ANNUAL REPORT | APRIL 2023

RED BLUFF SUBBASIN GROUNDWATER SUSTAINABILITY PLAN ANNUAL REPORT – 2022

PREPARED FOR

TEHAMA COUNTY FLOOD CONTROL AND

WATER CONSERVATION DISTRICT

TEHAMA COUNTY GSA

PREPARED BY

CERTIFIED HYDROGEOLOGIST EDDY W. TEASDALE No. 926 STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST EDDY W. TEASDALE No. 7791 STATE OF CALIFORNIA

EDDY TEASDALE, PG, CHG
SUPERVISING HYDROGEOLOGIST

LUHDORFF AND SCALMANINI, CONSULTING ENGINEERS
500 1ST STREET
WOODLAND, CA 95695

Luhdorff & Scalmanini Consulting Engineers

DAVIDS ENGINEERING, INC

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
AEM	airborne electromagnetic
af	acre-feet
af/ac	acre-feet per acre
bgs	below ground surface
CASGEM	California Statewide Groundwater Elevation Monitoring Online System
CSD	Community Services District
CVO	Central Valley Operations
CVP	Central Valley Project
District	Tehama County Flood Control and Water Conservation District
DMS	data management system
DWR	Department of Water Resources
ET	evapotranspiration
ft	feet
GAMA	Groundwater Ambient Monitoring and Assessment Program
GIS	geospatial information system
GPCD	gallons per capita per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IM	interim milestone
InSAR	interferometric synthetic aperture radar
km	kilometer
m	meter
MO	measurable objective
MT	minimum threshold
NAVD 88	North American Vertical Datum of 1988
PMAs	Projects and Management Actions
PRISIM	Parameter-elevation Regressions on Independent Slopes Model
RMS	representative monitoring site
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
Subbasin	Red Bluff Groundwater Subbasin
SVSim	Sacramento Valley Groundwater-Surface Water Simulation Model

Acronym	Meaning
Tehama IHM	Tehama Integrated Hydrogeological Model
Tehama County FCWCD	Tehama County Flood Control and Water Conservation District
TSS	DWR Technical Support Services
USBR	United States Bureau of Reclamation
UWMP	urban water management plan
WY	water year

EXECUTIVE SUMMARY

ES 1. Introduction

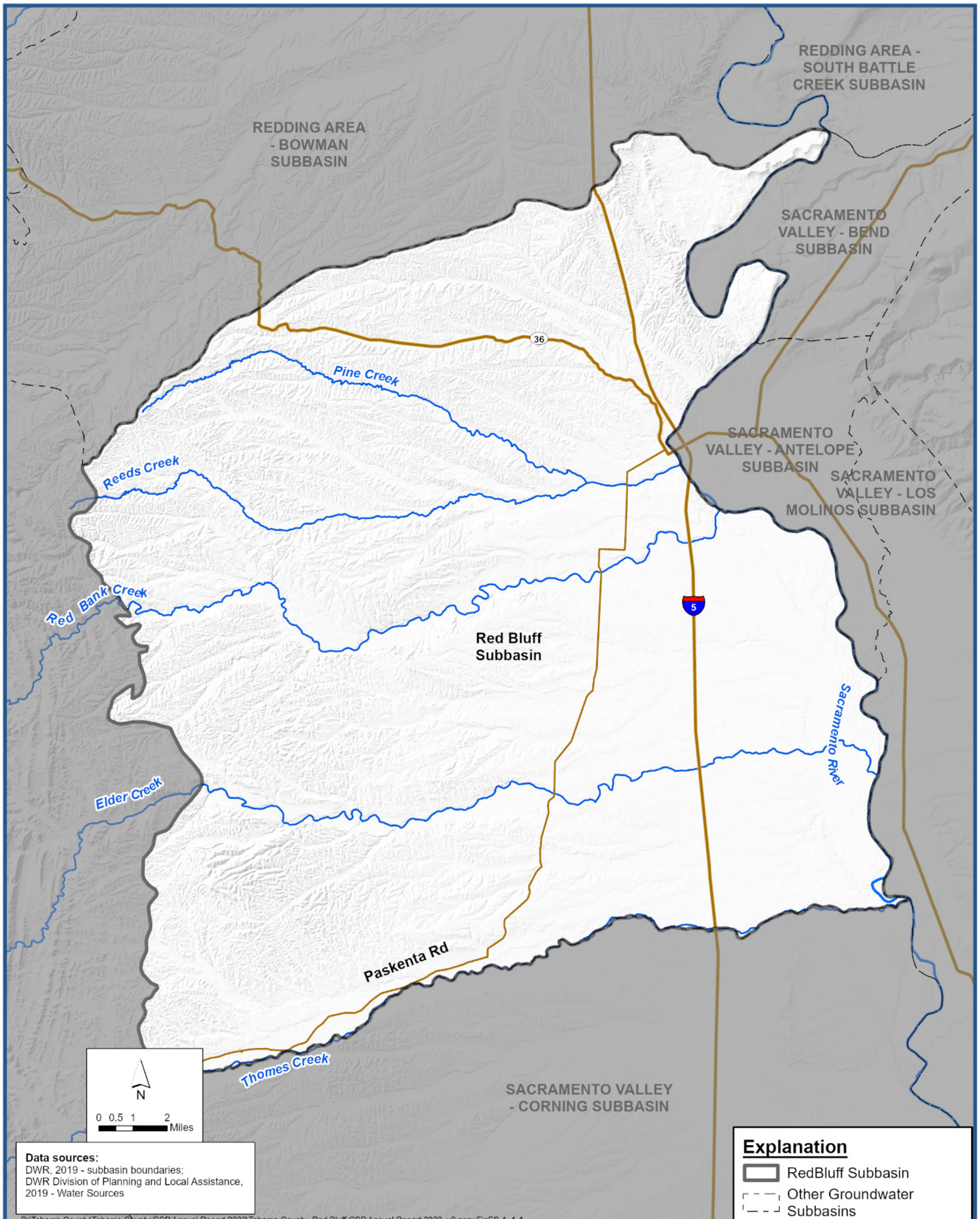
The annual report for the Red Bluff Subbasin (Subbasin) (5-021.50) was prepared on behalf of the Tehama County Groundwater Sustainability Agency (GSA or District) to fulfill the statutory requirements of the Sustainable Groundwater Management Act (SGMA) legislation (Section 10728) and regulatory requirements developed by the California Department of Water Resources (DWR) included in the Groundwater Sustainability Plan (GSP) Regulations (Section 354.40 and Section 356.2). The Regulations require the GSA to submit an Annual Report to DWR by April 1st following the reporting year (October through September).

The Red Bluff Subbasin covers 271,800 acres and is in the Northern Sacramento Valley Groundwater Basin (**Figure ES-1**). Red Bluff is one of seven (7) groundwater subbasins within Tehama County. The Tehama County FCWCD is the exclusive GSA for six (6) of those subbasins: Antelope, Bend, Bowman, Los Molinos, Red Bluff, and South Battle Creek. The seventh is the Corning Subbasin which extends into Glenn County that subbasin is managed in a coordinated effort between the Tehama County and the Corning Sub-basin GSAs.

This report is the second Annual Report prepared to support the adopted Red Bluff Subbasin GSP submitted in January 2022. This Annual Report includes data elements for the current reporting Water Year (WY) of 2022. Pursuant to GSP Regulations, the Annual Report includes:

1. Groundwater Elevation Data
2. Water Supply and Use
3. Change in Groundwater Storage
4. GSP Implementation Progress

This Annual Report coincides with one of the most severe and extensive droughts in the western United States' recorded history. In WY 2022, drought conditions in this subbasin were classified as ranging from "extreme" to "exceptional," the most extreme classification defined by the U.S. Drought Monitor. Historically, observed impacts during exceptional drought generally include: widespread water supply shortages, depleted surface water supplies, extremely low federal and state surface water deliveries, curtailment of water rights, extremely high surface water prices, increased groundwater pumping to satisfy water demands, dry groundwater wells, increased well drilling and deepening, increased pumping costs, wildfire, decreased recreational opportunities, and poor water quality, among other potential impacts reported by the U.S. Drought Monitor. All of these conditions were experienced to a degree across California in 2022 and, at least in part, within the Subbasin.



TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

LSCE Team

Subbasin Area Map

Groundwater Sustainability Plan – Annual Report WY 2022
Red Bluff Subbasin

Figure ES-1

ES 2. Groundwater Elevations

Groundwater elevation data in the Upper and Lower Aquifers for WY 2022 was analyzed. The WY is defined as October through September. Groundwater elevation contour maps for seasonal low and seasonal high-water levels were prepared for WY 2022. Seven representative monitoring site (RMS) wells exist that monitor groundwater levels in the Upper Aquifer while only one RMS well is screened in the Lower Aquifer. Through the DWR Technical Support Services (TSS) program, one additional well has already been installed and there are plans to install two more. In total the TSS wells will provide three additional wells to both the Upper and Lower Aquifers. Seasonal high groundwater elevations were near or above the measurable objectives in all RMS wells during WY 2022.

ES 3. Water Supply and Use

Table ES-1 includes groundwater use data by sector for WY 2022, numbers are rounded to two significant digits, except totals which are unrounded. The agricultural sector had the greatest decrease in use from 140,000 acre-feet (af) in WY 2021 to 110,000 af in WY 2022. Native vegetation experienced an increase from 2,000 in WY 2021 to 5,400 af in WY 2022, while urban groundwater use saw an increase from 5,800 af in WY 2021 to 7,400 af WY 2022. In 2021 Urban use included an estimated Rural Residential use, in the WY 2022 Annual Report it is reported separately as Rural Residential. The increase in Urban use is expected and described in the Projected Water Budget Summary Section of the GSP. The increase in Urban use is a general trend seen county wide, particularly in densely populated areas round the City of Red Bluff. Water Year 2022 has been preliminarily classified as Critical by DWR (DWR, 2022).

Table ES-1. Groundwater Use by Water Use Sector

Sector	2022 (af)
Agricultural	110,000
Urban	6,400
Rural Residential	980
Riparian Vegetation (Plant groundwater uptake)	5,400
Total	**122,780**
Total (excluding Riparian Vegetation[1])	**117,380**

[1] Excludes native vegetation which involves only natural plant uptake of shallow groundwater, not direct pumping, and extraction.

Total surface water deliveries have been estimated from total surface water diversions by accounting for conveyance losses, reuse, and boundary outflows for WY 2022 and are presented in **Table ES-2**, numbers are rounded to two significant digits, except totals which are unrounded. Total surface water deliveries for the Red Bluff Subbasin were estimated to be about 35 af for WY 2022.

Table ES-2. Surface Water Deliveries by Sector and Source		
Sector	2022 (af)	
	Supply Source	
	CVP	Local
Agricultural	35	0
Urban	0	0
Riparian Vegetation	0	0
Total	**35**	

ES 4. Groundwater Storage

Changes in groundwater storage from Spring 2021 to Spring 2022 were calculated using measured groundwater levels and a storage coefficient for the Aquifer. Changes in groundwater levels from Spring 2021 to Spring 2022 at selected wells were interpolated to estimate the groundwater elevation change in areas where sufficient data was available. Estimated elevation change was multiplied by a storage coefficient (0.066) available from the Tehama Integrated Hydrogeological Model (Tehama County FCWCD, 2022) to estimate the groundwater storage change volume in the Upper and Lower aquifers. Changes in storage calculations are described further in **Sections 2.1**. **Table ES-3** presents the annual storage change values for each principal Aquifer.

Table ES-3. Change in Groundwater Storage Based on Seasonal High Groundwater Levels	
Aquifer	2022 (af)
Upper Aquifer	-35,000
Lower Aquifer	-52,000
Total	-87,000

ES 5. GSP Implementation Progress

ES 5.1 Progress Towards Achieving Sustainability

Groundwater conditions were above the established minimum thresholds (MTs) for the chronic lowering of groundwater levels sustainable management criteria (SMC) in Spring 2022. Overall, water levels in Spring 2022 were lower than Spring 2021 due to extended drought conditions.

The GSA is on track to stay above the MT for the land subsidence SMC. The land subsidence MT is 0.5 feet (ft) per five years.

The depletion of interconnected surface water SMC uses spring groundwater elevations in wells within the monitoring network, and all interconnected surface water RMS wells' water levels were above MT levels.

ES 5.2 Progress Towards PMA Implementation

The Tehama County GSA has applied for grants through DWR's SGM Grant Program to implement Projects and Management Actions (PMAs), with a draft awards list expected in June 2023. The grant application has three components, including GSP implementation and outreach, ongoing monitoring and data enhancements, and project implementation focused on recharge. These projects aim to achieve sustainability goals in the GSP. Additionally, the GSA coordinated with DWR who conducted an AEM survey in 2022 to address data gaps in the subbasin. The collected data is available online and will be used to refine the hydrogeologic conceptual model.

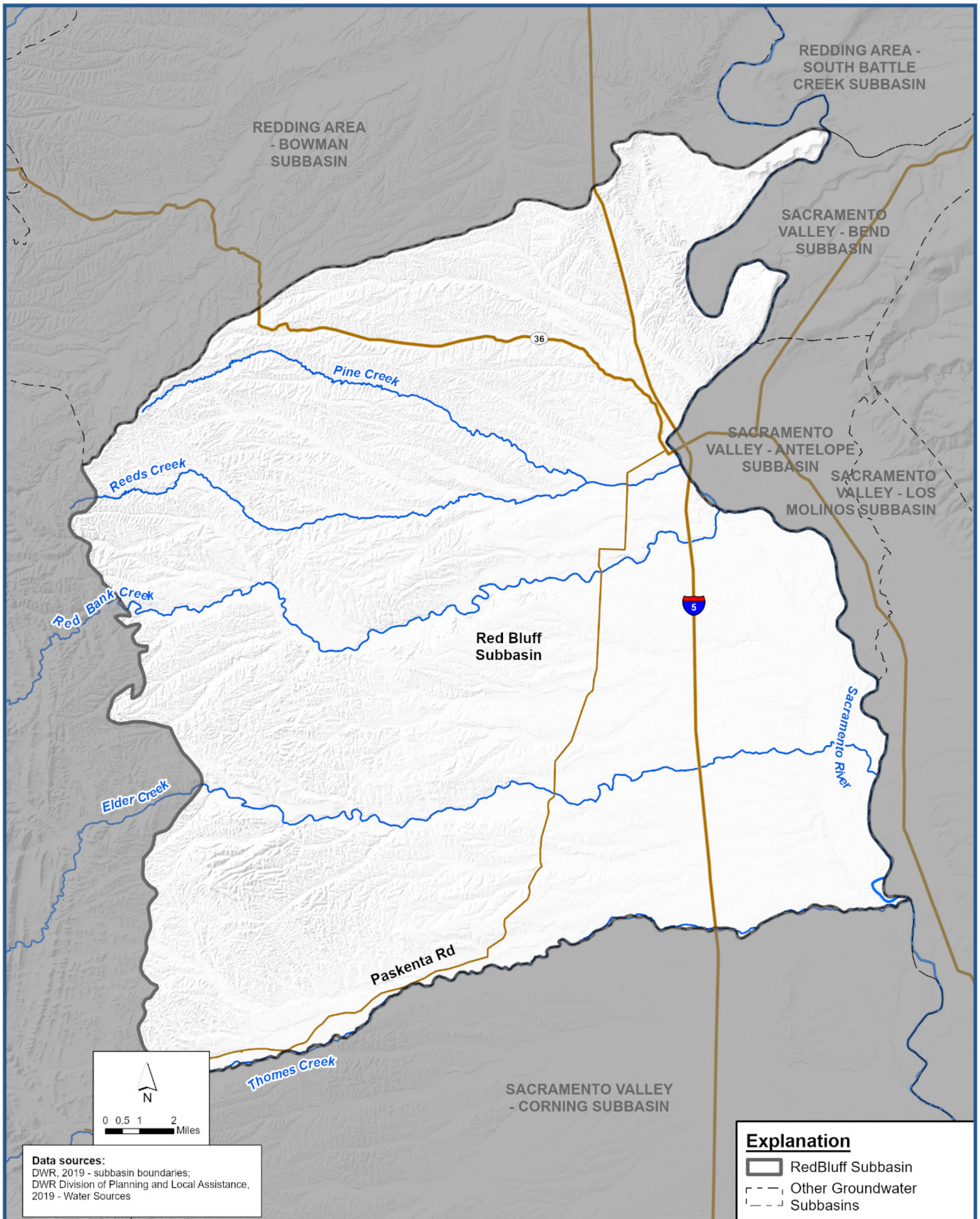
1. GENERAL INFORMATION

The annual report for the Red Bluff Subbasin (Subbasin) (5-021.50) was prepared on behalf of the Tehama County Groundwater Sustainability Agency (GSA) to fulfill the statutory requirements of the Sustainable Groundwater Management Act (SGMA) legislation (Section 10728) and regulatory requirements developed by the California Department of Water Resources (DWR) included in the Groundwater Sustainability Plan (GSP) Regulations (Section 354.40 and Section 356.2). The Regulations require the GSA to submit an Annual Report to DWR by April 1st following the reporting year (October through September).

1.1. Subbasin Setting

The Red Bluff Subbasin (DWR Subbasin No. 5-021.50) covers 271,800 acres located in the Northern Sacramento Valley Groundwater Basin. The lateral extent of the Subbasin is defined by the Subbasin boundaries provided in Bulletin 118 (DWR, 2018). It is bounded on the north by the Bowman Subbasin (DWR Subbasin No. 5-006.01) on the east by the Bend Subbasin (DWR Subbasin No. 5-021.53), the Antelope Subbasin (DWR Subbasin No. 5-021.54), and the Los Molinos Subbasin (DWR Subbasin No. 5-021.56), on the south by the Corning Subbasin (DWR Subbasin No. 5-021.51) and on the west by the Coastal Mountain Range. The eastern and western boundaries of the Subbasin generally follow the Sacramento River and Coastal Mountain Range, respectively, and the southern boundary generally follows Thomes Creek. (**Figure 1-1**).

Current data sources (discussed in **Section 3.2**) estimate 78% of the Subbasin is native vegetation, 13% is agricultural, and 1% is riparian vegetation. The Subbasin's agricultural water users rely on both surface water and groundwater to irrigate their crops. The Subbasin receives surface water supplies from the Central Valley Project (CVP) through the Corning Canal to the Proberta Water District and portions of the Thomes Creek Water District that overlie the Red Bluff Subbasin.



TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
LSCE Team

Subbasin Area Map

Groundwater Sustainability Plan – Annual Report WY 2022
Red Bluff Subbasin

Figure 1-1

Fresh groundwater bearing geologic deposits in the Subbasin are subdivided from previous studies into two units: The Upper Aquifer and the Lower Aquifer (DWR, 2003; DWR, 2004). The two-aquifer designation is based on an examination of groundwater elevation time - series, electric resistivity data from geophysical logs, lithologic logs, well construction details, and review of previous studies in the Subbasin. Generally, semi-confined, and confined aquifer conditions are encountered at depth and unconfined conditions are seen in the shallower porous media. The complexity of the geologic materials and the formations makes it difficult to define a singular widespread aquitard or distinctive change in geologic materials separating an Upper and Lower Aquifer. To delineate between areas with a higher likelihood of confined conditions, well construction data throughout the Subbasin were examined. Water bearing geologic units in the Upper Aquifer include the Quaternary formations and the upper portions of the Tehama and Tuscan Formations. Wells screened in the Upper Aquifer are largely for domestic purposes. The depth to the bottom of the Upper Aquifer is approximately 350-450 feet (ft) below ground surface (bgs).

The Lower Aquifer is defined as the freshwater bearing geologic units throughout the Subbasin from the bottom of model layer five at approximately 350-450 ft bgs, to the bottom of the Subbasin. The aquifer is confined to semi-confined conditions. Water bearing geologic units include the lower portions of the Tehama and Tuscan Formations. Wells screened in the Lower Aquifer are largely for non-domestic purposes.

1.2. Report Contents

This report is the second Annual Report prepared to support the adopted Red Bluff Subbasin GSP submitted in January 2022. The Annual Report includes data elements for the current reporting Water Year (WY), 2022. Data elements presented in this report refer to the Water Year (the 12-month periods from October through September) unless otherwise noted. Pursuant to of the GSP Regulations, the Annual Report includes:

1. Groundwater Elevation Data
2. Water Supply and Use
3. Change in Groundwater Storage
4. GSP Implementation Progress

2. GROUNDWATER ELEVATIONS – SECTION 356.2(B)(1)

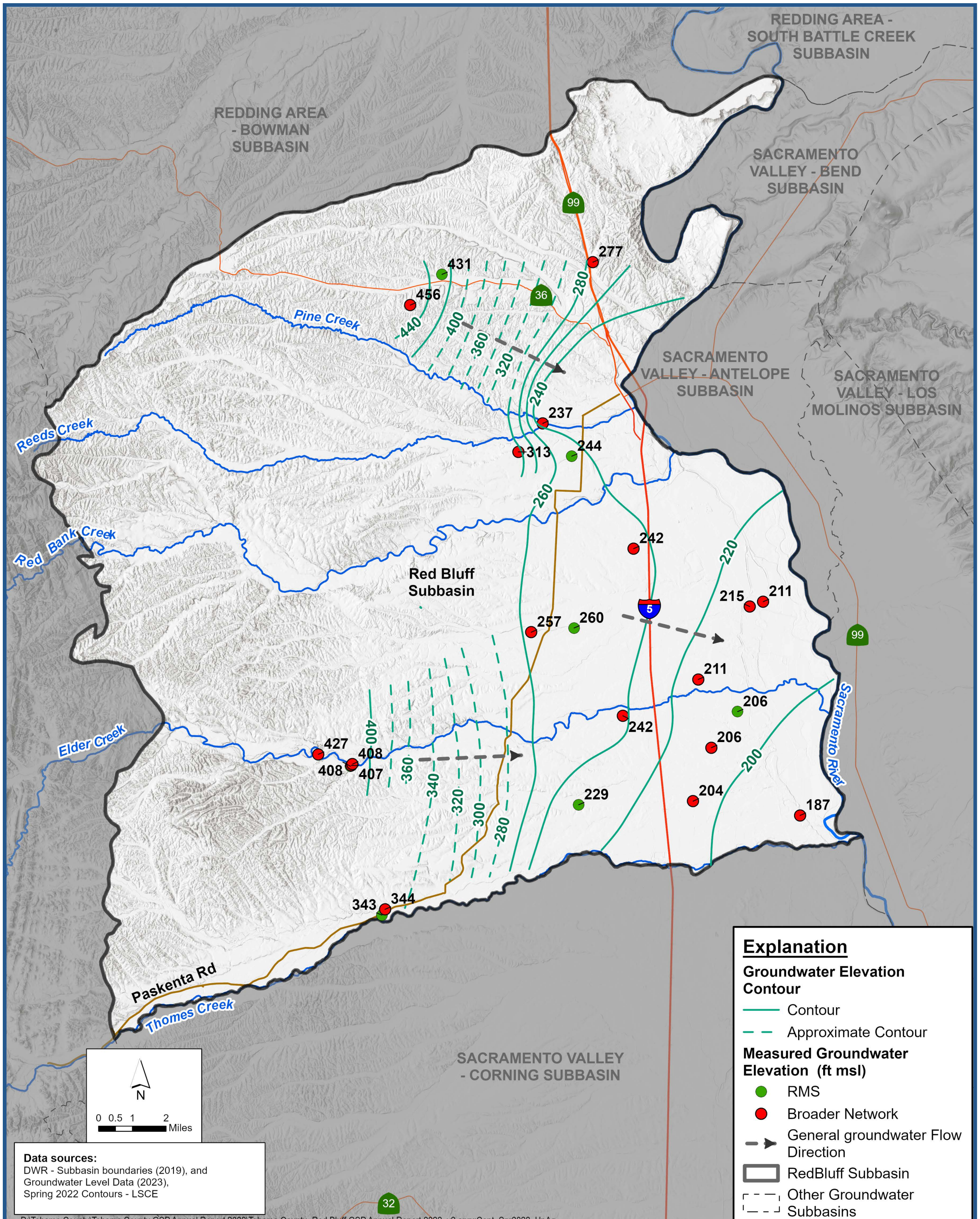
Currently, 35 wells are monitored as part of a broad network for groundwater levels and eight are representative monitoring sites (RMS) wells with assigned sustainability management criteria (SMC). The wells are measured at least in the spring and fall each year. Groundwater elevation data in each of the principal aquifers for WY 2022 were analyzed. Hydrographs for these wells are included in Appendix A. Appendix B includes a copy of the monitoring data used to generate this Annual Report pursuant to GSP regulations (Section 354.40). Groundwater elevation contour maps for seasonal low and seasonal high-water levels were prepared for WY 2022. Groundwater level data collected at RMS and other wells used to develop groundwater contours and RMS well hydrographs are collected by DWR, United States Geological Survey (USGS)The Nature Conservancy (TNC) and the District and records are maintained by the State Water Resources Control Board (GAMA) and DWR (CASGEM). Records of groundwater elevations are also maintained in the GSA's data management system (DMS).

2.1. Groundwater Elevation Contours – Section 356.2(b)(1)(A)

Seasonal high and seasonal low groundwater elevation contour maps for WY 2022 are presented for the Upper Aquifer on **Figures 2-1** and **2-2**. The seasonal high contours were prepared based on observed maximum springtime (February-May) water levels, while the seasonal low contours were prepared based on minimum water levels measured in July-October. Due to the limited number of wells in the subbasin and to resolve data gaps near the edge of the subbasin wells neighboring the Red Bluff subbasin were included in the contouring process. Wells were not displayed in contour maps if data did not exist at that well during the mapping period. Contours are shown solid if there is good confidence in the contour placement whereas contours are shown dashed if their position is inferred from data yet generally representative of the contour's true location. Contours are not drawn if confidence in contours is poor. Contours were not extended to these wells due to the great distances between these and other monitoring wells. For these reasons both wells were previously excluded when creating contours for the GSP and while water level measurements were shown at these wells in figures they were excluded from contours in this Annual Report as well. Groundwater elevations on the contour maps are shown as feet above mean sea level based on the North American Vertical Datum of 1988 (NAVD 88). No contours were produced for the Lower Aquifer due to the limited number of available Lower Aquifer wells.

The contour maps illustrate general features of the groundwater flow system in the Red Bluff Subbasin, including:

- A general groundwater flow moving from the northwest to southeast within the subbasin.
- Movement of water towards the Sacramento River most notably in spring contours.
- Steep groundwater gradients in the north and west sides of the subbasin with gradual gradients in the southeast part of the subbasin.



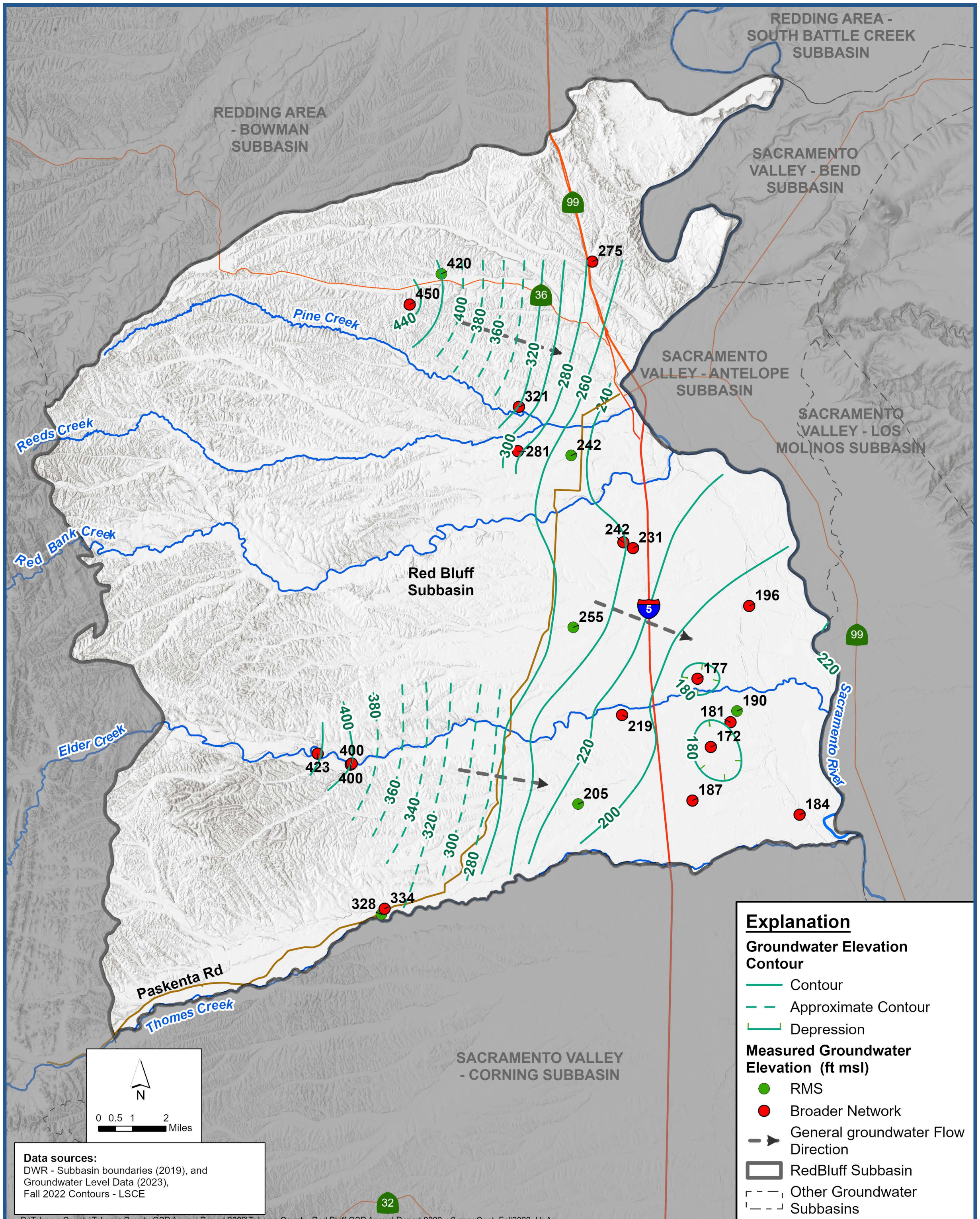
TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

LSCE

Contours of Equal Groundwater Elevation, Upper Aquifer - Spring 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Red Bluff Subbasin

Figure 2-1



TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

LSCE Team

Contours of Equal Groundwater Elevation, Upper Aquifer - Fall 2021

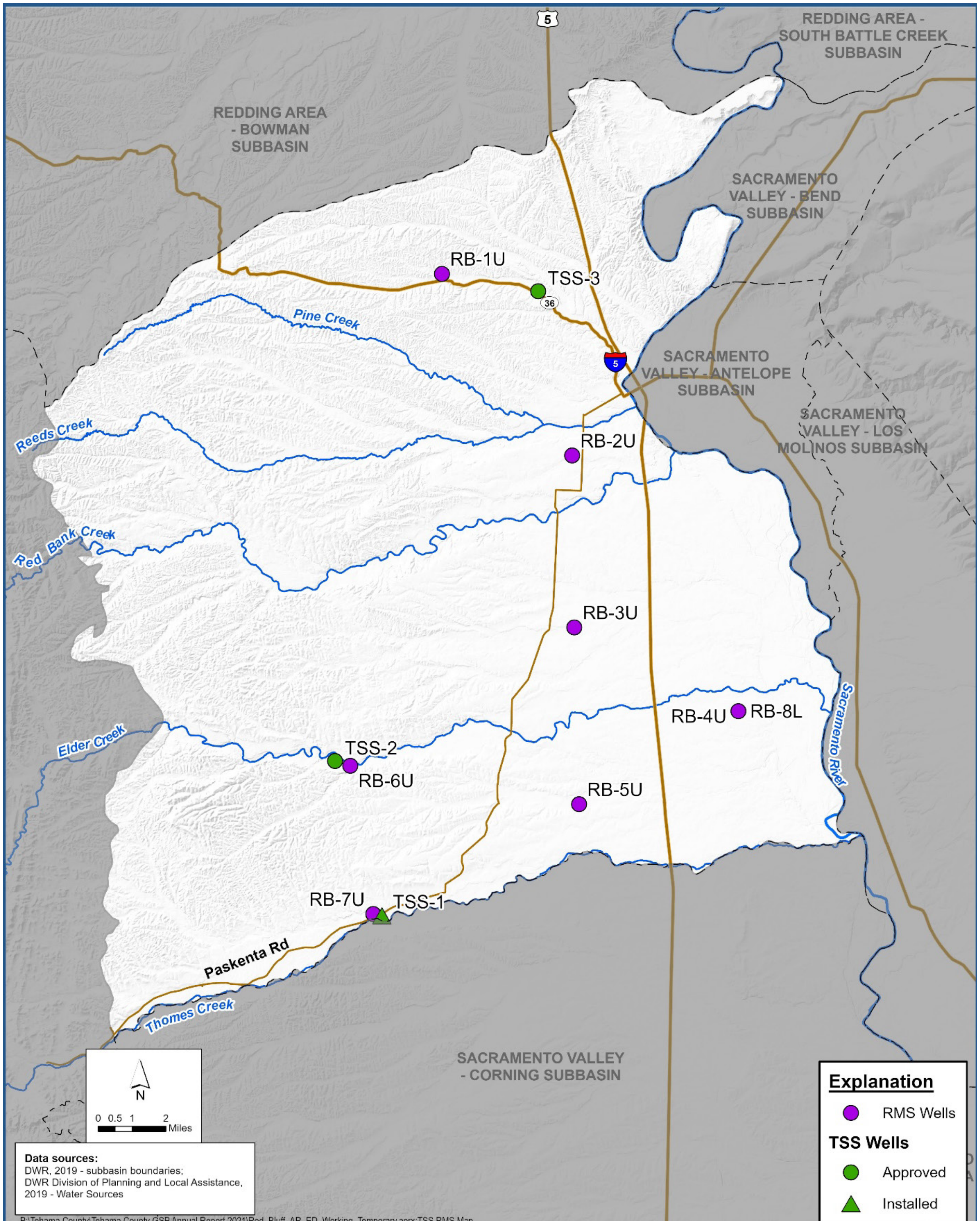
Groundwater Sustainability Plan – Annual Report WY 2022
Red Bluff Subbasin

Figure 2-2

2.2. Groundwater Elevation Hydrographs – Section 356.2(b)(1)(B)

Hydrographs of groundwater elevations were prepared for all eight RMS wells in both the Upper and Lower Aquifers. RMS wells are distributed throughout the Subbasin to provide broad spatial coverage of the Subbasin. **Figure 2-3** shows the distribution of the current RMS wells and the locations of the constructed DWR Technical Support Services (TSS) well and two approved TSS wells slated for installation. The process for selecting these sites is documented in the Red Bluff Subbasin GSP. Long-term fluctuations in groundwater levels (and groundwater in storage) occur when there is an imbalance between the volume of water recharged into the aquifer and the volume of water removed from the aquifer, either by extraction or natural discharge to surface water bodies. If, over a period of years, the amount of water recharged to the aquifer exceeds the amount of water removed from the aquifer, then groundwater levels will increase and groundwater storage increases (i.e., positive change in storage). Conversely, if, over time, the amount of water removed from the aquifer exceeds the amount of water recharged then groundwater levels decline. These long-term changes can be linked to various factors including increased or decreased groundwater extraction or variations in recharge associated with wet or dry hydrologic cycles.

The eight RMS wells in the Upper and Lower Aquifers all had seasonal high groundwater elevations near or above the measurable objective (MO) during WY 2022. Some wells, including RB-1U, RB-3U, RB-4U, RB-5U, RB-7U and RB-8L showed seasonal low water levels below the Measurable Objectives (MO). All wells were above minimum thresholds throughout the Water Year. Copies of hydrographs for all RMS wells are included in **Appendix A**.



TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
LSCE Team

Red Bluff Subbasin RMS Network

Groundwater Sustainability Plan – Annual Report WY 2022
Red Bluff Subbasin

Figure 2-3

3. WATER SUPPLY AND USE

Water supply and use information are presented below. Water use data by sector (required per Section 356.2) is summarized in **Section 3** and categorized by groundwater extraction, surface water supply and total supply using the best data available. Water use sectors are broadly identified as agricultural, urban, and native vegetation land uses.

Groundwater use data was taken from records where available and otherwise were estimate from 2022 land use data, climate conditions, and crop coefficients consistent with those used in the Tehama Integrated Hydrogeological Model (Tehama IHM). Surface water use was estimated from historic deliveries when records were not available. Numbers are rounded to two significant digits, except totals which are unrounded.

3.1. Water Budget Approach

Water supply and use in the Subbasin were quantified using the best available data sources and information. Where available, groundwater extraction and surface water supplies were quantified directly from measured and reported groundwater pumping, surface water diversions, and deliveries data. However, groundwater extraction data has historically been limited, particularly for privately-owned wells. Thus, a water budget approach has been used to estimate the remaining, unmeasured volume of groundwater extraction that has occurred to meet demand in the Subbasin.

The Tehama IHM model was used to prepare water budgets for the Subbasin during GSP development. The model was adapted from the Sacramento Valley Groundwater-Surface Water Simulation Model (SVSim, version BETA 3-19-2020, DWR 2020). Direct measurements of groundwater extraction data could not be used in the model calibration to determine accuracy due to the limited number of observations. Instead, water levels and stream flows were used to calibrate the model resulting in a normalized root mean of squared residual error of five percent. The first Annual Report for WY 2021 leveraged information from the Tehama IHM model to quantify subregion-scale water budgets in the Subbasin through WY 2021. More information about the model's development process can be found in the GSP Appendix 2-J. In WY 2022, a modified approach to the water budget calculation was utilized since a Tehama IHM model update was not feasible and to enhance the resolution of the water budget. The method follows the framework laid out in Hessels et al. (2022).

Building on past work, the water budget approach used in this Annual Report utilizes available geospatial data and information to quantify crop water demand, precipitation, and other parameters with pixel-scale resolution (30-meter (m) x 30 m), corresponding to the spatial resolution of satellite imagery used in developing these inputs. In addition to geospatial data, available surface water supply and groundwater extraction data is incorporated into the water budget by distributing that water out to specific regions where that water is used (e.g., surface water supplier service areas). The remaining groundwater extraction needed to meet demand is then calculated based on the balance of water demand and available water supplies, with consideration for rainfall, irrigation, and soils characteristics. The result is a spatially distributed water budget calculated with a finer spatial resolution than was possible in the previous water budgets. The pixel-scale water budget results provide greater insight into where water use occurs in the Subbasin and are configurable to create water budget summaries for any region of the Subbasin.

This approach was used to calculate monthly water budgets by water use sector in the Subbasin during the current reporting year (WY 2022), as required in Title 23 of the California Code of Regulations Section 356.2. Key water budget inflows and outflows calculated in this water budget approach were compared with equivalent values from the Tehama IHM model and the first Annual Report, allowing for verification of the consistency between this water budget approach and previous approaches.

Data and information that is used in the water budget approach generally includes:

- Actual evapotranspiration (ET) estimates, extracted from OpenET remote sensing analyses. OpenET is a multi-agency web-based geospatial information system (GIS) utility that quantifies spatial ET using satellite imagery. While OpenET is a new utility, the underlying methodologies to quantify ET apply a variety of well-established modeling approaches that are widely used in government and research. The OpenET modeling approaches utilize the same surface energy balance approach used in the Tehama IHM model used in GSP development. OpenET results are available in the Subbasin with a spatial resolution of 30 m x 30 m (approximately 0.22 acres), allowing easily scalable ET quantification.
    - Additional information about the OpenET team, data sources, and methodologies are available at: https://openetdata.org/.
- Precipitation estimates, extracted from the Parameter-elevation Regressions on Independent Slopes Model (PRISM), developed by the PRISM Climate Group at Oregon State University. PRISM quantifies spatial precipitation estimates, among other climate parameters, based on available weather station data and modeled spatial relationships with topography and other factors influencing weather and climate. PRISM data is available in the Subbasin with a spatial resolution of 4-kilometer (km) x 4 km.
    - Additional information about the PRISM data and methodologies are available at: https://prism.oregonstate.edu.
- 2022 land use data, evaluated through two approaches. Both datasets were compared and evaluated to identify changes in land use as well as the spatial extent of water use sectors in the Subbasin.
    - Pixel-scale (30 m x 30 m) land use coverages of the Subbasin were prepared through analysis of the following datasets:
    - DWR 2019 statewide crop mapping dataset (https://data.cnra.ca.gov/dataset/statewide-crop-mapping)
    - United States Department of Agriculture (USDA) CropScape 2022 Cropland Data Layer coverage (https://nassgeodata.gmu.edu/CropScape/).
        - Measured surface water diversions data, reported from water supplier records, or collected from publicly available sources (water rights diversion records, etc.). Surface water diversions data are generally available at the supplier scale. In this water budget approach, diversions were distributed evenly across the irrigated pixels associated with that supplier's service area.
        - Measured groundwater extraction data, reported from municipal and agricultural water supplier pumping records and private pumping records, where available. Groundwater extraction data is generally available at the supplier scale and was

distributed evenly across the urban or irrigated pixels associated with that supplier's service area.

- Measured boundary water outflow data, reported from water supplier records where available.

Additional details for groundwater extraction and surface water supply data sources are given in the sections below.

3.2. Groundwater Extraction – Section 356.2(b)(2)

Groundwater extraction in the Subbasin is summarized in **Table 3-1**. Groundwater extraction is reported from pumping records where available, while the remaining groundwater extraction in the Subbasin is estimated through the water budget approach described in the previous section.

The majority of the Subbasin is dependent on groundwater as the only available water source for agricultural irrigation. During dry and critically dry years, agricultural groundwater extraction increases relative to long-term average demand due to less rainfall, reduced soil moisture, increased evapotranspiration associated with hotter, drier conditions, and less surface water available for diversion. There are a total of 35,400 cropped acres in the Red Bluff Subbasin, and the agricultural groundwater extraction for these lands (estimated through the water budget approach described above) for WY 2022 was 114,000 acre-feet (af).

All municipal suppliers in the Subbasin are reliant on groundwater for their municipal water supplies. The largest is the City of Red Bluff (86% of the city lies within the Subbasin; the remainder is in the neighboring Antelope Subbasin). Other municipal suppliers include the City of Tehama and the Gerber-Las Flores Community Services District (CSD). In contrast to agricultural water use, municipal water use during drought years may decrease relative to long-term averages due to urban conservation efforts. Municipal water supplies in the Red Bluff Subbasin were measured and provided by each utility/water agency. The total volume during WY 2022 was 6,400 af.

Additionally, private domestic wells provide rural residential water needs throughout the Subbasin. Rural residential groundwater extraction through domestic wells was estimated based on the City of Red Bluff's 2020 Urban Water Management Plan's (UWMP) 2020 water use (City of Red Bluff, 2020), which is considered to be representative of the area. Water use in 2020 was 253 gallons per capita per day (GPCD). In order to estimate Rural Residential groundwater extraction, the 2020 GPCD was applied to residential parcels located within the subbasin but outside of municipal service areas. To obtain this information, census data from 2020 was combined with parcel data obtained from county GIS portals. The census designated value of 2.63 persons per household for the county was multiplied by the selected residential parcels to determine the number of people in those households. This value was then used to estimate water usage using the GPCD. The total volume during WY 2022 was 980 af.

Environmental groundwater use in the Subbasin includes uptake of shallow groundwater from deeply rooted plants. Although no groundwater is directly pumped or extracted for use in these areas, the consumptive use of shallow groundwater has been estimated through the water budget approach described above for areas classified as riparian vegetation. The estimated volumes are based on the evaporative demand not through precipitation that must be met through shallow groundwater. There are roughly 2,100 acres of riparian vegetation that had a total estimated groundwater use of 5,400 af, roughly 2.5 af per acre (af/ac). This method of estimating environmental groundwater use is dependent on both precipitation and ET estimates. Since environmental groundwater use is modeled over a large area, small changes or uncertainties in precipitation, ET, or ET from precipitation have a large impact on the overall estimated volume. Additionally, the method does not differentiate between evapotranspiration coming from changes in root zone soil moisture storage and the shallow groundwater system. As a result, a portion of the quantified environmental groundwater demand may be met through a depletion of root zone soil moisture rather than uptake of shallow groundwater from the aquifer. All else being equal, larger depletions of root zone soil moisture are more likely to occur (1) during below normal, dry, and critical water years and (2) in landscapes with deeply rooted vegetation.

Also, there are a total of 211,000 additional acres of native vegetation, which are primarily grasslands and oak woodlands in the western portion of the Subbasin. Potential shallow groundwater use from deeply-rooted plants in these areas has not been quantified for the Annual Report, but could be considered and further evaluated in future years.

The Red Bluff Subbasin did not have managed recharge or groundwater extractions for managed wetlands in WY 2022. The municipal supplies do not distinguish between urban and industrial water uses.

The total estimated groundwater extraction in WY 2022 was approximately 110,000 af. This is about 40,000 af less than WY 2021 groundwater extraction of 150,000 af for the Subbasin reported in the last Annual Report (2021 WY). Figure 3-1 shows the location and volume of 2022 groundwater extractions in the Subbasin. Table 3-1 shows groundwater use by sector. WY 2022 has been preliminarily classified as Critical by DWR (DWR, 2022).

The agricultural sector had the greatest decrease in use from 140,000 af in 2021 to 110,000 af in 2022. Native vegetation experienced an increase from 2,000 in 2021 to 5,400 af in 2022, while urban groundwater use saw an increase from 5,800 af in 2021 to 7,400 af 2022. In WY 2021 Urban use included an estimated Rural Residential use, in WY 2022 they reported separately. The increase in Urban use is expected and described in the Projected Water Budget Summary Section of the GSP. The increase in Urban use is a general trend seen county wide, particularly in densely populated areas round the City of Red Bluff. In WY 2022 the agricultural sector accounted for approximately 85% of the total groundwater extraction, while the remaining 15% was utilized for urban, rural residential, and riparian vegetation water needs.

Table 3-1. Groundwater Use by Water Use Sector	
Sector	**2022 (af)**
Agricultural	110,000
Urban	6,400
Rural Residential	980
Riparian Vegetation (Plant groundwater uptake)	5,400
Total	**122,780**
Total (excluding Riparian Vegetation[1])	**117,380**

[1] Excludes native vegetation which involves only natural plant uptake of shallow groundwater, not direct pumping, and extraction.

3.3. Surface Water Supply – Section 356.2(b)(3)

Surface water supplies used or available for use in the Subbasin are summarized in Table 3-2. Surface water supplies are reported directly from water supplier records or collected from publicly available sources (water rights diversion records, etc.) where available.

Surface water provided less than one percent of the agricultural water demand in the Subbasin for WY 2022. There are limited local supplies available within the Subbasin. Surface water supplies primarily are diversions from the Tehama-Colusa Canal, which were minimal in 2022. Surface water suppliers include Proberta Water District and Thomes Creek Water District. Diversion records were accessed from the United States Bureau of Reclamation (USBR) Central Valley Operations (CVO) delivery tables (USBR, 2023). CVP supplies, although minimal, constituted the entirety of supplies available within the Subbasin in 2022.

There are currently no surface water supplies for use by the urban or riparian/native vegetation sectors in the Red Bluff Subbasin; all surface water use is for agricultural purposes. Two surface water supply volumes are included and reported in this section. Table 3-2 depicts total diverted surface water, which are the volumes obtained from the sources described above. Total surface water diversions for the Red Bluff Subbasin were estimated to be about 40 af for the WY 2022.

Table 3-2. Surface Water Diversions by Water Use Sector and Source		
Sector	**2022 (af)**	
	Supply Source	
	CVP	**Local**
Agricultural	40	0
Urban	0	0
Riparian Vegetation	0	0
Total	**40**	

Table 3-3 depicts total surface water deliveries, estimated from total surface water diversions by accounting for conveyance losses, reuse, and boundary outflows. Total surface water deliveries for the Red Bluff Subbasin were estimated to be about 35 af for WY 2022, as shown in **Table 3-2**.

Table 3-3. Surface Water Deliveries by Water Use Sector and Source

Sector	2022 (af)	
	Supply Source	
	CVP	Local
Agricultural	35	0
Urban	0	0
Riparian Vegetation	0	0
Total	**35**	

3.4. Total Water Use by Sector – Section 356.2(b)(4)

Total water use in the Subbasin was tabulated from groundwater extraction volumes reported in **Table 3-1** and the surface water supply deliveries reported in **Table 3-3**. Total water available is summarized in **Table 3-4** for WY 2022. The results are either based on measured data or estimates as described in the previous two sections.

In total, groundwater supplied over 99% of the agricultural water demand in the Subbasin and also constituted over 99% of the total water supplies for all water demand sectors in WY 2022.

Table 3-4. Total Water Use by Water Use Sector

Sector	2022 (af)		
	Groundwater	Surface Water	Total
Agricultural	110,000	35	110,035
Urban	6,400	0	6,400
Rural Residential	980	0	980
Riparian Vegetation (Plant groundwater uptake)	5,400	0	5,400
Total	**122,780**	**35**	**122,815**
Total (excluding Riparian Vegetation[1])	**117,380**	**35**	**117,415**

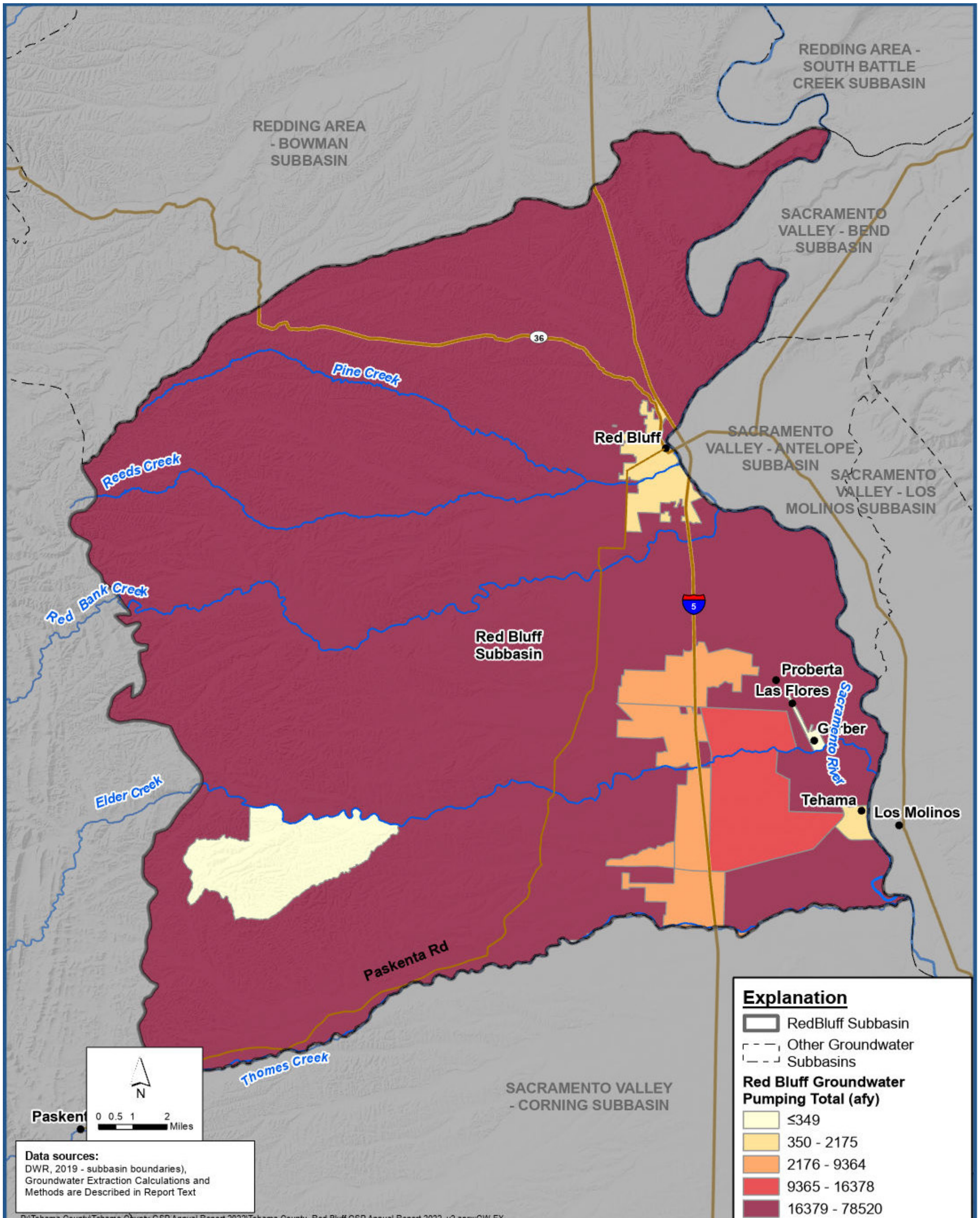
[1] *Excludes native vegetation which involves only natural plant uptake of shallow groundwater, not direct pumping, and extraction.*

3.5. Uncertainties in Water Use Estimates

Estimated uncertainties in the water budget components are presented in **Table 3-5**. The uncertainty of these water budget components is based on typical accuracies given in technical literature and the cumulative estimated accuracy of all inputs used to calculate the components.

Table 3-5. Estimated Uncertainty in Water Use Estimates			
Water Budget Component	**Data Source**	**Estimated Uncertainty (%)**	**Source**
Groundwater Water			
Agricultural	Measurement	20%	Typical uncertainty from water balance calculation.
Urban	Measurement/ Estimate	5%	Typical accuracy of urban water system reporting.
Rural Residential	Calculation	15%	Estimated from per capita water use and Census information.
Native Vegetation (Plant groundwater uptake)	Calculation	25%	Estimated based on land use classification, precipitation, and ET.
Surface Water			
Agricultural	Calculation	10%[1]	Estimated from SB 88 measurement accuracy standards.

[1] Higher uncertainty of 10%-20% is typical for estimated surface water inflows, including un-gaged inflows from small watersheds into creeks that enter the Basin.



TEHAMA COUNTY

LSCE Team

Groundwater Extraction in the Subbasin Water Year 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Red Bluff Subbasin

Figure 3-1

4. GROUNDWATER STORAGE

Changes in groundwater storage from Spring 2021 to Spring 2022 were calculated for the Upper and Lower Aquifers. Spring (seasonal high) groundwater levels are less influenced by groundwater pumping compared to Fall (seasonal low) groundwater levels; therefore, they are more reliable to calculate groundwater storage change.

Changes of the groundwater levels from Spring 2021 to Spring 2022 at wells screened in the Upper Aquifer were interpolated to estimate the groundwater elevation change in areas where sufficient data was available. Estimated elevation change was multiplied by a spatially variable aquifer storage coefficient available from the Tehama Integrated Hydrogeological Model (Tehama County FCWCD, 2022) to estimate the groundwater storage change volume in the Upper Aquifer. The spatial extent of this estimate was limited to areas where measured groundwater levels were available (**Figure 4-1**). Therefore, an area-weighted adjustment was applied to the estimated storage to estimate the subbasin-wide change in storage.

Sufficient groundwater level data were not available to interpolate water level changes in the Lower Aquifer. Therefore, Lower Aquifer storage change was estimated using the Upper Aquifer storage change and historical ratio of storage changes in the two aquifers for critical years. The summation of the changes in the Upper and Lower Aquifers provides the total groundwater storage change in the Subbasin. **Table 4--1** presents the annual storage change values for both the Upper and Lower Aquifers.

Table 4-1. Change in Groundwater Storage Based on Seasonal High Groundwater Levels

Aquifer	2022 (af)
Upper Aquifer	-35,000
Lower Aquifer	-52,000
Total	**-87,000**

Since there are a limited number of monitoring wells in the Lower Aquifer within the subbasin an average change in groundwater elevations from Lower Aquifer wells within and near the subbasin was applied to the entire subbasin. Aquifer properties for the Lower Aquifer were obtained from the groundwater model to calculate change in storage.

It should be noted that the groundwater model was not used to estimate storage changes for 2020 through 2022. Therefore, future updates to the model may result in different estimates for 2020 through 2022 groundwater storage changes. The approach of using spring groundwater elevation contours is considered reasonable and cost effective for the purposes of the annual report. **Table 4-2** includes estimates of annual groundwater pumping, groundwater uptake, storage change and cumulative storage change for WYs 1990-2022. Change in storage and cumulative change in storage for WYs 2020-2022 was estimated based on the above method. The Tehama IHM Model was used to estimate groundwater pumping, groundwater uptake, change in storage, and cumulative change in storage for WYs 1990-2019.

Table 4-2. Change in Groundwater Storage (Annual and Cumulative)				
Water Year & Type[a]	Groundwater Pumping (af)	Groundwater Uptake (af)	Annual Groundwater Storage Change [b] (af)	Cumulative Groundwater Storage Change (af)
1990 (C)	-78,000	-9,400	-77,000	-77,000
1991 (C)	-80,000	-6,300	-77,000	-150,000
1992 (C)	-81,000	-5,800	-41,000	-200,000
1993 (AN)	-69,000	-7,900	56,000	-140,000
1994 (C)	-83,000	-7,200	-53,000	-190,000
1995 (W)	-66,000	-10,000	99,000	-93,000
1996 (W)	-72,000	-13,000	37,000	-56,000
1997 (W)	-79,000	-13,000	-3,900	-60,000
1998 (W)	-50,000	-16,000	130,000	70,000
1999 (W)	-67,000	-17,000	-16,000	54,000
2000 (AN)	-66,000	-15,000	-9,500	45,000
2001 (D)	-76,000	-13,000	-61,000	-16,000
2002 (D)	-86,000	-11,000	-37,000	-53,000
2003 (AN)	-67,000	-12,000	31,000	-22,000
2004 (BN)	-87,000	-13,000	-1,000	-23,000
2005 (AN)	-64,000	-13,000	30,000	6,600
2006 (W)	-71,000	-16,000	44,000	51,000
2007 (D)	-86,000	-12,000	-93,000	-42,000
2008 (C)	-98,000	-9,400	-65,000	-110,000
2009 (D)	-90,000	-6,900	-65,000	-170,000
2010 (BN)	-74,000	-7,900	23,000	-150,000
2011 (W)	-70,000	-9,900	21,000	-130,000
2012 (BN)	-85,000	-8,800	-60,000	-190,000
2013 (D)	-99,000	-6,500	-41,000	-230,000
2014 (C)	-99,000	-3,800	-78,000	-310,000
2015 (C)	-100,000	-3,200	-37,000	-340,000
2016 (BN)	-92,000	-3,400	19,000	-330,000
2017 (W)	-84,000	-6,600	88,000	-240,000
2018 (BN)	-100,000	-4,200	-74,000	-310,000
2019 (W)	-82,000	-6,300	75,000 [b]	-240,000
2020 (D)	-126,000	-3,300	-49,000 [b]	-290,000

Table 4-2. Change in Groundwater Storage (Annual and Cumulative)				
Water Year & Type[a]	Groundwater Pumping (af)	Groundwater Uptake (af)	Annual Groundwater Storage Change [b] (af)	Cumulative Groundwater Storage Change (af)
2021 (C)	-146,000	-2,100	-164,000 [b]	-450,000
2022 (C)	-120,000	-5,400	-87,000 [b]	-537,000
Average	**-85,000**	**-9,000**	**-16,000**	**-**

Note: All volumes are rounded to two significant digits

[a] Sacramento Valley Water Year Type is provided by DWR for the years 1990-2021. Water Year 2022 has been preliminarily classified as Critical by DWR (DWR, 2022). W = Wet; AN = Above Normal; BN = Below Normal; D = Dry; C = Critical

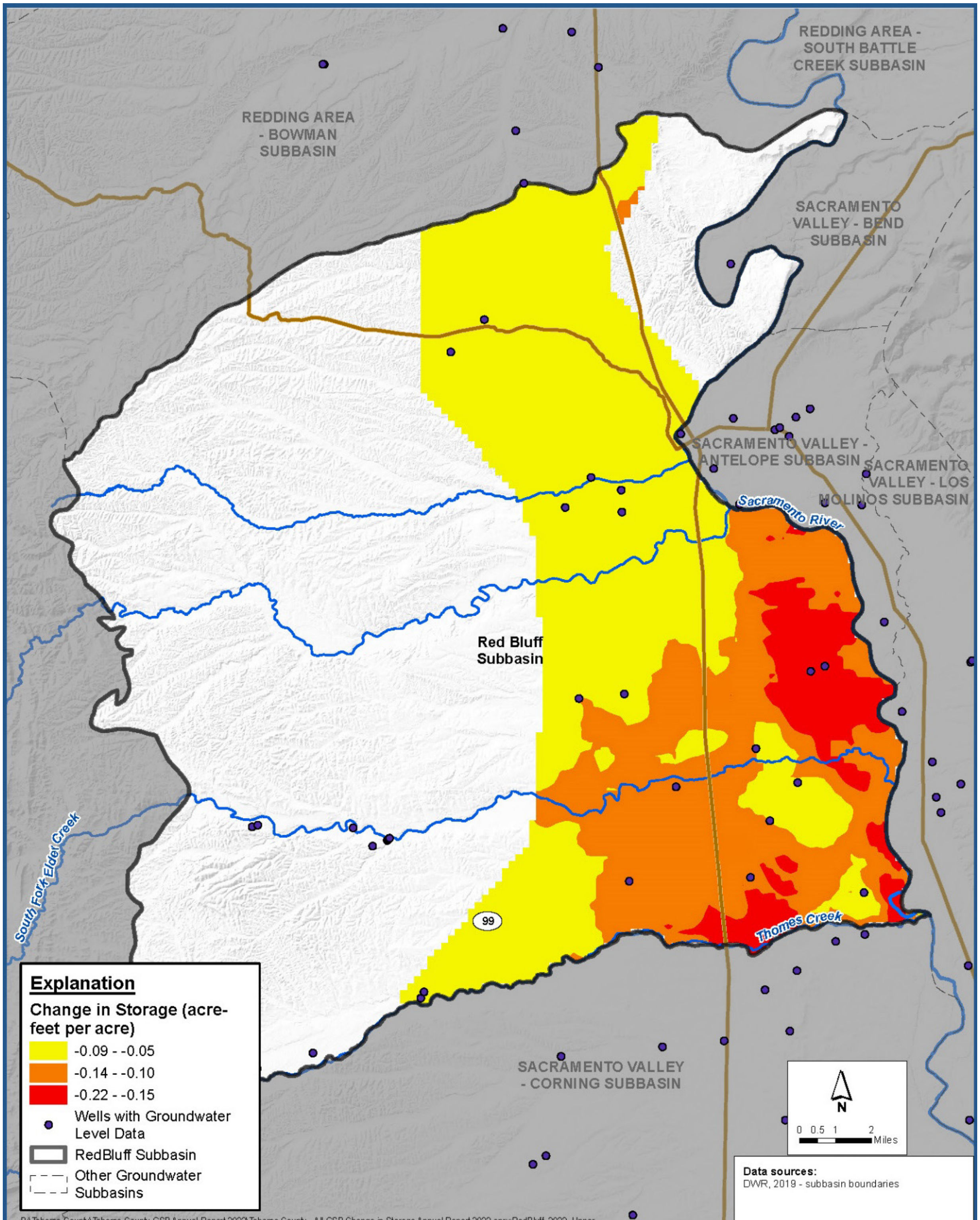
[b] Storage change in water years 2019-2022 were estimated using the change in seasonal high spring to spring water levels.

4.1. Groundwater Storage Maps – Section 356.2(b)(5)(A)

Figure 4-1 presents the distribution of storage change in the Upper Aquifer for WY 2022. Maps include the groundwater wells used to calculate the change in storage. Groundwater storage change is not shown on **Figure 4-1** outside the established monitoring area to avoid extrapolating beyond the control points (i.e., reliable monitoring well data). Lower Aquifer storage change maps were not prepared because groundwater elevation surfaces were not created due to lack of sufficient Lower Aquifer wells.

4.2. Subbasin Water Budget – Section 356.2(b)(5)(B)

A graph depicting the Water Year type, groundwater pumping, groundwater uptake, the annual change in groundwater storage, and the cumulative change in groundwater storage is presented on **Figure 4-2**.

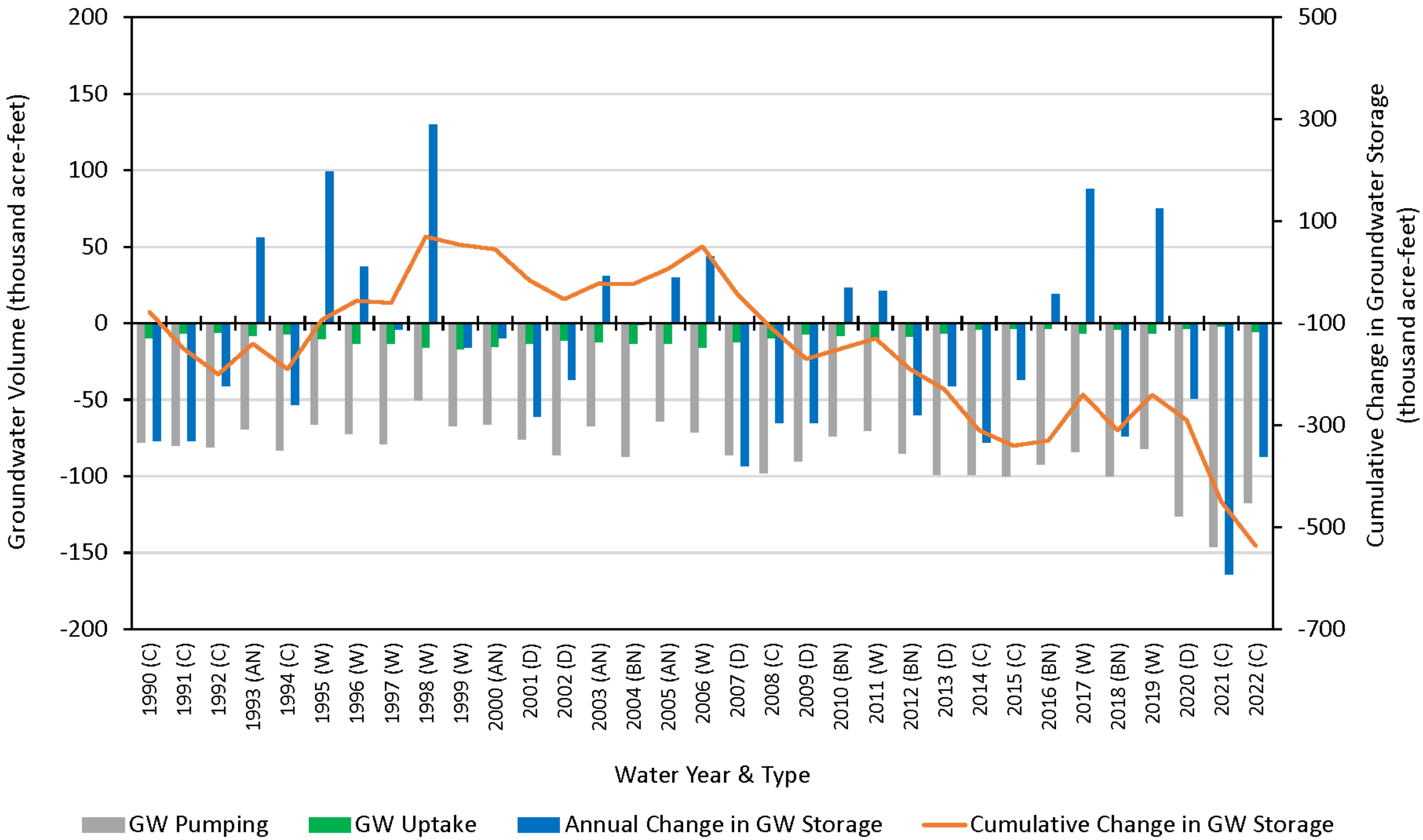


TEHAMA COUNTY
LSCE Team

Change in Groundwater Storage, Spring 2021 to Spring 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Red Bluff Subbasin

Figure 4-1



TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

LSCE Team

Groundwater Extraction and Change in Groundwater Storage

Groundwater Sustainability Plan - Annual Report WY 2022
Red Bluff Subbasin

Figure 4-2

5. GSP IMPLEMENTATION PROGRESS – SECTION 356.2(B)

The GSP for the Red Bluff Subbasin was adopted by the GSA in December 2021 and submitted to DWR in January 2022. This is the second annual report to be prepared since the GSP was submitted. The GSP implementation progress reported in this report covers ongoing work during WY 2022. Projects and management actions (PMAs) were developed to manage groundwater conditions in the Subbasin and achieve groundwater sustainability objectives described in the GSP.

5.1. Progress Toward Achieving Sustainability

5.1.1. Chronic Lowering of Groundwater Levels and Reduction in Groundwater Storage SMC

The reduction in groundwater storage SMC utilizes the chronic lowering of groundwater levels SMC as a proxy. Thus, groundwater conditions related to storage and chronic lowering of groundwater levels are discussed together. In Spring 2022, all groundwater elevations were above the established minimum thresholds (MTs) (as indicated in **Table 5-1**). The lower water levels in Spring 2022 compared to Spring 2021 were expected due to extended drought conditions, which have caused reductions in surface water supplies and increased demands for groundwater in the Subbasin.

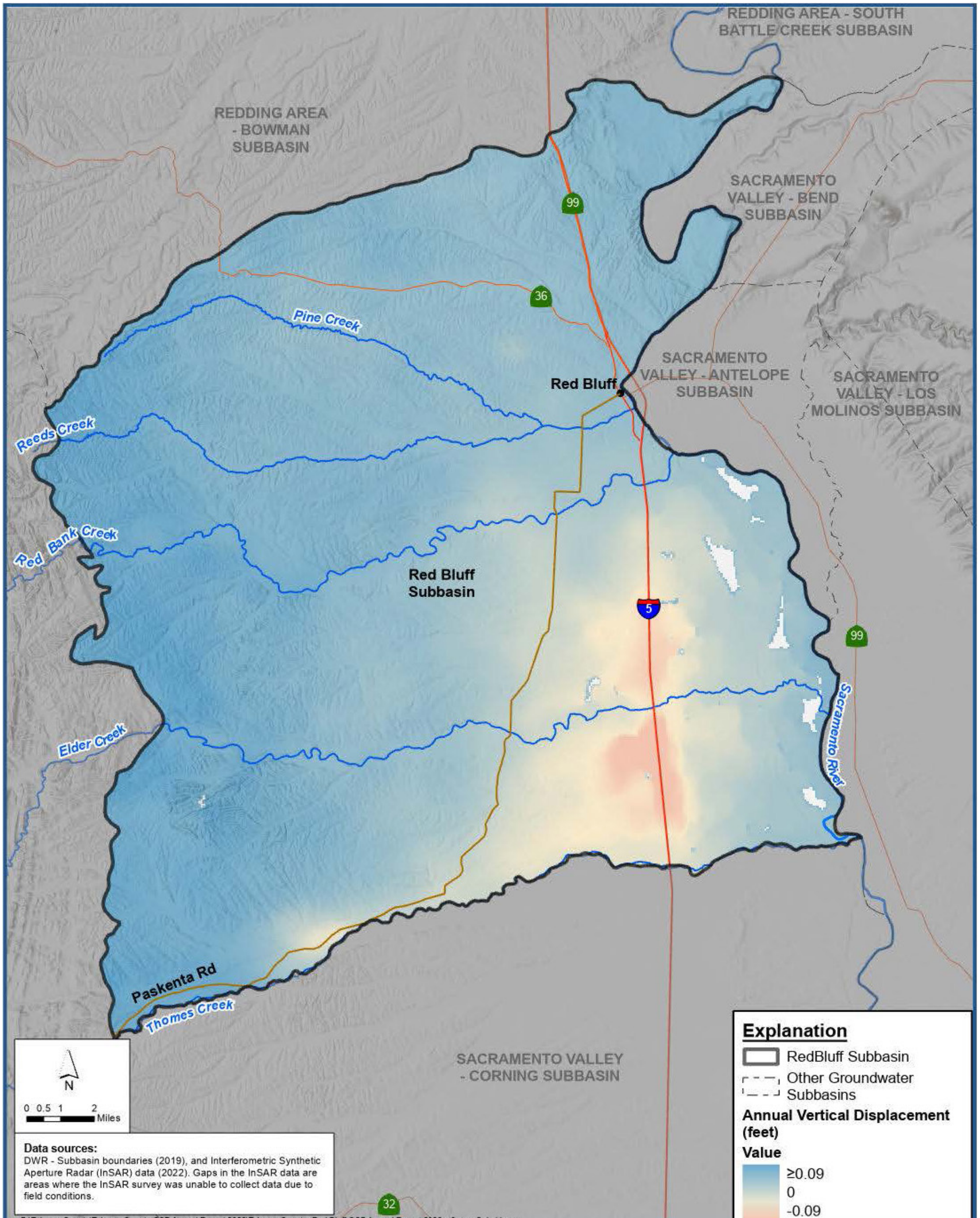
Table 5-1. Groundwater Level Measurements and MT Exceedances

Well ID	State Well Number	MT	MO	2027 IM	Recent Spring Groundwater Level Measurements		Spring 2022 MT Exceedance	Two Consecutive WY MT Exceedances
					2021	2022		
Upper Aquifer								
RB-1U	27N04W05G002M	302.5	432.4	433.9	434.3	430.8	-	-
RB-2U	27N04W36G001M	207.4	241.5	245.8	247.3	244.3	-	-
RB-3U	26N04W25J001M	223.5	257.1	262	263.6	259.8	-	-
RB-4U	25N03W11B001M	152.1	203.0	213.9	217.5	206.4	-	-
RB-5U	25N03W19N001M	177.5	224.2	238.1	242.8	228.6	-	-
RB-6U	25N05W24D001M	355.6	401.3	408.5	395.9	408.2	-	-
RB-7U	NA	276.0	329.1	347.6	353.8	342.8	-	-
Lower Aquifer								
RB-8L	25N03W11B002M	92.0	202.0	208.7	215.3	210.2	-	-

IM = interim milestone

5.1.2. Land Subsidence SMC

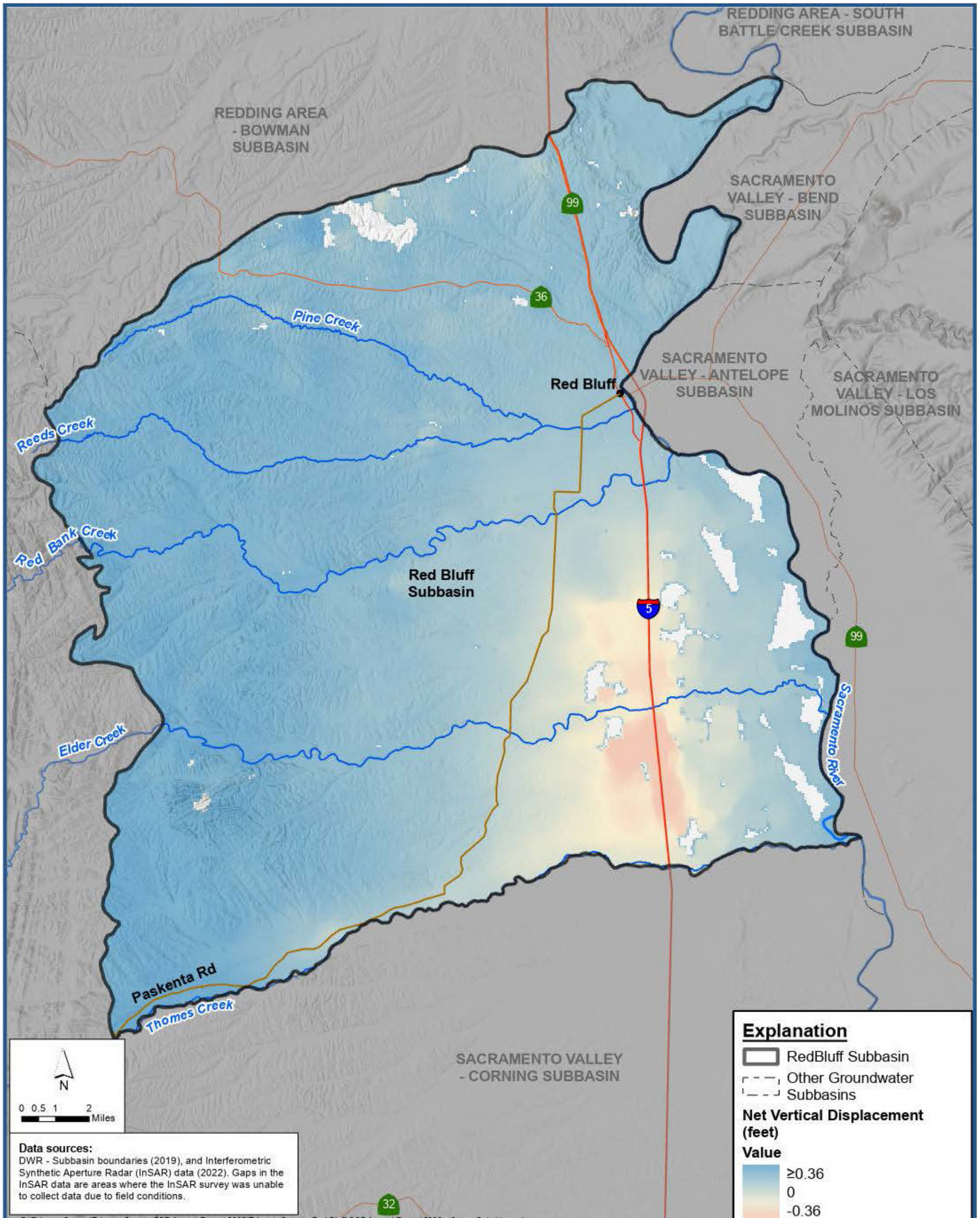
The land subsidence MT is 0.5 feet per five years (i.e., averaged 0.1 foot per year) and the MO for land subsidence is zero throughout the subbasin. Only inelastic subsidence, defined as subsidence solely due to lowered groundwater elevations, will be considered in this SMC. Due to the measurement error of 0.1 feet associated with the Interferometric Synthetic Aperture Radar (InSAR) method, any measurements must be beyond the error to be considered inelastic subsidence. Subsidence measured by InSAR in WY 2022 (**Figure 5-1**) ranged from 0.09 feet of subsidence to 0.02 ft of uplift. No subsidence measured during WY 2022 is considered inelastic due to being less than the measurement error of 0.1 feet. The total subsidence measured from 2015 through WY 2022 (**Figure 5-2**) ranged from 0.36 feet of subsidence in the southeast area of the subbasin to 0.1 feet of uplift on the western edge of the subbasin. The GSA is on track to stay above the MT for land subsidence.



Annual Vertical Displacement in 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Red Bluff Subbasin

Figure 5-1



TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

LSCE

Net Vertical Displacement 2015 through 2022

Groundwater Sustainability Plan – Annual Report WY 2022
Red Bluff Subbasin

Figure 5-2

5.1.3. Depletion of Interconnected Surface Water SMC

Depletion of Interconnected Surface Water SMC utilizes fall groundwater elevations in the shallow wells within the groundwater level monitoring network nearest the interconnected streams. All interconnected surface water RMS were above MT levels and on track to meeting the 2027 interim milestone (IM) if trends hold (**Table 5-2**).

Table 5-2. Depletion of Interconnected Surface Water Data and SMC

Well ID	State Well Number	MT	MO	2027 IM	Recent Fall Groundwater Level Measurements		Fall 2022 MT Exceedance	Undesirable Result (Two Consecutive WY MT Exceedances)
					2021	2022		
Upper Aquifer								
RB-1U	27N04W05G002M	302.5	432.4	433.9	434.3	430.8	-	-
RB-2U	27N04W36G001M	207.4	241.5	245.8	247.3	244.3	-	-
RB-3U	26N04W25J001M	223.5	257.1	262	263.6	259.8	-	-
RB-4U	25N03W11B001M	152.1	203.0	213.9	217.5	206.4	-	-
RB-5U	25N03W19N001M	177.5	224.2	238.1	242.8	228.6	-	-
RB-6U	25N05W24D001M	355.6	401.3	408.5	395.9	408.2	-	-
RB-7U	NA	276.0	329.1	347.6	353.8	342.8	-	-

5.2. Progress Toward PMA Implementation

The Tehama County GSA is pursuing grants through DWR's SGM Grant Program for funding to assist in the implementation of PMAs. The grant application was submitted in December 2022, and a draft awards list is anticipated to be released by DWR in June 2023. The grant application included three components, each fulfilling a different need of the GSA:

- GSP Implementation Outreach and Compliance Activities
- Ongoing Monitoring, Data Gaps, and Enhancements
- Project and Management Action Implementation – Recharge Focused

Together, if funded, these projects will assist the GSAs in meeting the sustainability goals set forth in the GSP.

As part of the GSA's efforts to address data gaps in the subbasin, an airborne electromagnetic (AEM) survey by DWR took place in the summer of 2022. The data collected provides a better understanding of aquifer characteristics and will help to refine the current hydrogeologic conceptual model. Data is available at https://data.cnra.ca.gov/dataset/aem/resource/29c4478d-fc34-44ab-a373-7d484afa38e8.

6. CONCLUSIONS

In WY 2022, groundwater conditions are considered sustainable. All measured sustainability indicators were above the MT values. Recent progress made on all of the above-mentioned activities applicable to the GSA since late 2021, demonstrates the commitment of the GSA to implement the GSP by allocating the necessary time and resources to achieve long-term sustainable management of the groundwater resources in the Subbasin.

7. REFERENCES

California Department of Water Resources (DWR). 2022. California's Groundwater Conditions, Semi-Annual Update: October 2022. https://data.cnra.ca.gov/dataset/california-s-groundwater-semi-annual-conditions-updates/resource/7e57614f-9868-4d2e-bbb8-0621be558b9c.

California Department of Water Resources (DWR). 2019. SVSim: Sacramento Valley Groundwater-Surface Water Simulation Model. https://data.cnra.ca.gov/dataset/svsim.

California Department of Water Resources (DWR). 2018. Groundwater Basin Boundary Assessment Tool. https://gis.water.ca.gov/app/bbat/.

California Department of Water Resources. 2004. Sacramento Valley Groundwater Basin, Red Bluff Subbasin, California's Groundwater, Bulletin 118. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/2003-Basin-Descriptions/5_021_50_RedBluffSubbasin.pdf.

California Department of Water Resources (DWR). 2003. Tehama County Groundwater Inventory. Pre-Publication Draft.

City of Red Bluff. 2020. 2020 Urban Water Management Plan. https://cms5.revize.com/revize/redbluff/2020_UWMP_CERTIFIED.pdf

Tehama County Flood Control and Water Conservation District. 2022. Tehama Integrated Hydrogeological Model.

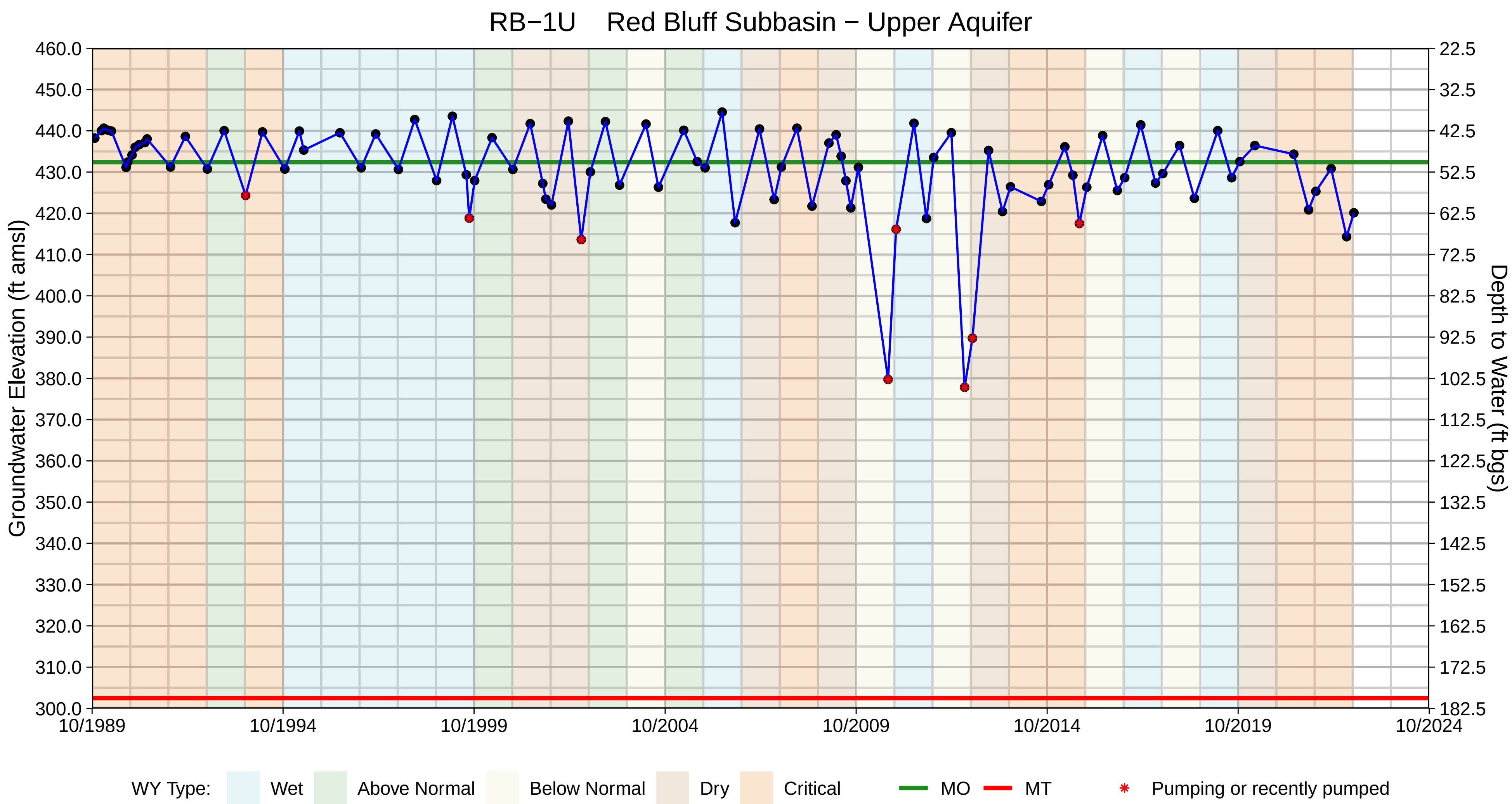
Tehama County Flood Control and Water Conservation District. 2022. Red Bluff Groundwater Sustainability Plan. https://tehamacountywater.org/gsa/groundwater-sustainability-plans-public-draft/#red-bluff-subbasin-final-gsp.

Hessels, Tim, Jeffrey C. Davids, and Wim Bastiaanssen (Hessels et al.). 2022. Scalable Water Balances from Earth Observations (SWEO): results from 50 years of remote sensing in hydrology. Water International. Vol 47 No 6. Pg. 866-886. DOI: 10.1080/02508060.2022.2117896. Access at: https://doi.org/10.1080/02508060.2022.2117896.

United States Bureau of Reclamation (USBR).2023. Central Valley Operations. Accessed March 21st 2023. https://www.usbr.gov/mp/cvo/deliv.html.

Appendix A

Water Level Hydrographs of Representative Monitoring Wells for Groundwater Level



SWN: 27N04W05G002M

Site Code: 402273N1223376W001

Total Depth (ft):260

Perf. Top (ft bgs): 231

Perf. Bottom (ft bgs): 251

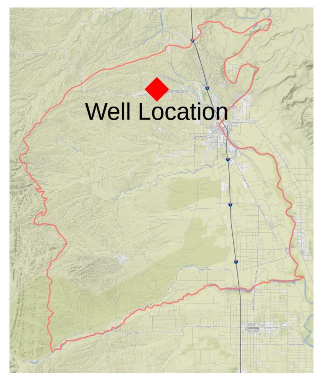
Well Type: Residential

GSE (ft amsl): 482.5

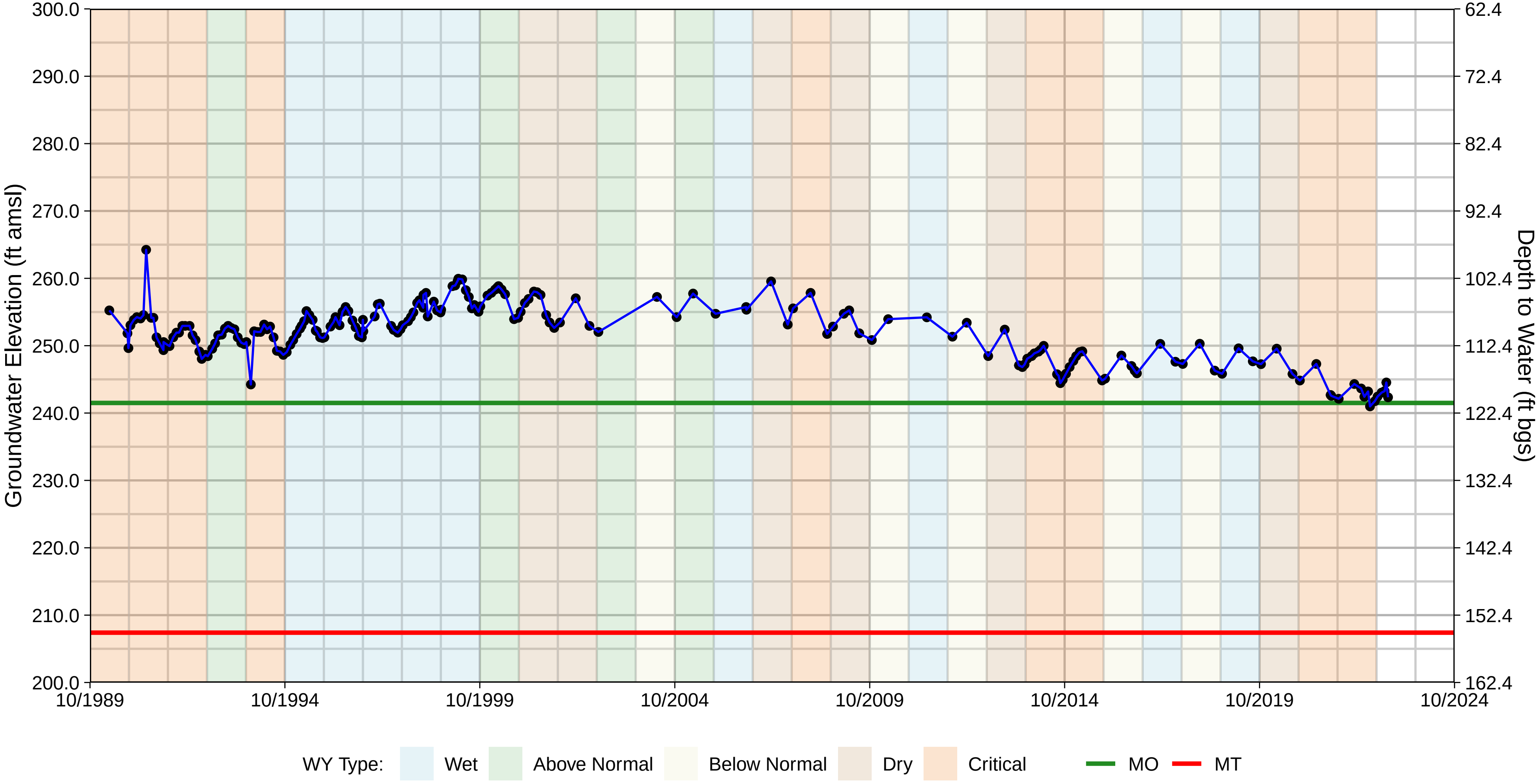
Sustainable Management Criteria

MO: 432.4 ft amsl (50.1 ft bgs)

MT: 302.5 ft amsl (180 ft bgs)



RB−2U Red Bluff Subbasin − Upper Aquifer



SWN: 27N04W36G001M

Site Code: 401512N1222608W001

Total Depth (ft):155

Perf. Top (ft bgs): 135

Perf. Bottom (ft bgs): 155

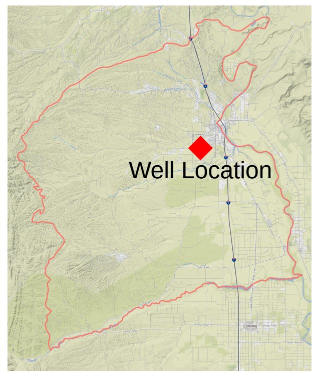
Well Type: Residential

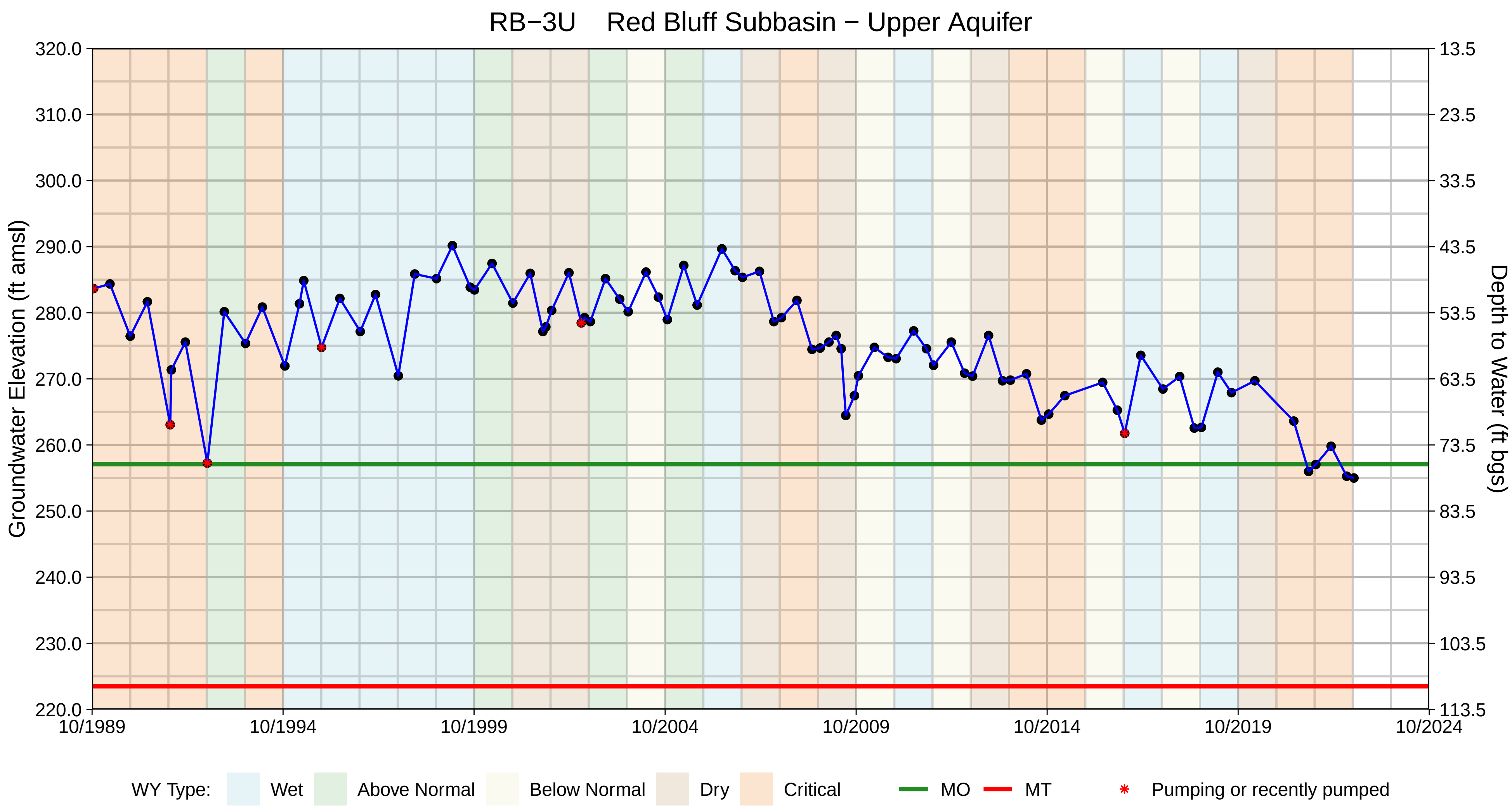
GSE (ft amsl): 362.4

Sustainable Management Criteria

MO: 241.5 ft amsl (120.9 ft bgs)

MT: 207.4 ft amsl (155 ft bgs)





SWN: 26N04W25J001M

Site Code: 400770N1222590W001

Total Depth (ft):128

Perf. Top (ft bgs): 116

Perf. Bottom (ft bgs): 124

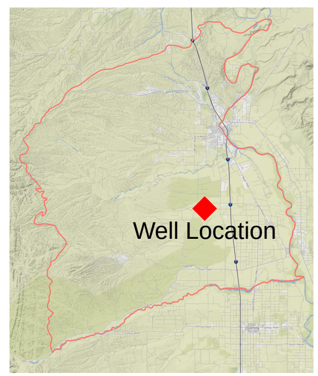
Well Type: Residential

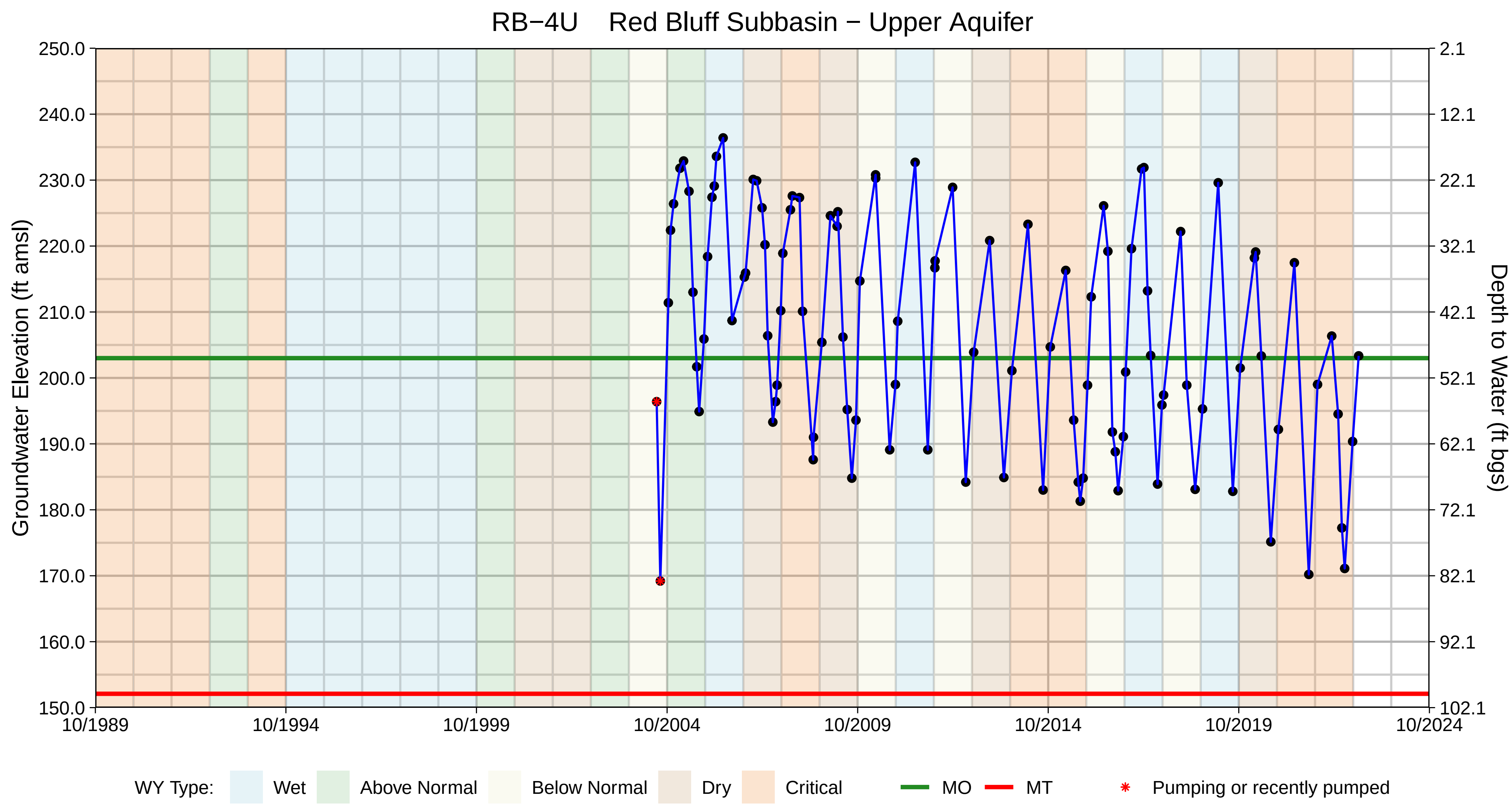
GSE (ft amsl): 333.5

Sustainable Management Criteria

MO: 257.1 ft amsl (76.4 ft bgs)

MT: 223.5 ft amsl (110 ft bgs)





SWN: 25N03W11B001M

Site Code: 400428N1221665W001

Total Depth (ft):255

Perf. Top (ft bgs): 150

Perf. Bottom (ft bgs): 180

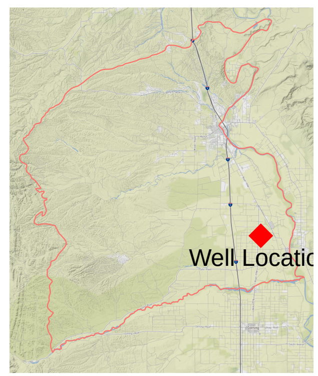
Well Type: Observation

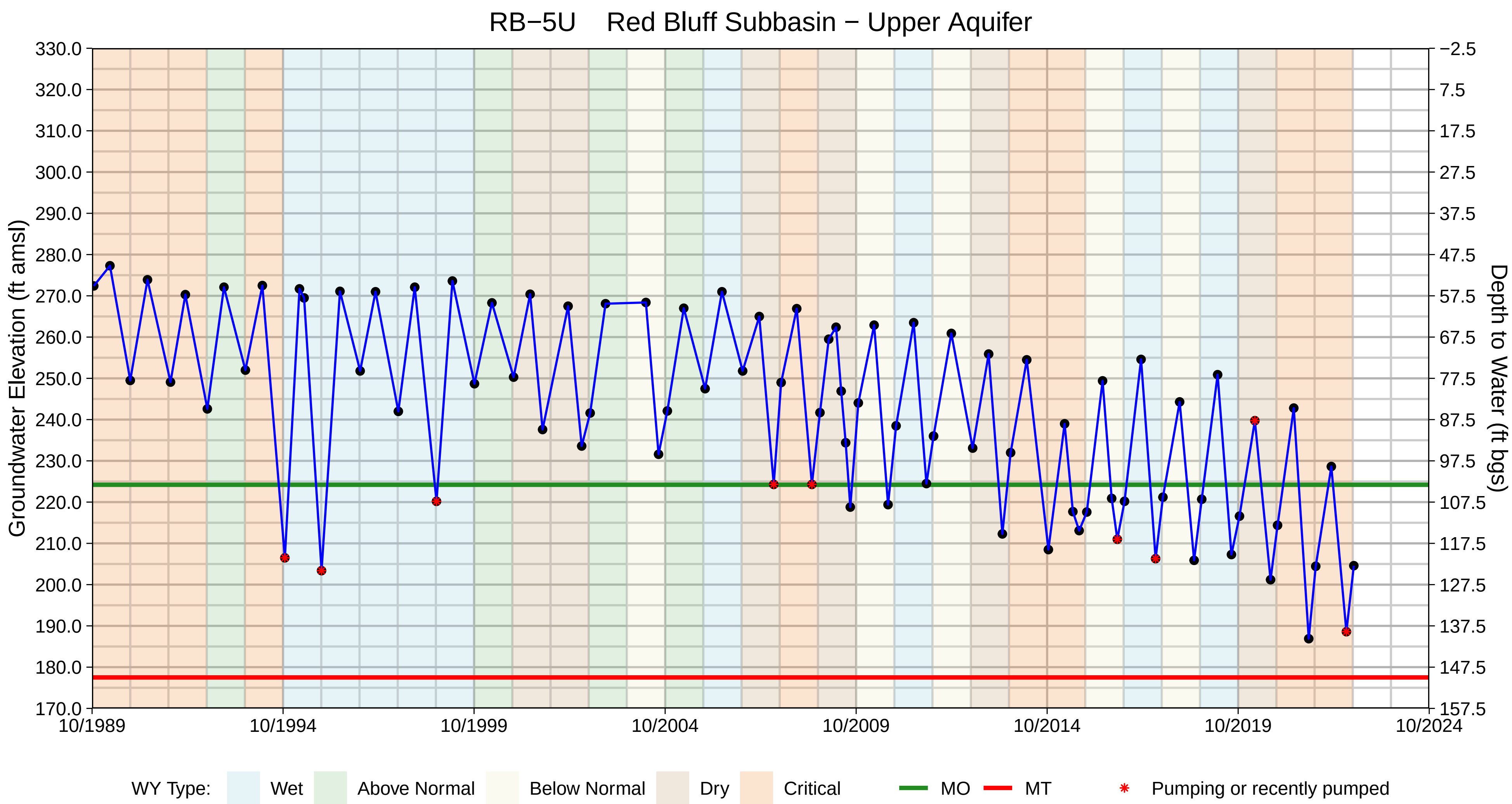
GSE (ft amsl): 252.1

Sustainable Management Criteria

MO: 203 ft amsl (49.1 ft bgs)

MT: 152.1 ft amsl (100 ft bgs)





SWN: 25N03W19N001M

Site Code: 400013N1222540W001

Total Depth (ft):370

Perf. Top (ft bgs): 135

Perf. Bottom (ft bgs): 358

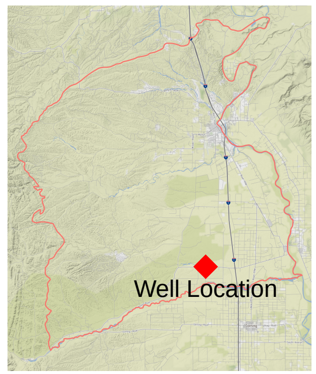
Well Type: Irrigation

GSE (ft amsl): 327.5

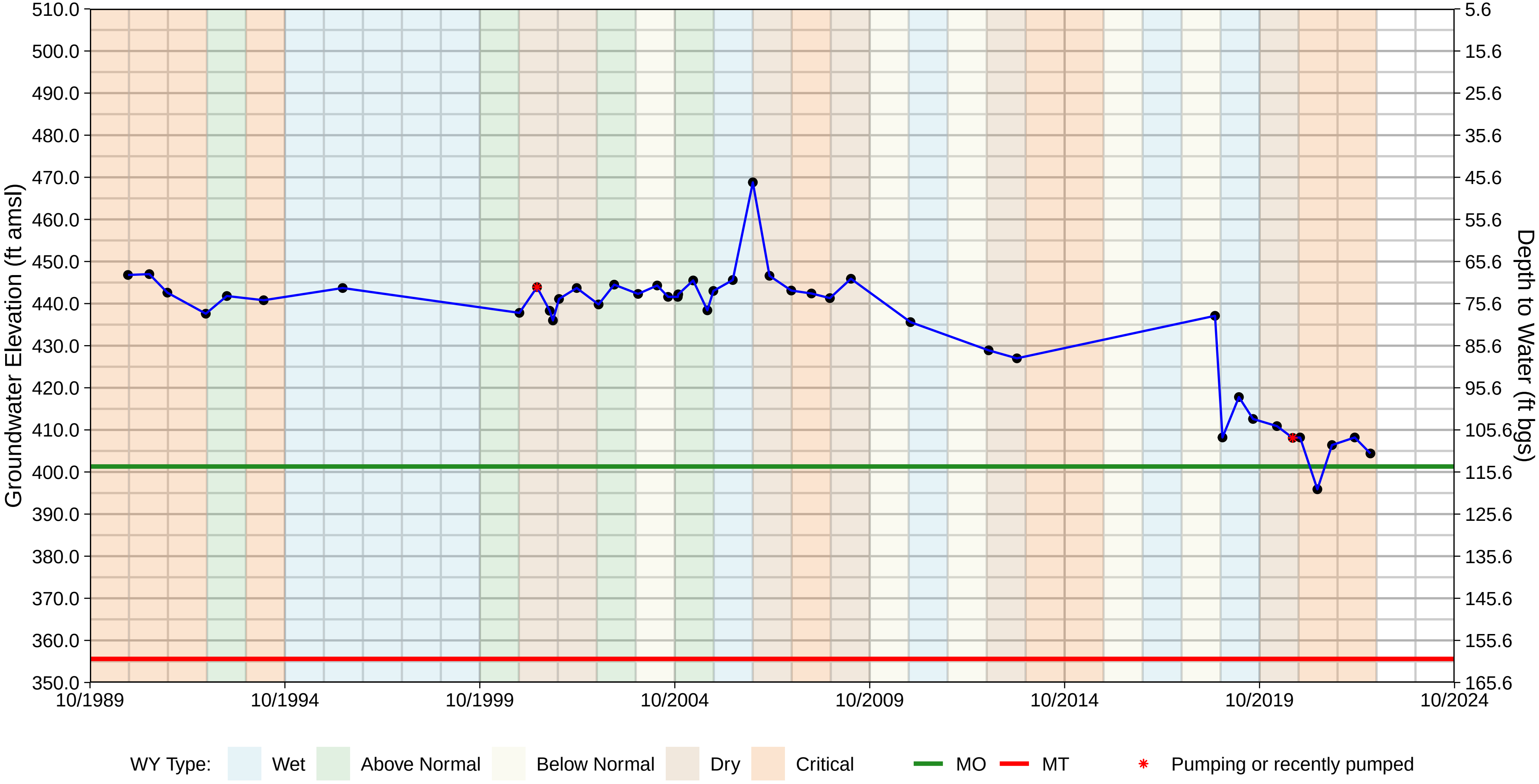
Sustainable Management Criteria

MO: 224.2 ft amsl (103.3 ft bgs)

MT: 177.5 ft amsl (150 ft bgs)



RB−6U   Red Bluff Subbasin − Upper Aquifer



SWN: 25N05W24D001M

Site Code: 400147N1223785W001

Total Depth (ft):183

Perf. Top (ft bgs): 143

Perf. Bottom (ft bgs): 183

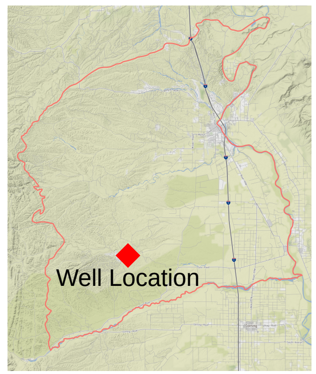
Well Type: Industrial

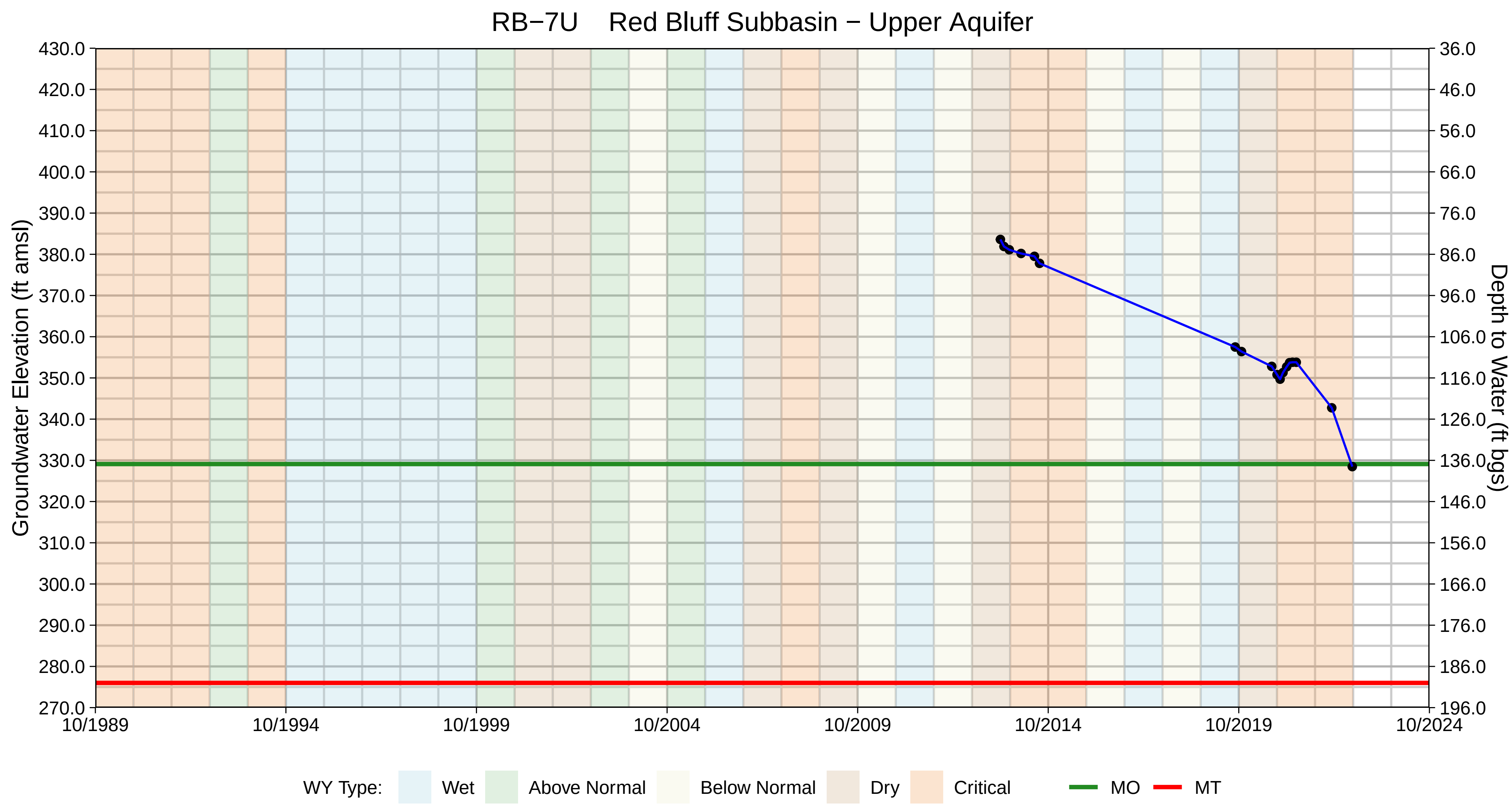
GSE (ft amsl): 515.6

Sustainable Management Criteria

MO: 401.3 ft amsl (114.3 ft bgs)

MT: 355.6 ft amsl (160 ft bgs)





SWN: NA

Site Code: 399519N1223622W001

Total Depth (ft):240

Perf. Top (ft bgs): NA

Perf. Bottom (ft bgs): NA

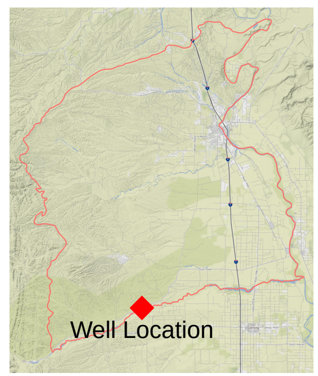
Well Type: Residential

GSE (ft amsl): 466

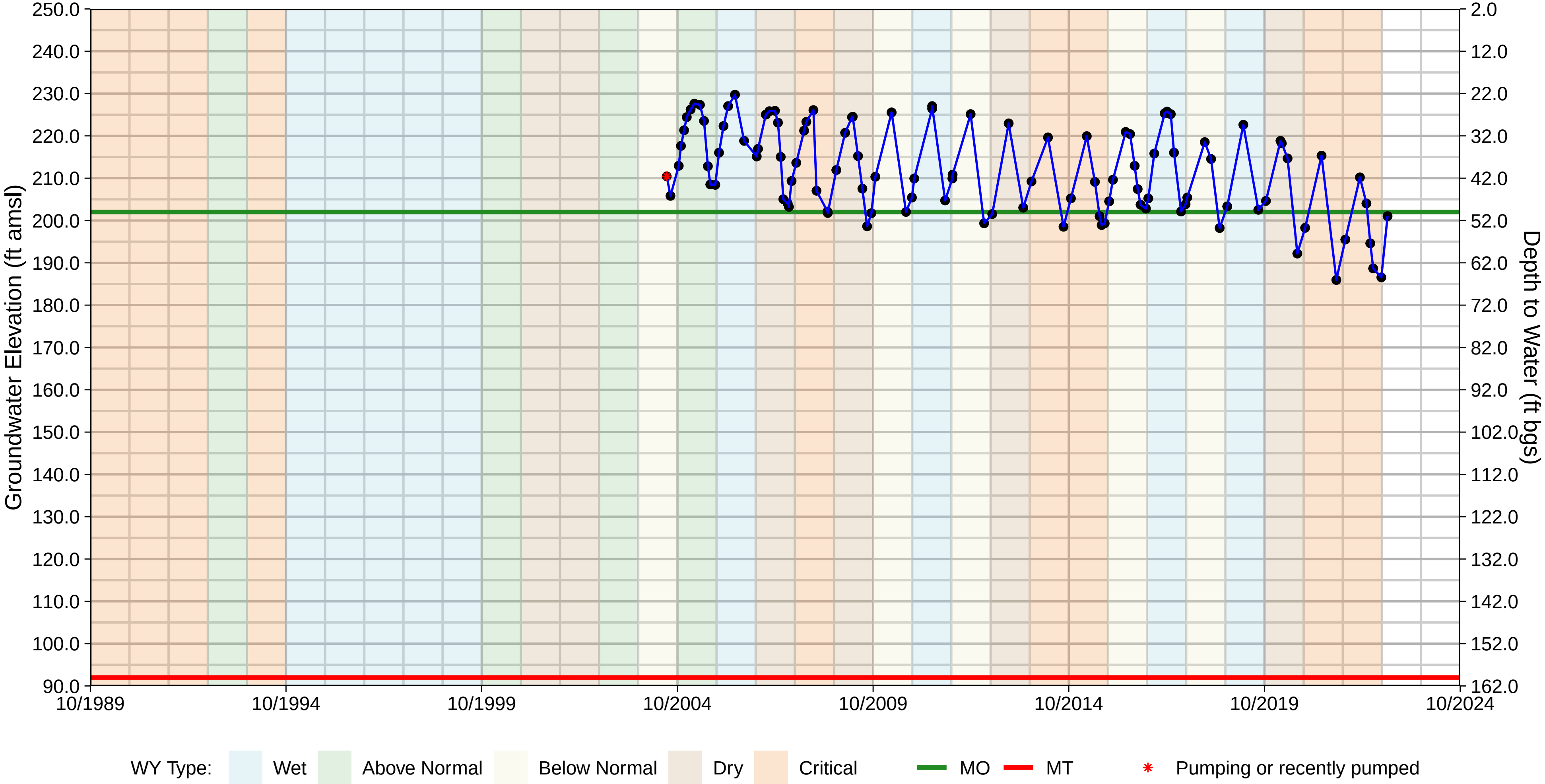
Sustainable Management Criteria

MO: 329.1 ft amsl (136.9 ft bgs)

MT: 276 ft amsl (190 ft bgs)



RB−8L Red Bluff Subbasin − Lower Aquifer



SWN: 25N03W11B002M

Site Code: 400428N1221665W002

Total Depth (ft):789

Perf. Top (ft bgs): 680

Perf. Bottom (ft bgs): 750

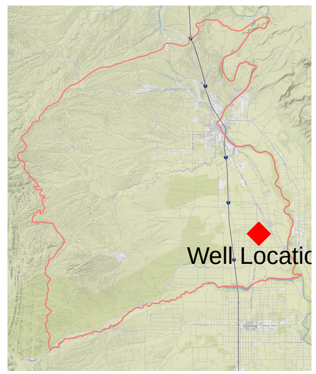
Well Type: Observation

GSE (ft amsl): 252

Sustainable Management Criteria

MO: 202 ft amsl (50 ft bgs)

MT: 92 ft amsl (160 ft bgs)



APPENDIX B

Annual Report Water Level Data

Data sources:

CA Department of Water Resources

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
24N04W07F003M	7/12/2022	460.1	457.78	30.62	32.94	427.16		
24N04W07F003M	8/4/2022	460.1	457.78	30.84	33.16	426.94		
24N04W07F003M	9/15/2022	460.1	457.78	31.02	33.34	426.76		
24N04W07F003M	10/11/2022	460.1	457.78	30.76	33.08	427.02		
24N04W07F003M	12/12/2022	460.1	457.78	30.51	32.83	427.27		
24N04W07F004M	7/12/2022	460.06	457.78	82.47	84.75	375.31		
24N04W07F004M	8/4/2022	460.06	457.78	85.29	87.57	372.49		
24N04W07F004M	9/15/2022	460.06	457.78	90.04	92.32	367.74		
24N04W07F004M	10/11/2022	460.06	457.78	85.64	87.92	372.14		
24N04W07F004M	12/12/2022	460.06	457.78	77.56	79.84	380.22		
24N04W07F005M	7/12/2022	459.96	457.78	121.54	123.72	336.24		
24N04W07F005M	8/4/2022	459.96	457.78	124.6	126.78	333.18		
24N04W07F005M	9/15/2022	459.96	457.78	126.97	129.15	330.81		
24N04W07F005M	10/11/2022	459.96	457.78	125.39	127.57	332.39		
24N04W07F005M	12/12/2022	459.96	457.78	119.37	121.55	338.41		
24N04W07F006M	7/12/2022	459.85	457.78	70.27	72.34	387.51		
24N04W07F006M	8/4/2022	459.85	457.78	70.81	72.88	386.97		
24N04W07F006M	9/15/2022	459.85	457.78	72.28	74.35	385.5		
24N04W07F006M	10/11/2022	459.85	457.78	72.18	74.25	385.6		
24N04W07F006M	12/12/2022	459.85	457.78	71.49	73.56	386.29		
24N05W20K001M	3/11/2022	596.1	595	79.9	81	515.1		
24N05W20K001M	10/11/2022	596.1	595	23.8	24.9	571.2		
24N05W22C001M	3/6/2022	541.3	540	96.3	97.6	443.7		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 6-Other, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
24N05W22C001M	8/4/2022	541.3	540	100.8	102.1	439.2		
24N05W22C001M	10/11/2022	541.3	540	100.5	101.8	439.5		
24N05W15P001M	8/4/2022	541.6	540	48.7	50.3	491.3		
24N05W15P001M	10/11/2022	541.6	540	60.3	61.9	479.7	1	
RB-7U	3/10/2022	466	466	123.25	123.25	342.75		
RB-7U	9/23/2022	466	466	137.52	137.52	328.48		
24N04W07F002M	3/11/2022	495	494.4	150.1	150.7	344.3		
24N04W07F002M	8/4/2022	495	494.4	147.6	148.2	346.8		
24N04W07F002M	10/11/2022	495	494.4	160.5	161.1	333.9	3	
25N02W30G001M	3/10/2022	228.73	228.43	41.9	42.2	186.53		
25N02W30G001M	8/1/2022	228.73	228.43	44.4	44.7	184.03		
25N02W30G001M	10/13/2022	228.73	228.43	44.1	44.4	184.33		
25N03W19N001M	3/10/2022	328.09	327.49	98.86	99.46	228.63		
25N03W19N001M	8/1/2022	328.09	327.49	138.9	139.5	188.59	2	
25N03W19N001M	10/11/2022	328.09	327.49	122.9	123.5	204.59		
25N03W22L001M	3/10/2022	277.95	277.45	73.2	73.7	204.25		
25N03W22L001M	5/10/2022	277.95	277.45	89.3	89.8	188.15		
25N03W22L001M	6/15/2022	277.95	277.45	93.3	93.8	184.15		
25N03W22L001M	8/1/2022	277.95	277.45	99.8	100.3	177.65		
25N03W22L001M	10/11/2022	277.95	277.45	90.6	91.1	186.85		
25N03W22L001M	11/23/2022	277.95	277.45	81.4	81.9	196.05		
25N03W22L001M	12/16/2022	277.95	277.45	74.7	75.2	202.75		
25N05W23A001M	3/11/2022	537.85	537	132.15	133	404.85		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 6-Other, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
25N05W23A001M	5/16/2022	537.85	537	132.25	133.1	404.75		
25N05W23A001M	8/5/2022	537.85	537	135.95	136.8	401.05		
25N05W23A001M	9/20/2022	537.85	537	137.05	137.9	399.95	3	
25N05W23A001M	10/18/2022	537.85	537	138.05	138.9	398.95		
25N05W23A001M	12/21/2022	537.85	537	137.15	138	399.85	4	
25N05W24D001M	3/11/2022	515.9	515.6	107.4	107.7	408.2		
25N05W24D001M	8/5/2022	515.9	515.6	111.2	111.5	404.4		
25N05W24D002M	3/11/2022	483.35	482	75.95	77.3	406.05		
25N05W24D002M	5/16/2022	483.35	482	75.25	76.6	406.75		
25N05W24D002M	8/5/2022	483.35	482	79.45	80.8	402.55		
25N05W24D002M	9/20/2022	483.35	482	81.25	82.6	400.75		
25N05W24D002M	10/18/2022	483.35	482	81.85	83.2	400.15		
25N05W24D002M	12/21/2022	483.35	482	80.45	81.8	401.55		
25N05W13P001M	3/11/2022	466.85	462	56.45	61.3	405.55		
25N05W13P001M	5/16/2022	466.85	462	54.25	59.1	407.75		
25N05W13P001M	8/5/2022	466.85	462	58.35	63.2	403.65		
25N05W13P001M	9/20/2022	466.85	462	60.15	65	401.85		
25N05W13P001M	10/18/2022	466.85	462	61.95	66.8	400.05		
25N05W13P001M	12/21/2022	466.85	462	58.95	63.8	403.05		
25N05W17P001M	3/11/2022	656.05	654	75.95	78	578.05		
25N05W17P001M	5/16/2022	656.05	654	76.05	78.1	577.95		
25N05W17P001M	8/5/2022	656.05	654	78.05	80.1	575.95		
25N05W17P001M	9/20/2022	656.05	654	77.85	79.9	576.15		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 6-Other, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
25N05W17P001M	10/18/2022	656.05	654	77.75	79.8	576.25		
25N05W17P001M	12/21/2022	656.05	654	76.75	78.8	577.25		
25N05W14L001M	3/11/2022	497.6	496	70	71.6	426		
25N05W14L001M	5/16/2022	497.6	496	69.1	70.7	426.9		
25N05W14L001M	9/20/2022	497.6	496	73.5	75.1	422.5		
25N05W14L001M	10/18/2022	497.6	496	73.5	75.1	422.5		
25N05W14L001M	12/21/2022	497.6	496	72.1	73.7	423.9		
25N05W17K001M	3/11/2022	629.25	629	50.55	50.8	578.45		
25N05W17K001M	5/16/2022	629.25	629	50.55	50.8	578.45		
25N05W17K001M	8/5/2022	629.25	629	52.05	52.3	576.95		
25N05W17K001M	9/20/2022	629.25	629	52.15	52.4	576.85		
25N05W17K001M	10/18/2022	629.25	629	52.25	52.5	576.75		
25N05W17K001M	12/21/2022	629.25	629	51.55	51.8	577.45		
25N03W11F001M	10/11/2022	258.43	258.43	77.1	77.1	181.33		
25N03W15A001M	3/10/2022	269.63	268.93	63.3	64	205.63		
25N03W15A001M	5/10/2022	269.63	268.93	72.1	72.8	196.83		
25N03W15A001M	6/15/2022	269.63	268.93	82.5	83.2	186.43		
25N03W15A001M	7/12/2022	269.63	268.93	95.5	96.2	173.43		
25N03W15A001M	8/1/2022	269.63	268.93	98.7	99.4	170.23	3	
25N03W15A001M	10/11/2022	269.63	268.93	97.4	98.1	171.53	3	
25N03W15A001M	11/23/2022	269.63	268.93	77.3	78	191.63		
25N03W15A001M	12/16/2022	269.63	268.93	68	68.7	200.93		
25N03W08E001M	3/10/2022	317.45	317.45	75	75	242.45		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 6-Other, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
25N03W08E001M	8/1/2022	317.45	317.45	124.9	124.9	192.55		
25N03W08E001M	10/11/2022	317.45	317.45	98	98	219.45		
25N03W11B001M	3/10/2022	254.2	252.1	45.75	47.85	206.35		
25N03W11B001M	5/10/2022	254.2	252.1	57.58	59.68	194.52		
25N03W11B001M	6/15/2022	254.2	252.1	74.85	76.95	177.25		
25N03W11B001M	7/12/2022	254.2	252.1	81	83.1	171.1		
25N03W11B001M	9/26/2022	254.2	252.1	61.74	63.84	190.36		
25N03W11B001M	11/23/2022	254.2	252.1	48.75	50.85	203.35		
25N03W11B002M	3/10/2022	253.93	252.03	41.83	43.73	210.2		
25N03W11B002M	5/10/2022	253.93	252.03	48	49.9	204.03		
25N03W11B002M	6/15/2022	253.93	252.03	57.42	59.32	194.61		
25N03W11B002M	7/12/2022	253.93	252.03	63.36	65.26	188.67		
25N03W11B002M	9/26/2022	253.93	252.03	65.47	67.37	186.56		
25N03W11B002M	11/23/2022	253.93	252.03	51	52.9	201.03		
25N03W11B003M	5/10/2022	253.65	252.05	68.09	69.69	183.96		
25N03W11B003M	6/15/2022	253.65	252.05	78.95	80.55	173.1		
25N03W11B003M	7/12/2022	253.65	252.05	92.85	94.45	159.2		
25N03W11B003M	11/23/2022	253.65	252.05	60.3	61.9	191.75		
26N03W34P001M	3/8/2022	275.33	275.33	64.3	64.3	211.03		
26N03W34P001M	8/4/2022	275.33	275.33	98.1	98.1	177.23		
26N03W34P001M	10/12/2022	275.33	275.33	98.5	98.5	176.83		
26N04W26K001M	3/8/2022	363.58	362.48	105	106.1	257.48		
26N04W25J001M	3/8/2022	334.46	333.46	73.65	74.65	259.81		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 6-Other, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
26N04W25J001M	8/4/2022	334.46	333.46	78.19	79.19	255.27		
26N04W25J001M	10/12/2022	334.46	333.46	78.46	79.46	255		
26N03W24M001M	3/8/2022	246.91	246.41	31.39	31.89	215.02		
26N03W24M001M	5/10/2022	246.91	246.41	38.6	39.1	207.81		
26N03W24M001M	6/16/2022	246.91	246.41	47.6	48.1	198.81		
26N03W24M001M	7/12/2022	246.91	246.41	51.4	51.9	195.01		
26N03W24M001M	8/4/2022	246.91	246.41	51.5	52	194.91		
26N03W24M001M	10/12/2022	246.91	246.41	50.7	51.2	195.71		
26N03W24F001M	3/8/2022	233.41	232.41	21.71	22.71	210.7		
26N03W24F001M	8/4/2022	233.41	232.41	25.36	26.36	207.05		
26N03W17B001M	3/9/2022	310.13	309.43	66.98	67.68	242.45		
26N03W17B001M	8/4/2022	310.13	309.43	74.99	75.69	234.44		
26N03W17B001M	10/12/2022	310.13	309.43	78.2	78.9	231.23		
26N03W08N001M	8/4/2022	310.03	310.03	77	77	233.03		
26N03W08N001M	10/12/2022	310.03	310.03	67.9	67.9	242.13		
27N04W36G001M	3/7/2022	364.24	362.44	118.13	119.93	244.31		
27N04W36G001M	5/10/2022	364.24	362.44	118.79	120.59	243.65		
27N04W36G001M	6/9/2022	364.24	362.44	120.02	121.82	242.42		
27N04W36G001M	7/14/2022	364.24	362.44	119.232	121.032	243.208		Actual Reading at Water Surface = 121 ft -.032 ft below zero reading.
27N04W36G001M	8/1/2022	364.24	362.44	121.45	123.25	240.99		
27N04W36G001M	9/15/2022	364.24	362.44	120.68	122.48	241.76		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 6-Other, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
27N04W36G001M	10/11/2022	364.24	362.44	119.99	121.79	242.45		
27N04W36G001M	11/18/2022	364.24	362.44	119.4	121.2	243.04		Run 95
27N04W36G001M	12/16/2022	364.24	362.44	119.18	120.98	243.26		
27N04W35E001M	3/9/2022	439.47	438.47	125.76	126.76	312.71		
27N04W35E001M	5/10/2022	439.47	438.47	131.65	132.65	306.82		
27N04W35E001M	6/14/2022	439.47	438.47	136.7	137.7	301.77		
27N04W35E001M	7/14/2022	439.47	438.47	141.97	142.97	296.5		
27N04W35E001M	8/4/2022	439.47	438.47	143.6	144.6	294.87		
27N04W35E001M	9/15/2022	439.47	438.47	157.8	158.8	280.67		
27N04W35E001M	10/12/2022	439.47	438.47	144.6	145.6	293.87		
27N04W35E001M	11/17/2022	439.47	438.47	149.9	150.9	288.57		
27N04W35E001M	12/16/2022	439.47	438.47	132.1	133.1	306.37		
27N04W25Q001M	3/9/2022	320	318	92.6	94.6	225.4		
27N04W25Q001M	8/4/2022	320	318	132.2	134.2	185.8	1	
27N04W25Q001M	10/12/2022	320	318	126.2	128.2	191.8		
27N04W26J002M	3/7/2022	313	309	71.9	75.9	237.1		
27N04W26J002M	5/10/2022	313	309	76.4	80.4	232.6		
27N04W26J002M	6/15/2022	313	309	79.75	83.75	229.25		
27N04W26J002M	7/14/2022	313	309	79.75	83.75	229.25		
27N04W26J002M	8/4/2022	313	309	90.95	94.95	218.05		
27N04W26J002M	9/3/2022	313	309	92.3	96.3	216.7		
27N04W26J002M	10/12/2022	313	309	99.4	103.4	209.6		
27N04W26J002M	11/16/2022	313	309	83.7	87.7	225.3		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 6-Other, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
27N04W26J002M	12/20/2022	313	309	79.5	83.5	229.5		
27N04W26D001M	8/4/2022	395.2	395	75.8	76	319.2	4	Pumping within the hour, measurement taken 8/24/22
27N04W26D001M	10/12/2022	395.2	395	73.7	73.9	321.3		
27N04W26D001M	12/16/2022	395.2	395	69.7	69.9	325.3		
27N04W07B001M	3/8/2022	603.55	602.55	146.1	147.1	456.45		
27N04W07B001M	8/5/2022	603.55	602.55	152.8	153.8	449.75		
27N04W07B001M	10/12/2022	603.55	602.55	152.1	153.1	450.45		
27N04W05G002M	3/8/2022	483.83	482.53	51.7	53	430.83		
27N04W05G002M	8/3/2022	483.83	482.53	68.2	69.5	414.33		
27N04W05G002M	10/12/2022	483.83	482.53	62.4	63.7	420.13		
28N03W31M002M	3/9/2022	361.7	360	41.96	43.66	318.04		
28N03W31M002M	5/10/2022	361.7	360	43.94	45.64	316.06		
28N03W31M002M	6/14/2022	361.7	360	44.47	46.17	315.53		
28N03W31M002M	7/14/2022	361.7	360	43.94	45.64	316.06		
28N03W31M002M	8/3/2022	361.7	360	46.18	47.88	313.82		
28N03W31M002M	9/15/2022	361.7	360	44.78	46.48	315.22		
28N03W31M002M	10/10/2022	361.7	360	46.62	48.32	313.38		
28N03W31M002M	11/17/2022	361.7	360	44.73	46.43	315.27		
28N03W31M002M	12/16/2022	361.7	360	44	45.7	316		
28N03W31M001M	3/9/2022	357.7	356	79.05	80.75	276.95		
28N03W31M001M	5/10/2022	357.7	356	79.5	81.2	276.5		
28N03W31M001M	6/14/2022	357.7	356	79.4	81.1	276.6		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 6-Other, 8-Oil or foreign substance in casing

Water Level Data for Water Year 2022								
Well ID	Measure Date	RPE (ft amsl)	GSE (ft amsl)	DTW (ft bgs)	DTW (ft brp)	WSE (ft amsl)	WL QM CD[1]	Comments
28N03W31M001M	7/14/2022	357.7	356	79.5	81.2	276.5		
28N03W31M001M	8/3/2022	357.7	356	83.9	85.6	272.1		
28N03W31M001M	9/15/2022	357.7	356	80.1	81.8	275.9		
28N03W31M001M	10/10/2022	357.7	356	81.2	82.9	274.8		
28N03W31M001M	11/17/2022	357.7	356	80.3	82	275.7		
28N03W31M001M	12/16/2022	357.7	356	80.2	81.9	275.8		

[1]WL QM CD: 1-Pumping, 2-Nearby pump operating, 3-Casing leaking or wet, 4-Pumped recently, 6-Other, 8-Oil or foreign substance in casing

APPENDIX C

DWR Upload Tables

A. Groundwater Extractions

Total Groundwater Extractions (AF)	Water Use Sector Urban (AF)	Water Use Sector Industrial (AF)	Water Use Sector Agricultural (AF)	Water Use Sector Managed Wetlands (AF)	Water Use Sector Managed Recharge (AF)	Water Use Sector Native Vegetation (AF)	Water Use Sector Other (AF)	Water Use Sector Other Description
122,780	6,400	0	110,000	0	0	5,400	980	Rural Residential

B. Groundwater Extraction Methods

Meters Volume (AF)	Meters Description	Meters Type	Meters Accuracy (%)	Meters Accuracy Description	Electrical Records Volume (AF)	Electrical Records Description	Electrical Records Type	Electrical Records Accuracy (%)	Electrical Records Accuracy Description	Land Use Volume (AF)	Land Use Description	Land Use Type	Land Use Accuracy (%)	Land Use Accuracy Description	Groundwater Model Volume (AF)	Groundwater Model Description	Groundwater Model Type	Groundwater Model Accuracy (%)	Groundwater Model Accuracy Description	Other Method(s) Volume (AF)	Other Method(s) Description	Other Method(s) Type	Other Method(s) Accuracy (%)	Other Method(s) Accuracy Description
6,061	Metered municipal wells	Direct	5-10	Metered connection maintained by the City of Red Bluff, City of Tehama, and El Camino Irrigation District	0					0					0					116,719	Where available, groundwater extraction and surface water supplies were quantified directly from measured and reported groundwater pumping, surface water diversions, and deliveries data. However, groundwater extraction data has historically been limited, particularly for privately-owned wells. Thus, a water budget approach has been used to estimate the remaining, unmeasured volume of groundwater extraction that has occurred to meet demand in the Subbasin. Water budget approach used in this Annual Report utilizes available geospatial data and information to quantify crop water demand, precipitation, and other parameters with pixel-scale resolution (30-meter (m) x 30 m), corresponding to the spatial resolution of satellite imagery used in developing these inputs. In addition to geospatial data, available surface water supply and groundwater extraction data is incorporated into the water budget by distributing that water out to specific regions where that water is used (e.g., surface water supplier service areas).	Estimate	20-30 %	The uncertainty of these water budget components is based on typical accuracies given in technical literature and the cumulative estimated accuracy of all inputs used to calculate the components.

C. Surface Water Supply

Total Surface Water Supply (AF)	Methods Used To Determine	Water Source Type Central Valley Project (AF)	Water Source Type State Water Project (AF)	Water Source Type Colorado River Project (AF)	Water Source Type Local Supplies (AF)	Water Source Type Local Imported Supplies (AF)	Water Source Type Recycled Water (AF)	Water Source Type Desalination (AF)	Water Source Type Other (AF)	Water Source Type Other Description
35	Surface water supplies are reported directly from water supplier records or collected from publicly available sources (water rights diversion records, etc.) where available.	35	0	0	-	0	0	0	0	

D. Total Water Use

Total Water Use (AF)	Methods Used To Determine	Water Source Type Groundwater (AF)	Water Source Type Surface Water (AF)	Water Source Type Recycled Water (AF)	Water Source Type Reused Water (AF)	Water Source Type Other (AF)	Water Source Type Other Description	Water Use Sector Urban (AF)	Water Use Sector Industrial (AF)	Water Use Sector Agricultural (AF)	Water Use Sector Managed Wetlands (AF)	Water Use Sector Managed Recharge (AF)	Water Use Sector Native Vegetation (AF)	Water Use Sector Other (AF)	Water Use Sector Other Description
122,815	Where available, groundwater extraction and surface water supplies were quantified directly from measured and reported groundwater pumping, surface water diversions, and deliveries data. However, groundwater extraction data has historically been limited, particularly for privately-owned wells. Thus, a water budget approach has been used to estimate the remaining, unmeasured volume of groundwater extraction that has occurred to meet demand in the Subbasin. water budget approach used in this Annual Report utilizes available geospatial data and information to quantify crop water demand, precipitation, and other parameters with pixel-scale resolution (30-meter (m) x 30 m), corresponding to the spatial resolution of satellite imagery used in developing these inputs. In addition to geospatial data, available surface water supply and groundwater extraction data is incorporated into the water budget by distributing that water out to specific regions where that water is used (e.g., surface water supplier service areas). Surface water supplies are reported directly from water supplier records or collected from publicly available sources (water rights diversion records, etc.) where available.	122,780	35	0	0	0		6,400	0	110,035	0	0	5,400	980	Rural Residential