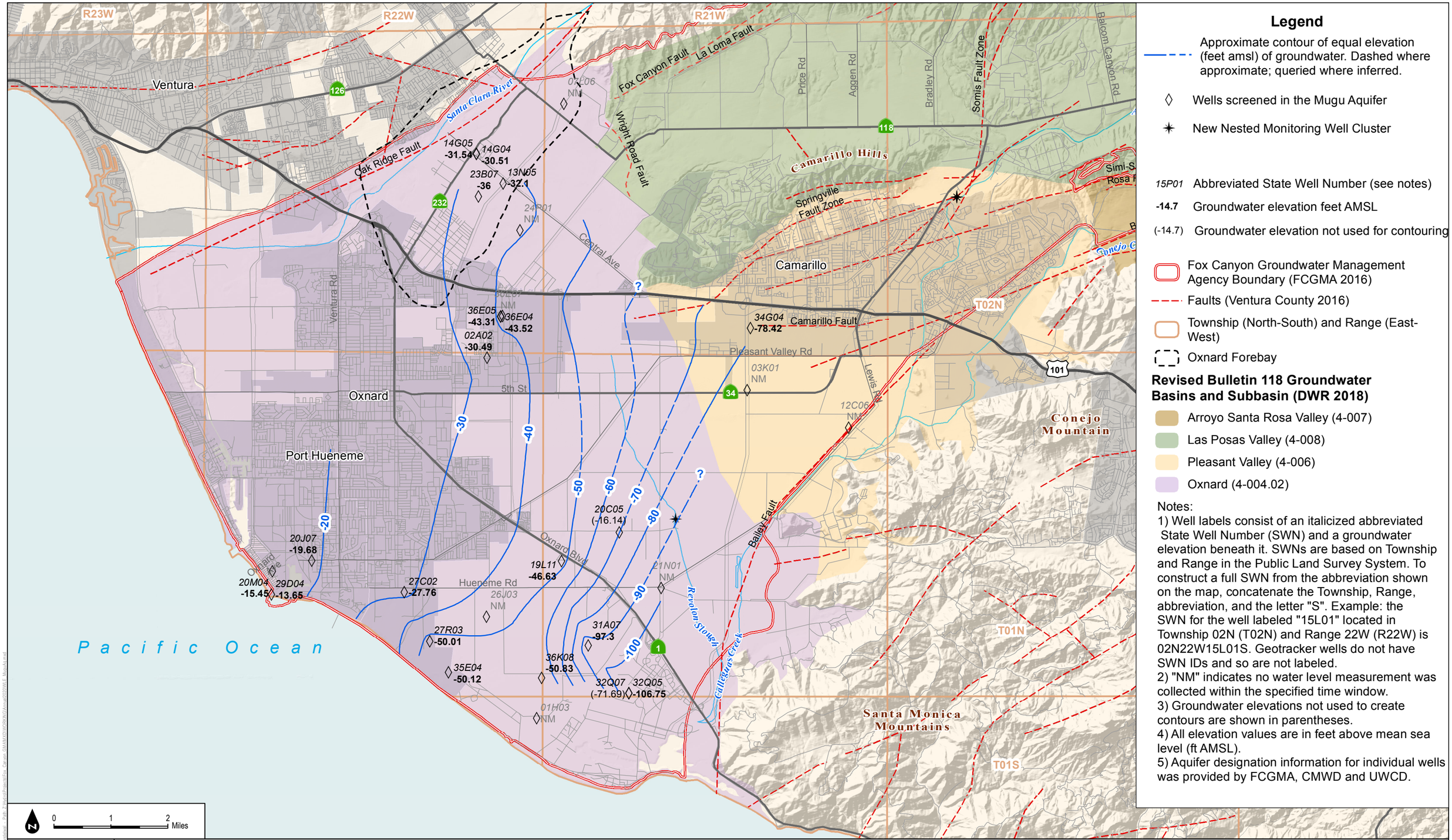
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-10

Groundwater Elevation Contours in the Older Alluvium (Mugu Aquifer), March 2-29, 2017

DUDEK



Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

◊ Wells screened in the Mugu Aquifer

✶ New Nested Monitoring Well Cluster

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)

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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.

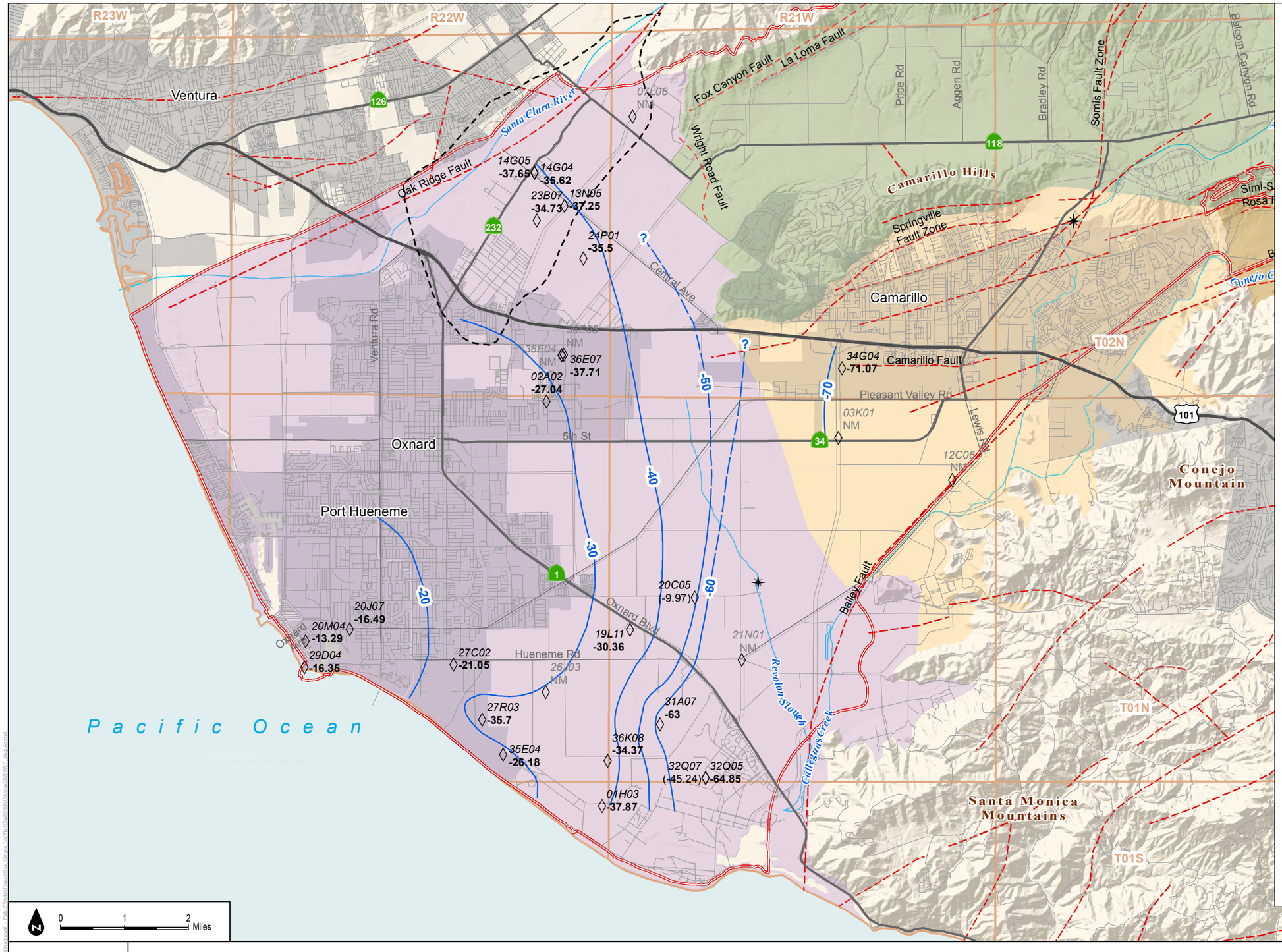
4) All elevation values are in feet above mean sea level (ft AMSL).

5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-11

Groundwater Elevation Contours in the Older Alluvium (Mugu Aquifer), October 2-29, 2017



Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

◊ Wells screened in the Mugu Aquifer

✶ New Nested Monitoring Well Cluster

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)

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Notes:

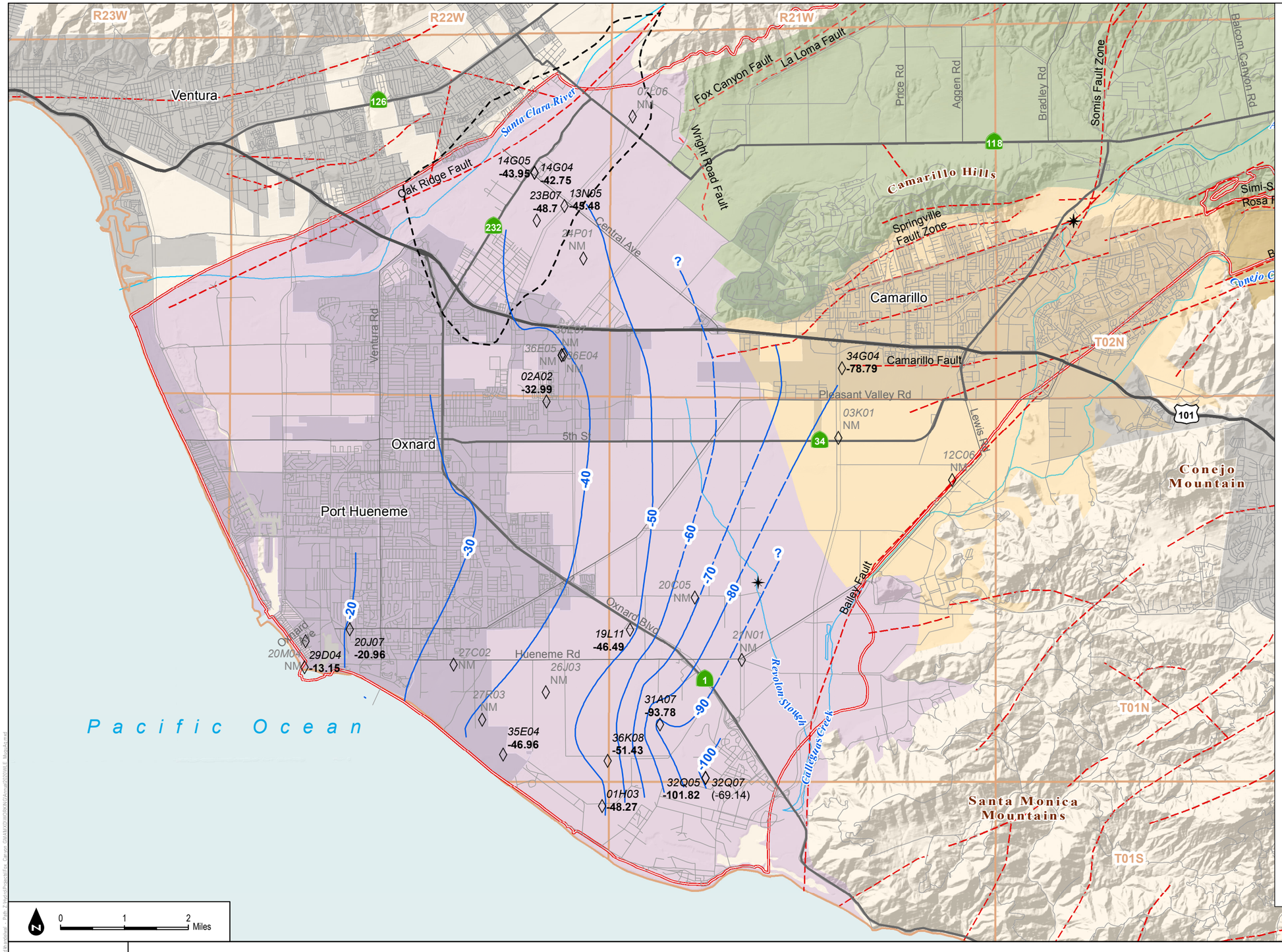
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and 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.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-12

Groundwater Elevation Contours in the Older Alluvium (Mugu Aquifer), March 2-29, 2018



Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

◊ Wells screened in the Mugu Aquifer

✶ New Nested Monitoring Well Cluster

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)

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Notes:

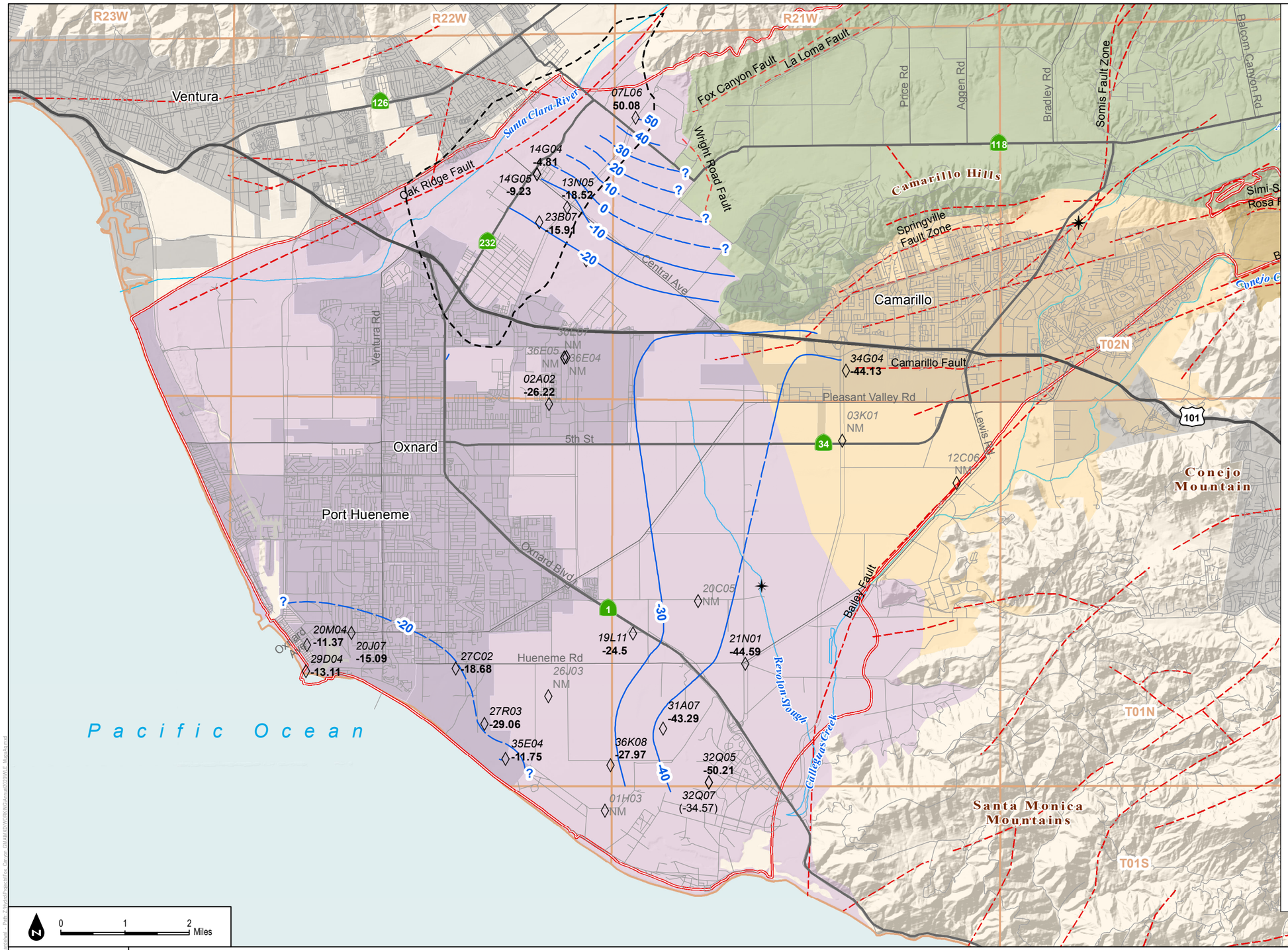
1) Well labels consist of an italicized abbreviated State Well Number (SWN) and a groundwater elevation beneath it. SWNs are based on Township and Range in the Public Land Survey System. To construct a full SWN from the abbreviation shown on the map, concatenate the Township, Range, abbreviation, and 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.

DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-13

Groundwater Elevation Contours in the Older Alluvium (Mugu Aquifer), October 2-29, 2018



Legend

Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.

◊ Wells screened in the Mugu Aquifer

✶ New Nested Monitoring Well Cluster

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)

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Notes:

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3) Groundwater elevations not used to create contours are shown in parentheses.

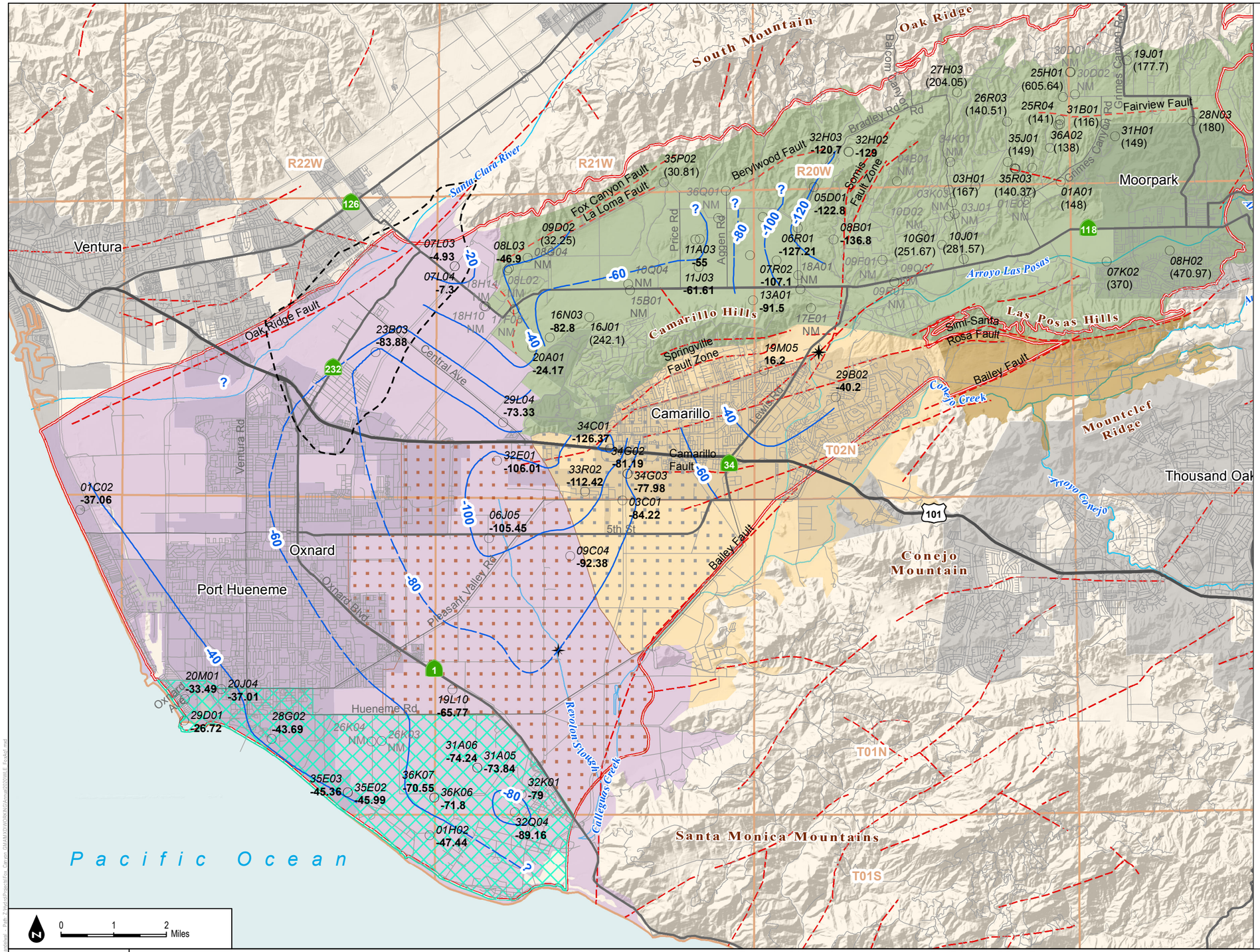
4) All elevation values are in feet above mean sea level (ft AMSL).

5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-14

Groundwater Elevation Contours in the Older Alluvium (Mugu Aquifer), March 2-29, 2019



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells Screened in the Fox Canyon Aquifer
- New Nested Monitoring Well Cluster
- *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)
- Oxnard Forebay
- Oxnard Pumping Depression Management Area
- Pleasant Valley Pumping trough Management Area
- Saline Intrusion Management
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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).

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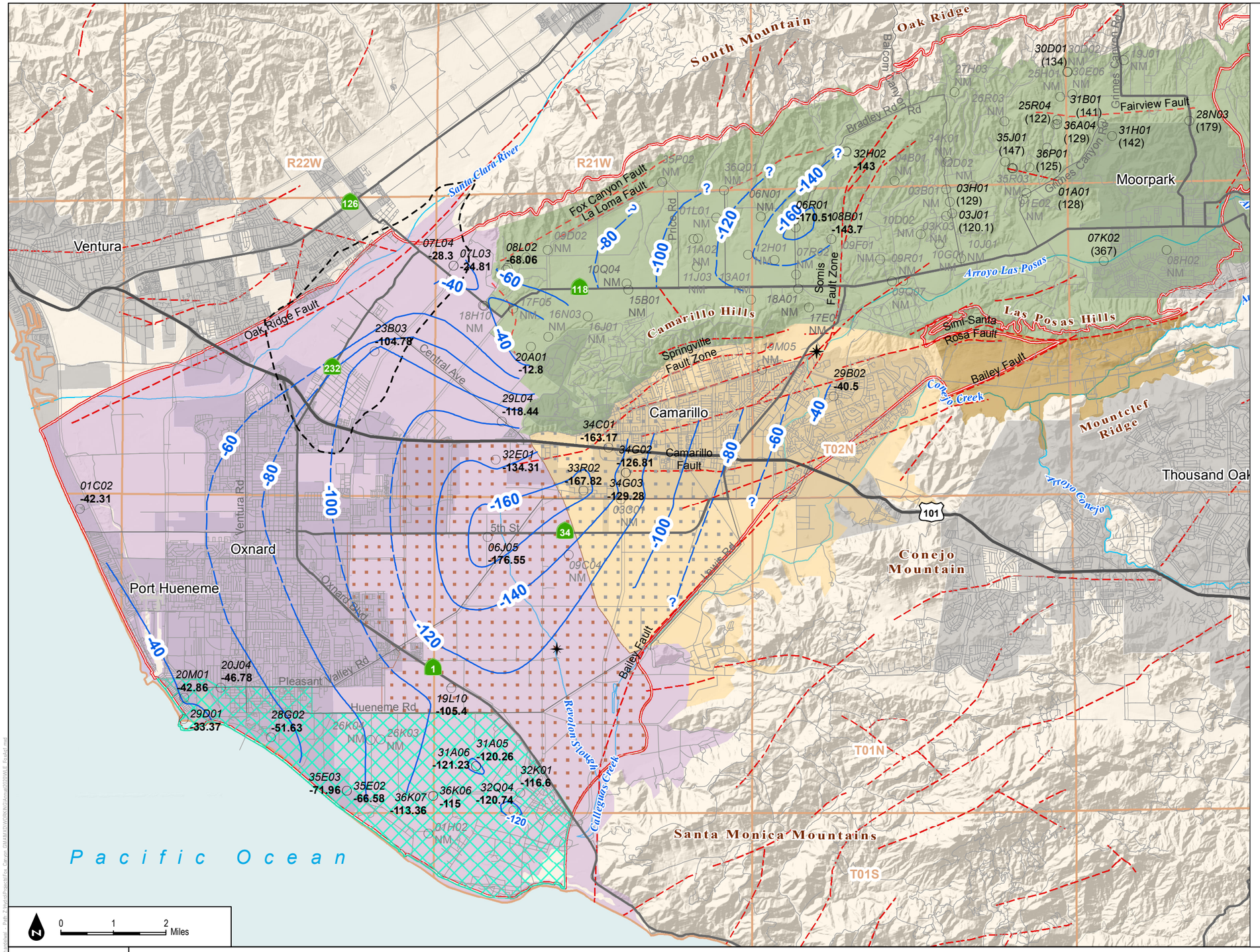
SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-15

Groundwater Elevation Contours in the Fox Canyon Aquifer, March 2-29, 2016



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells Screened in the Fox Canyon Aquifer
- New Nested Monitoring Well Cluster
- 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)
- Oxnard Forebay
- Oxnard Pumping Depression Management Area
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Notes:

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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).
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DUDEK

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-16

Groundwater Elevation Contours in the Fox Canyon Aquifer, October 2-29, 2016

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells Screened in the Fox Canyon Aquifer
- New Nested Monitoring Well Cluster
- *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)
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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.

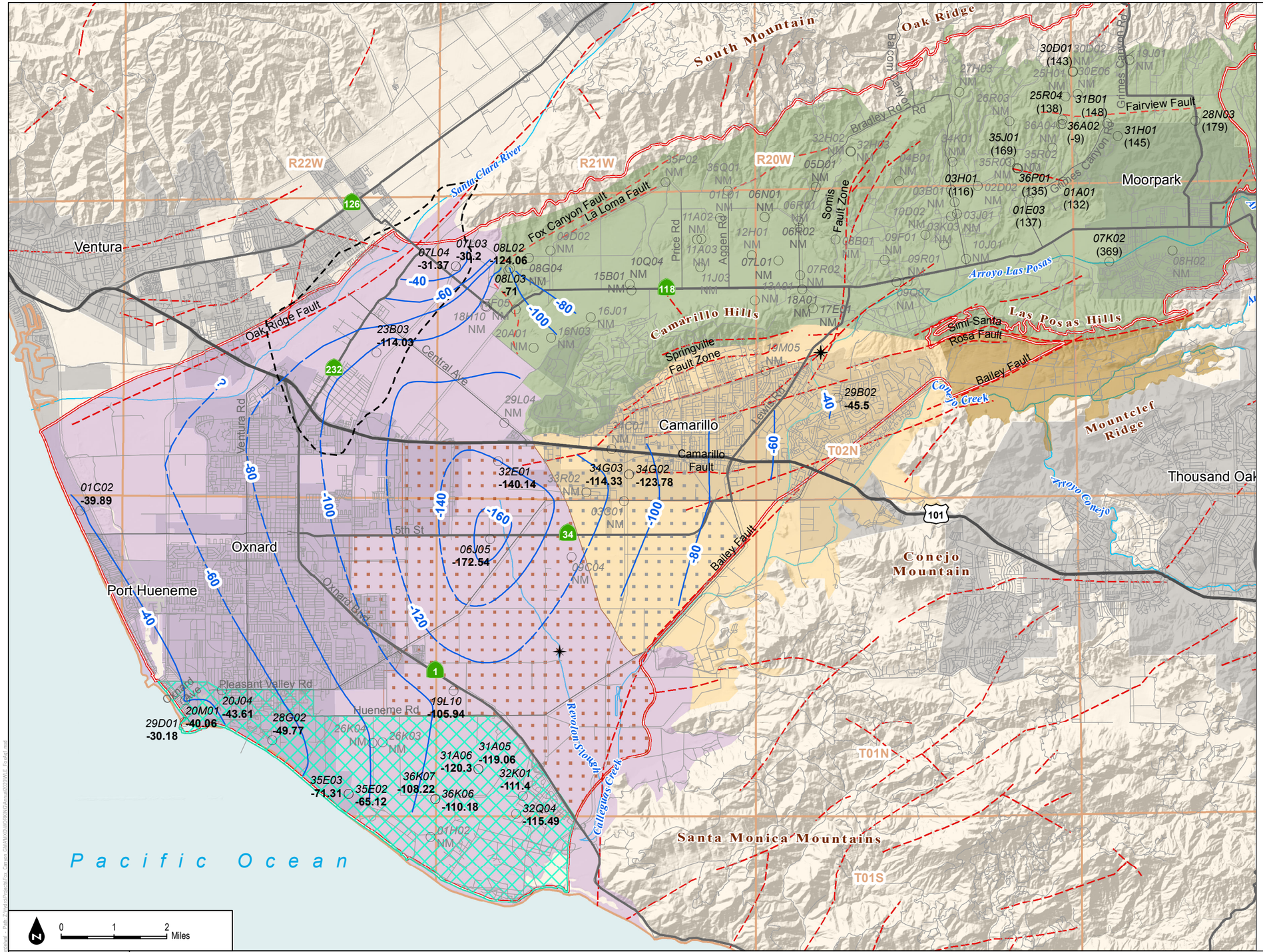
0 1 2 Miles

SOURCE: DWR; Ventura County; UWCD; CMWD

DUDEK

FIGURE 2-17

Groundwater Elevation Contours in the Fox Canyon Aquifer, March 2-29, 2017



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells Screened in the Fox Canyon Aquifer
- New Nested Monitoring Well Cluster
- 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)
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Notes:

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4) All elevation values are in feet above mean sea level (ft AMSL).

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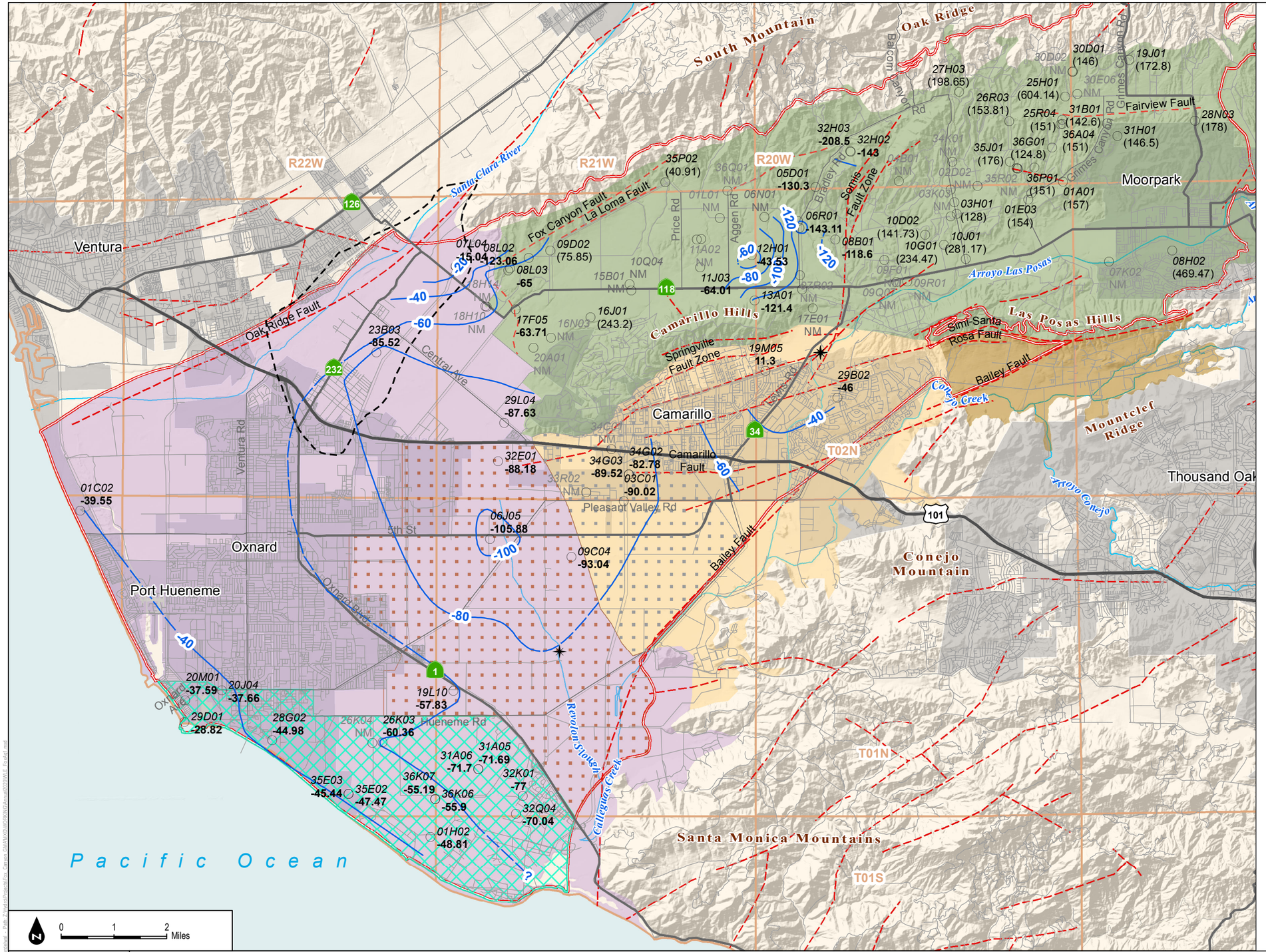
SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-18

Groundwater Elevation Contours in the Fox Canyon Aquifer, October 2-29, 2017



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells Screened in the Fox Canyon Aquifer
- New Nested Monitoring Well Cluster
- *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)
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Notes:
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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.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-19

Groundwater Elevation Contours in the Fox Canyon Aquifer, March 2-29, 2018

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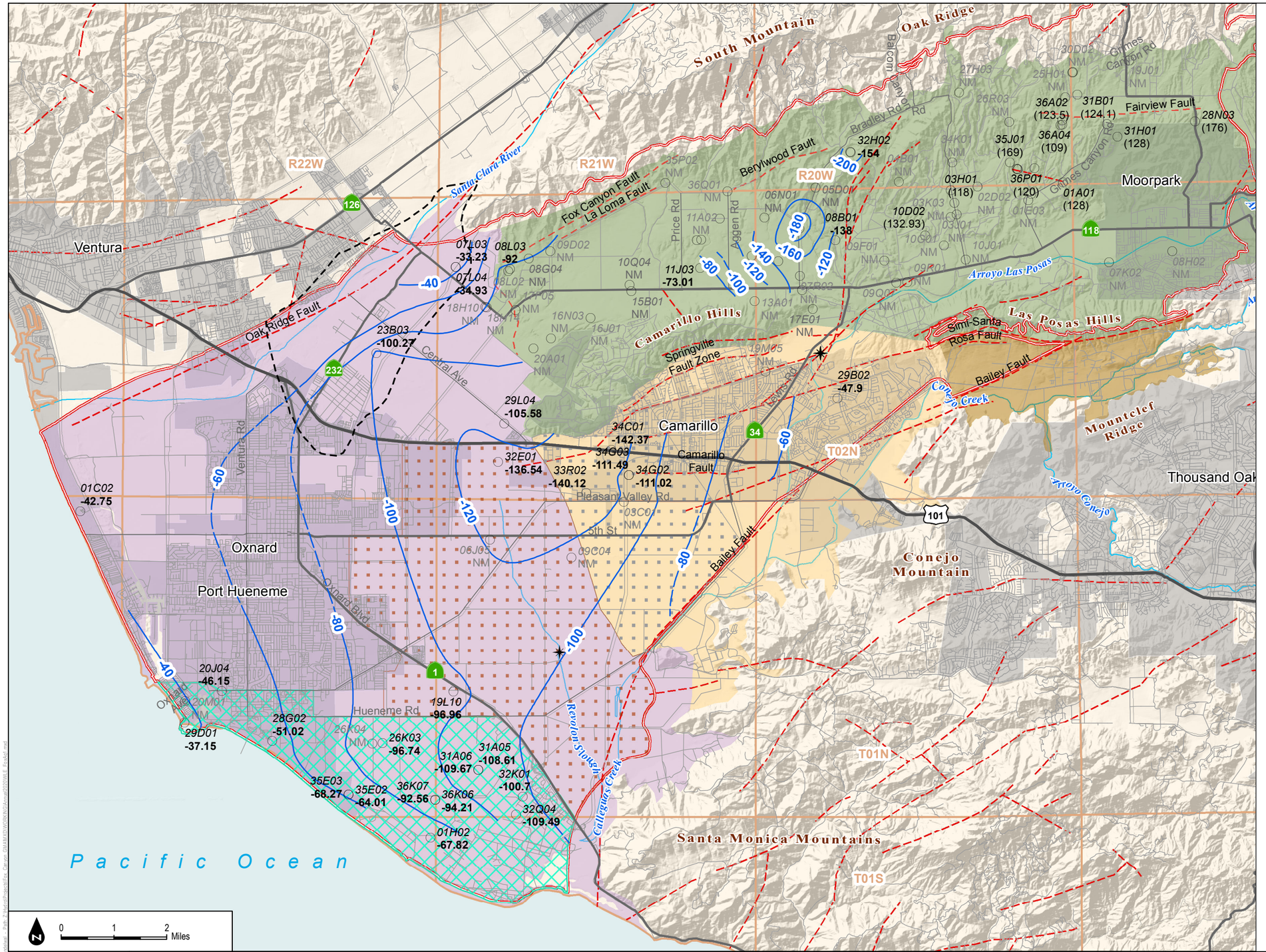

Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells Screened in the Fox Canyon Aquifer
- New Nested Monitoring Well Cluster
- 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)
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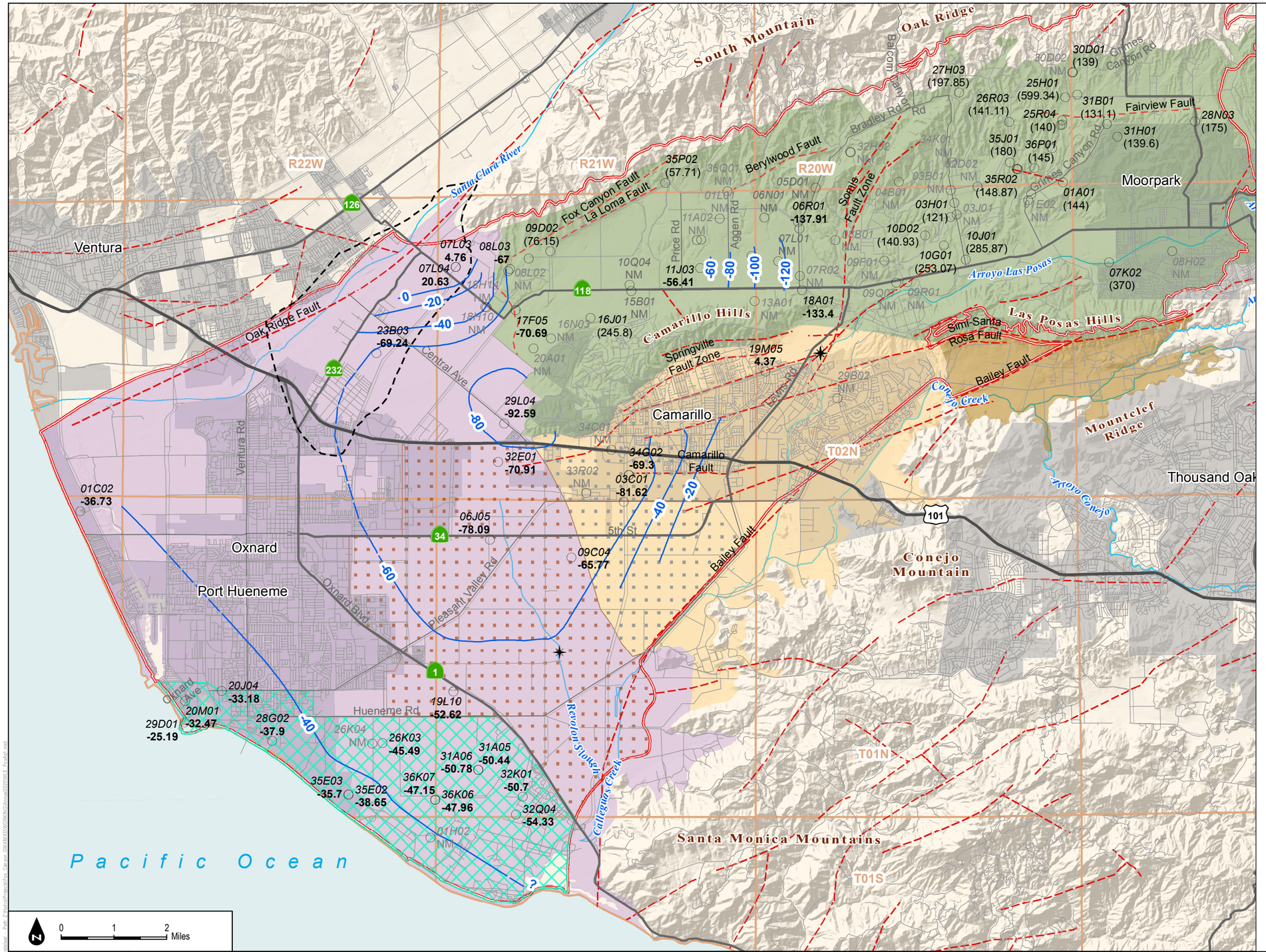
5) Aquifer designation information for individual wells was provided by FCGMA, CMWD and UWCD.

SOURCE: DWR; Ventura County; UWCD; CMWD

FIGURE 2-20

Groundwater Elevation Contours in the Fox Canyon Aquifer, October 2-29, 2018



Legend

- Approximate contour of equal elevation (feet amsl) of groundwater. Dashed where approximate; queried where inferred.
- Wells Screened in the Fox Canyon Aquifer
- New Nested Monitoring Well Cluster
- *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)
- Oxnard Forebay
- Oxnard Pumping Depression Management Area
- Pleasant Valley Pumping trough Management Area
- Saline Intrusion Management
- 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 2-21

Groundwater Elevation Contours in the Fox Canyon Aquifer, March 2-29, 2019

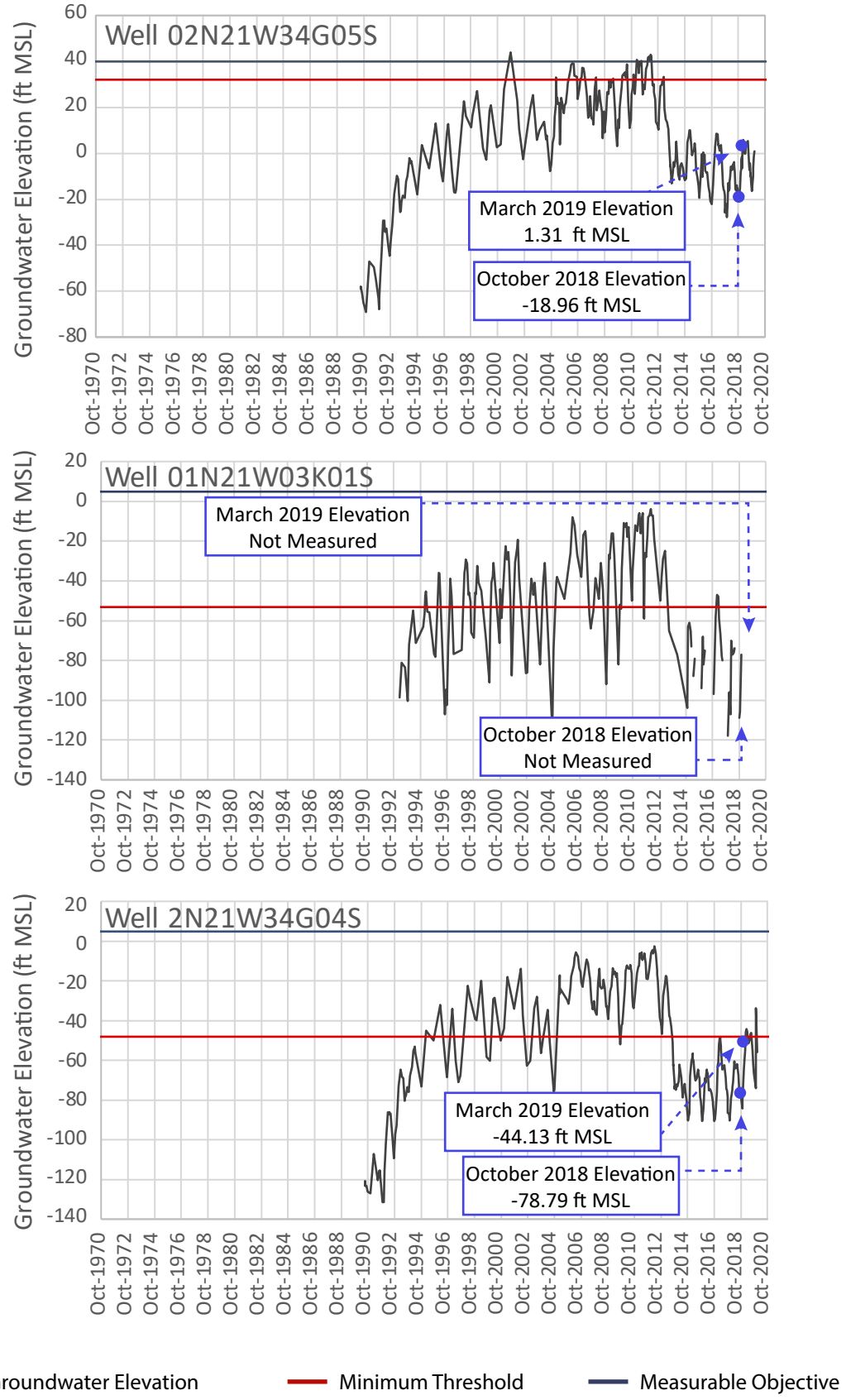


FIGURE 2-22

Groundwater Elevation Hydrographs for Representative Wells Screened in the Older Alluvium

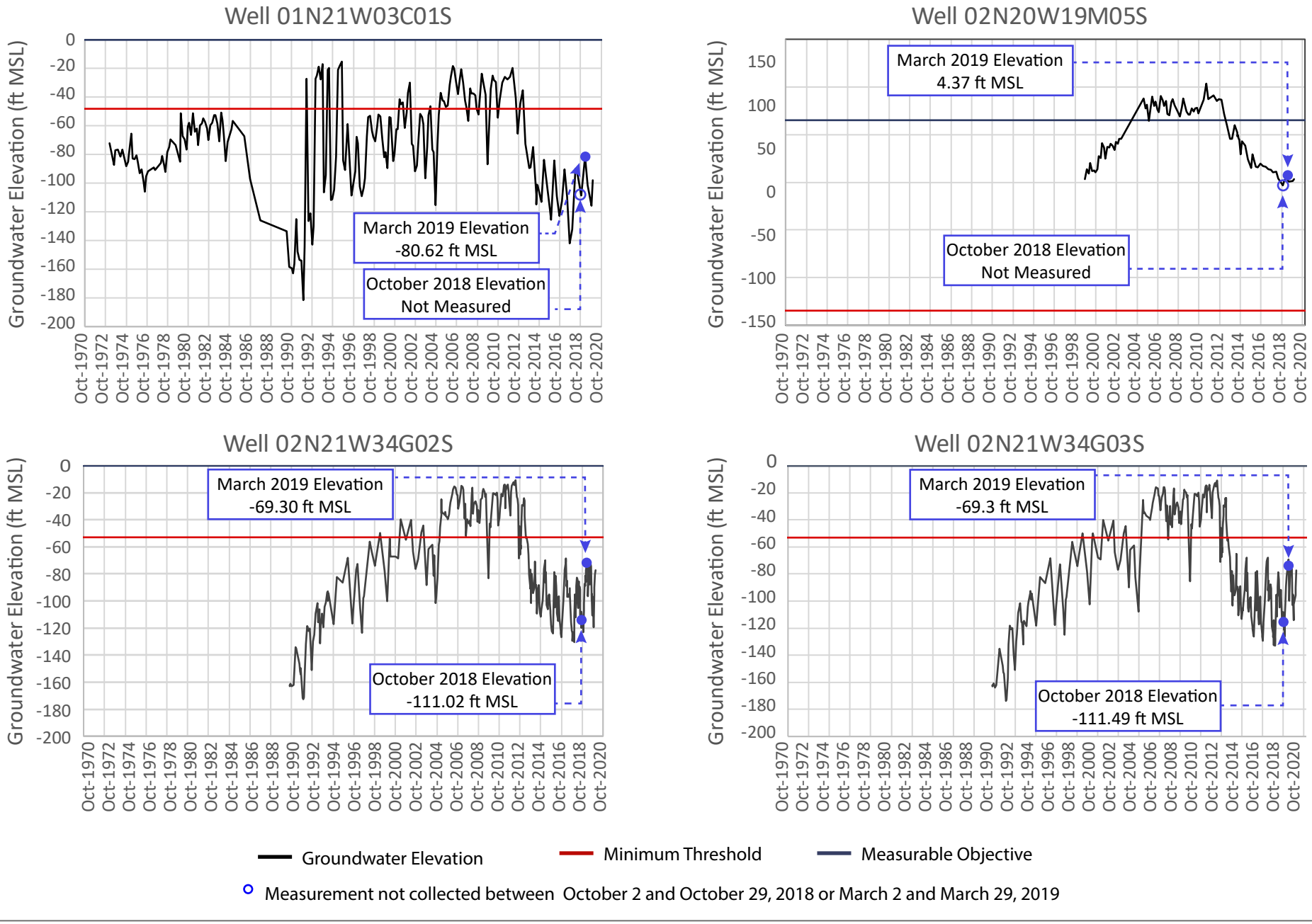


FIGURE 2-23

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

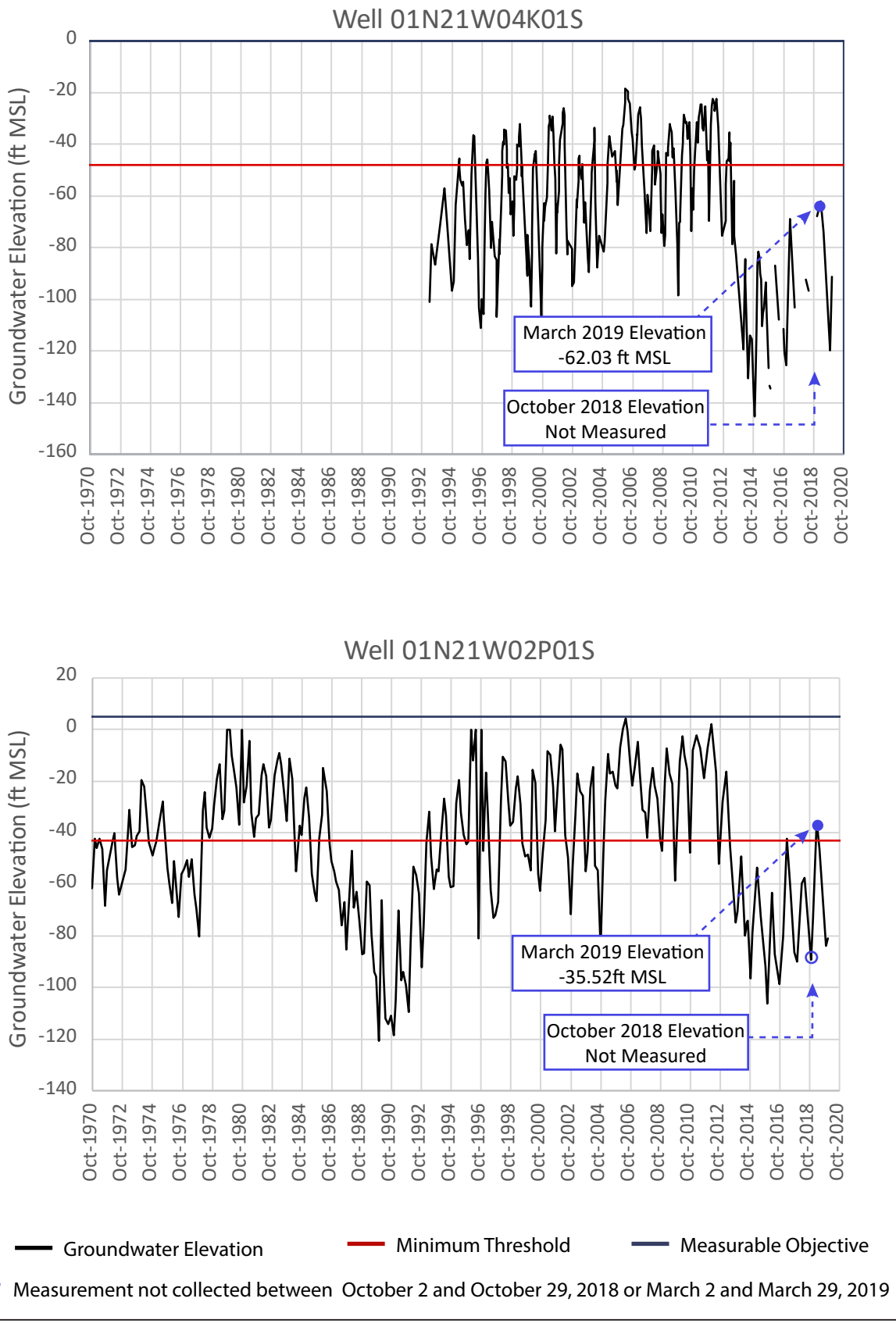
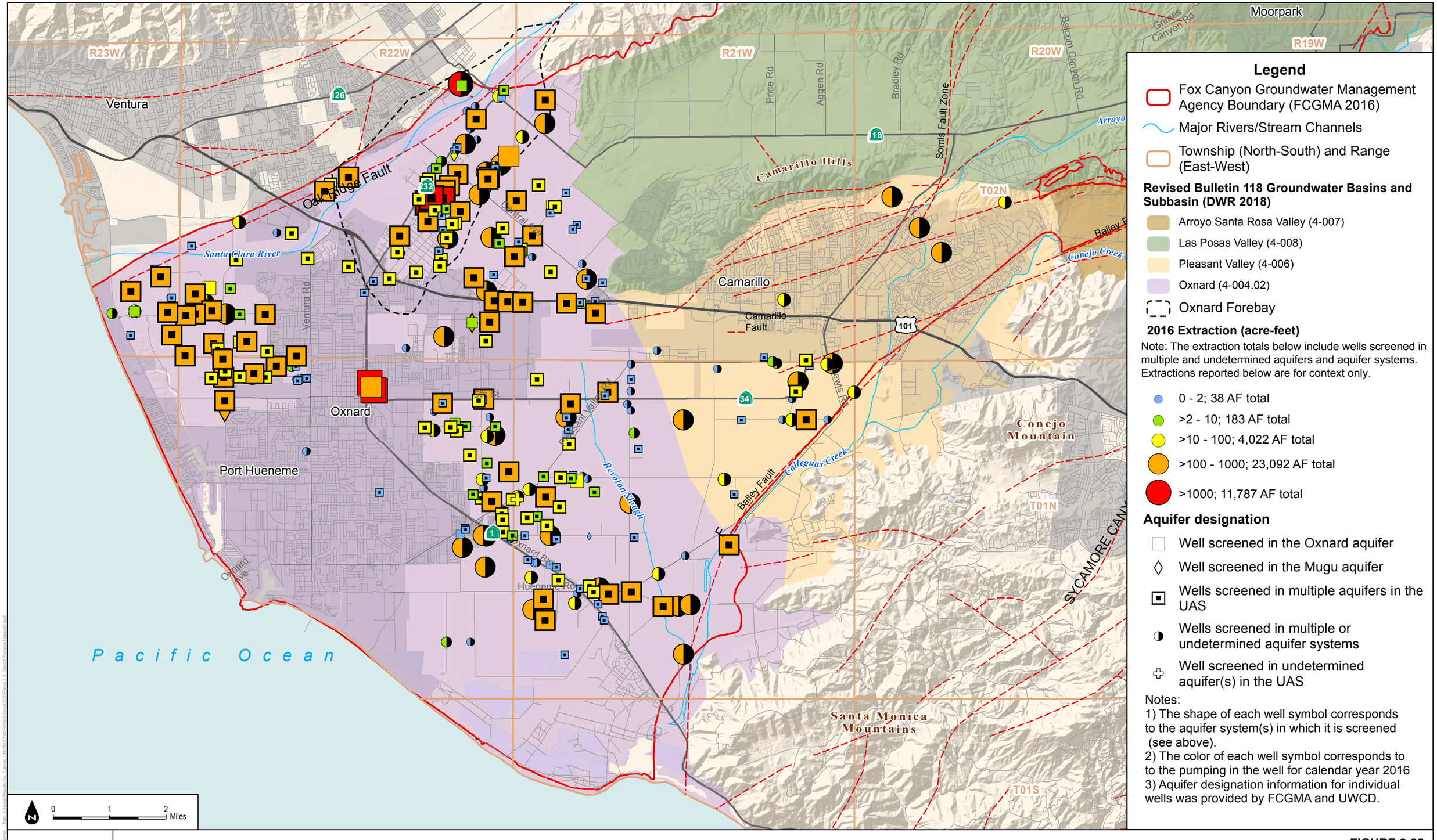


FIGURE 2-24

Groundwater Elevation Hydrographs for Representative Wells Screened in 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)
- Oxnard Forebay

2016 Extraction (acre-feet)

Note: The extraction totals below include wells screened in multiple and undetermined aquifers and aquifer systems. Extractions reported below are for context only.

- 0 - 2; 38 AF total
- >2 - 10; 183 AF total
- >10 - 100; 4,022 AF total
- >100 - 1000; 23,092 AF total
- >1000; 11,787 AF total

Aquifer designation

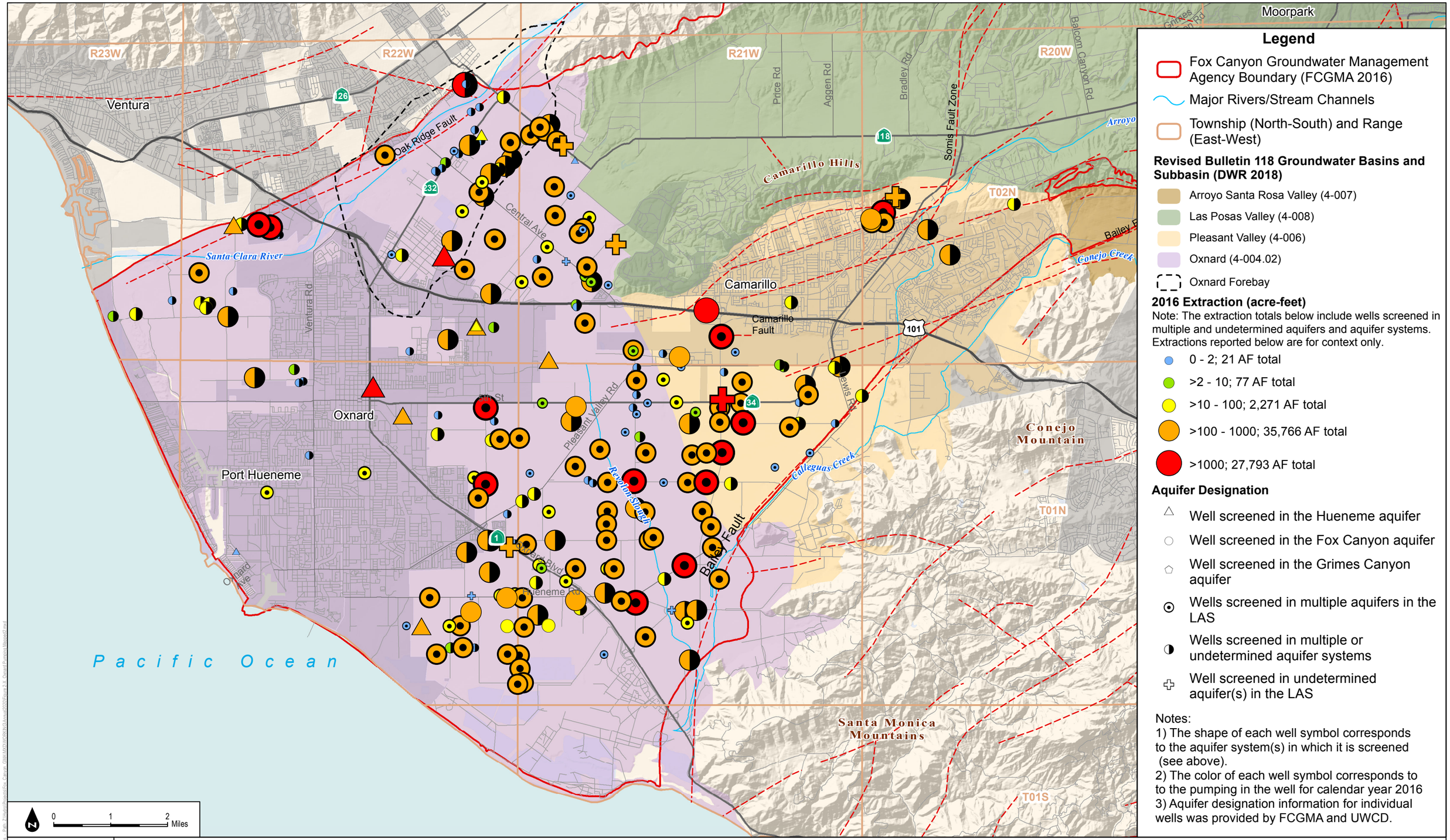
- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS
- Wells screened in multiple or undetermined aquifer systems
- Well screened in undetermined aquifer(s) in the UAS

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 for calendar year 2016
3) Aquifer designation information for individual wells was provided by FCGMA and UWCD.

SOURCE: DWR, FCGMA, VCWPD, UWCD

FIGURE 2-25

Groundwater Production from the UAS in Calendar Year 2016



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)
- Oxnard Forebay

2016 Extraction (acre-feet)

Note: The extraction totals below include wells screened in multiple and undetermined aquifers and aquifer systems. Extractions reported below are for context only.

- 0 - 2; 21 AF total
- >2 - 10; 77 AF total
- >10 - 100; 2,271 AF total
- >100 - 1000; 35,766 AF total
- >1000; 27,793 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

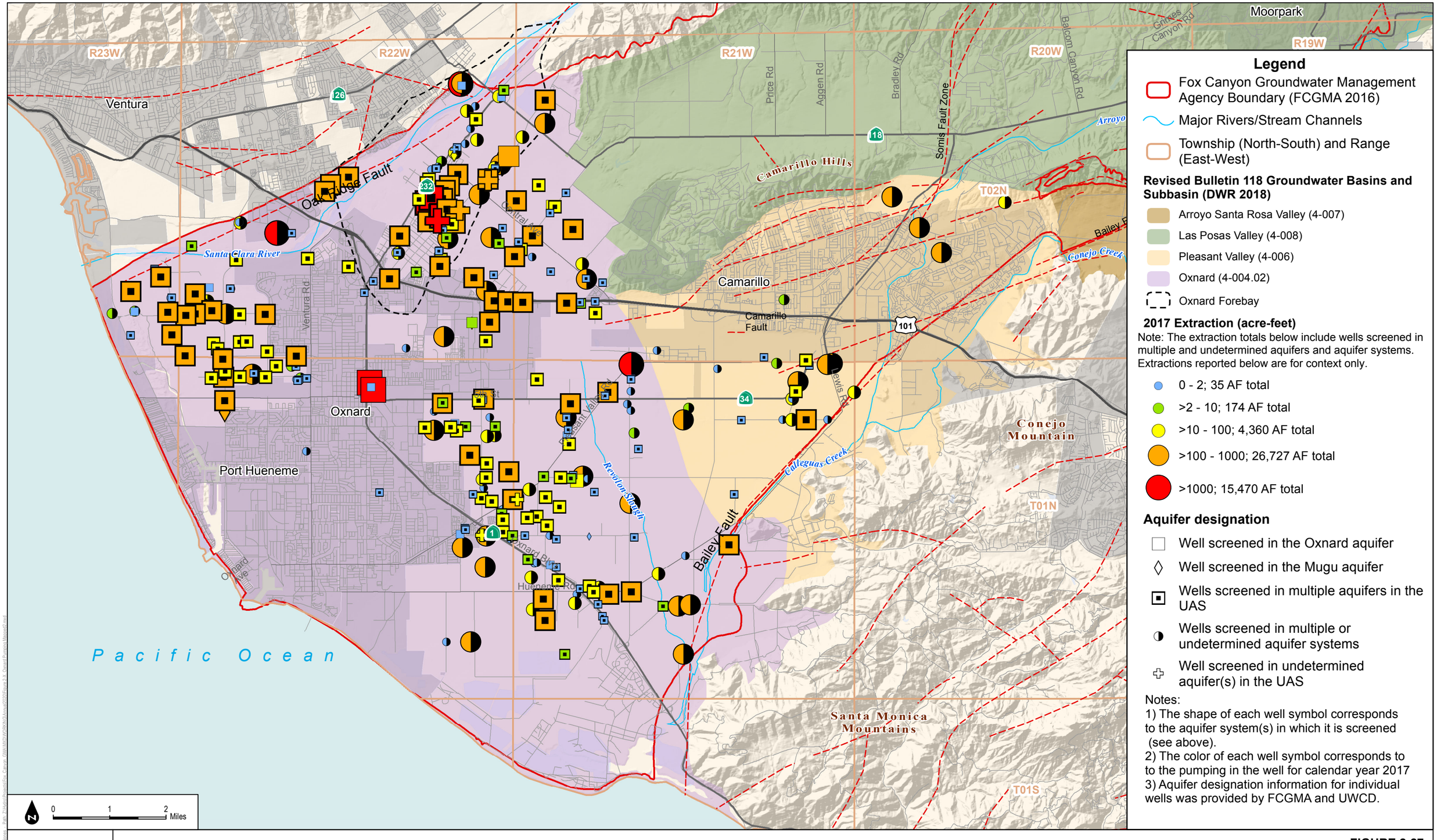
Notes:
1) The shape of each well symbol corresponds to the aquifer system(s) in which it is screened (see above).
2) The color of each well symbol corresponds to to the pumping in the well for calendar year 2016
3) Aquifer designation information for individual wells was provided by FCGMA and UWCD.

DUDEK

SOURCE: DWR, FCGMA, VCWPD, UWCD

FIGURE 2-26

Groundwater Production from the LAS in Calendar Year 2016



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)
- Oxnard Forebay

2017 Extraction (acre-feet)

Note: The extraction totals below include wells screened in multiple and undetermined aquifers and aquifer systems. Extractions reported below are for context only.

- 0 - 2; 35 AF total
- >2 - 10; 174 AF total
- >10 - 100; 4,360 AF total
- >100 - 1000; 26,727 AF total
- >1000; 15,470 AF total

Aquifer designation

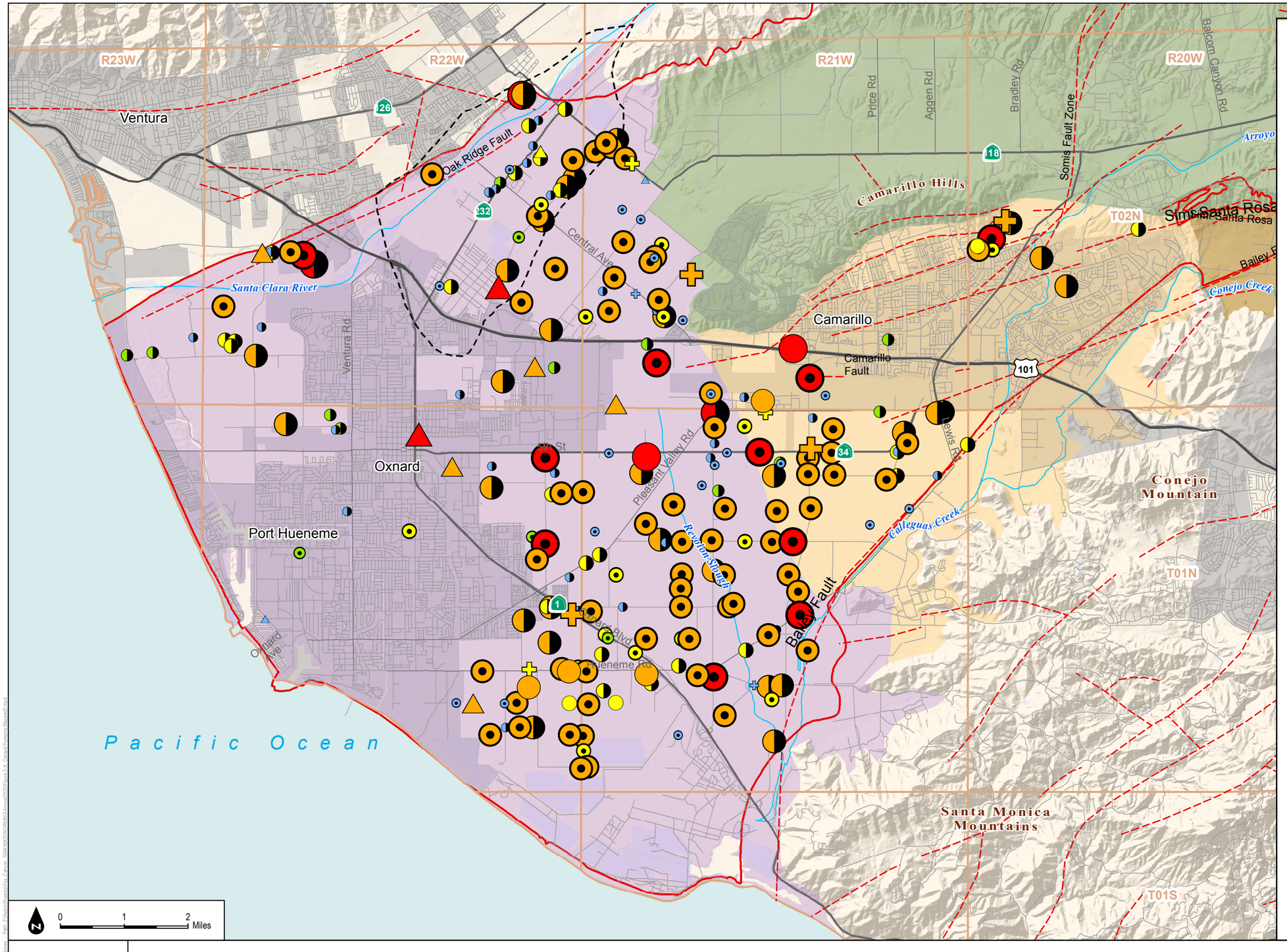
- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS
- Wells screened in multiple or undetermined aquifer systems
- Well screened in undetermined aquifer(s) in the UAS

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 for calendar year 2017
3) Aquifer designation information for individual wells was provided by FCGMA and UWCD.

SOURCE: DWR, FCGMA, VCWPD, UWCD

FIGURE 2-27

Groundwater Production from the UAS in Calendar Year 2017



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)
- Oxnard Forebay

2017 Extraction (acre-feet)

Note: The extraction totals below include wells screened in multiple and undetermined aquifers and aquifer systems. Extractions reported below are for context only.

- 0 - 2; 21 AF total
- >2 - 10; 74 AF total
- >10 - 100; 2,522 AF total
- >100 - 1000; 37,122 AF total
- >1000; 24,137 AF total

Aquifer Designation

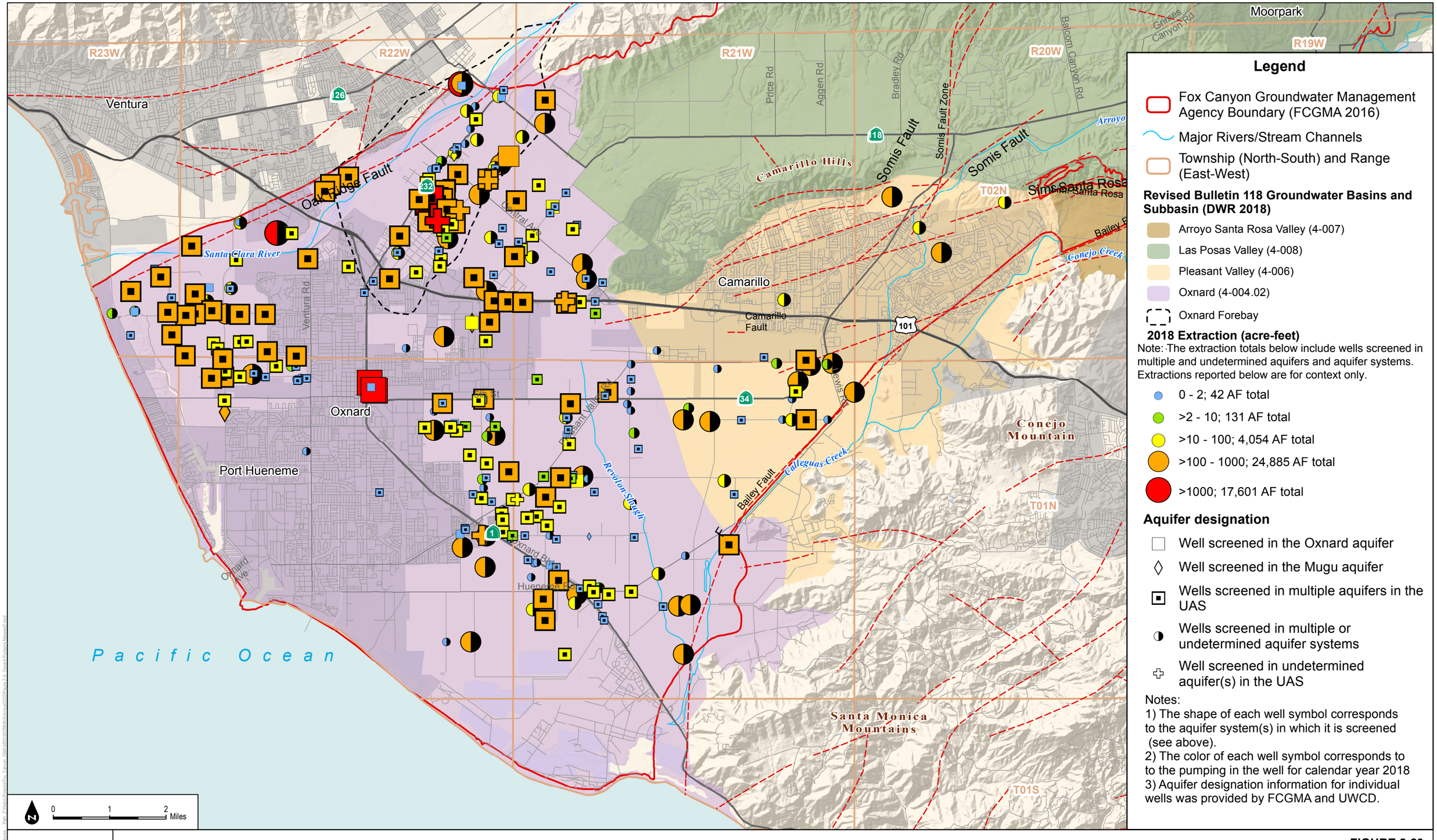
- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS
- Wells screened in multiple or undetermined aquifer systems
- Well screened in undetermined aquifer(s) in the LAS

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 for calendar year 2017
3) Aquifer designation information for individual wells was provided by FCGMA and UWCD.

SOURCE: DWR, FCGMA, VCWPD, UWCD

FIGURE 2-28

Groundwater Production from the LAS in Calendar Year 2017



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)
- Oxnard Forebay

2018 Extraction (acre-feet)

Note: The extraction totals below include wells screened in multiple and undetermined aquifers and aquifer systems. Extractions reported below are for context only.

- 0 - 2; 42 AF total
- >2 - 10; 131 AF total
- >10 - 100; 4,054 AF total
- >100 - 1000; 24,885 AF total
- >1000; 17,601 AF total

Aquifer designation

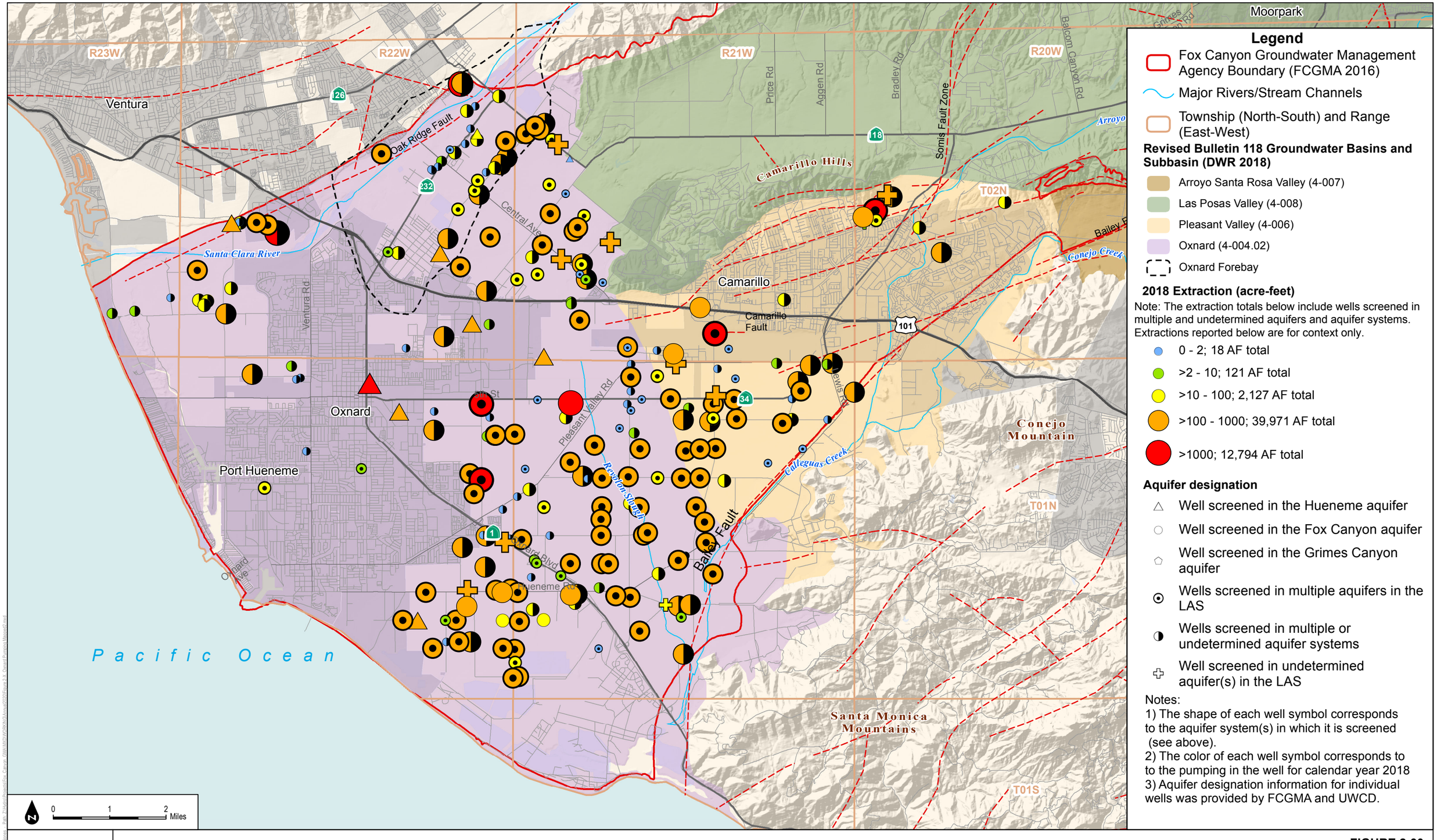
- Well screened in the Oxnard aquifer
- Well screened in the Mugu aquifer
- Wells screened in multiple aquifers in the UAS
- Wells screened in multiple or undetermined aquifer systems
- Well screened in undetermined aquifer(s) in the UAS

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 for calendar year 2018
3) Aquifer designation information for individual wells was provided by FCGMA and UWCD.

SOURCE: DWR, FCGMA, VCWPD, UWCD

FIGURE 2-29

Groundwater Production from the UAS in Calendar Year 2018



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)
- Oxnard Forebay

2018 Extraction (acre-feet)

Note: The extraction totals below include wells screened in multiple and undetermined aquifers and aquifer systems. Extractions reported below are for context only.

- 0 - 2; 18 AF total
- >2 - 10; 121 AF total
- >10 - 100; 2,127 AF total
- >100 - 1000; 39,971 AF total
- >1000; 12,794 AF total

Aquifer designation

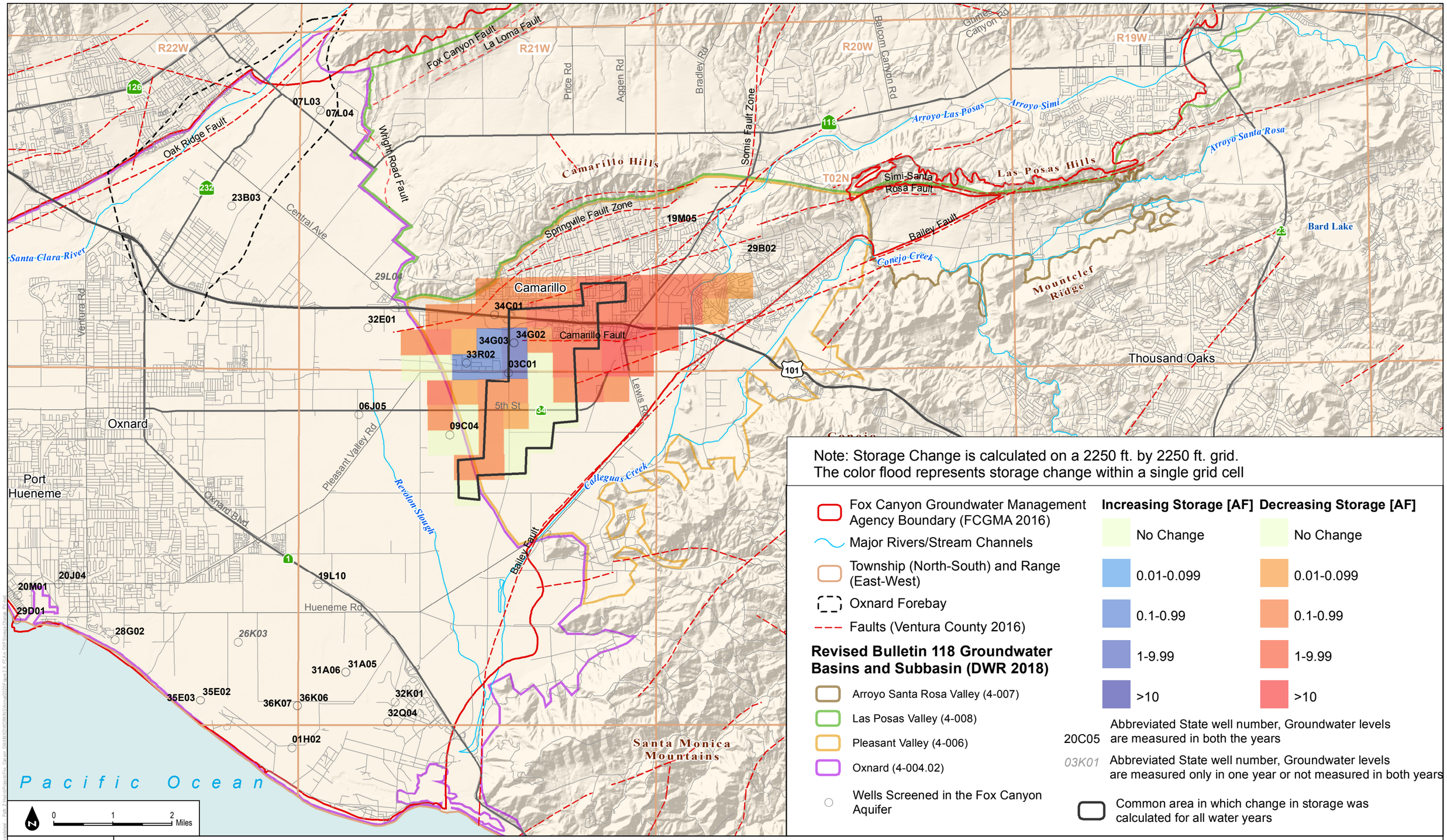
- Well screened in the Hueneme aquifer
- Well screened in the Fox Canyon aquifer
- Well screened in the Grimes Canyon aquifer
- Wells screened in multiple aquifers in the LAS
- Wells screened in multiple or undetermined aquifer systems
- Well screened in undetermined aquifer(s) in the LAS

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 for calendar year 2018
3) Aquifer designation information for individual wells was provided by FCGMA and UWCD.

SOURCE: DWR, FCGMA, VCWPD, UWCD

FIGURE 2-30

Groundwater Production from the LAS in Calendar Year 2018



Note: Storage Change is calculated on a 2250 ft. by 2250 ft. grid.
The color flood represents storage change within a single grid cell

- 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)

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)
- Wells Screened in the Fox Canyon Aquifer

Increasing Storage [AF]	Decreasing Storage [AF]
No Change	No Change
0.01-0.099	0.01-0.099
0.1-0.99	0.1-0.99
1-9.99	1-9.99
>10	>10

20C05 Abbreviated State well number, Groundwater levels are measured in both the years

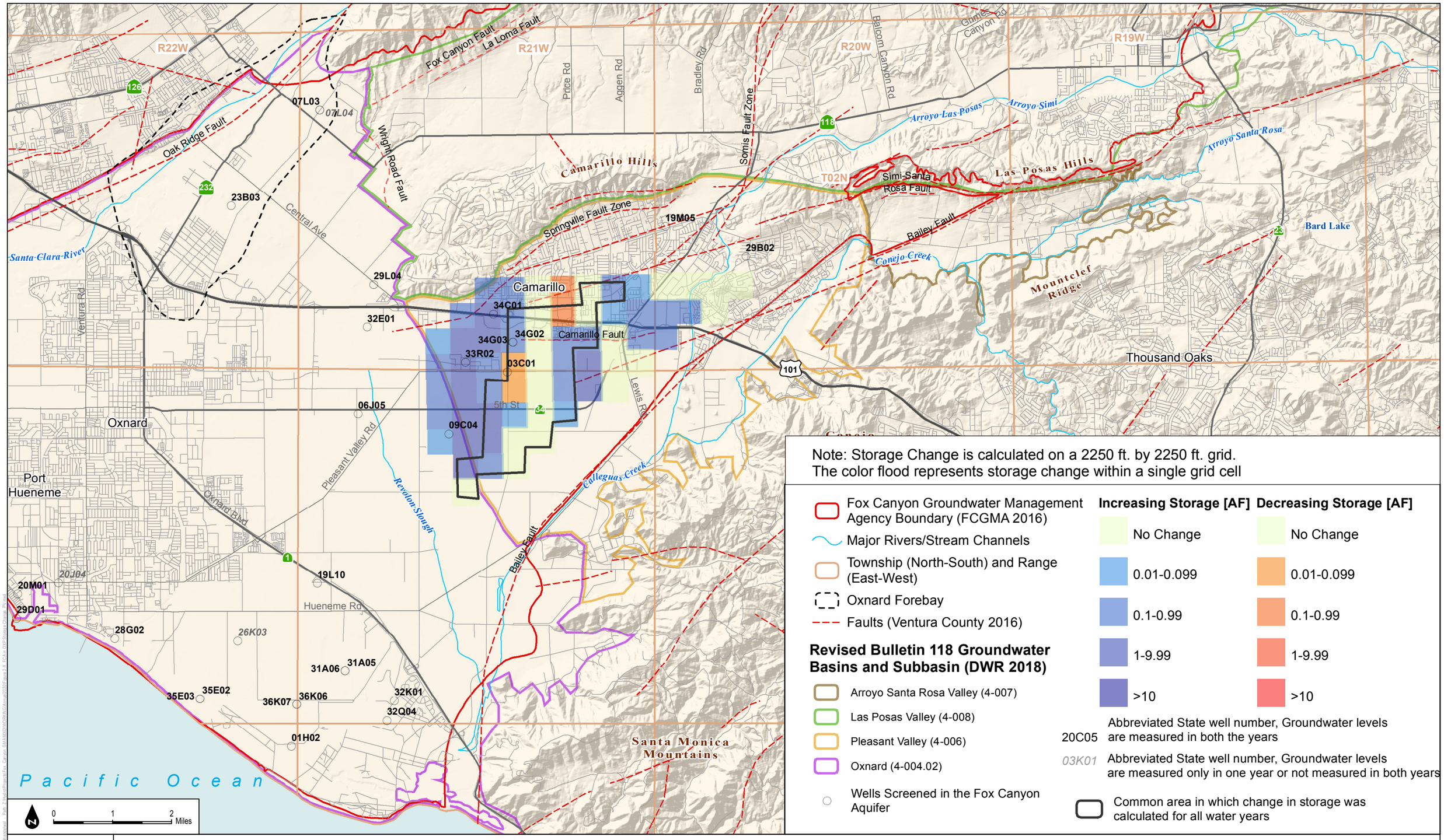
03K01 Abbreviated State well number, Groundwater levels are measured only in one year or not measured in both years

Common area in which change in storage was calculated for all water years

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-31

Change in Storage in the Fox Canyon Aquifer: Spring 2015 to Spring 2016



Note: Storage Change is calculated on a 2250 ft. by 2250 ft. grid.
The color flood represents storage change within a single grid cell

- 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)

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)

Wells Screened in the Fox Canyon Aquifer

Increasing Storage [AF]	Decreasing Storage [AF]
No Change	No Change
0.01-0.099	0.01-0.099
0.1-0.99	0.1-0.99
1-9.99	1-9.99
>10	>10

20C05 Abbreviated State well number, Groundwater levels are measured in both the years

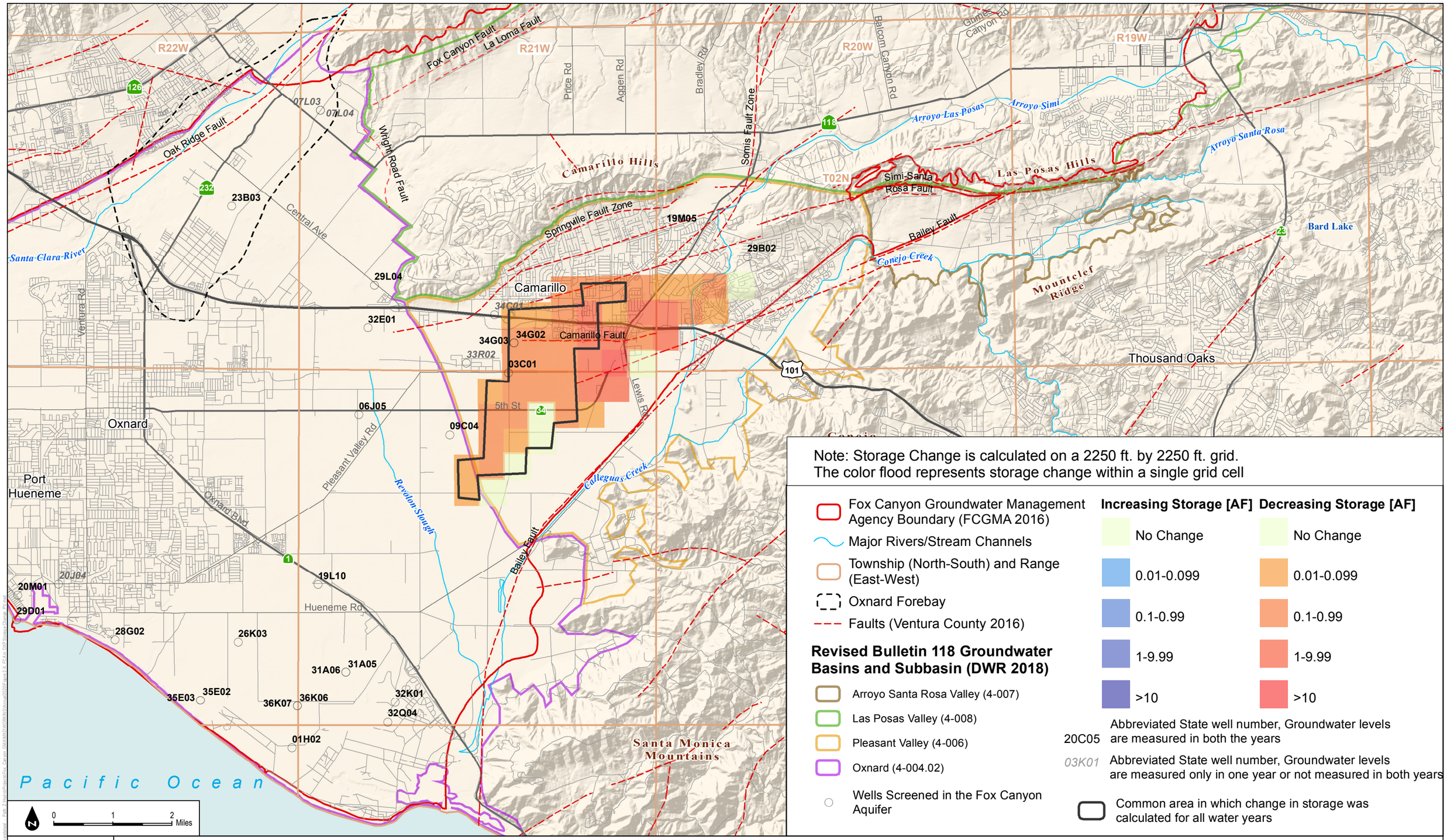
03K01 Abbreviated State well number, Groundwater levels are measured only in one year or not measured in both years

Common area in which change in storage was calculated for all water years

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-32

Change in Storage in the Fox Canyon Aquifer: Spring 2016 to Spring 2017



Note: Storage Change is calculated on a 2250 ft. by 2250 ft. grid.
The color flood represents storage change within a single grid cell

- 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)

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)
- Wells Screened in the Fox Canyon Aquifer

Increasing Storage [AF]	Decreasing Storage [AF]
No Change	No Change
0.01-0.099	0.01-0.099
0.1-0.99	0.1-0.99
1-9.99	1-9.99
>10	>10

20C05 Abbreviated State well number, Groundwater levels are measured in both the years

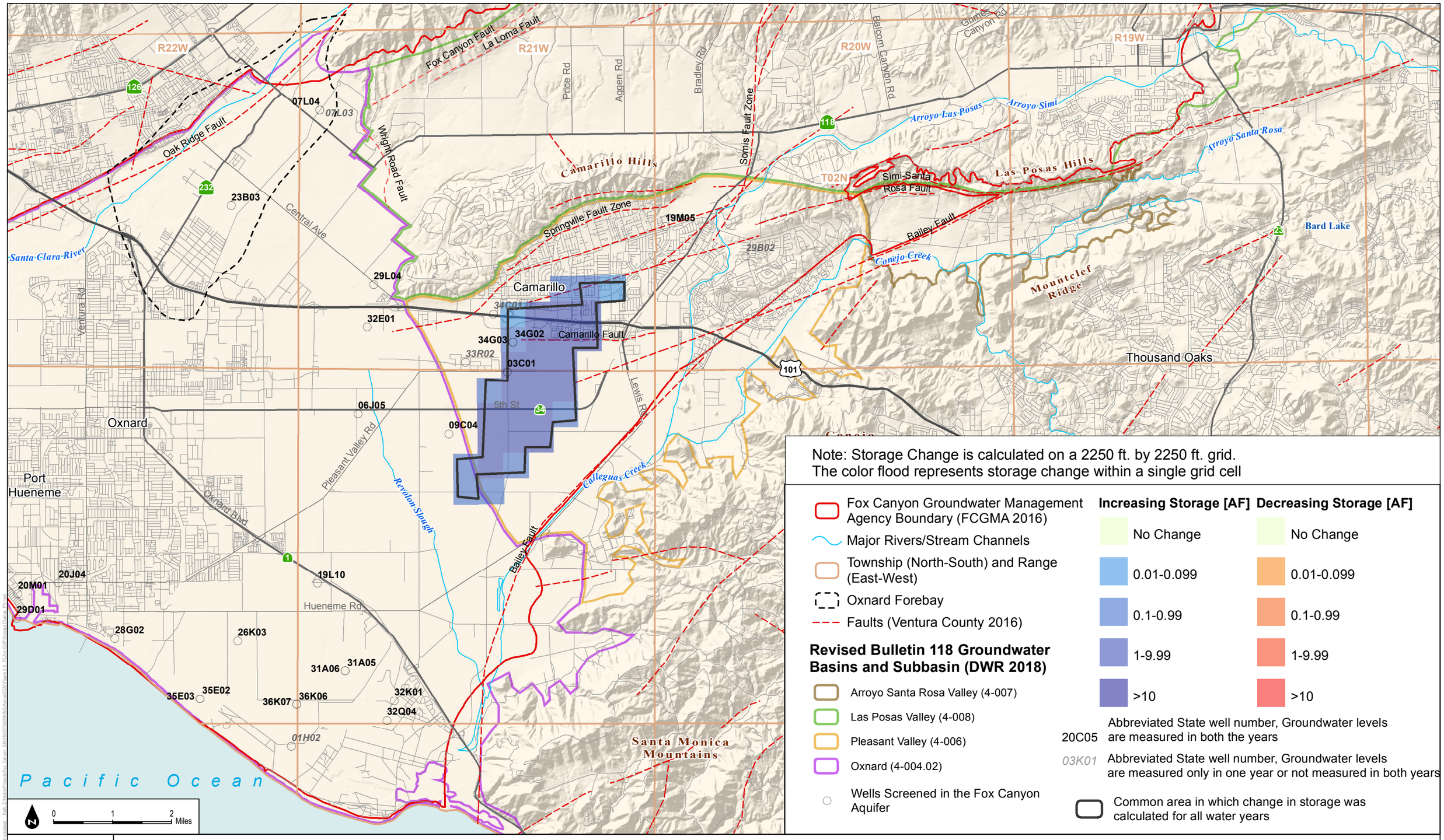
03K01 Abbreviated State well number, Groundwater levels are measured only in one year or not measured in both years

Common area in which change in storage was calculated for all water years

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-33

Change in Storage in the Fox Canyon Aquifer: Spring 2017 to Spring 2018



Note: Storage Change is calculated on a 2250 ft. by 2250 ft. grid.
The color flood represents storage change within a single grid cell

- 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)

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)
- Wells Screened in the Fox Canyon Aquifer

Increasing Storage [AF]	Decreasing Storage [AF]
No Change	No Change
0.01-0.099	0.01-0.099
0.1-0.99	0.1-0.99
1-9.99	1-9.99
>10	>10

20C05 Abbreviated State well number, Groundwater levels are measured in both the years

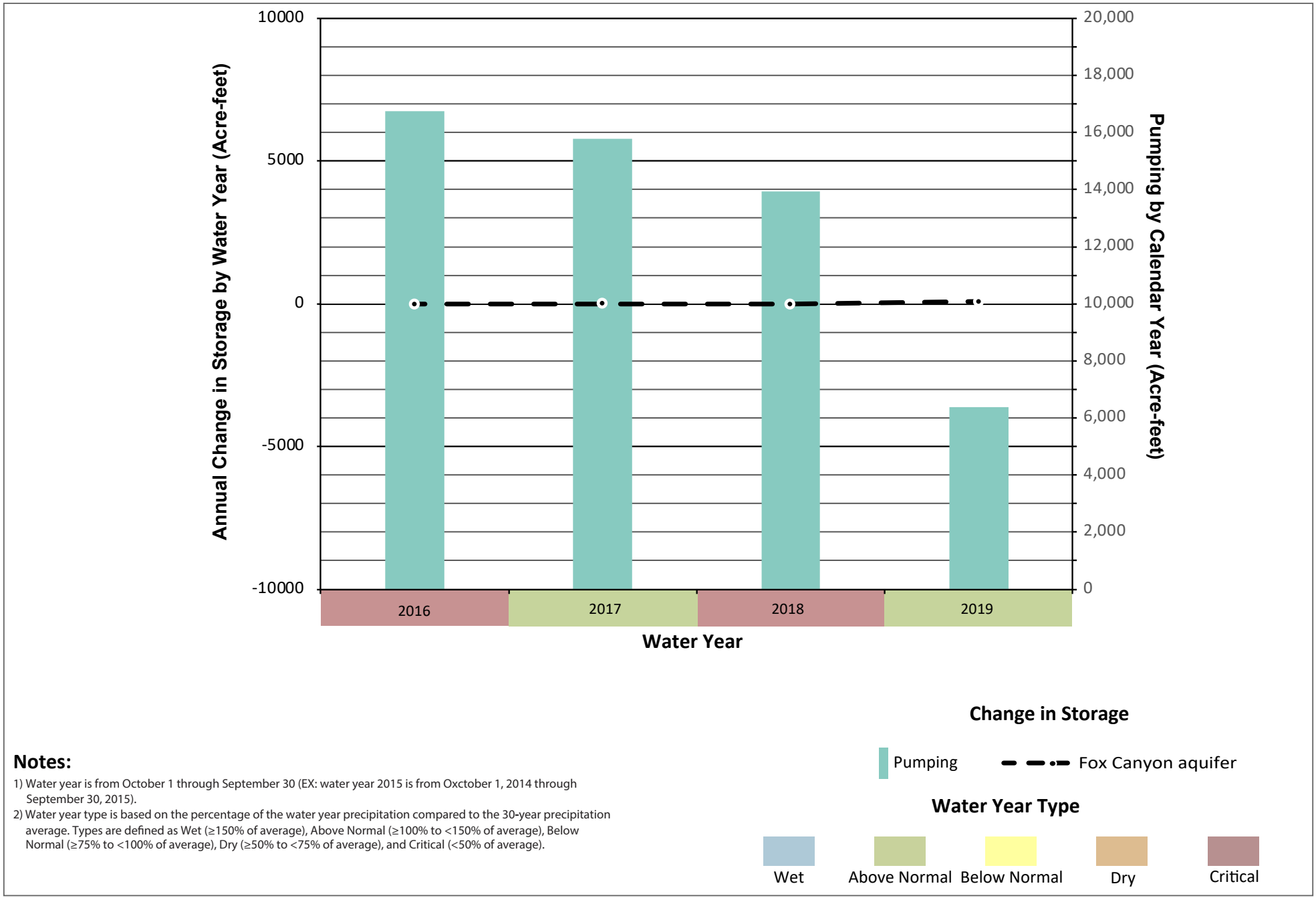
03K01 Abbreviated State well number, Groundwater levels are measured only in one year or not measured in both years

Common area in which change in storage was calculated for all water years

SOURCE: DWR, FCGMA, VCWPD, CMWD, UWCD

FIGURE 2-34

Change in Storage in the Fox Canyon Aquifer: Spring 2018 to Spring 2019

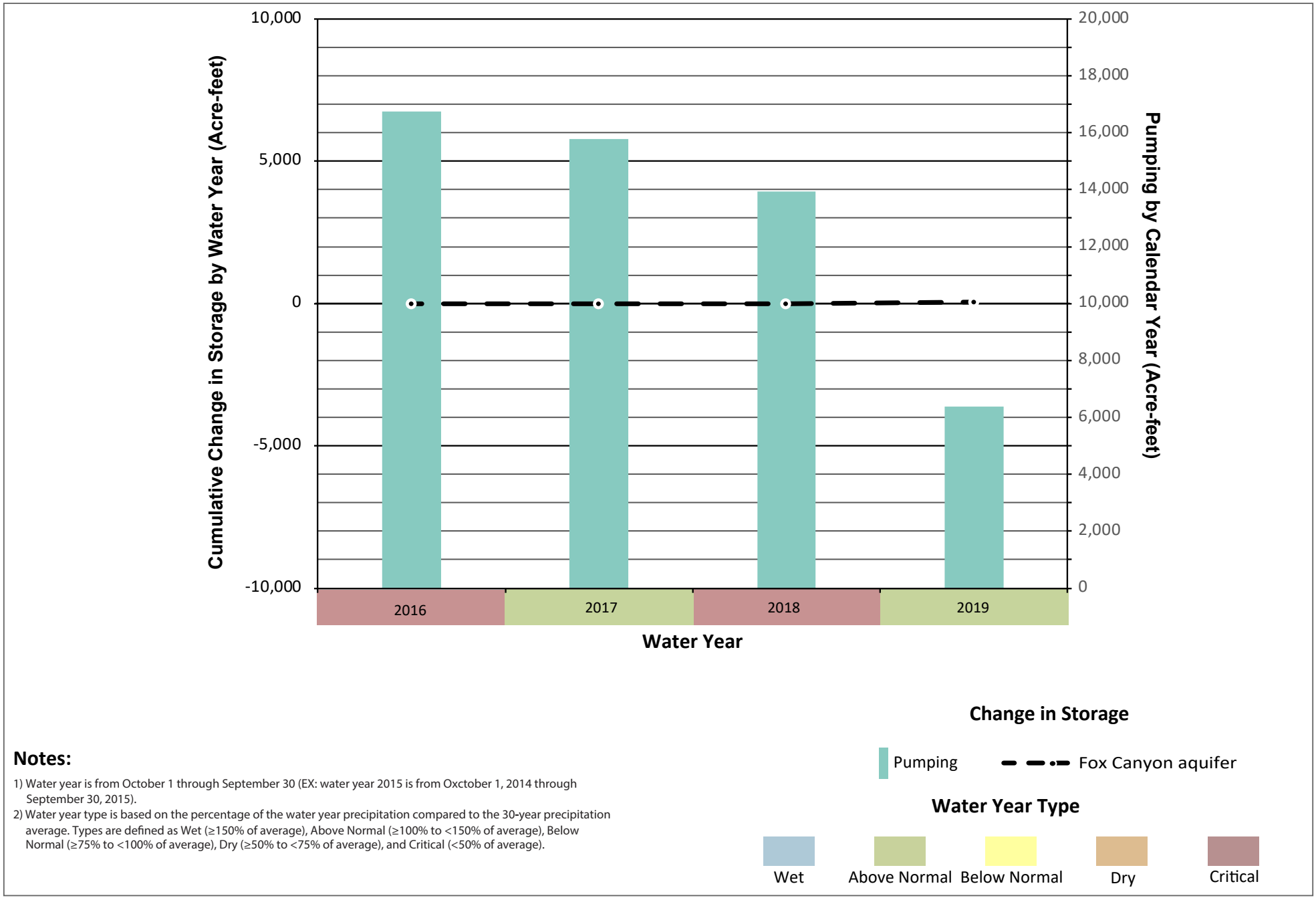


Notes:

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

FIGURE 2-35

Water Year Type, Groundwater Use, and Annual Change in Storage in the Pleasant Valley Basin



Notes:

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

FIGURE 2-36

Water Year Type, Groundwater Use, and Cumulative Change in Storage in the Pleasant Valley Basin