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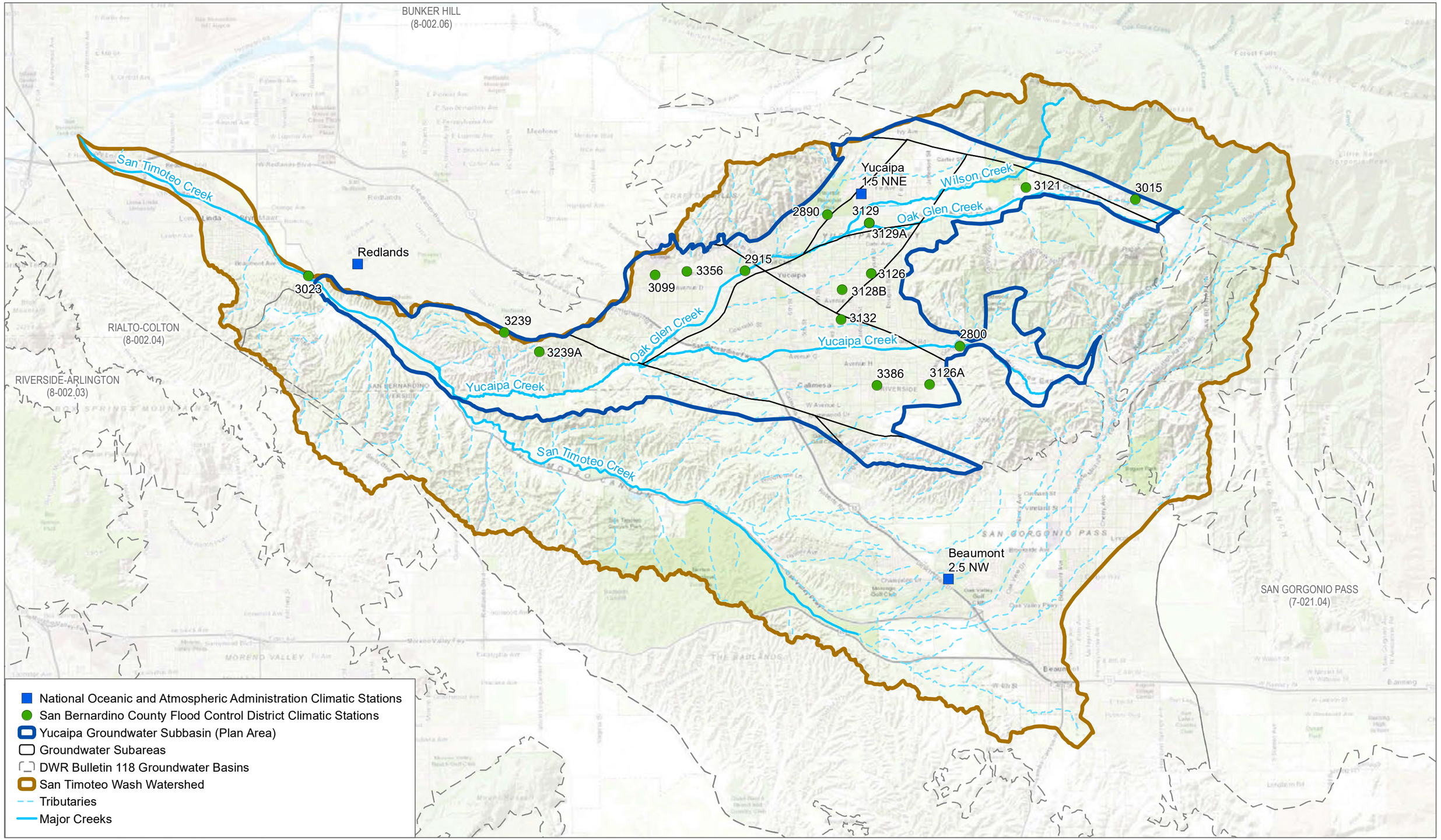

SOURCE: ESRI, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordanance Survey, ESRI Japan, METI, ESRI China (Hong Kong), swisstopo, OpenStreetMap contributors, and the GIS User Community; DWR 2015; USGS NHD 2017; Geoscience 2017

DUDEK 0 0.5 1 Miles

FIGURE 2-1

Climate Station Locations in the San Timoteo Wash Watershed

Groundwater Sustainability Plan for the Yucaipa Valley Subbasin

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Figure 2-2. Cumulative Departure from Mean Monthly Precipitation at the SBCFCD Oak Glen and Calimesa East Climatic Stations and the NOAA Redlands Climatic Station

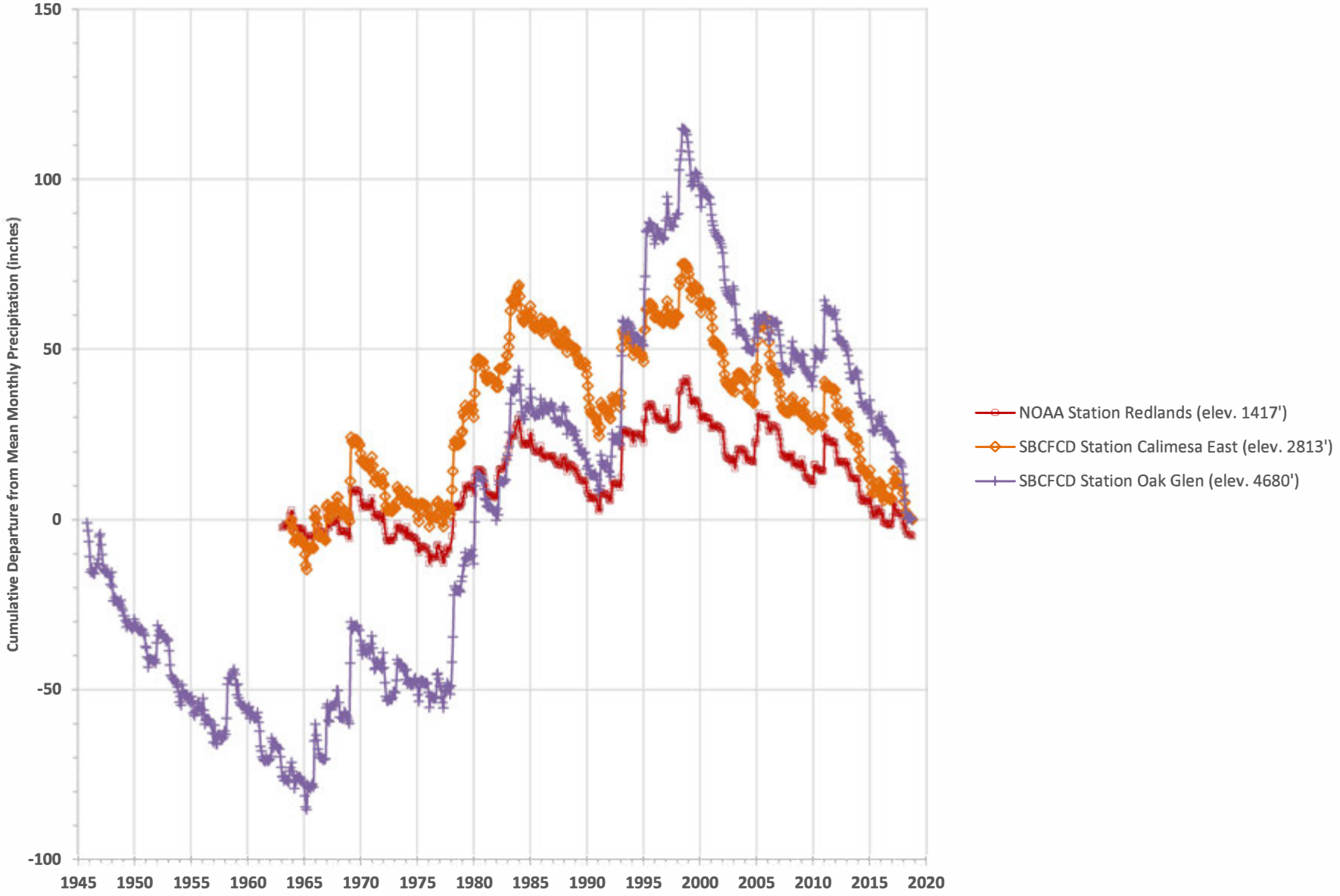

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Figure 2-3. Historical Water Year Types in the Yucaipa Subbasin

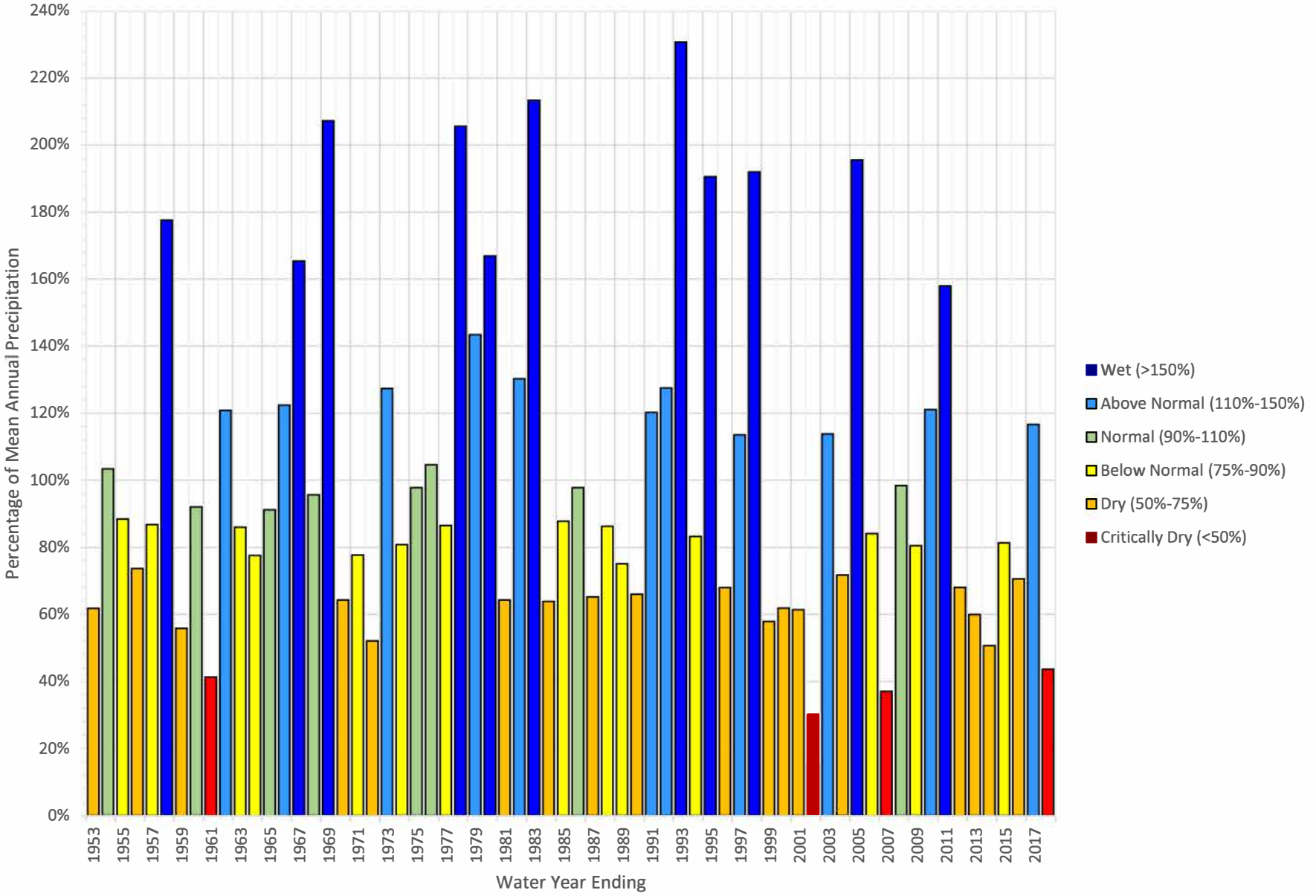

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Figure 2-4. Mean Daily Maximum and Minimum Temperature (Degrees Celsius) at NOAA Redlands Climate Station

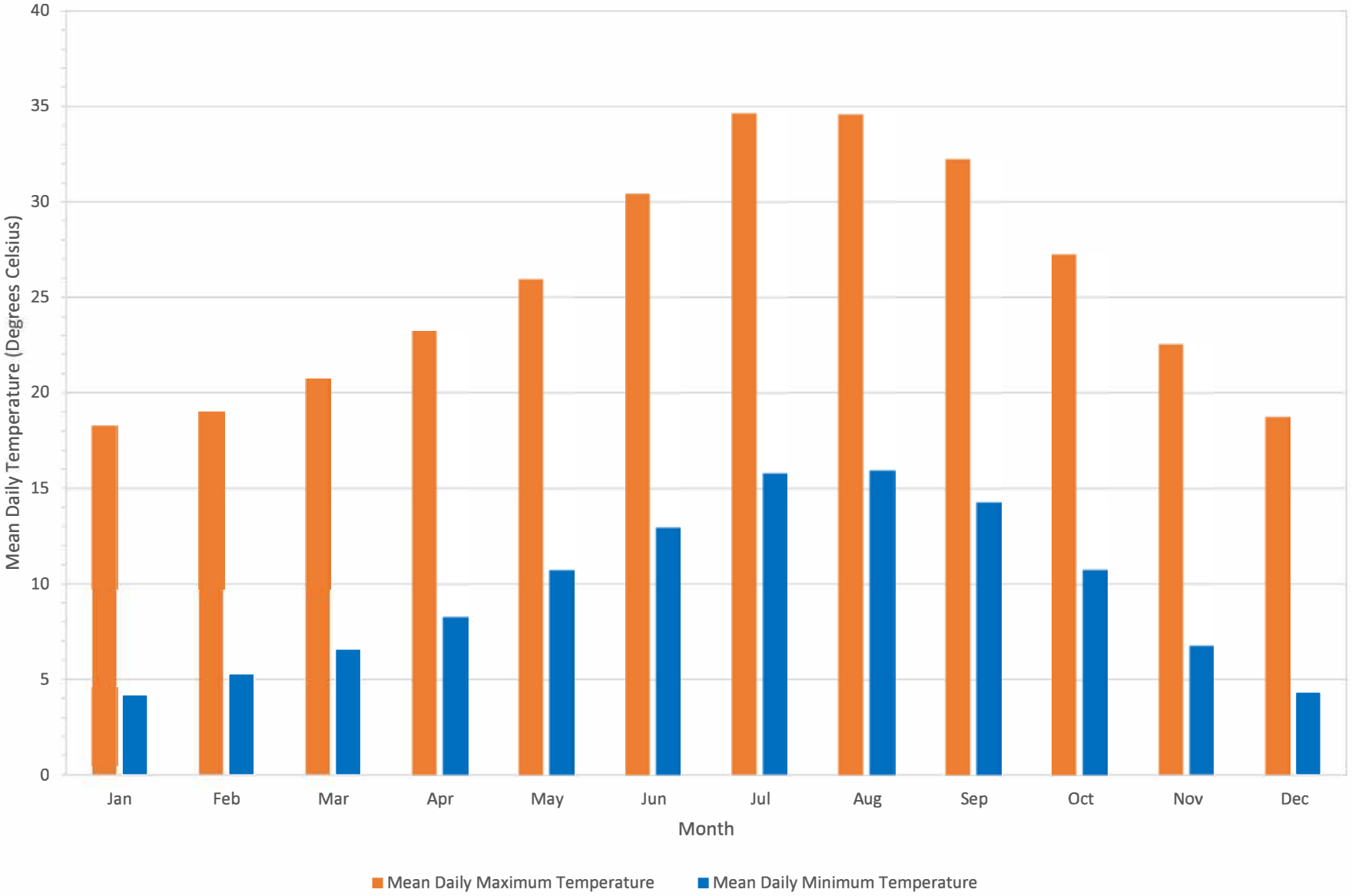

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Figure 2-5. Mean Daily Maximum and Minimum Temperature (Degrees Fahrenheit) at NOAA Redlands Climate Station

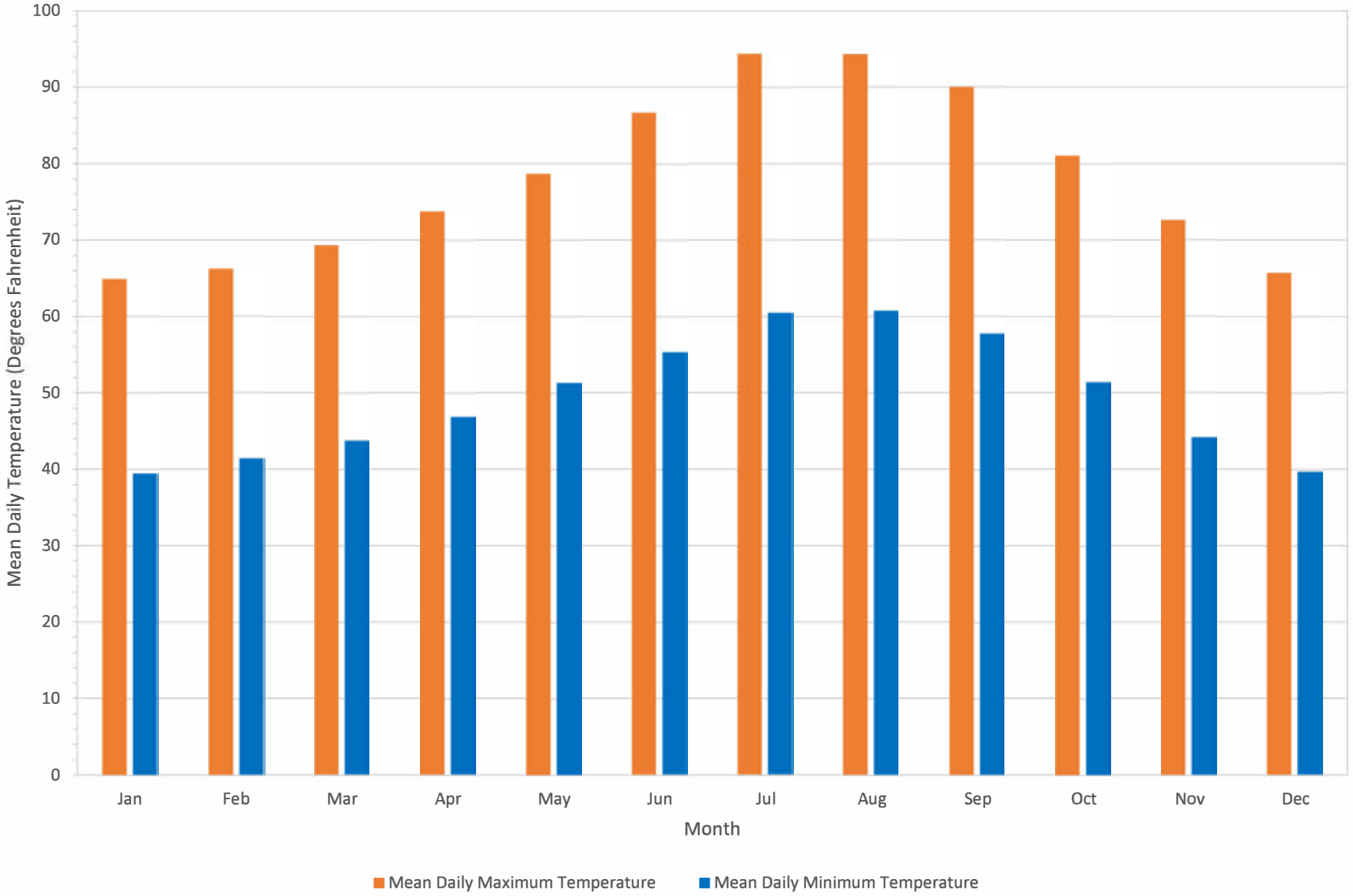

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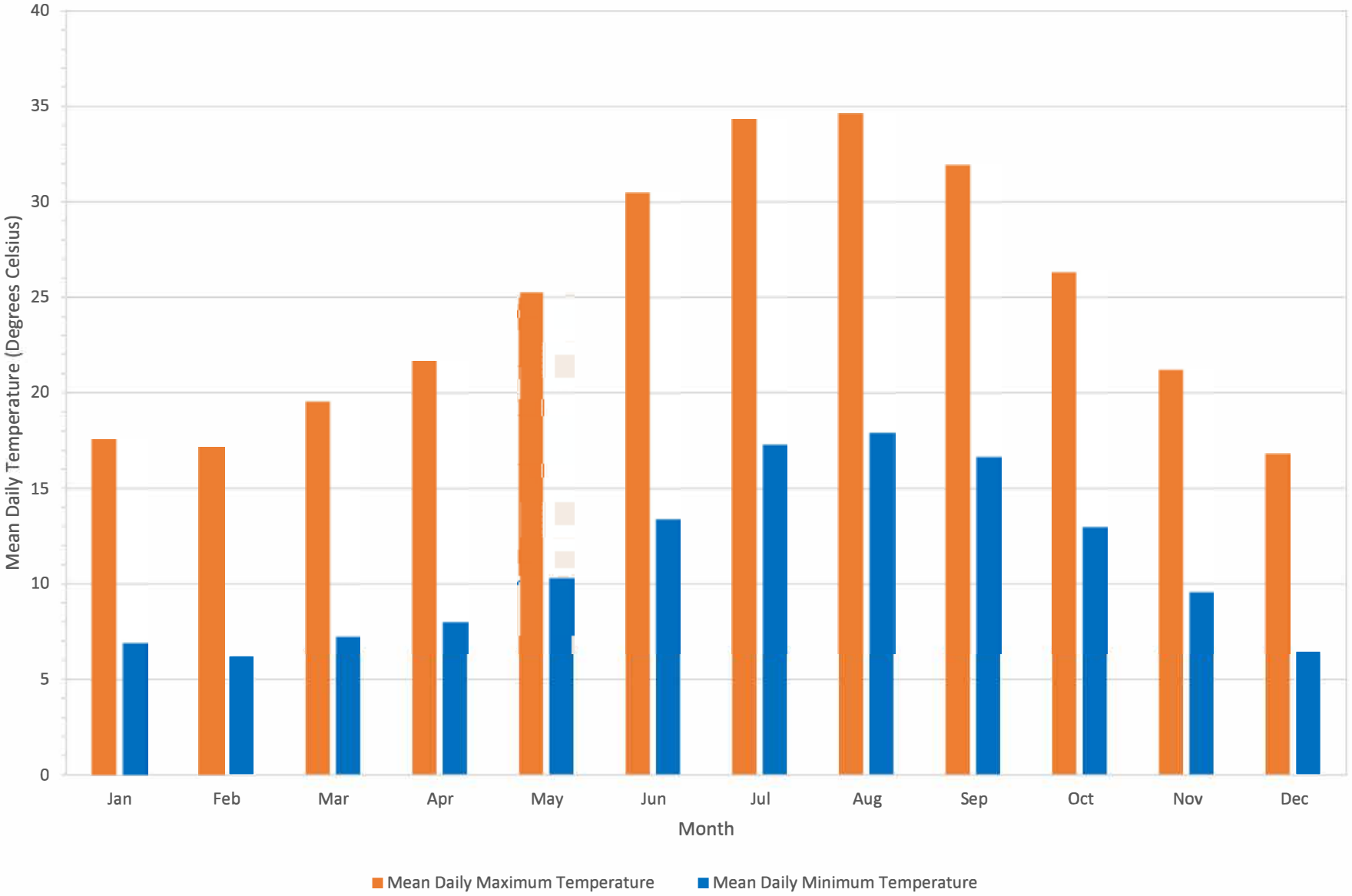
Figure 2-6. Mean Daily Maximum and Minimum Temperature (Degrees Celsius) at NOAA Mill Creek BDF Climate Station



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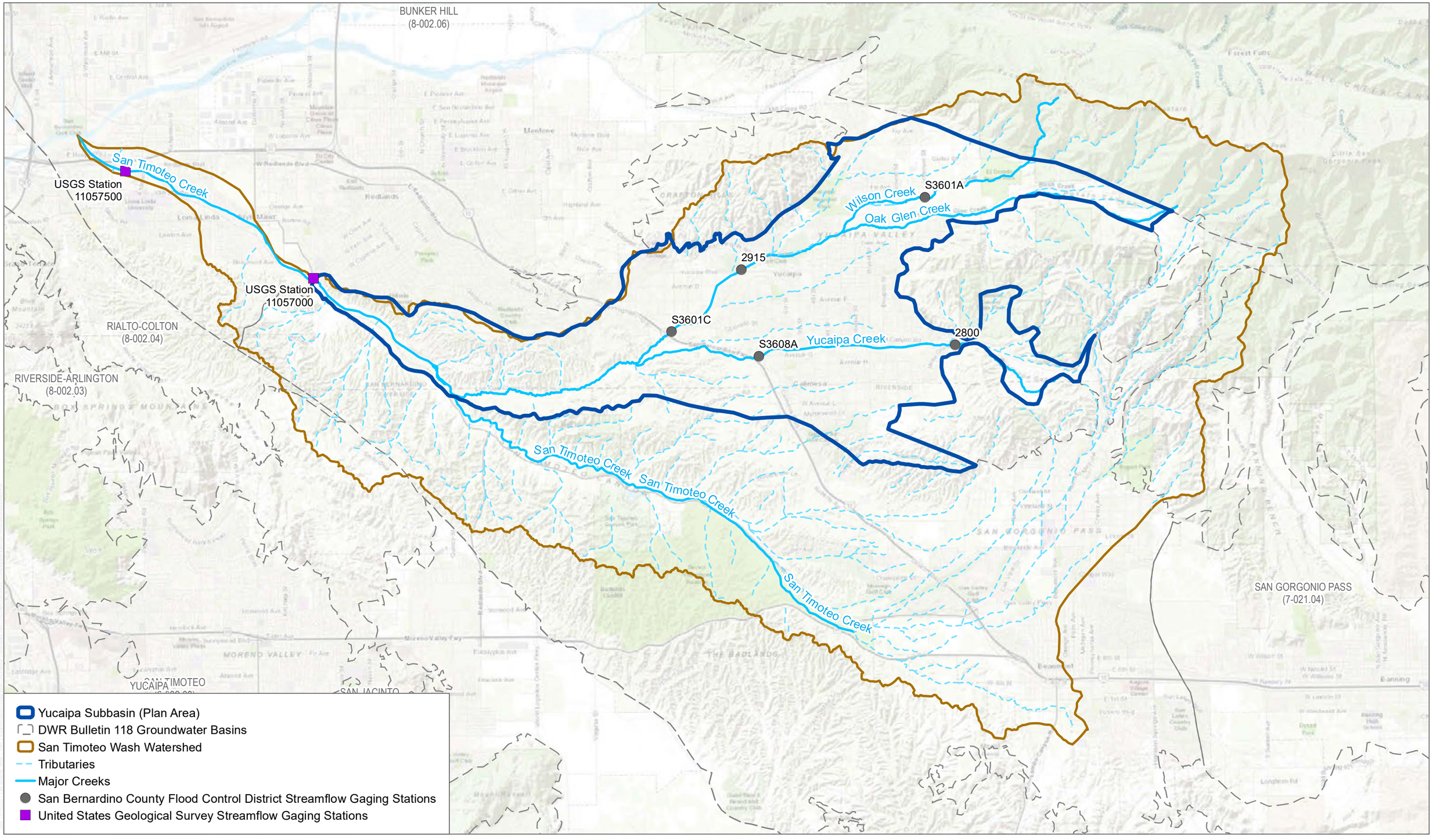

SOURCE: DWR; USGS; San Bernardino County Flood Control District

DUDEK 0 0.5 1 Miles

FIGURE 2-7

Surface Water Flow in San Timoteo Wash Watershed

Yucaipa Subbasin Groundwater Sustainability Plan

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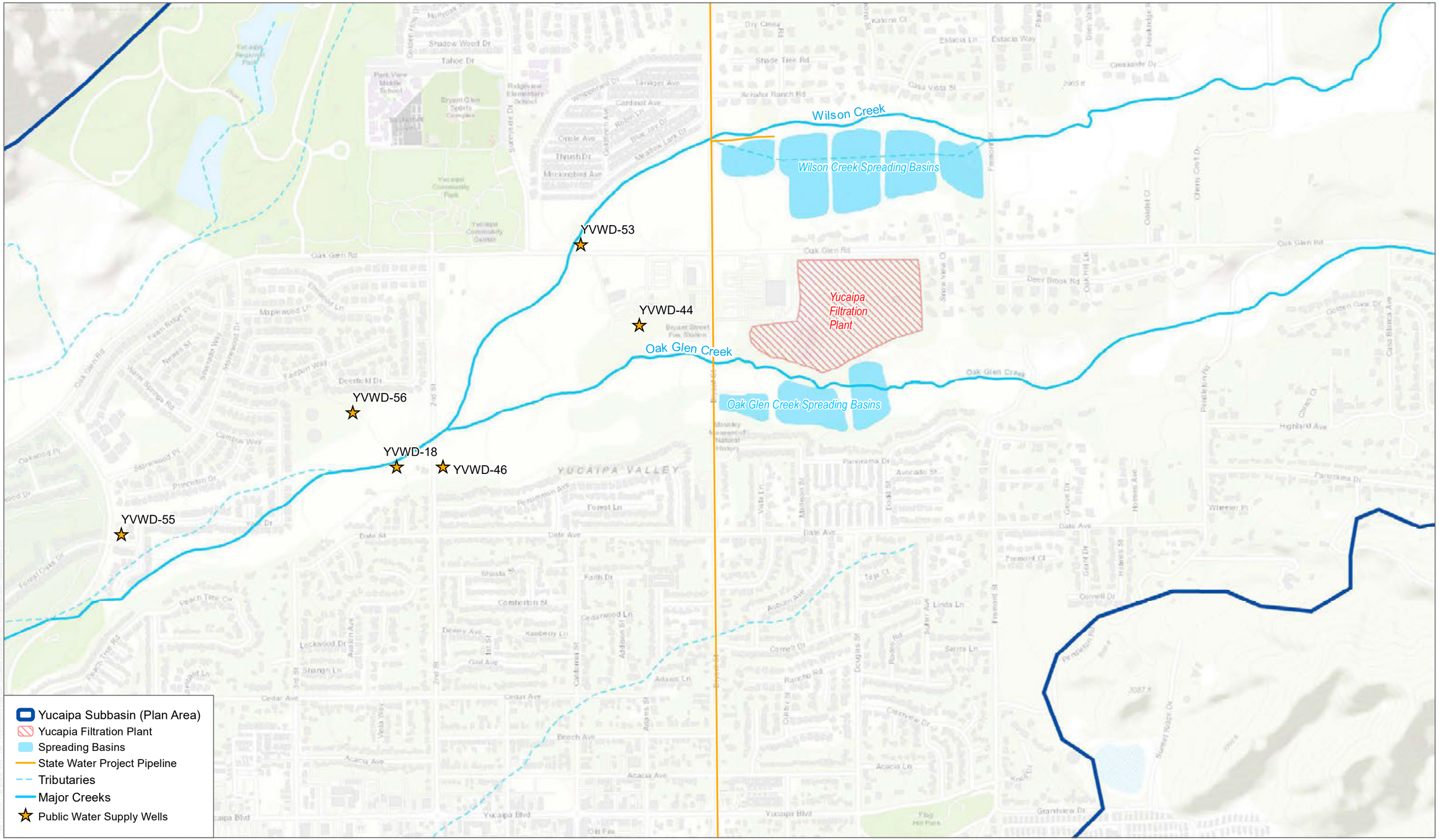

SOURCE: DWR

DUDEK

0 500 1,000 Feet

FIGURE 2-8

Locations of the Wilson Creek and Oak Glen Creek Spreading Basins in the Yucaipa Subbasin

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Figure 2-9. Cumulative Stream Flow at
SBCFCD Stations 2915 and S3601C on Oak Glen Creek

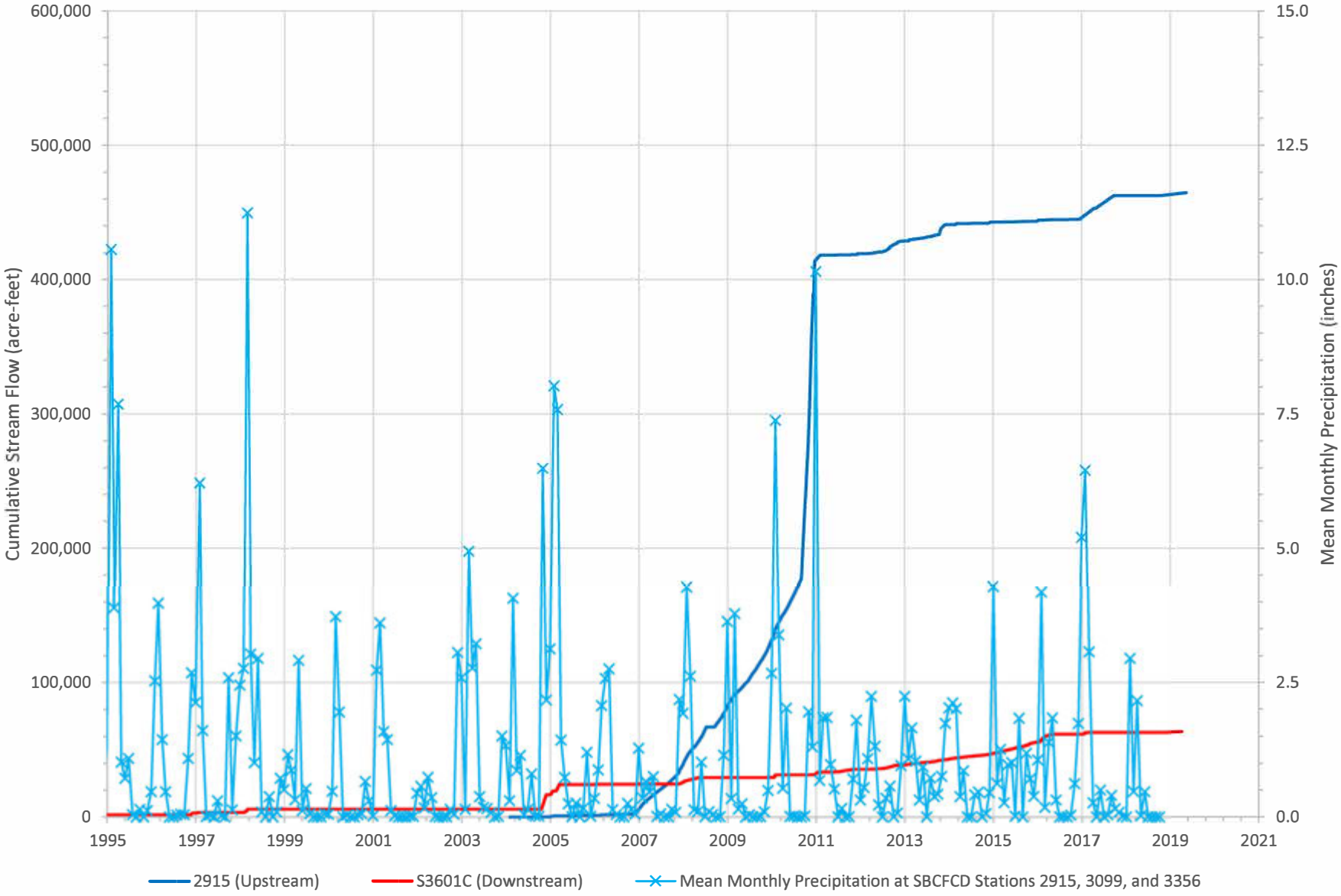

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Figure 2-10. Cumulative Stream Flow at
SBCFCD Stations 2800 and S3608A on Yucaipa Creek

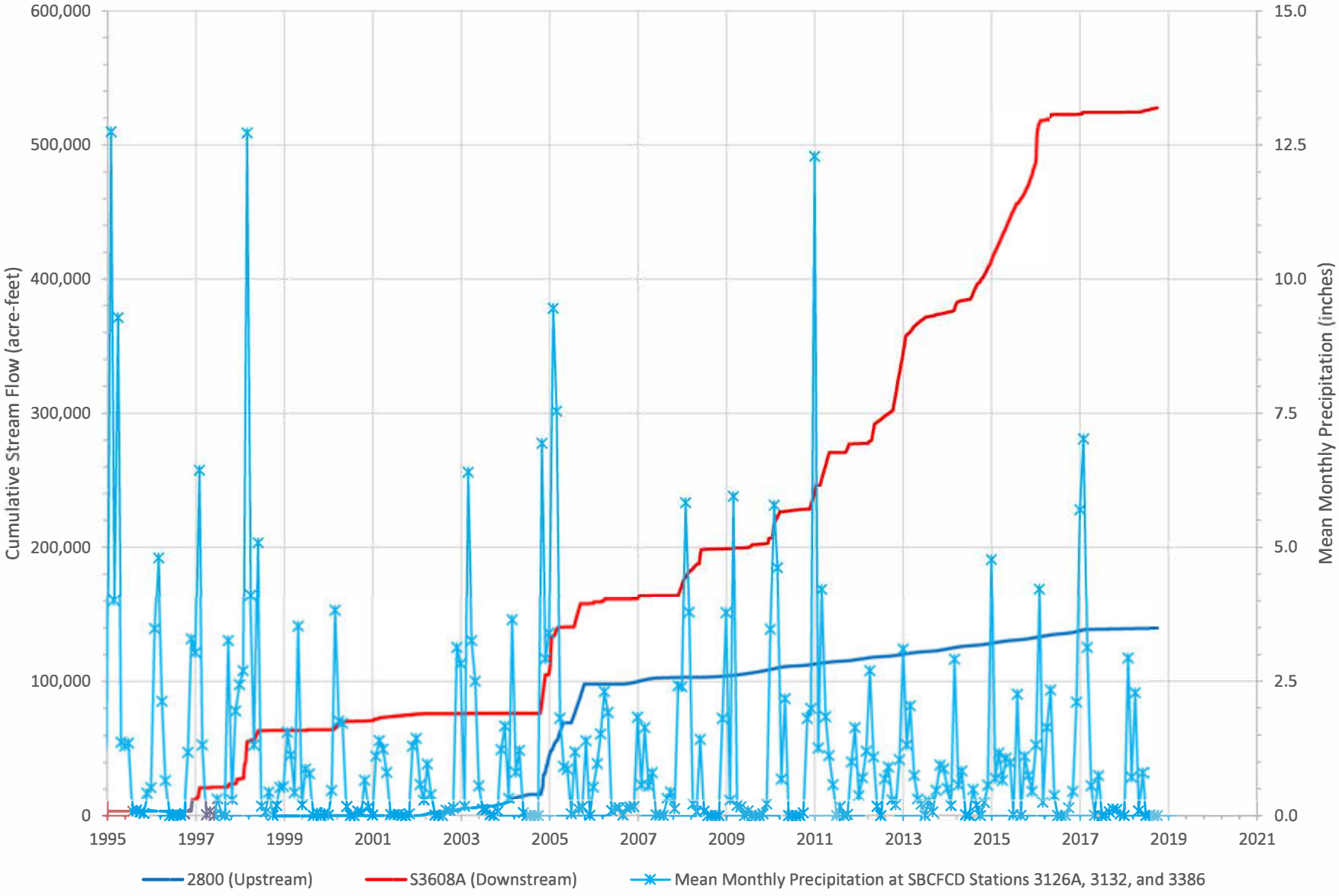

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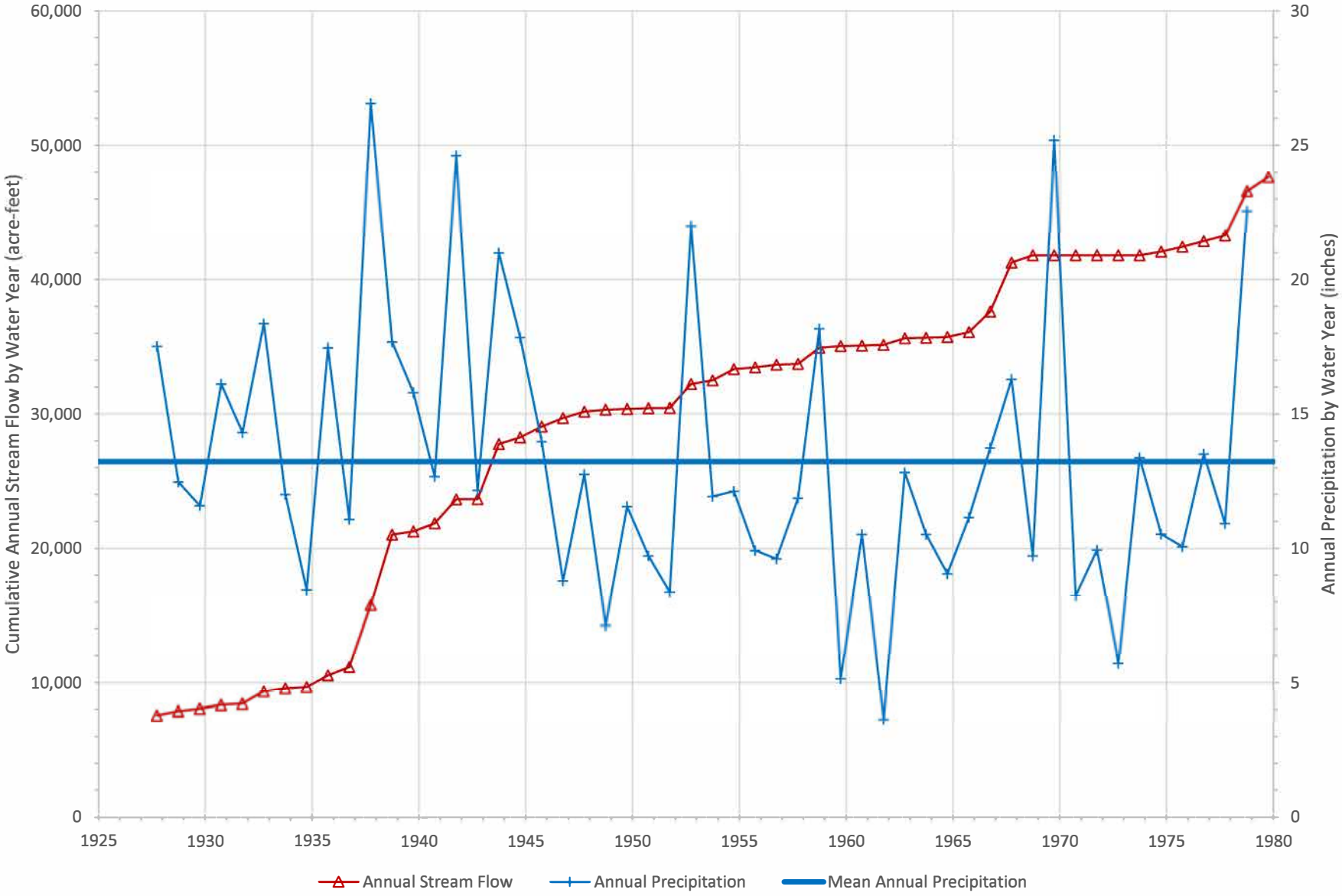
Figure 2-11. Stream Flow Measured at USGS Station 11057000 and Precipitation at NOAA Redlands



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Yucaipa Groundwater Subbasin

Groundwater Subareas

Geologic Units (CGS 2012)

Quaternary

Qa, Young

Qsdloc, Sedimentary Deposits of Live Oak Formation

Tertiary

QTst, San Timoteo Formation (Middle Member)

Tsh, Mill Creek Formation

Tv, Dacite Dikes

Mesozoic and Older

pKm, Cretaceous and Pre-Cretaceous Metamorphic Formations of Sedimentary and Volcanic Origin

Trb, Granitic and Other Intrusive Crystalline Rocks, San Gabriel Mountains-type

Faults and Geologic Contacts

contact, identity and existence certain, location accurate

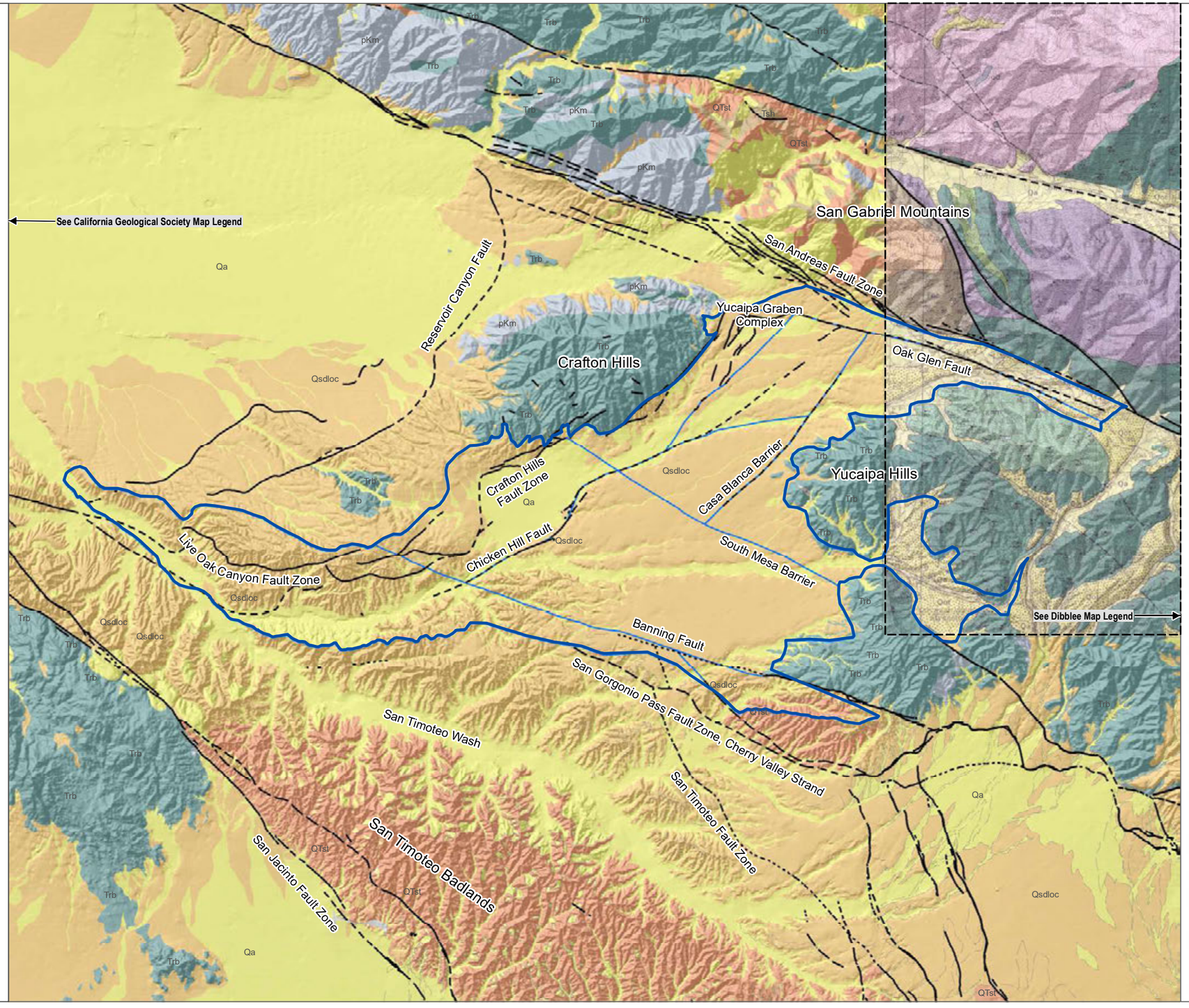
contact, identity and existence certain, location approximate

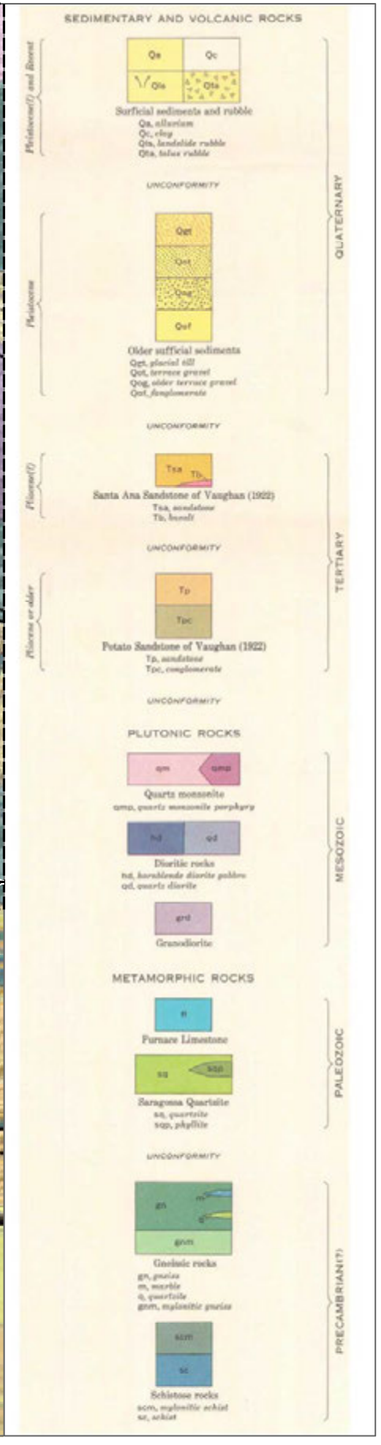
fault, identity and existence certain, location accurate

fault, identity and existence certain, location approximate

fault, identity and existence certain, location concealed

fault, identity and existence certain, location inferred





SOURCE: CGS 2012, USGS 1999

DUDEK

0 0.5 1 2 Miles

FIGURE 2-12

Geologic Map of the Yucaipa Subbasin

Yucaipa Subbasin Groundwater Sustainability Plan

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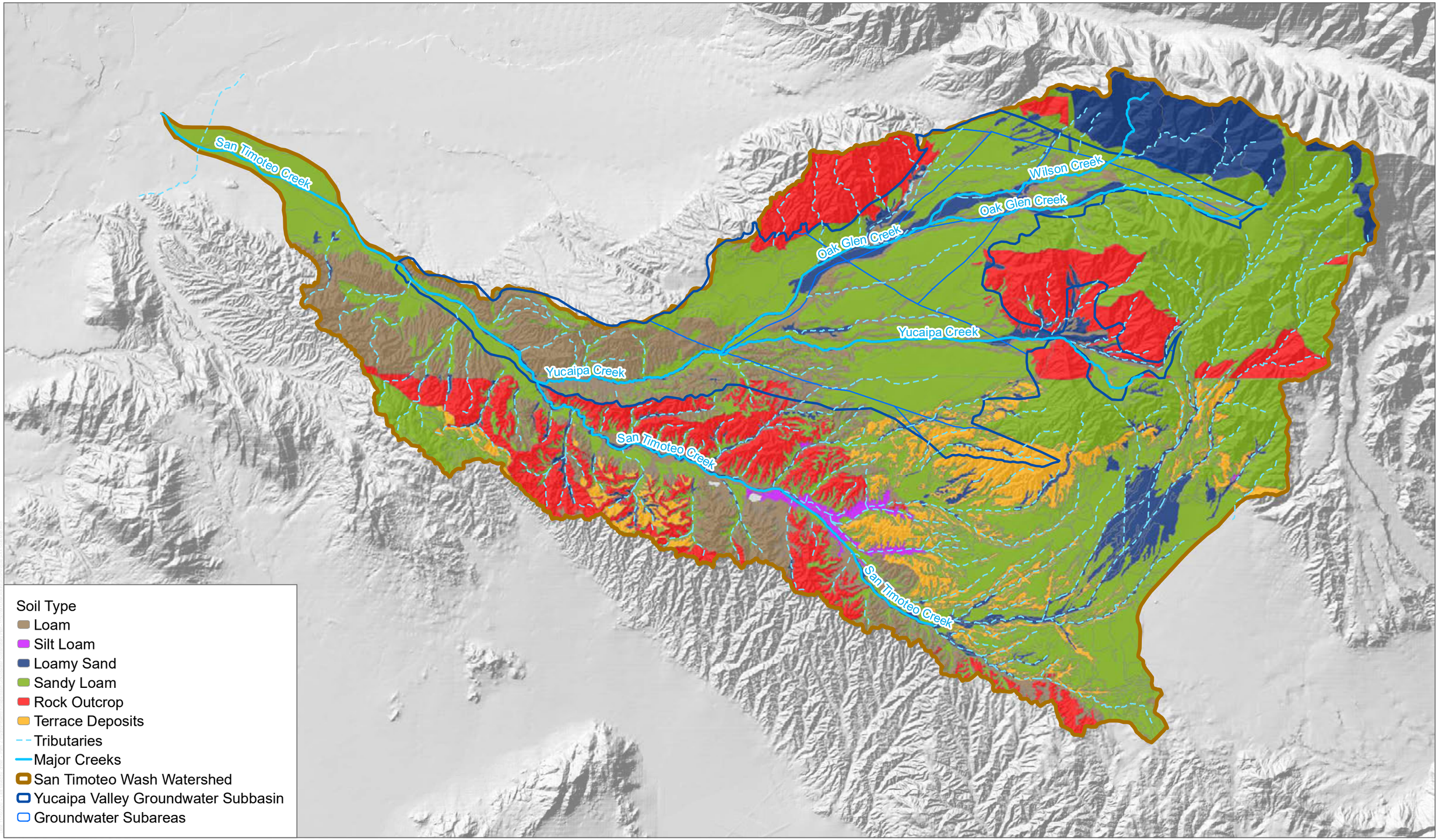

SOURCE: Source: USDA 2020

DUDEK

0 4,200 8,400 Feet

FIGURE 2-13

Soils within the San Timoteo Wash Watershed

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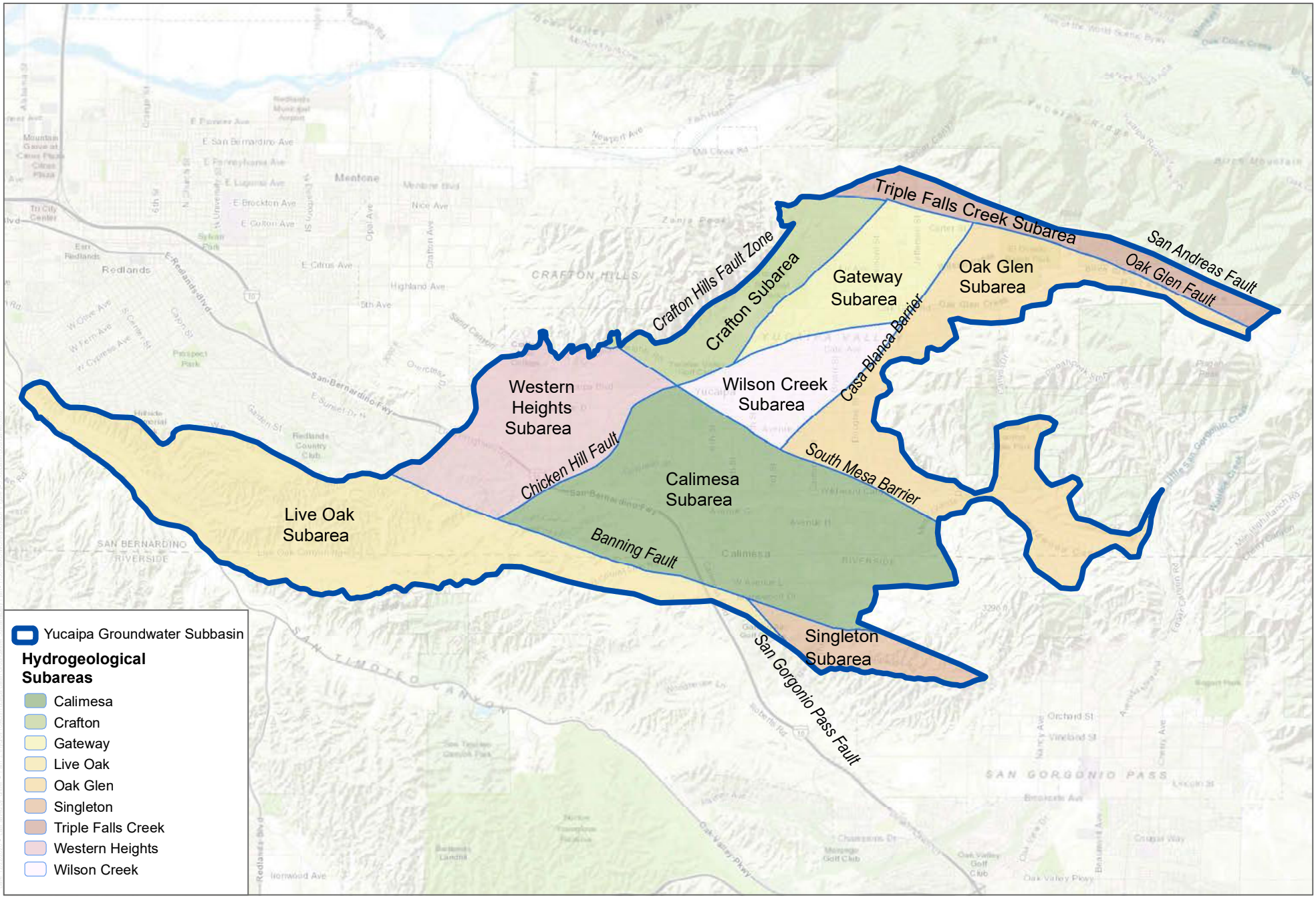

SOURCE: ESRI; Geoscience 2018

FIGURE 2-14

Hydrogeological Subareas in the Yucaipa Subbasin

Yucaipa Subbasin Groundwater Sustainability Plan

DUDEK

0 0.5 1 Miles

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Figure 2-15. Hydraulic Heads across the Chicken Hill Fault

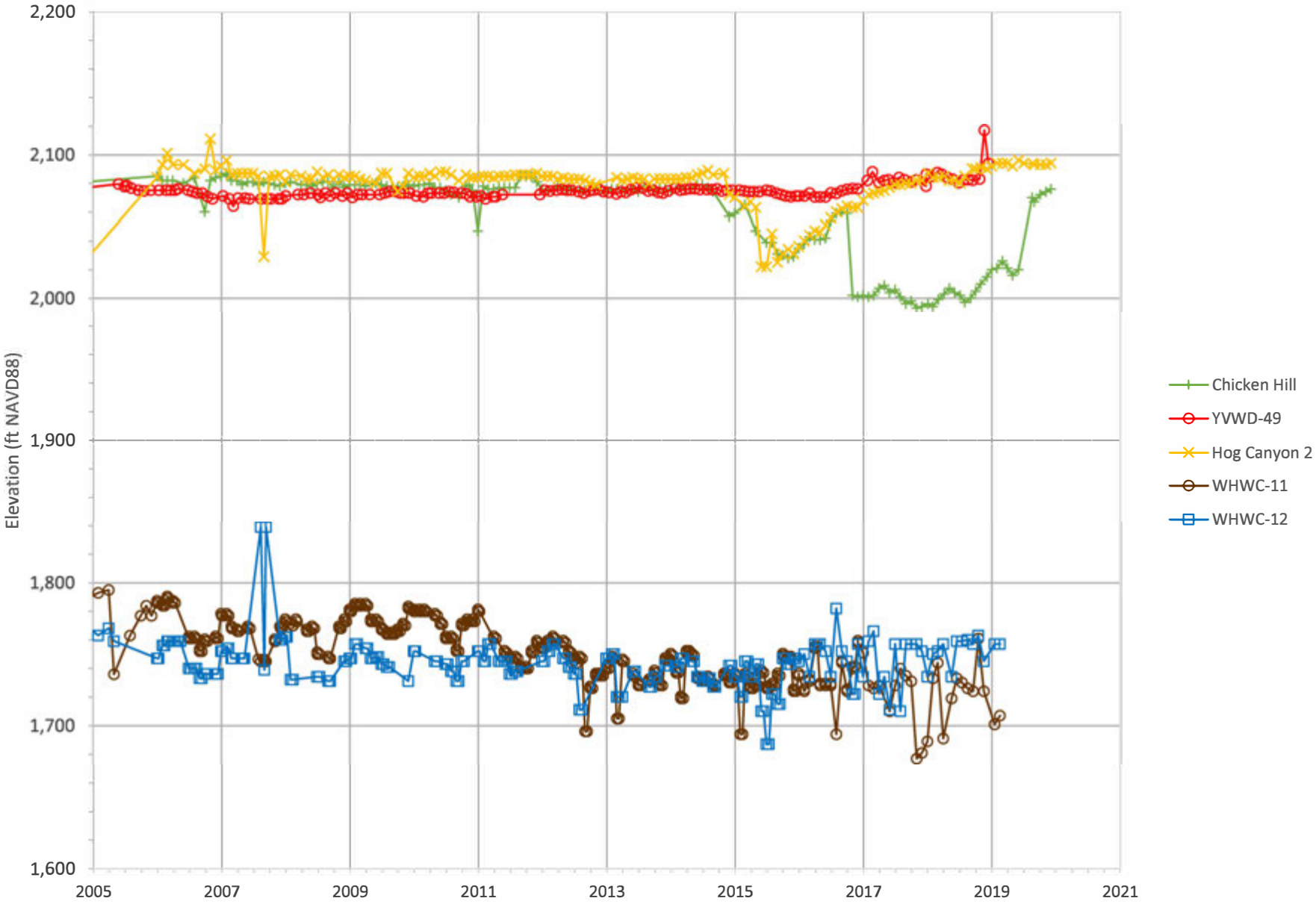

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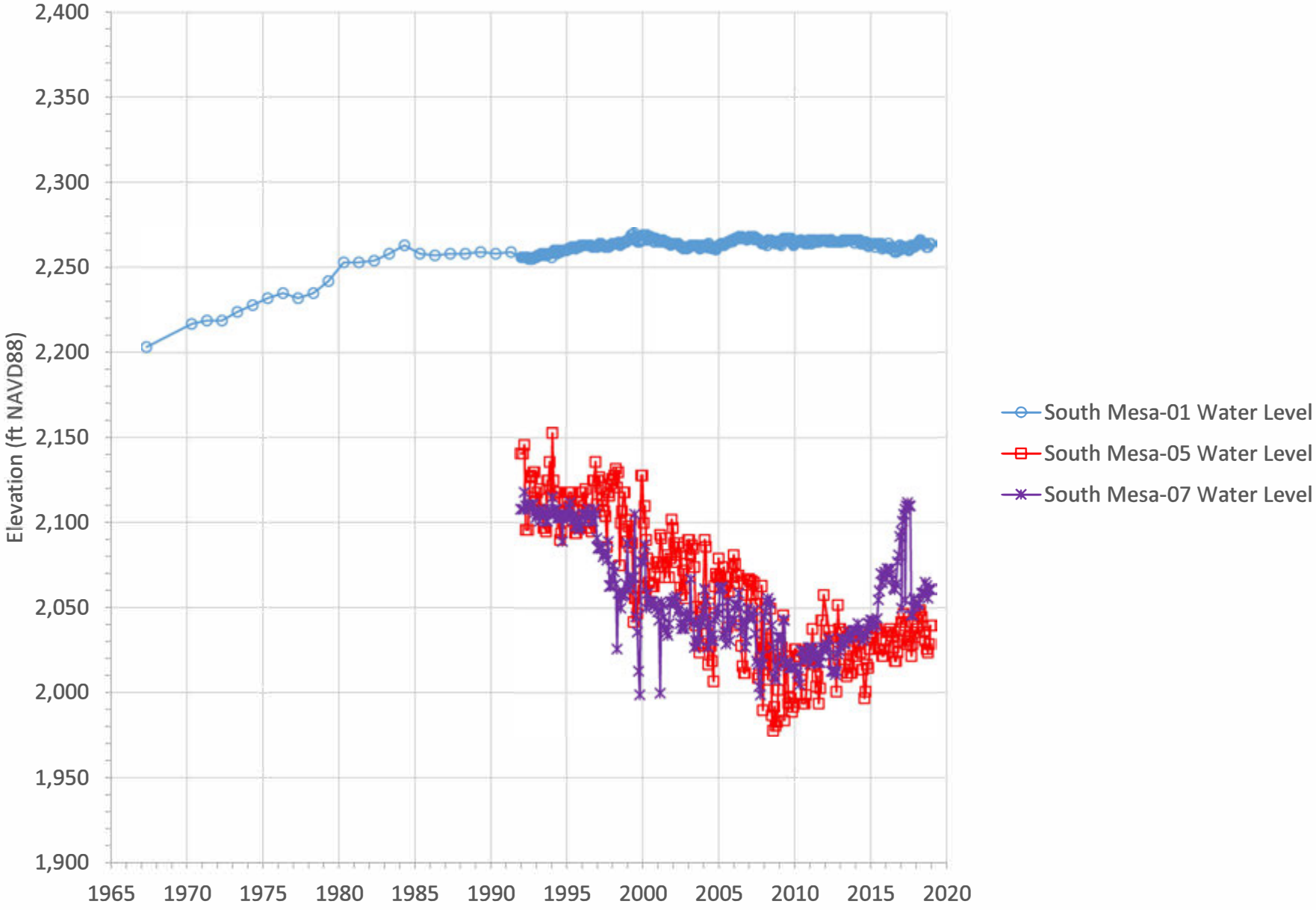
Figure 2-16. Hydraulic Heads at South Mesa Wells 1, 5, and 7



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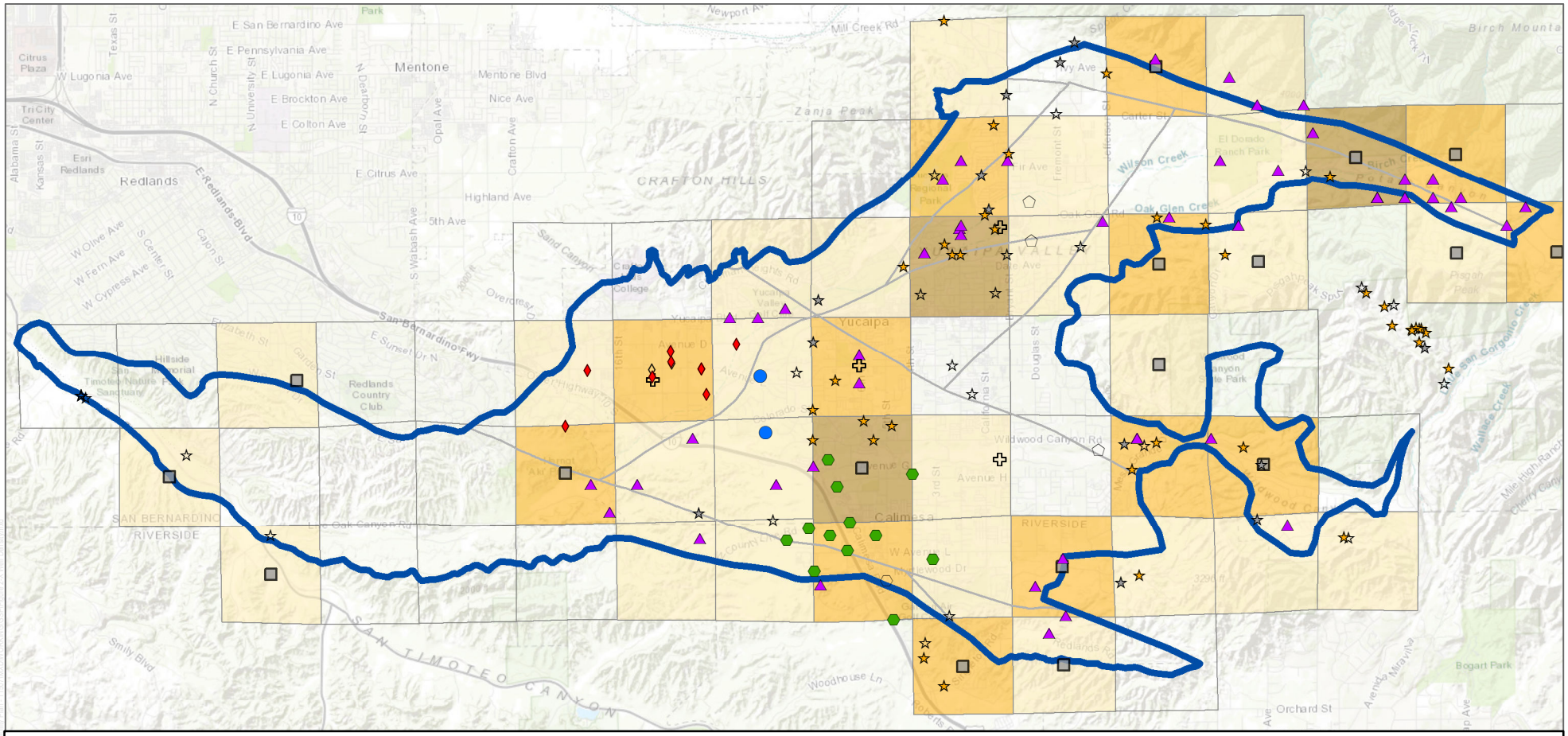

SOURCE: DWR; YVWD; City of Redlands; South Mesa; WHWC; USGS

DUDEK

FIGURE 2-17

Well Density, Well Owner, and Use Type Within the Yucaipa Subbasin

Yucaipa Subbasin Groundwater Sustainability Plan

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Figure 2-18. Annual Groundwater Production by Water Agency in the Yucaipa Subbasin

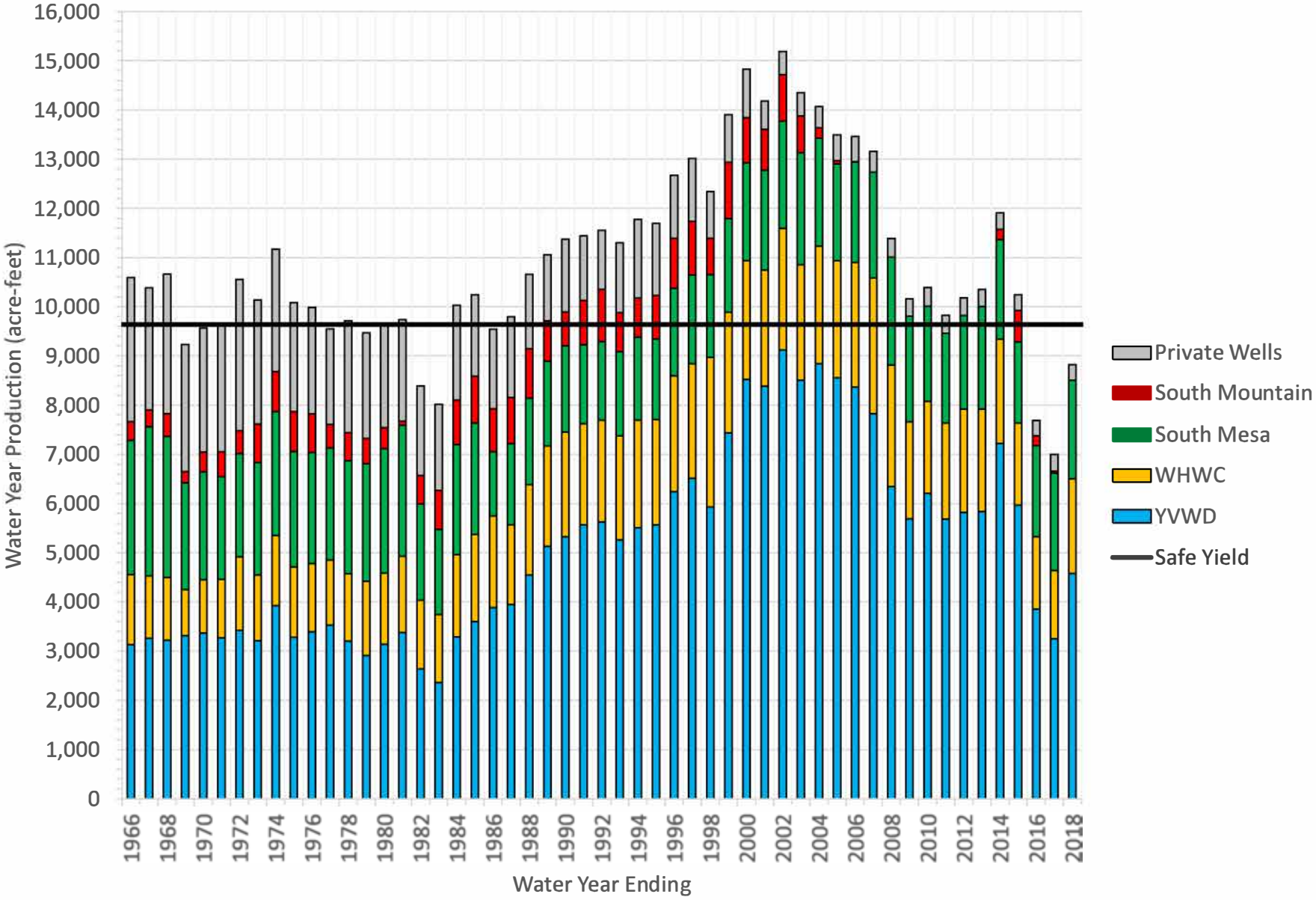

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Figure 2-19. Annual Groundwater Production by Hydrogeologic Subarea in the Yucaipa Subbasin

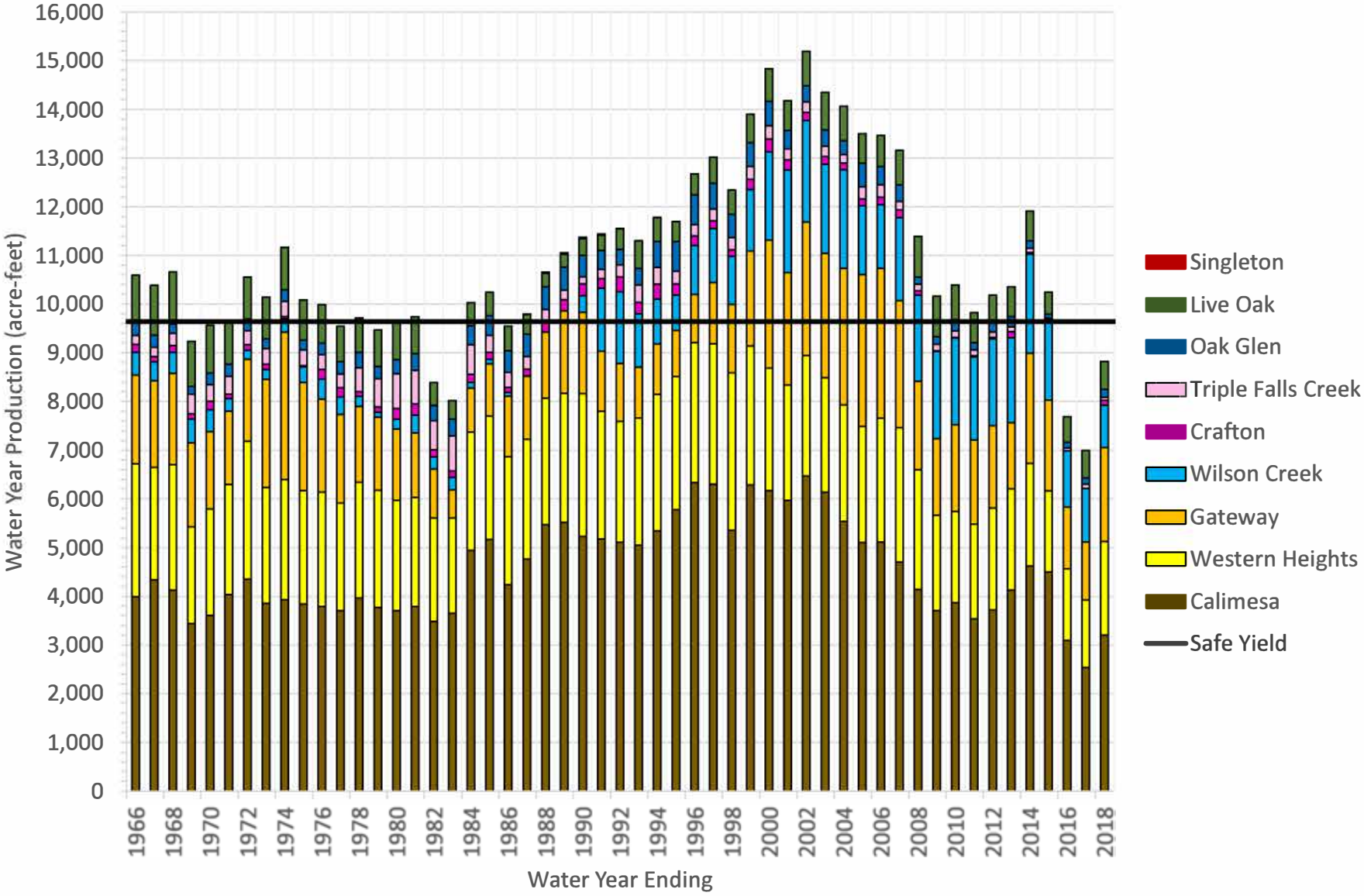

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Figure 2-20. Groundwater under the Influence of Surface Water

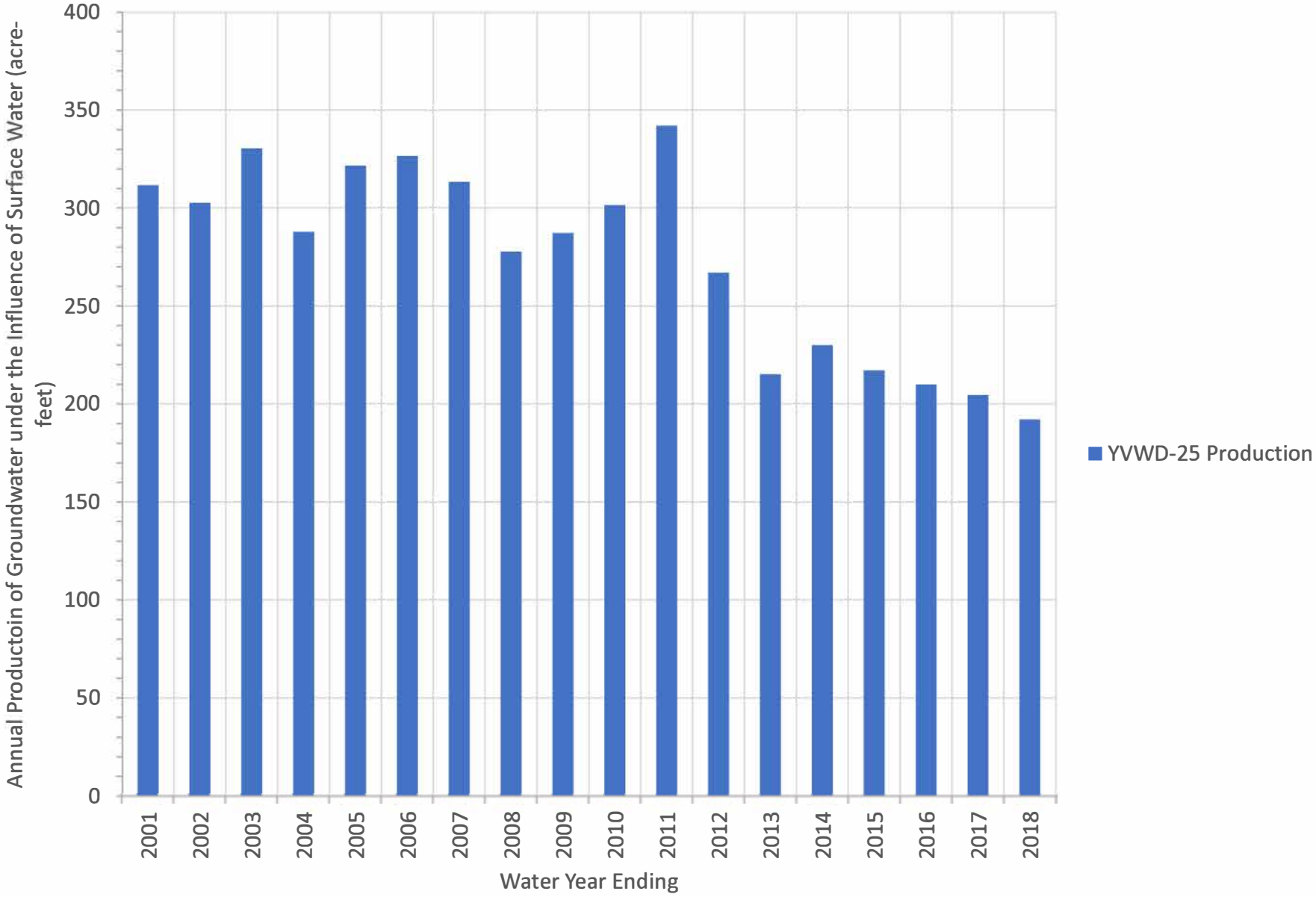

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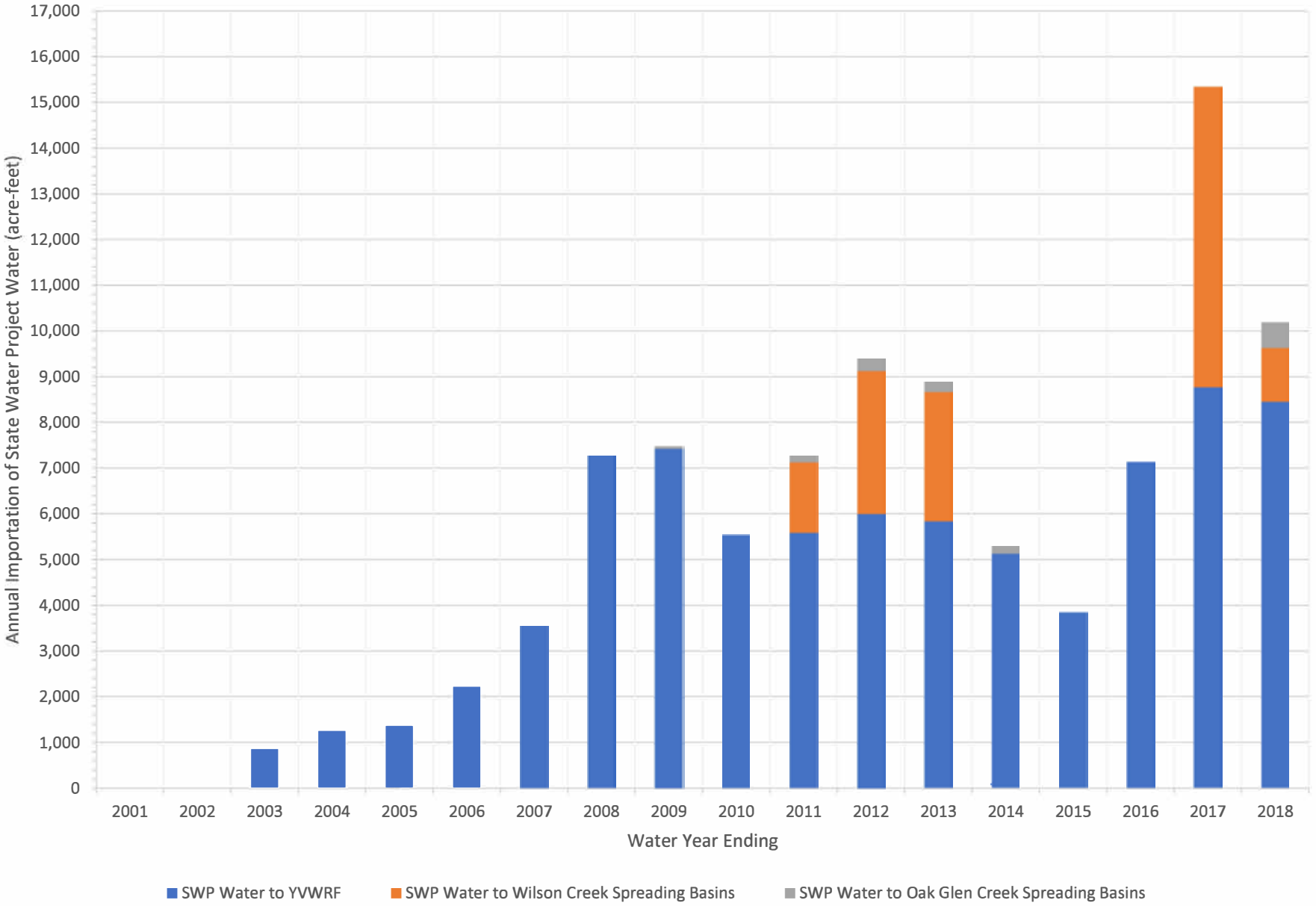
Figure 2-21. Annual Distribution of State Water Project Water in the Yucaipa Subbasin



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Yucaipa Groundwater Subbasin

Groundwater Subareas

Geologic Cross Section Locations

Geologic Units (CGS 2012)

Quaternary

Qa, Young Alluvium

Qsdloc, Sedimentary Deposits of Live Oak Formation

Tertiary

QTst, San Timoteo Formation (Middle Member)

Tsh, Mill Creek Formation

Tv, Dacite Dikes

Mesozoic and Older

pKm, Cretaceous and Pre-Cretaceous Metamorphic Formations of Sedimentary and Volcanic Origin

Trb, Granitic and Other Intrusive Crystalline Rocks, San Gabriel Mountains-type

Faults and Geologic Contacts

contact, identity and existence certain, location accurate

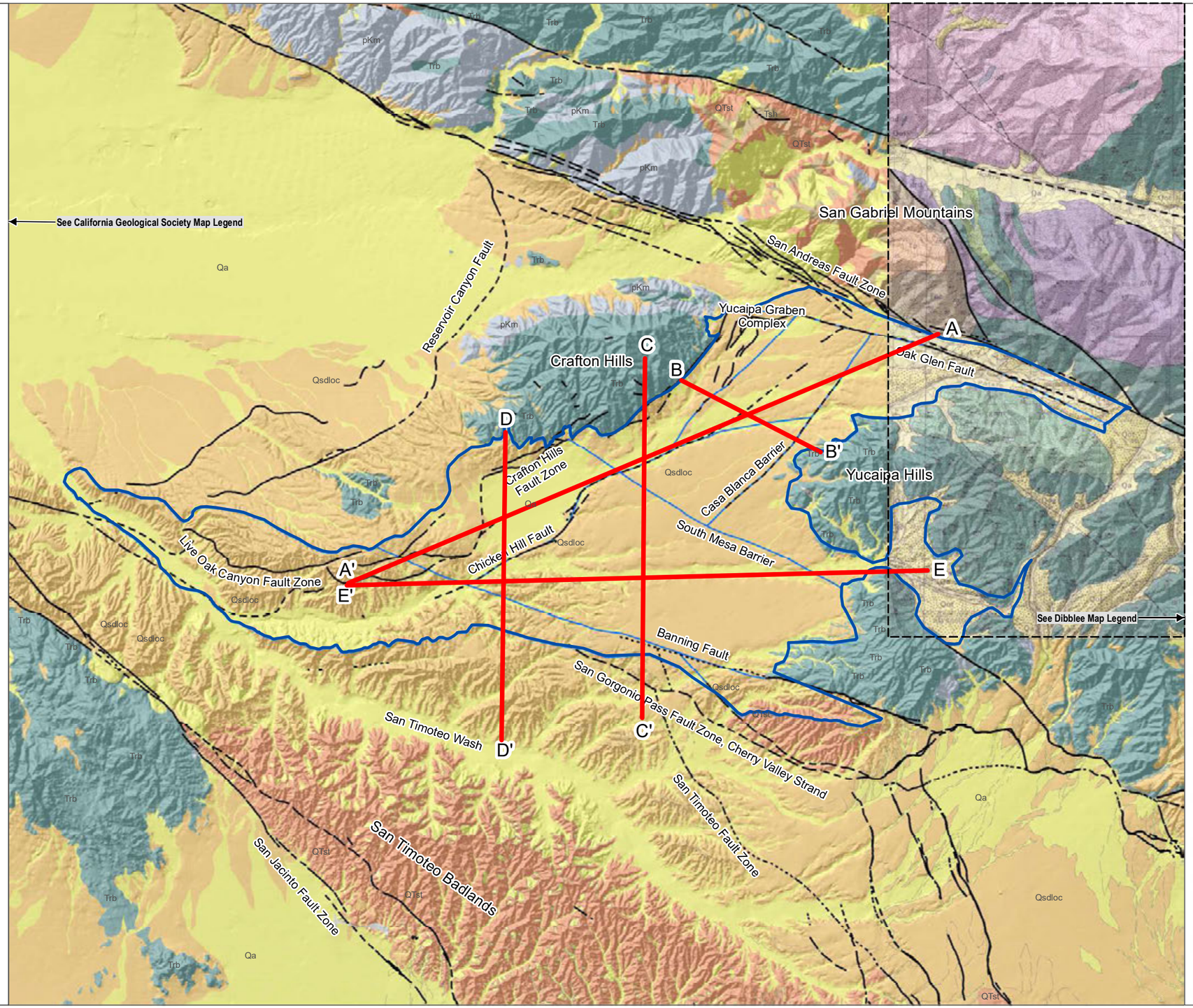
contact, identity and existence certain, location approximate

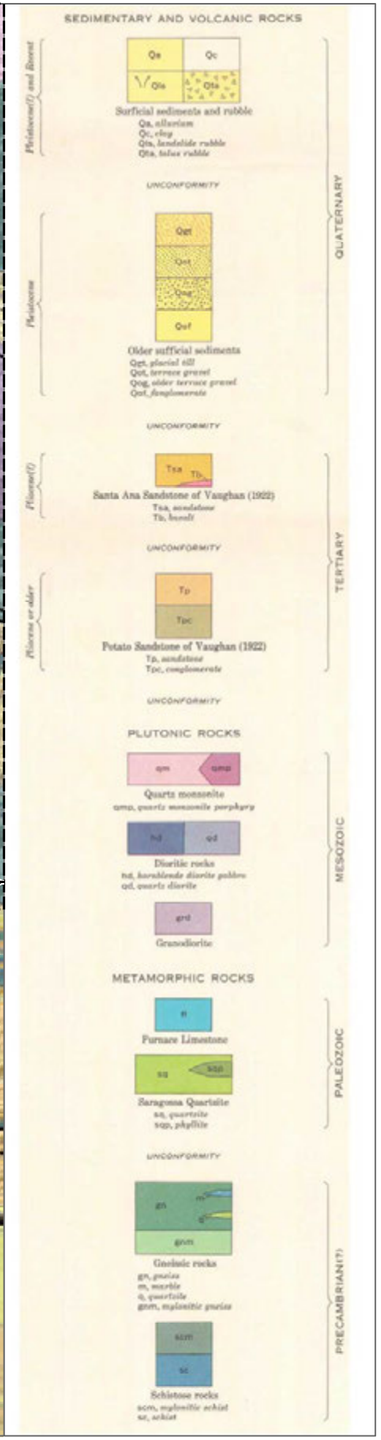
fault, identity and existence certain, location accurate

fault, identity and existence certain, location approximate

fault, identity and existence certain, location concealed

fault, identity and existence certain, location inferred





SOURCE: CGS 2012, USGS 1999

DUDEK

0 0.5 1 2 Miles

FIGURE 2-22

Geologic Map with Delineations of Geologic Cross Sections

Yucaipa Subbasin Groundwater Sustainability Plan

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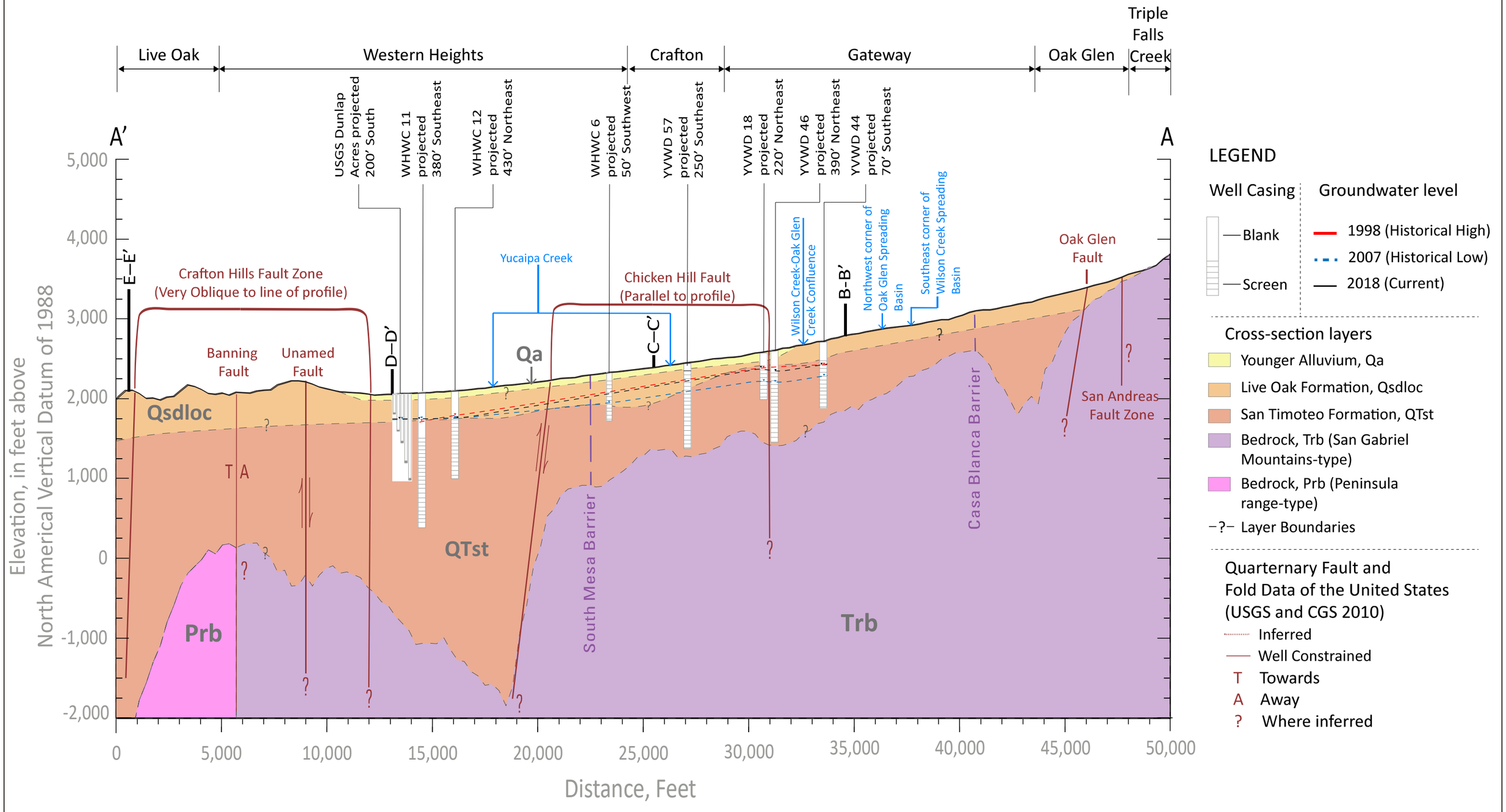

SOURCE: Geophysical Logs and Preliminary Data from Mendez (2013), Geoscience (2014), Motron and Miller (2006), Jennings, Strand, and Rogers (1977)

FIGURE 2-23

Geologic Cross Section A-A'

Yucaipa Subbasin Groundwater Sustainability Plan

DUDEK

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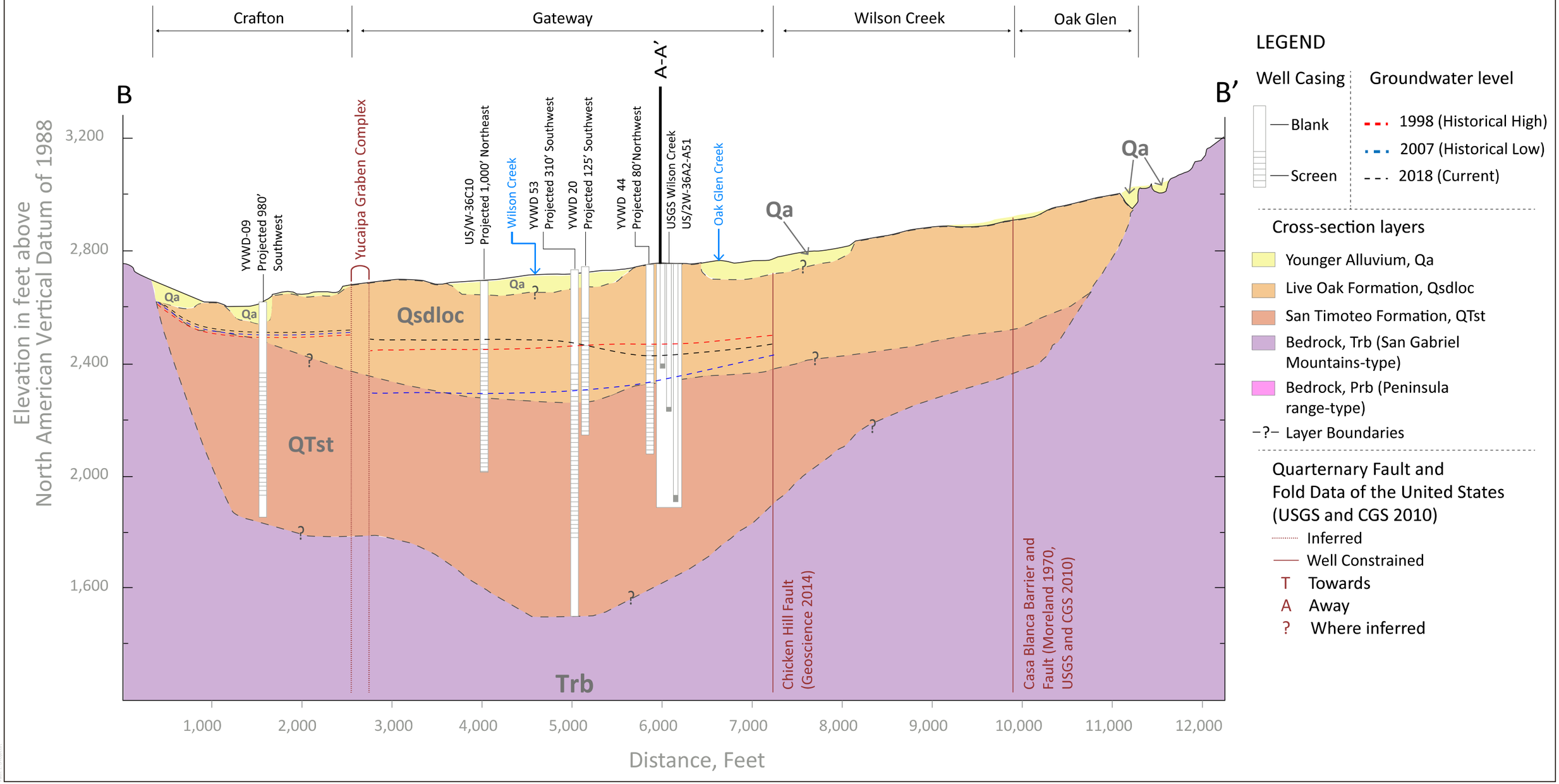

SOURCE: Geophysical Logs and Preliminary Data from Mendez (2013), Motron and Miller (2006), Jennings, Strand, and Rogers (1977)

DUDEK

Figure 2-24
Geologic Cross Section B-B'
Yucaipa Subbasin Groundwater Sustainability Plan

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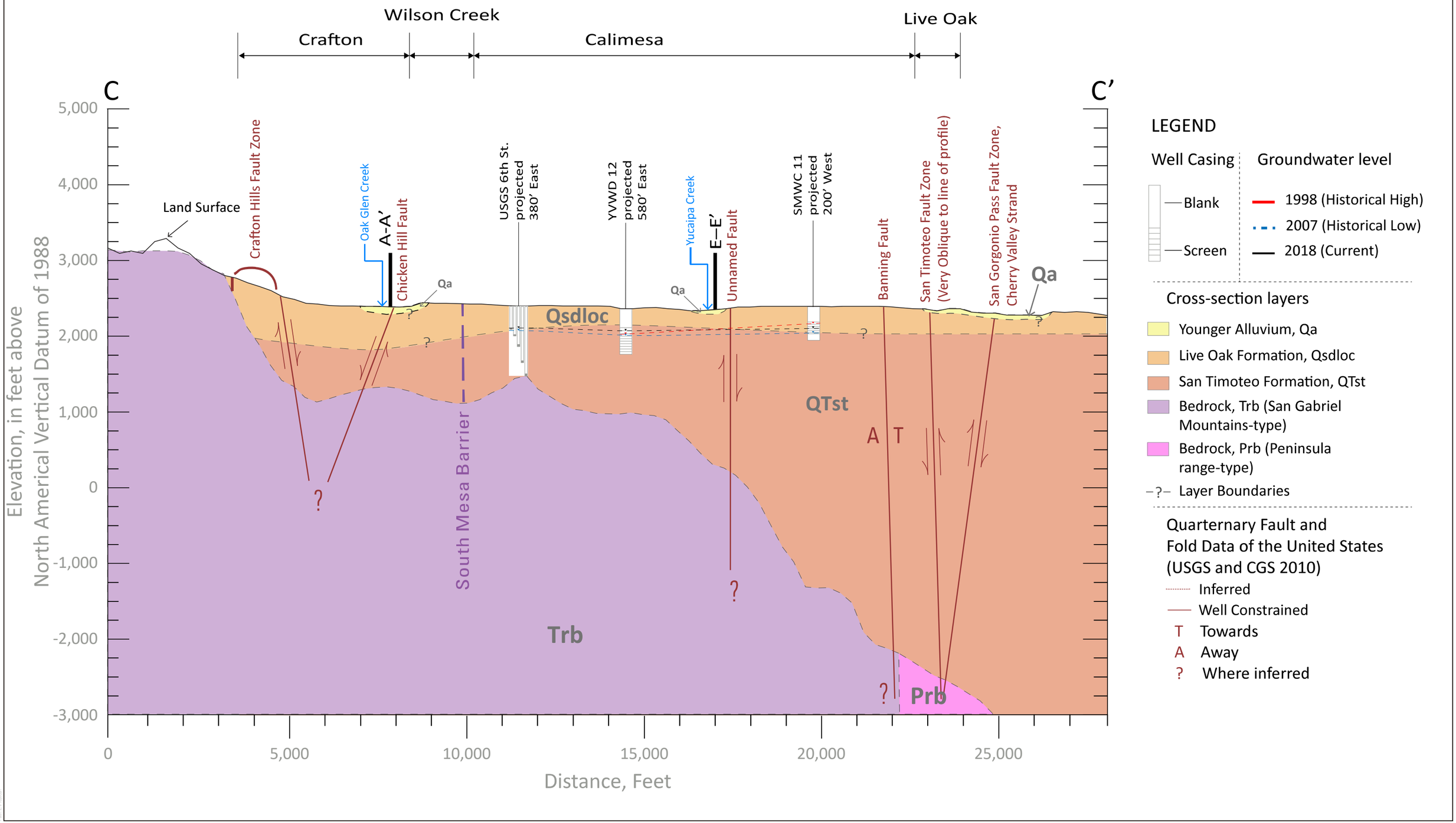

SOURCE: Geophysical Logs and Preliminary Data from Mendez (2013), Geoscience (2014), Motron and Miller (2006), Jennings, Strand, and Rogers (1977)

DUDEK

FIGURE 2-25
Geologic Cross Section C-C'
Yucaipa Subbasin Groundwater Sustainability Plan

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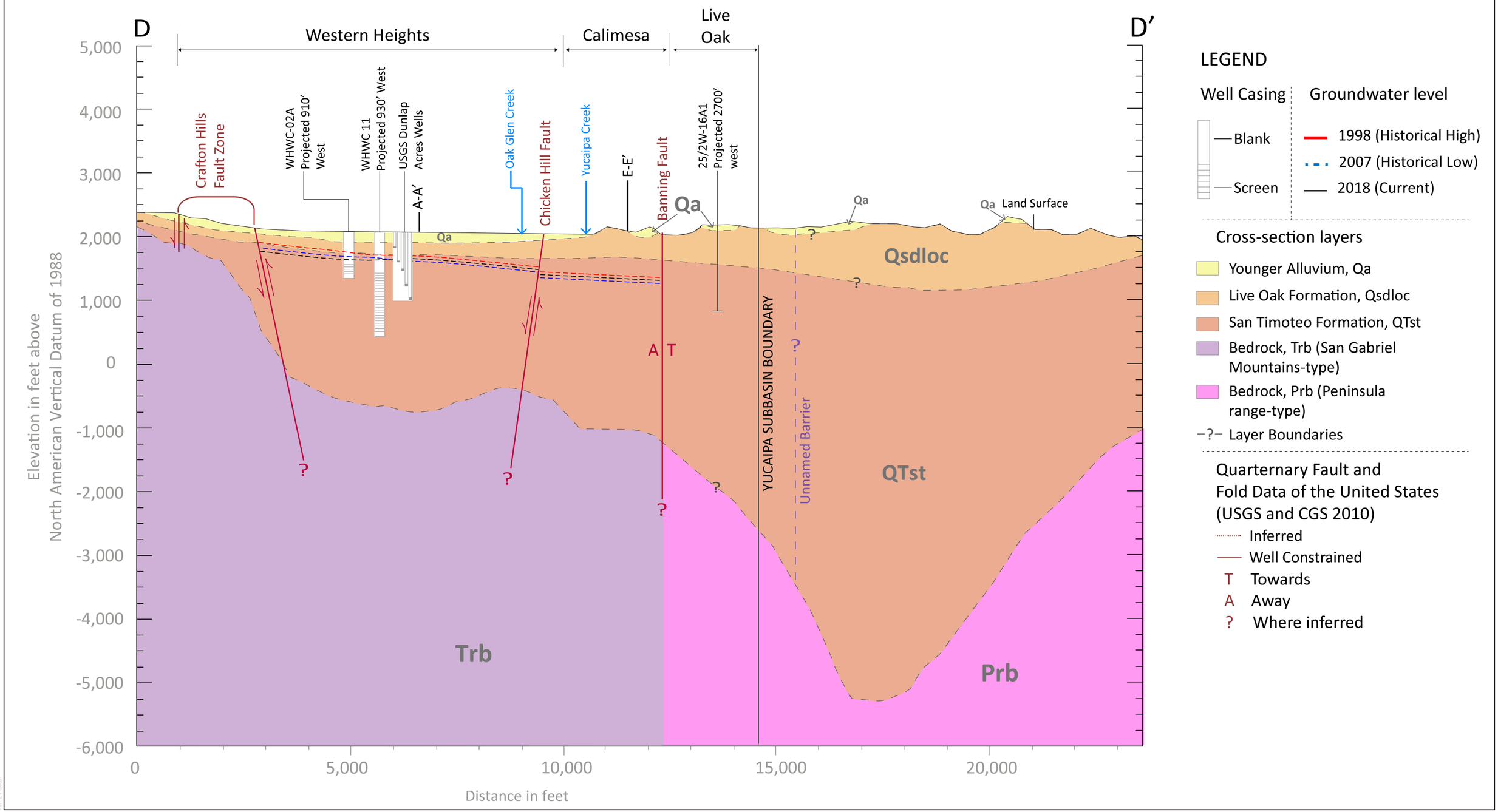

SOURCE: Geophysical Logs and Preliminary Data from Mendez (2013), Geoscience (2014), Motron and Miller (2006), Jennings, Strand, and Rogers (1977)

FIGURE 2-26
Geologic Cross Section D-D'
Yucaipa Subbasin Groundwater Sustainability Plan

DUDEK

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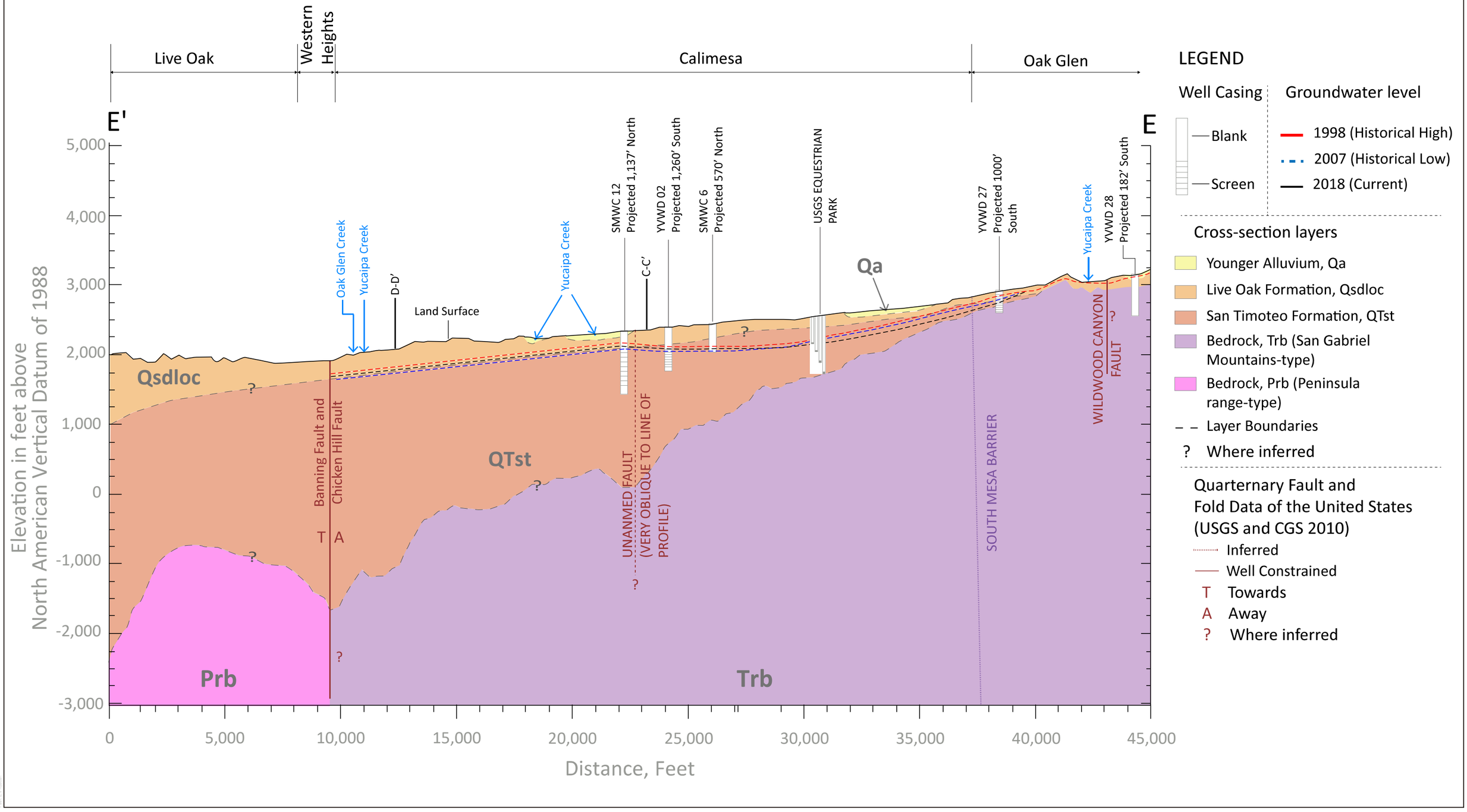

SOURCE: Geophysical Logs and Preliminary Data from Mendez (2013), Geoscience (2014), Motron and Miller (2006), Jennings, Strand, and Rogers (1977)

FIGURE 2-27
Geologic Cross Section E-E'
Yucaipa Subbasin Groundwater Sustainability Plan

DUDEK

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LEGEND

---- Subbasin borders

Fault Zones

Groundwater Production Wells

Geology

Qa, Young Alluvium

Qsdloc, Sedimentary Depsoits of Live Oak Formation

QTst, San Timoteo Formation

pKm,Metamorphic formations

gr, Granite and Crystalline rocks

Spreading Basins

Wilson Creek

Oak Glen

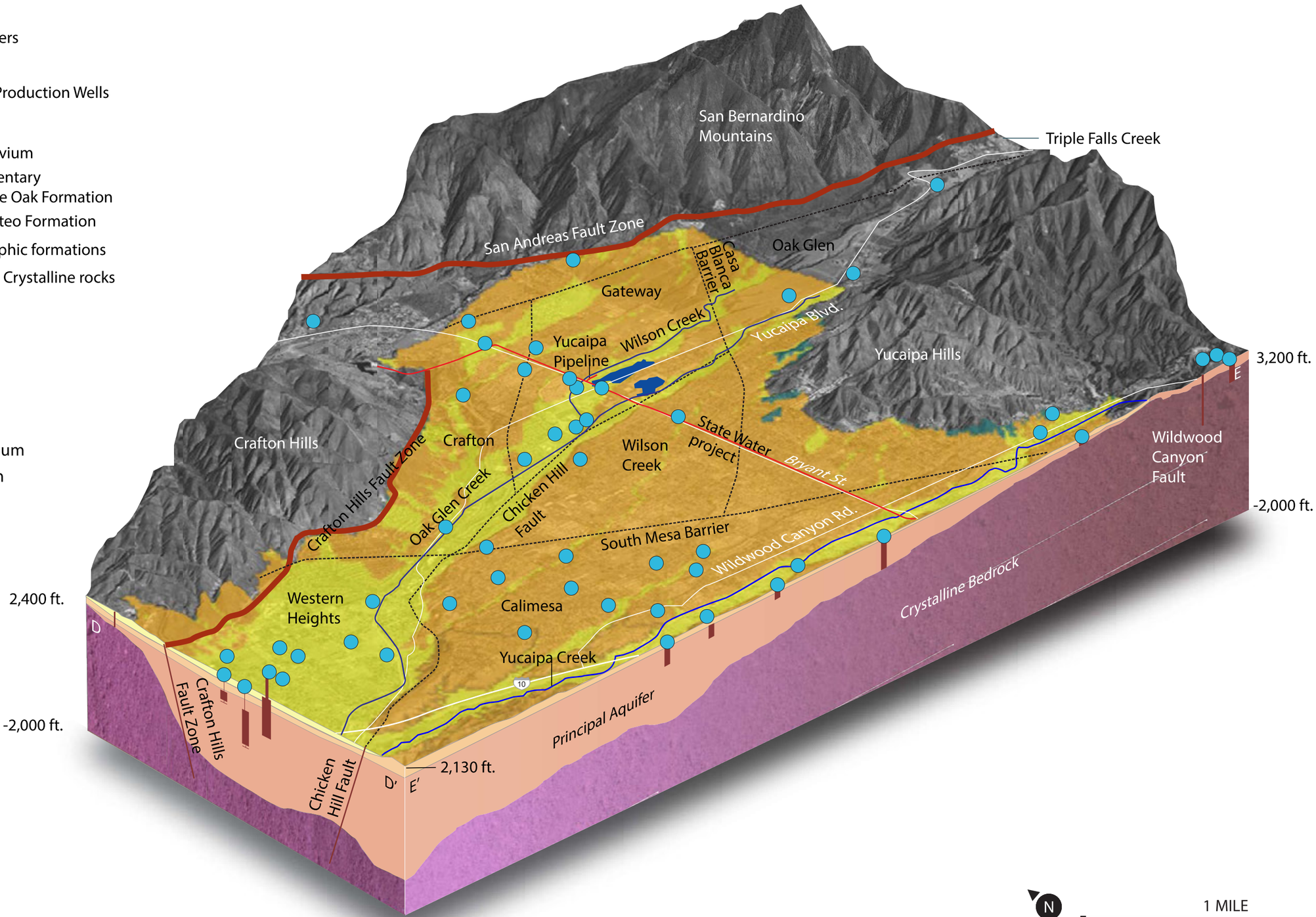
Formations

Younger alluvium

Older alluvium

San Timoteo Formation

Bedrock



SOURCE: USGS, DWR, Google Earth

FIGURE 2-28

Hydrogeologic Conceptual Model of the Yucaipa Subbasin

Yucaipa Subbasin Groundwater Sustainability Plan

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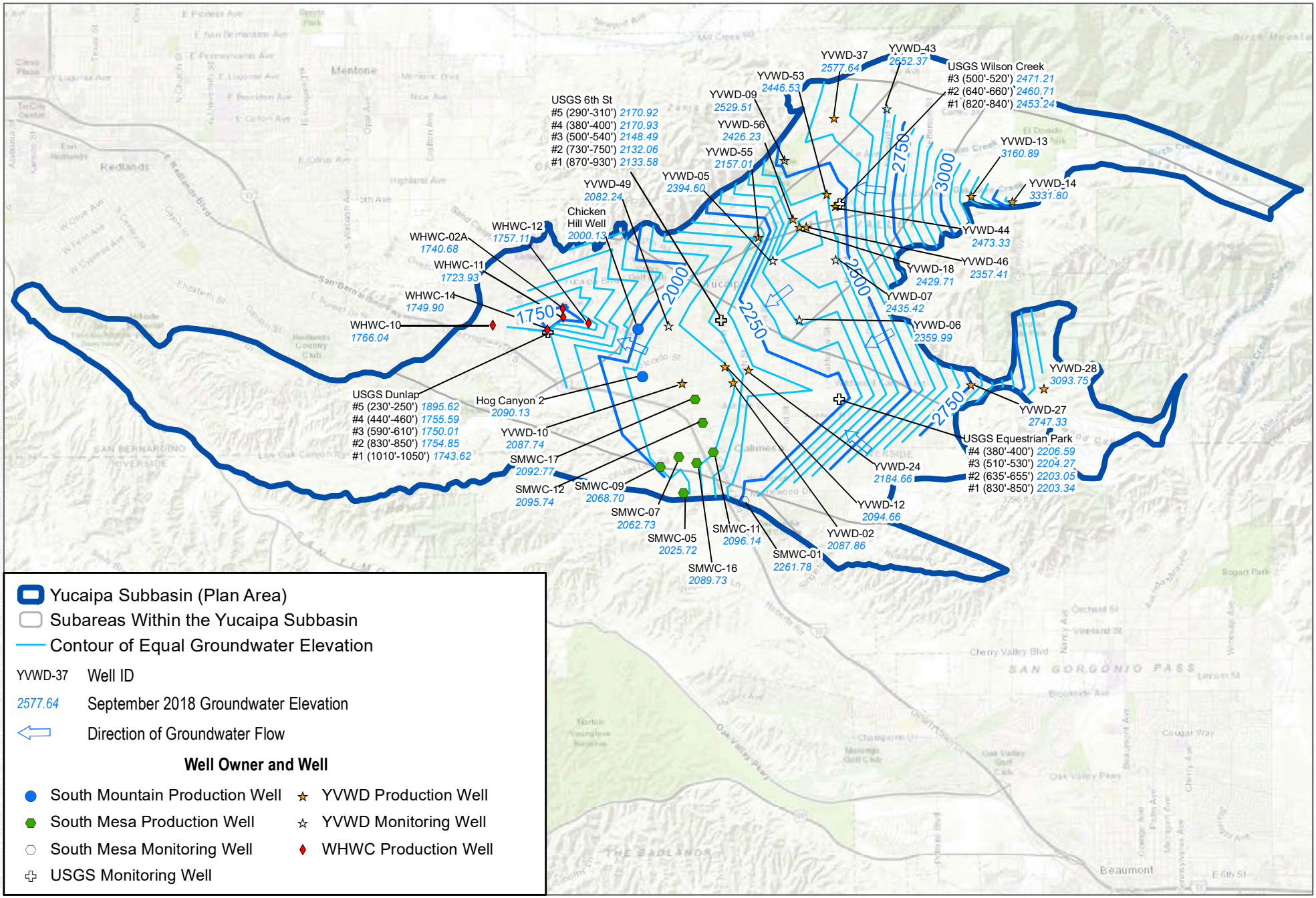

SOURCE: YVWD, WHWC, South Mesa, City of Redlands, USGS

FIGURE 2-29

September 2018 Groundwater Elevations within the Yucaipa Subbasin

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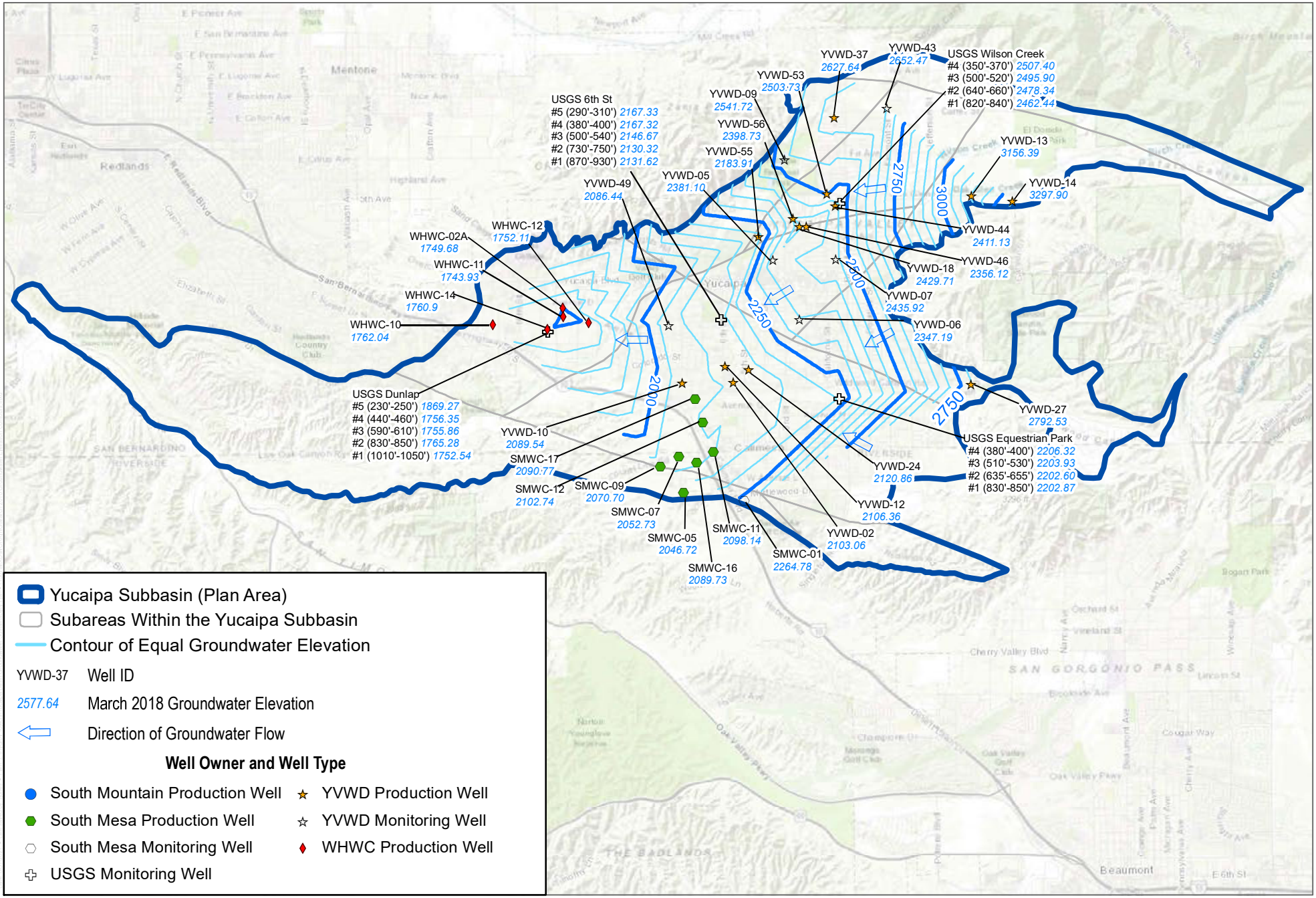

SOURCE: YVWD, WHWC, South Mesa, City of Redlands, USGS

FIGURE 2-30

March 2018 Groundwater Elevations within the Yucaipa Subbasin

Yucaipa Subbasin Groundwater Sustainability Plan

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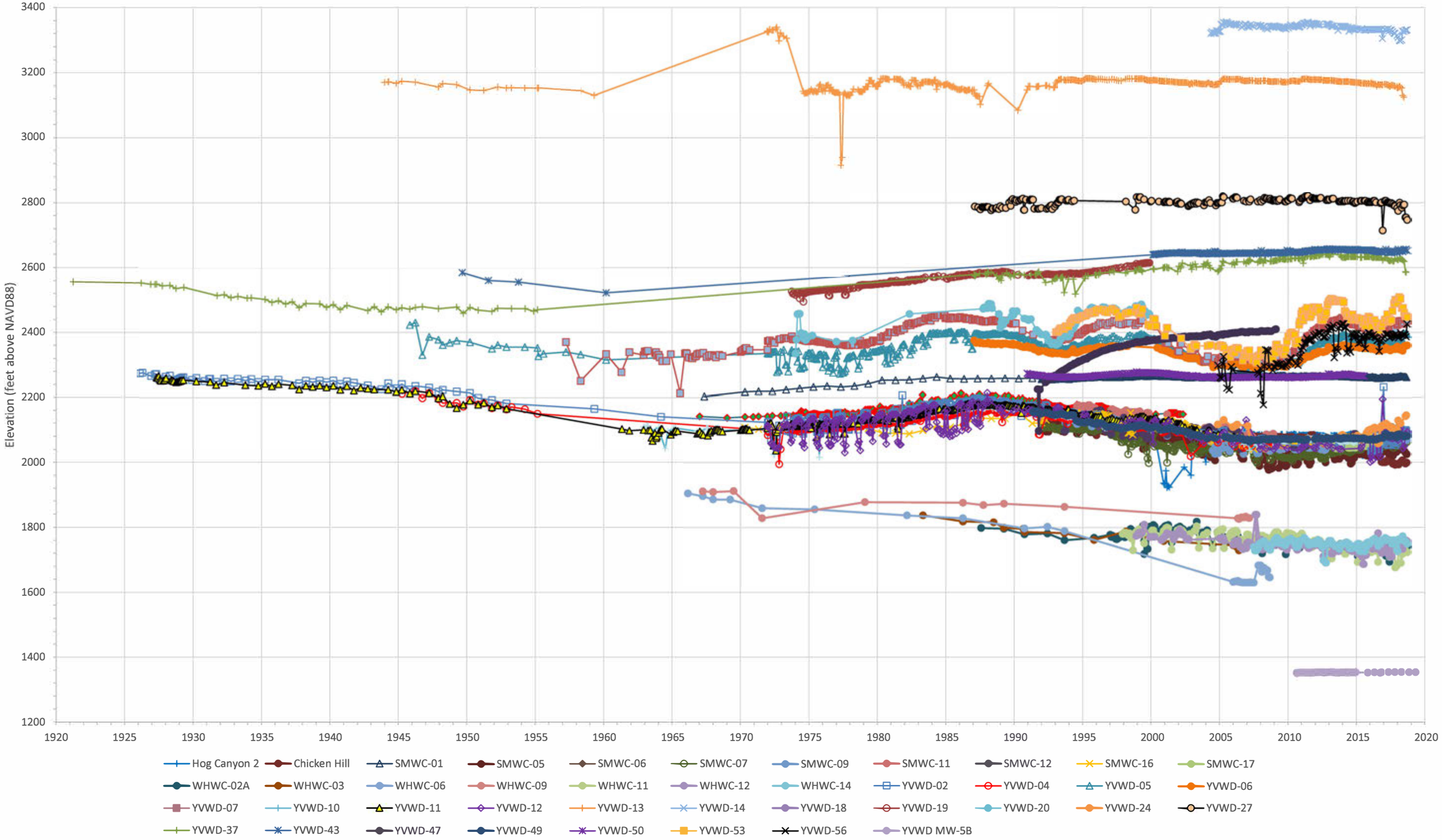
Figure 2-31. Historical Groundwater Elevations in the Yucaipa Subbasin



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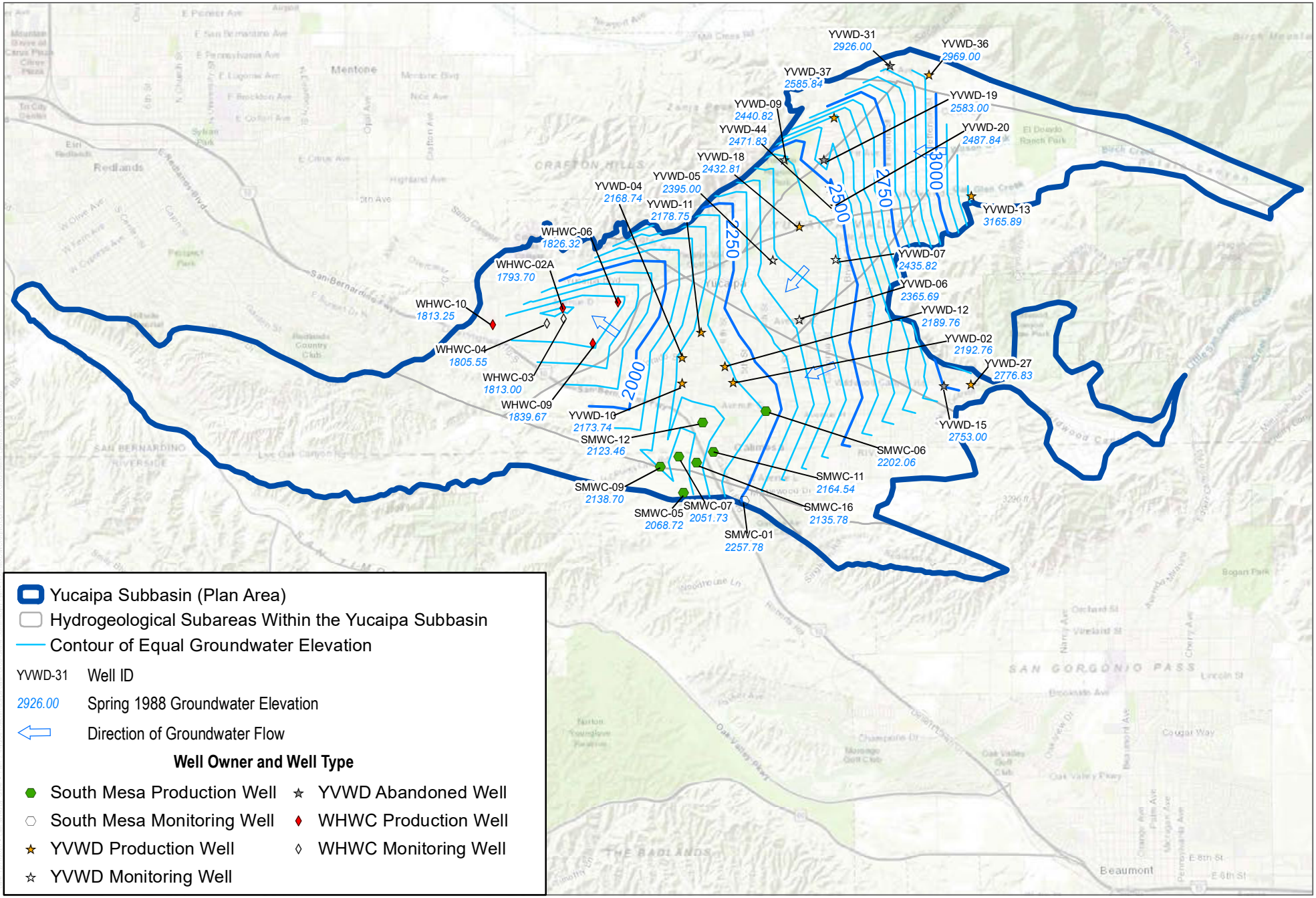

SOURCE: YVWD, WHWC, South Mesa

FIGURE 2-32

Historical High (Spring 1998) Groundwater Elevations in the Yucaipa Subbasin

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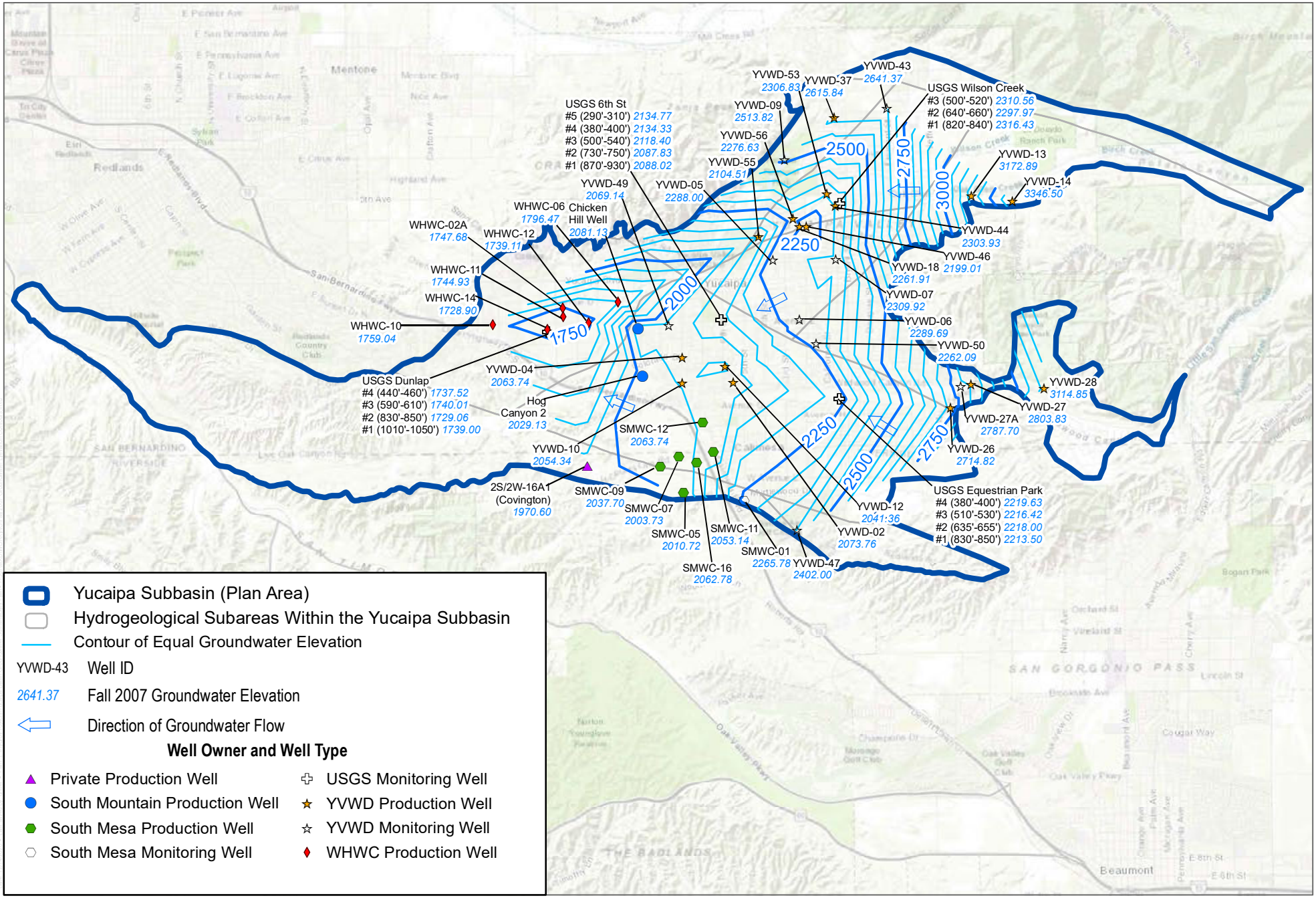

SOURCE: YVWD, WHWC, South Mesa, City of Redlands

FIGURE 2-33

Historical Low (Fall 2007) Groundwater Elevations in the Yucaipa Subbasin

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Figure 2-34. Annual Groundwater Production by Water Year and Groundwater Elevations in the Calimesa Subarea

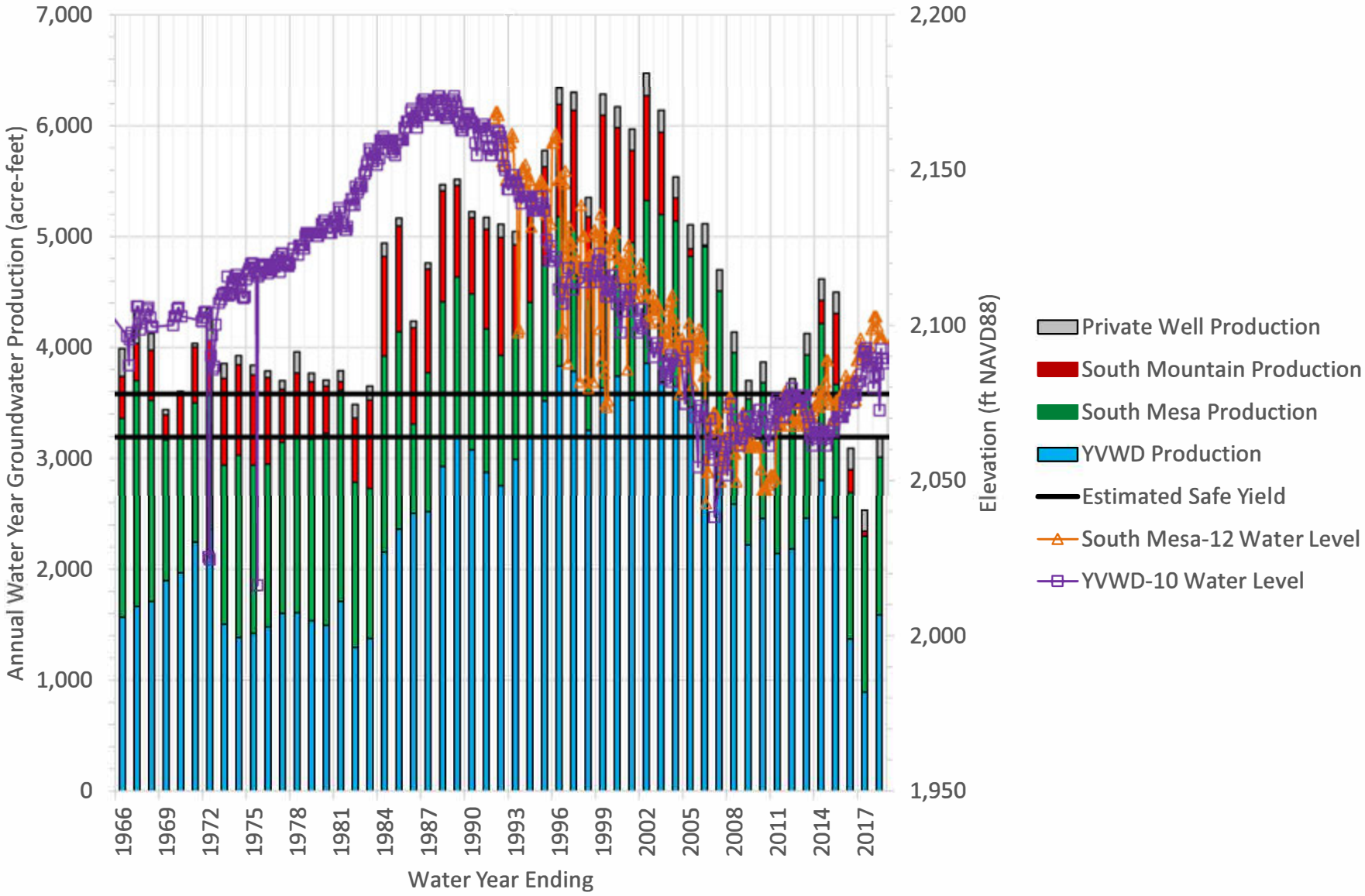

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Figure 2-35. Historical Groundwater Elevations vs. Water Year Type in the Yucaipa Subbasin

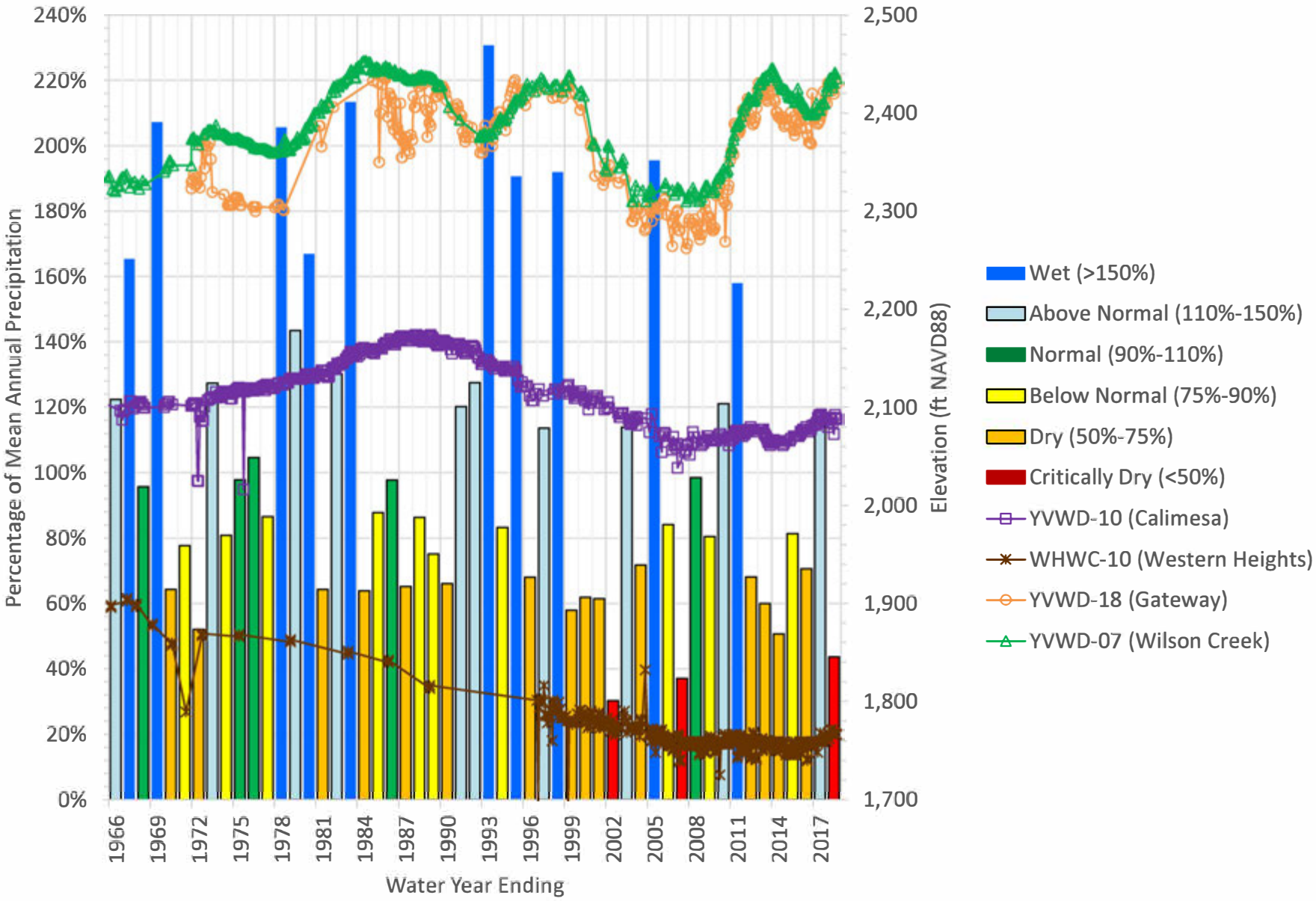

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Figure 2-36. Annual Groundwater Production by Water Year and Groundwater Elevations in the Wilson Creek Subarea

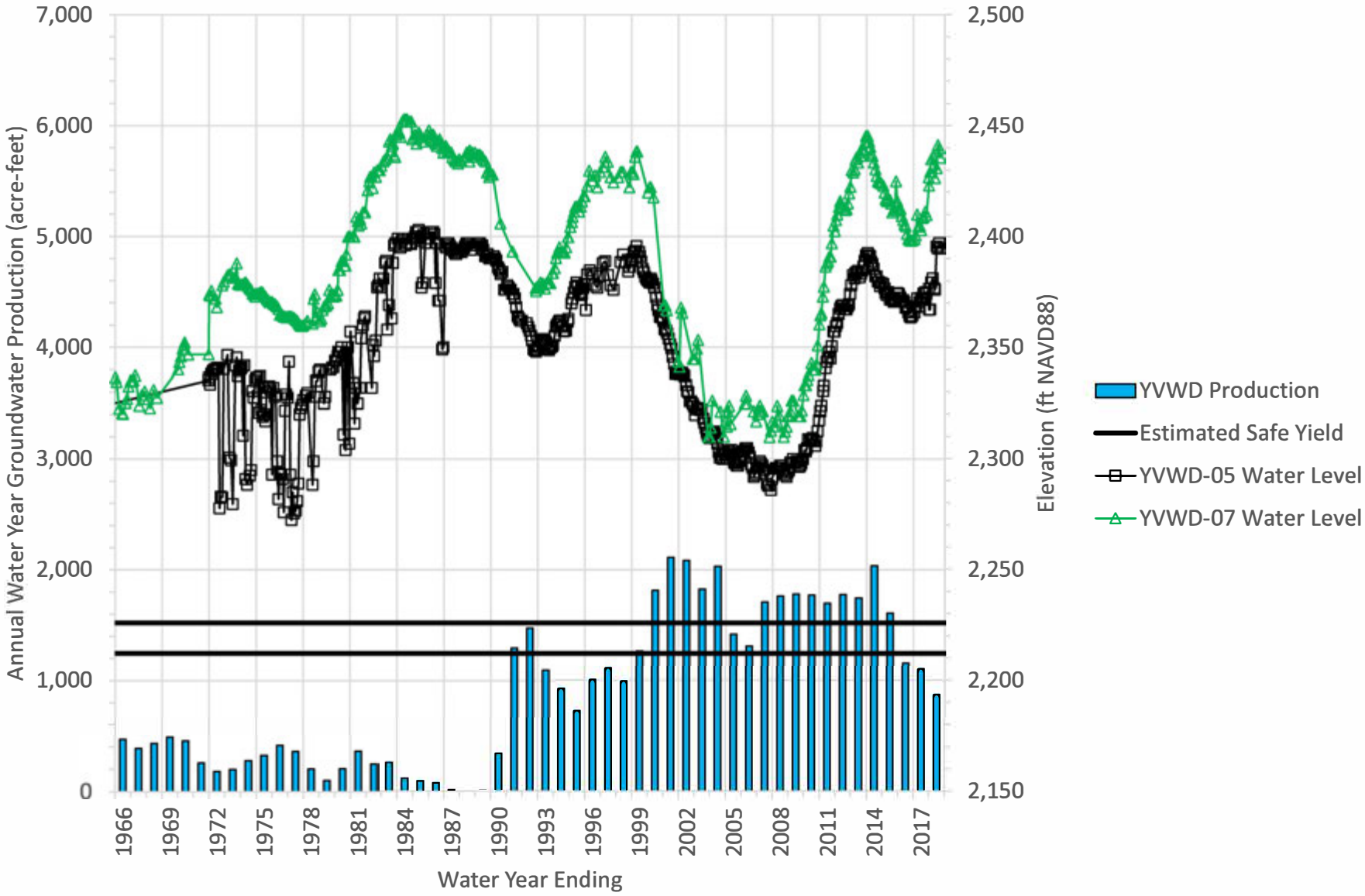

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Figure 2-37. Annual Groundwater Production by Water Year and Groundwater Elevations in the Gateway Subarea

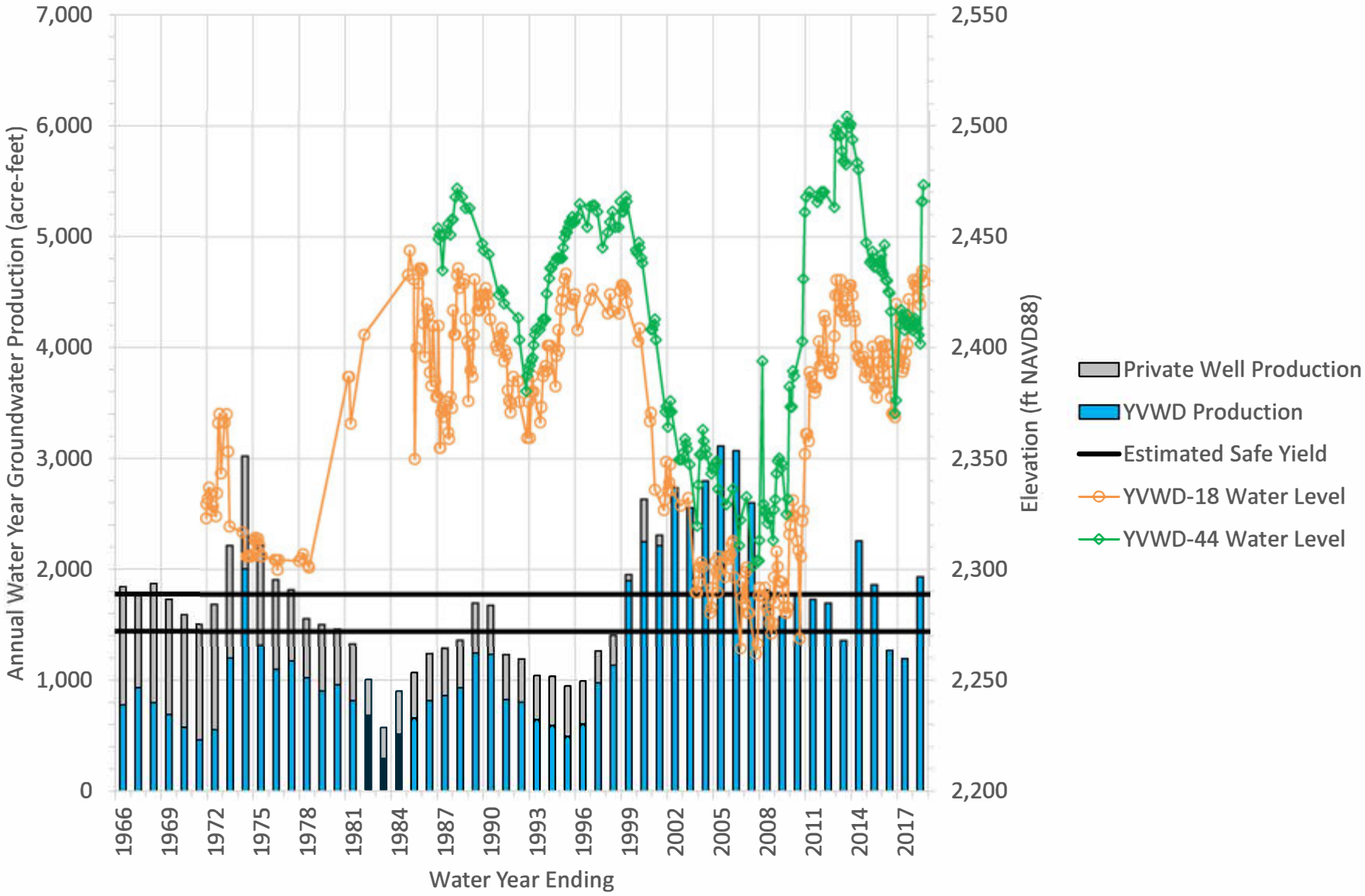

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Figure 2-38. Annual Groundwater Production by Water Year and Groundwater Elevations in the Western Heights Subarea

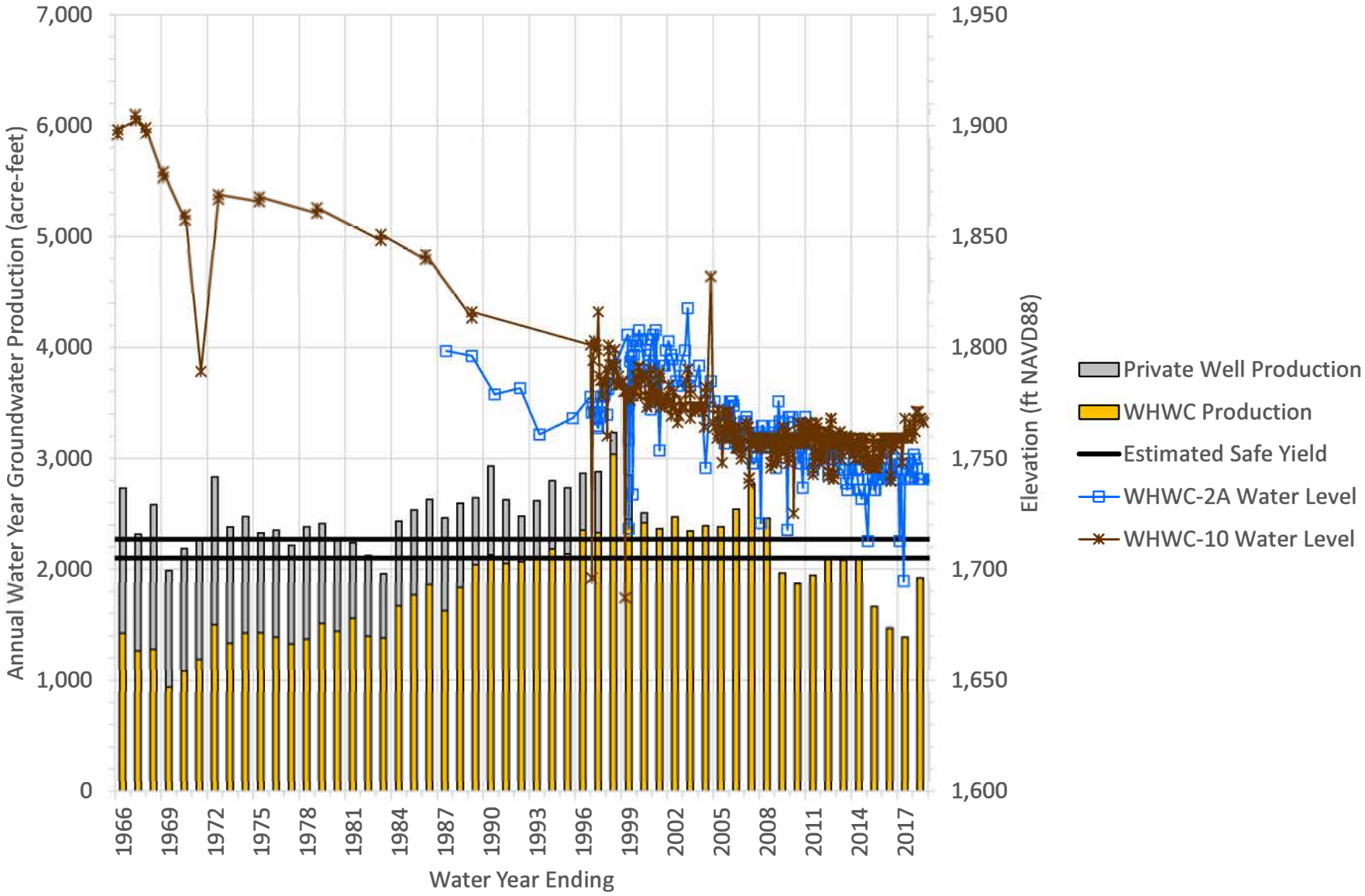

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Figure 2-39. Concentrations of Total Dissolved Solids at the Former Yucaipa Landfill in the Yucaipa Subbasin

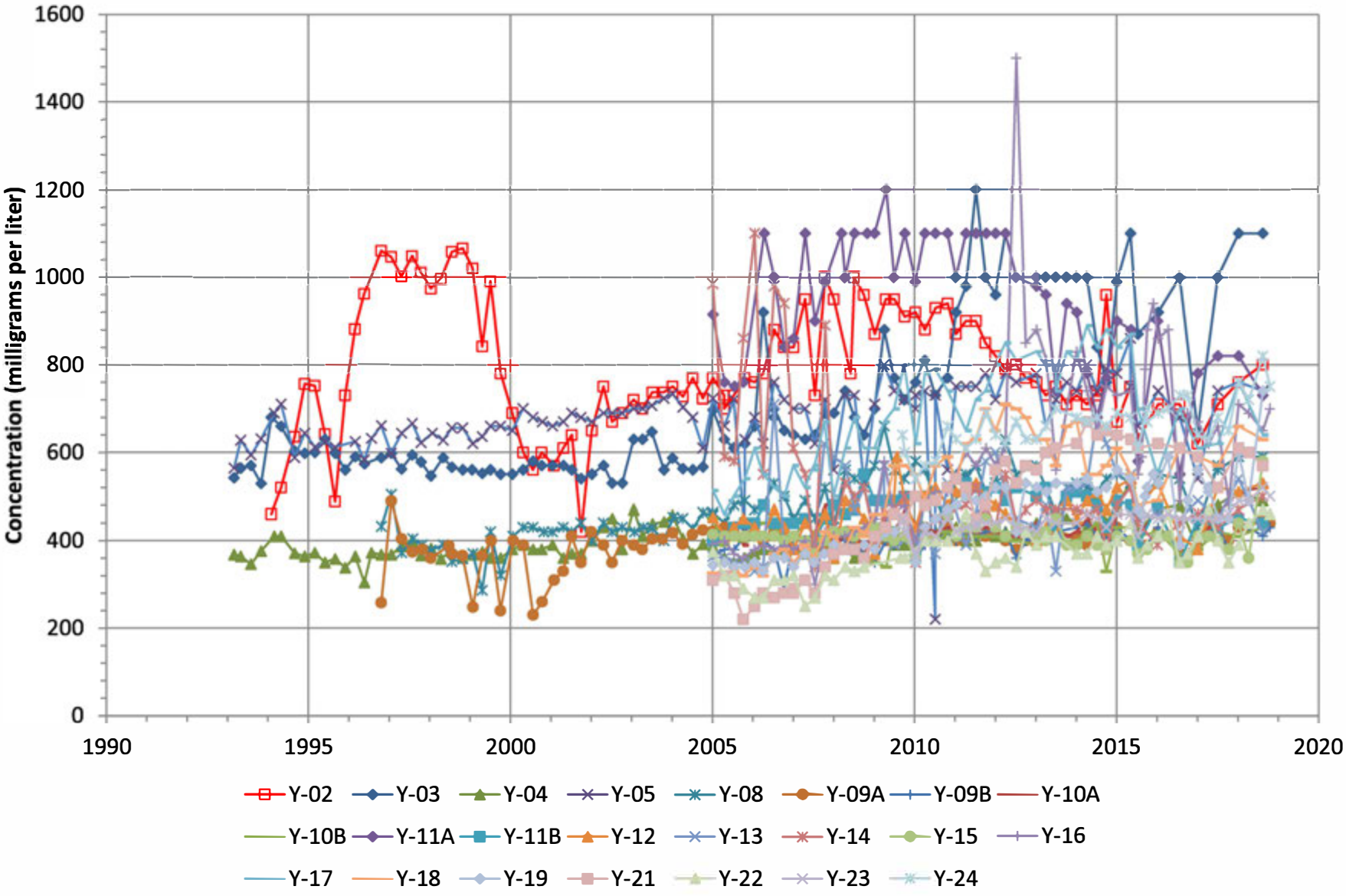

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Figure 2-40. Concentrations of Total Dissolved Solids at USGS Observation Wells in the Yucaipa Subbasin

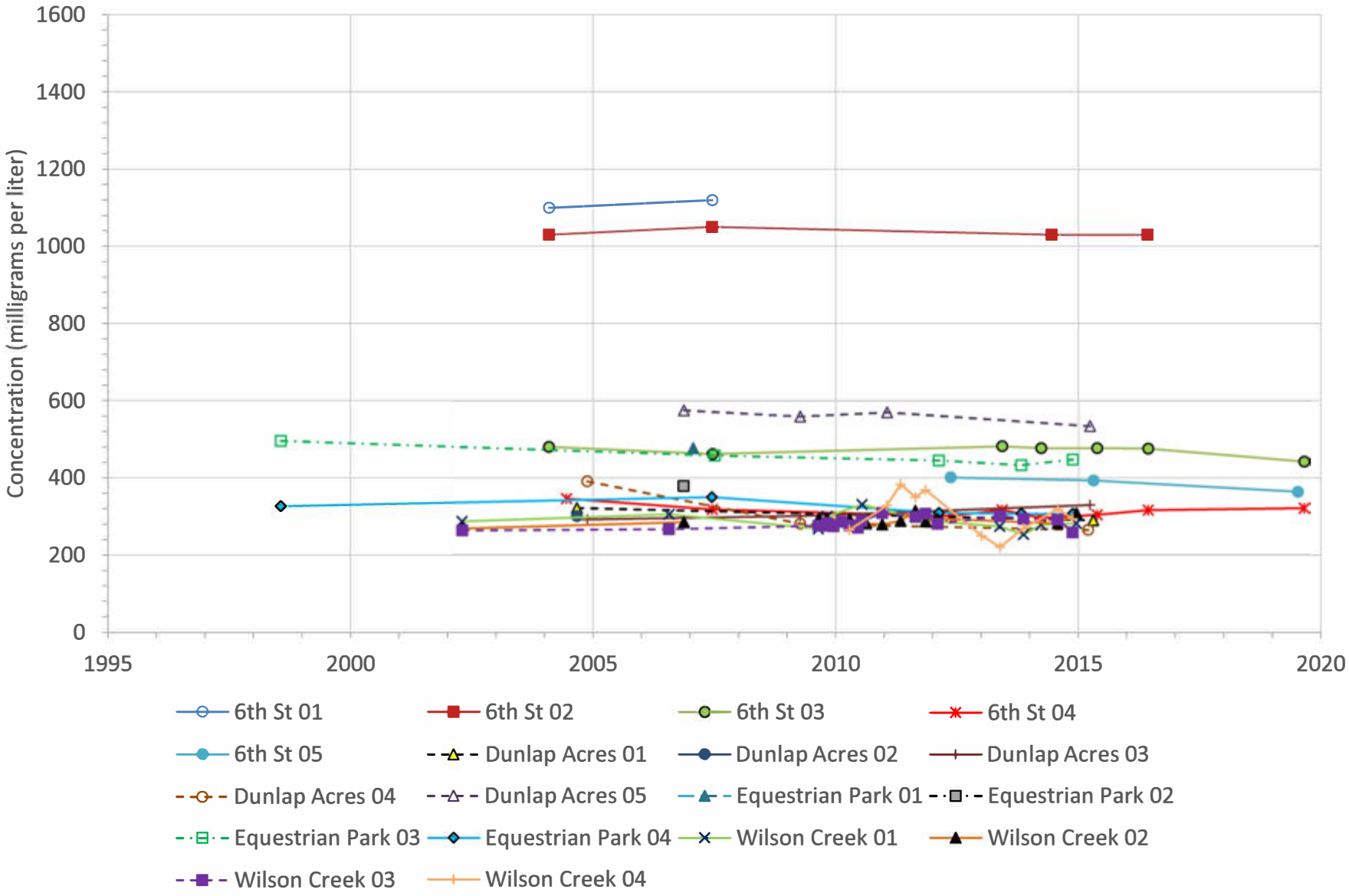

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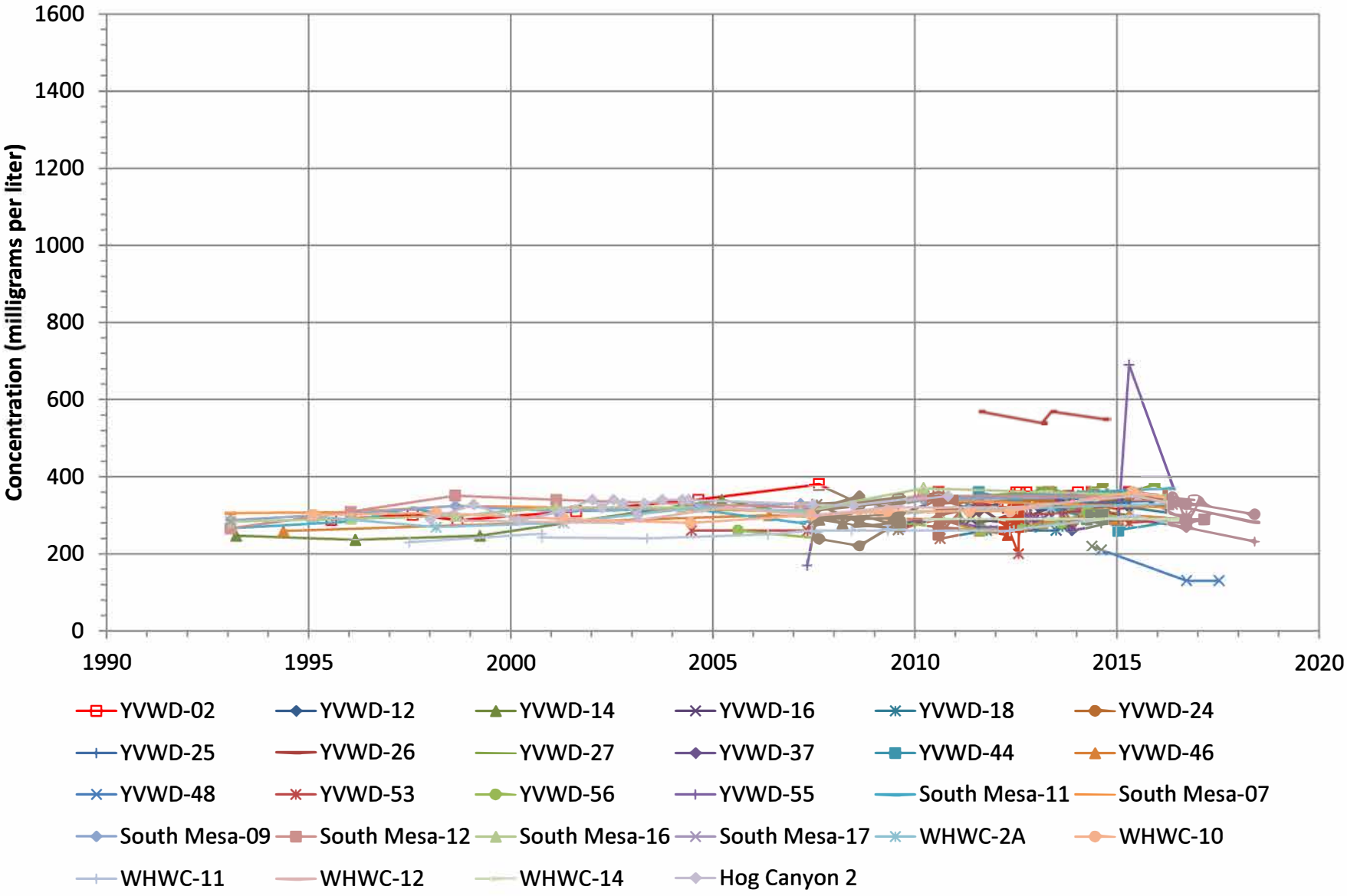
Figure 2-41. Concentrations of Total Dissolved Solids at Public Water Supply Wells in the Yucaipa Subbasin



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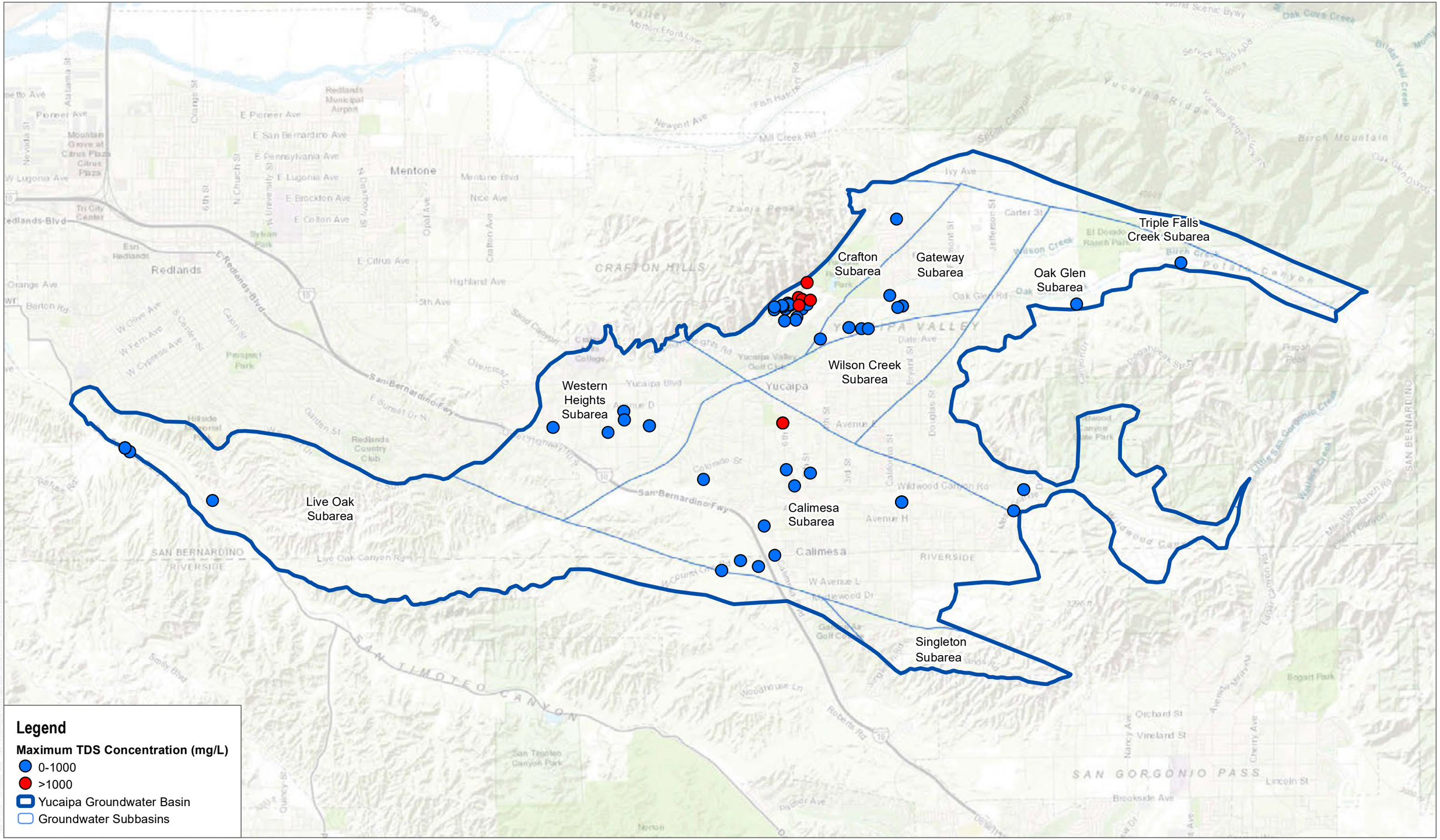

SOURCE: ESRI

DUDEK

0 0.5 1 Miles

FIGURE 2-42

Maximum Total Dissolved Solids Concentrations Detected Above the MCL in Groundwater Wells

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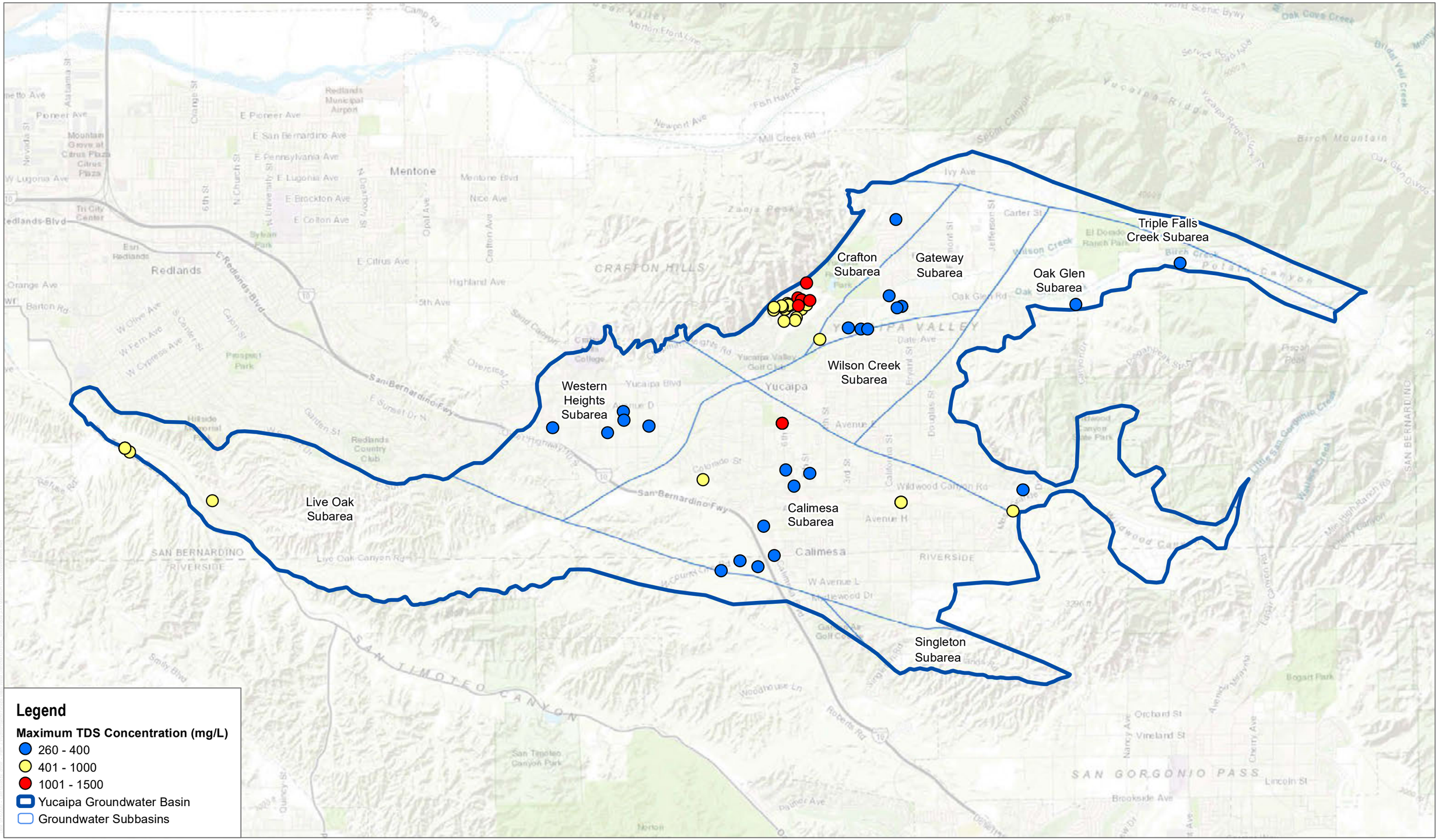

SOURCE: ESRI

DUDEK

FIGURE 2-43

Maximum Total Dissolved Solids Concentrations Detected in Groundwater Wells Relative to Maximum Benefit Water Quality Objectives

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Figure 2-44. Total Dissolved Solids and Monthly Discharges of Recycled Water at WRWRF OutFall

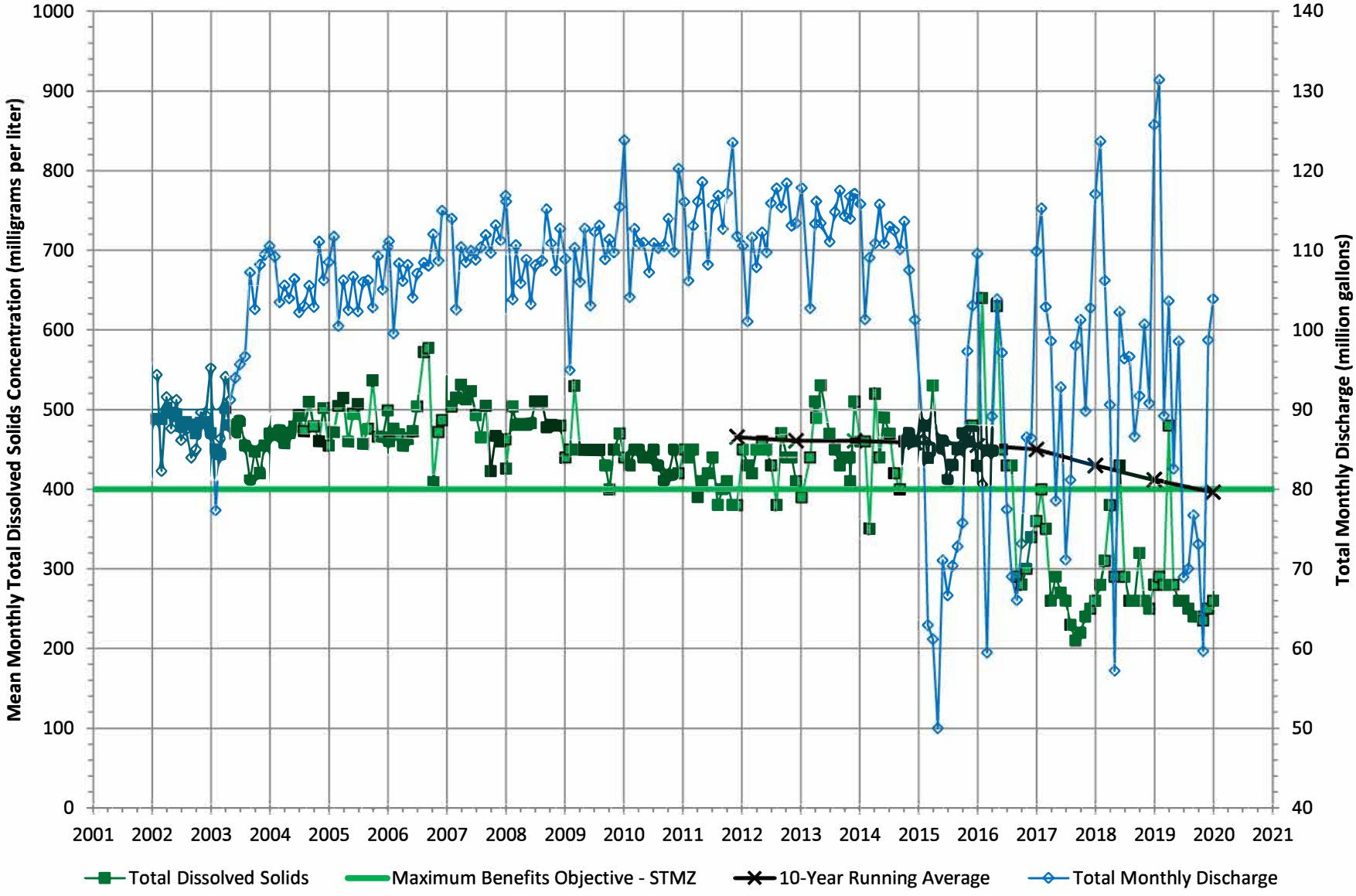

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Figure 2-45. Concentrations of Nitrate (as Nitrogen) at the Former Yucaipa Landfill in the Yucaipa Subbasin

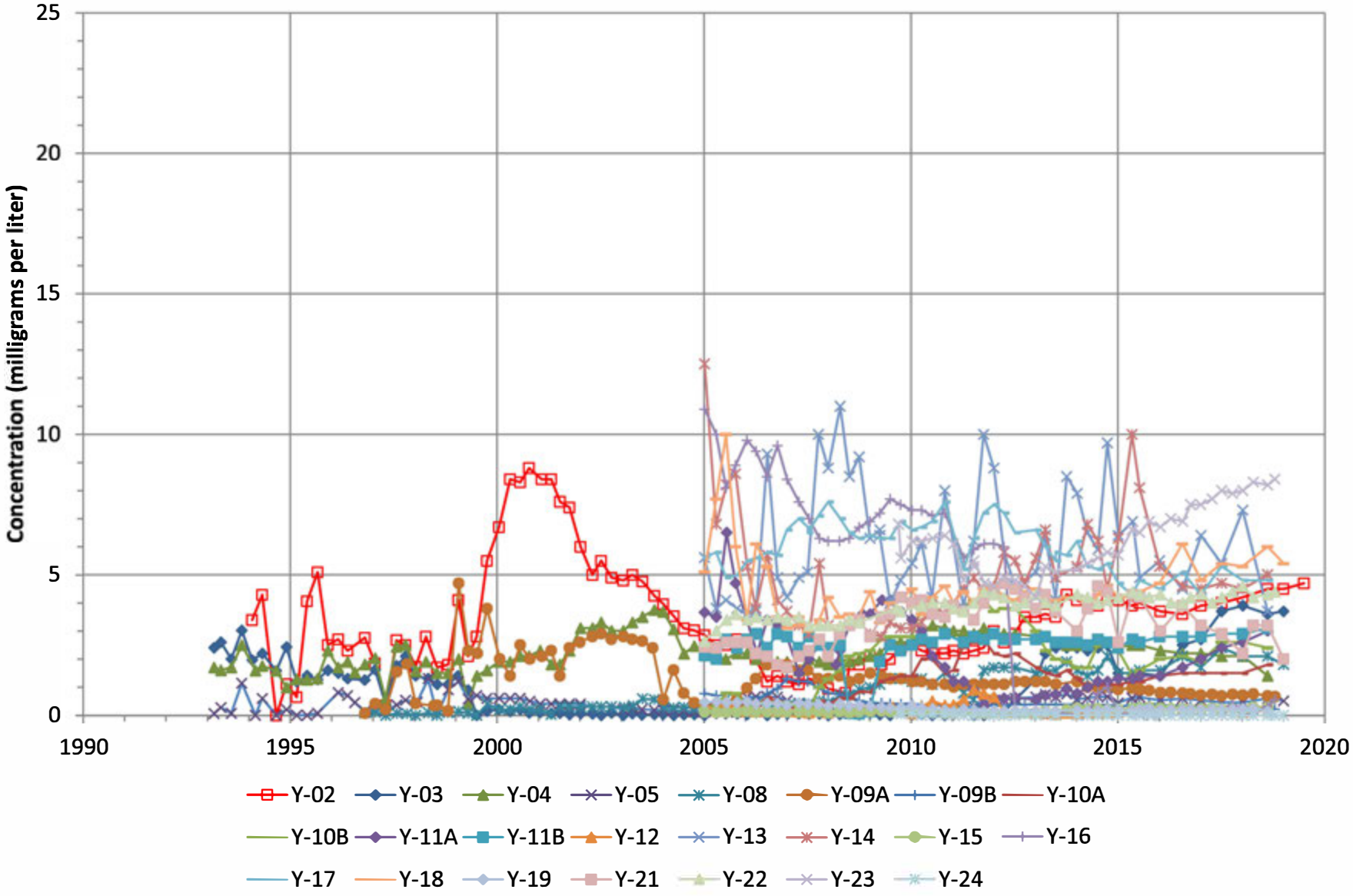

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Figure 2-46. Concentrations of Nitrate (as Nitrogen) at USGS Observation Wells in the Yucaipa Subbasin

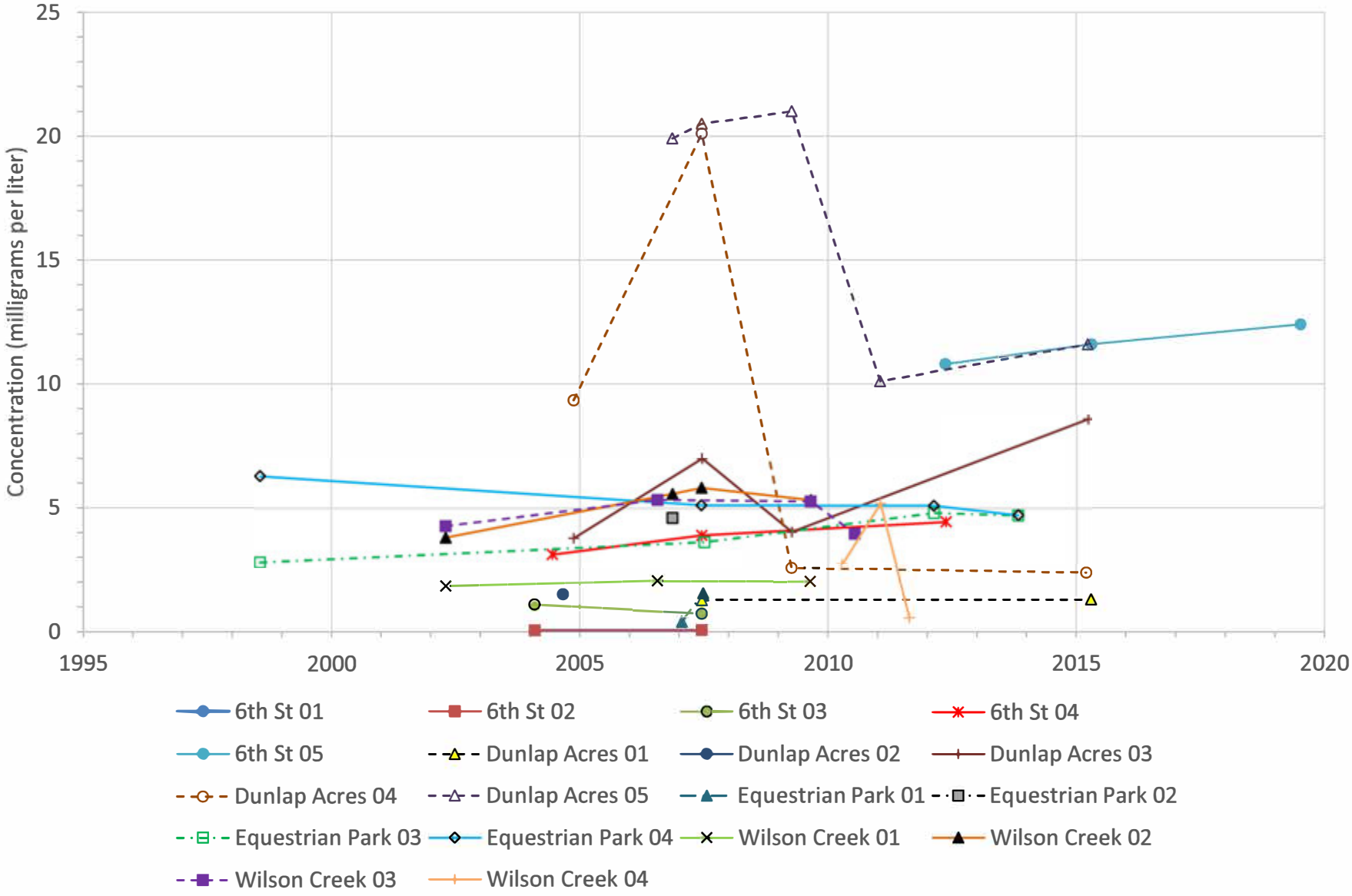

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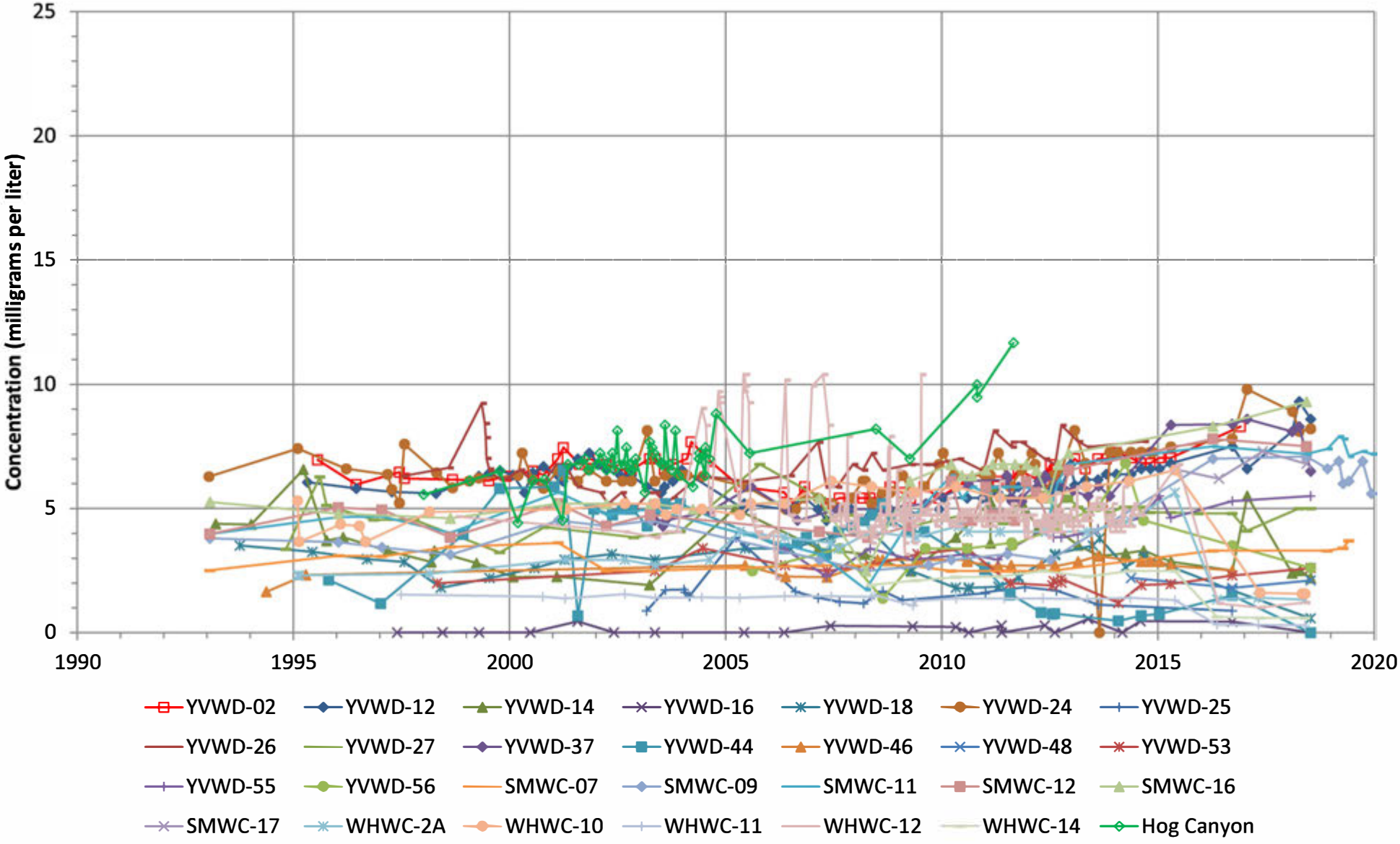
Figure 2-47. Concentrations of Nitrate (as Nitrogen) at Public Water Supply Wells in the Yucaipa Subbasin



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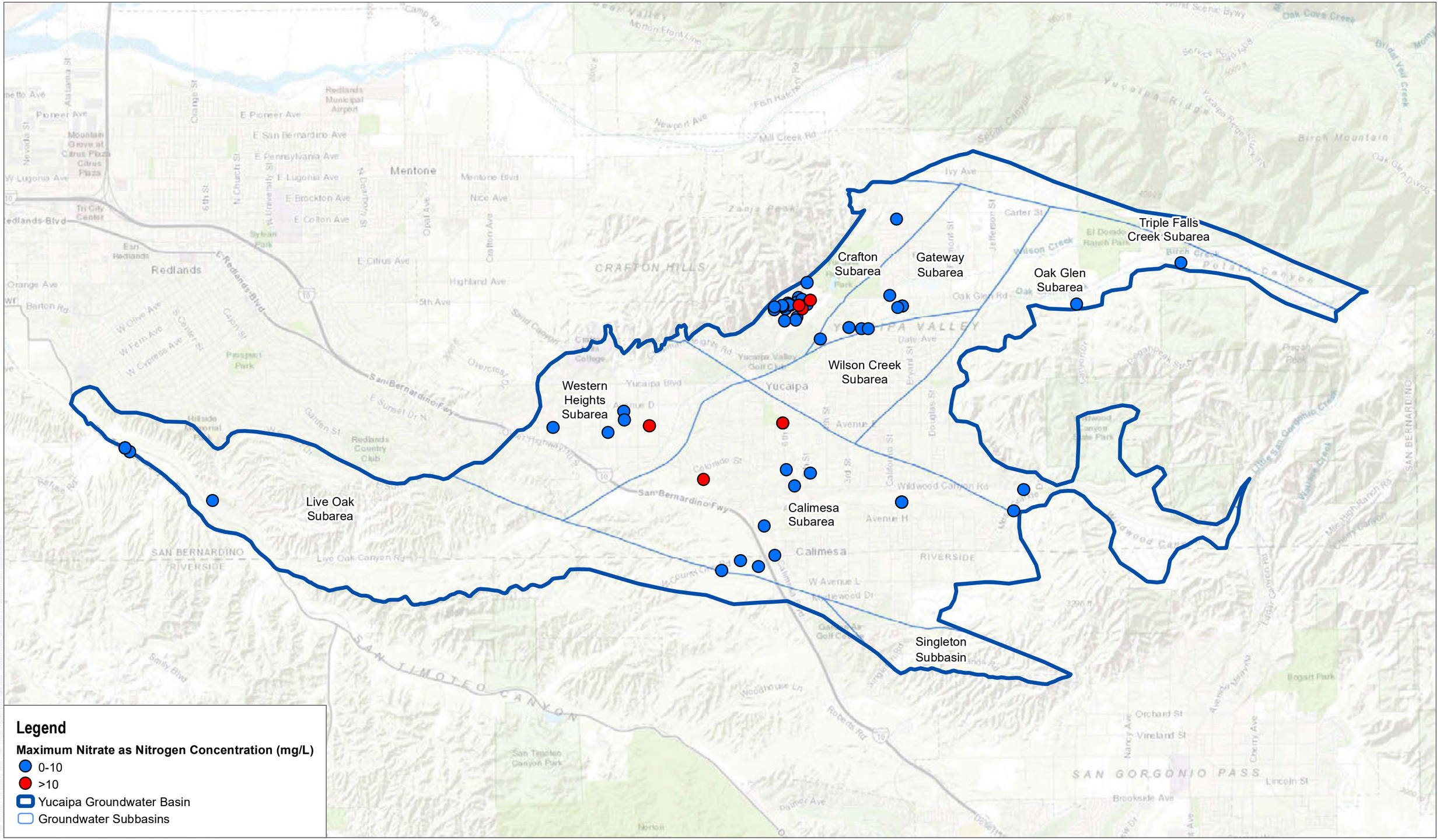

SOURCE: ESRI

DUDEK 0 0.5 1 Miles

FIGURE 2-48

Maximum Nitrate Concentrations Detected in Groundwater Wells

Yucaipa Subbasin Groundwater Sustainability Plan

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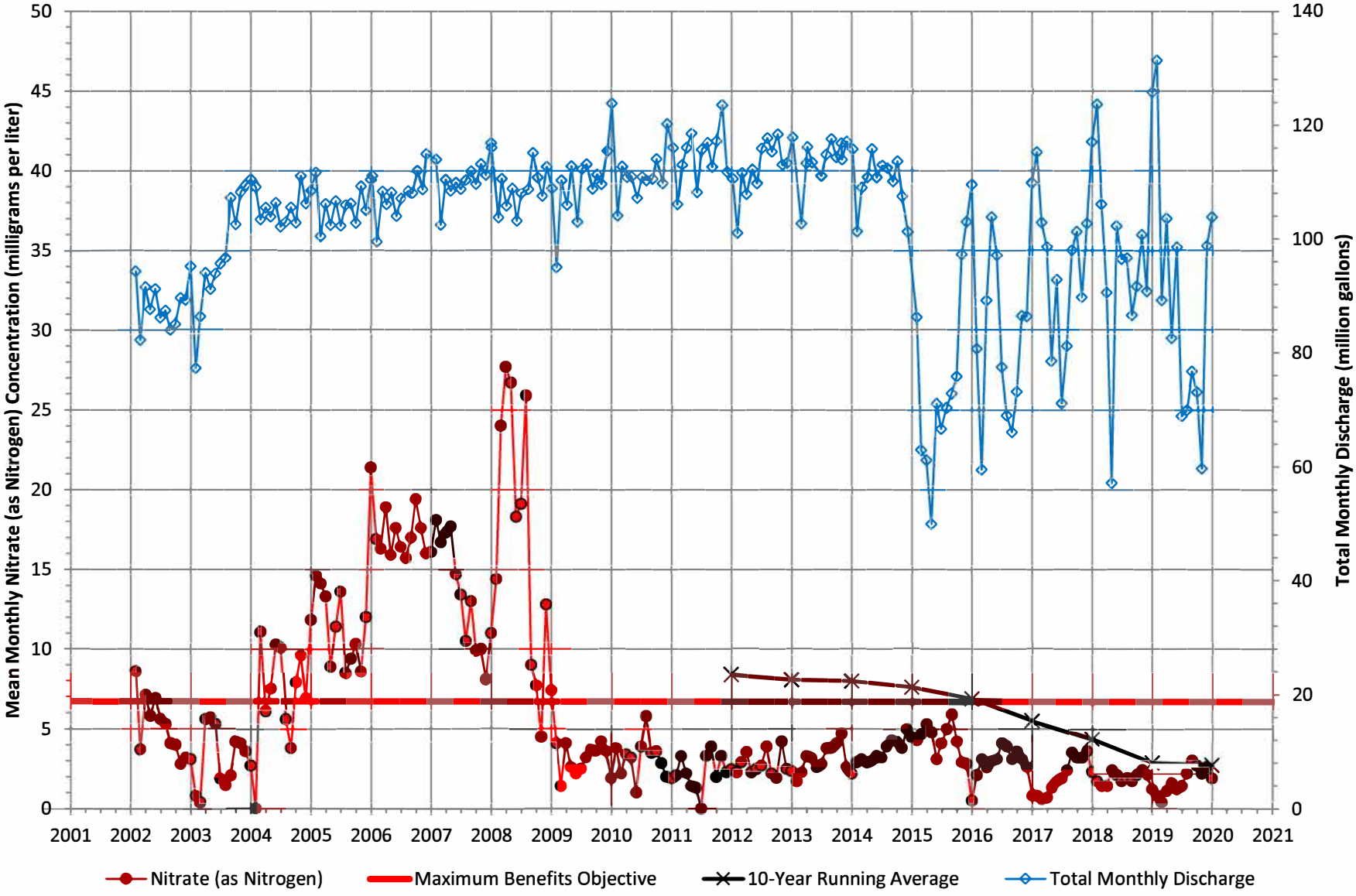
Figure 2-49. Nitrate (as Nitrogen) and Monthly Discharges of Recycled Water from WRWRF to San Timoteo Creek



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Crafton Subarea
Gateway Subarea
Triple Falls Creek Subarea
Oak Glen Subarea
Wilson Creek Subarea
Western Heights Subarea
Live Oak Subarea
Calimesa Subarea
Singleton Subbasin

Legend

Maximum Nitrate as Nitrogen Concentration (mg/L)

- 0.06 - 5.00
- 5.01 - 10.00
- >10
- Yucaipa Groundwater Basin
- Groundwater Subbasins

SOURCE: ESRI

DUDEK

0 0.5 1 Miles

FIGURE 2-50

Maximum Nitrate Concentrations Detected in Groundwater Wells

Yucaipa Subbasin Groundwater Sustainability Plan

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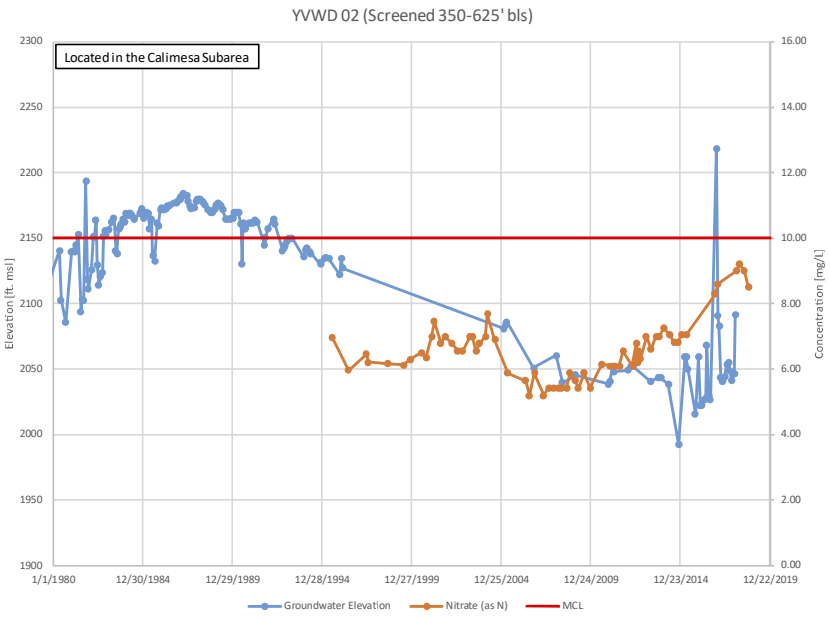

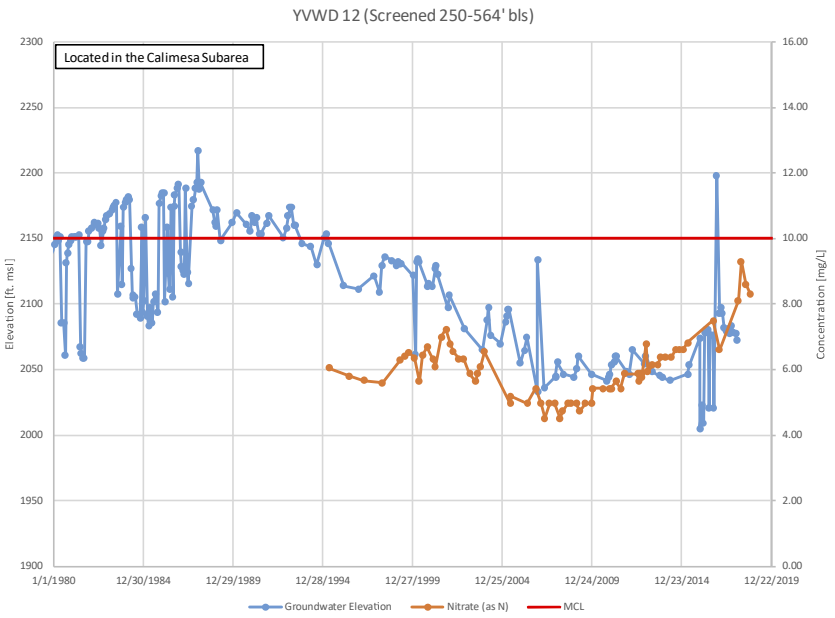

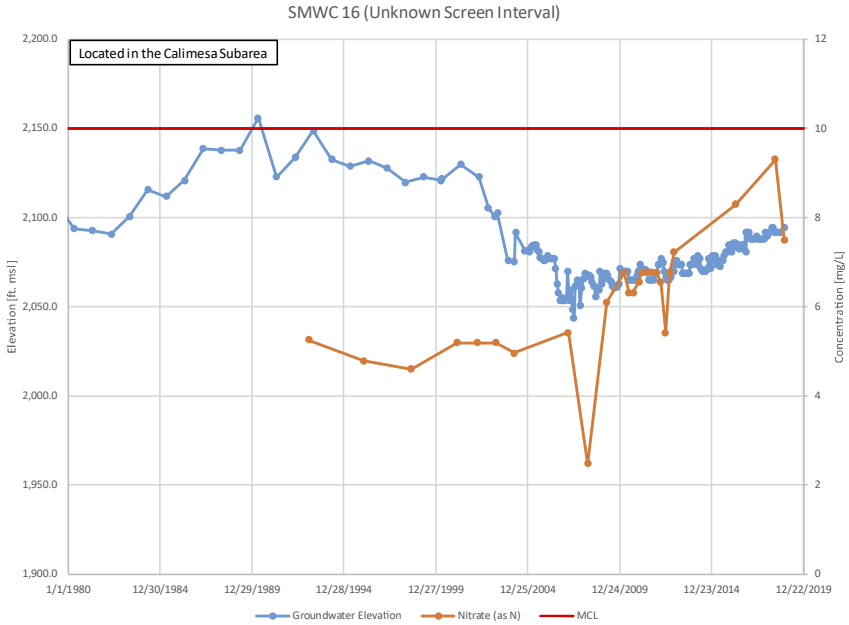

FIGURE 2-51

Water Quality Hydrographs - Calimesa Subarea

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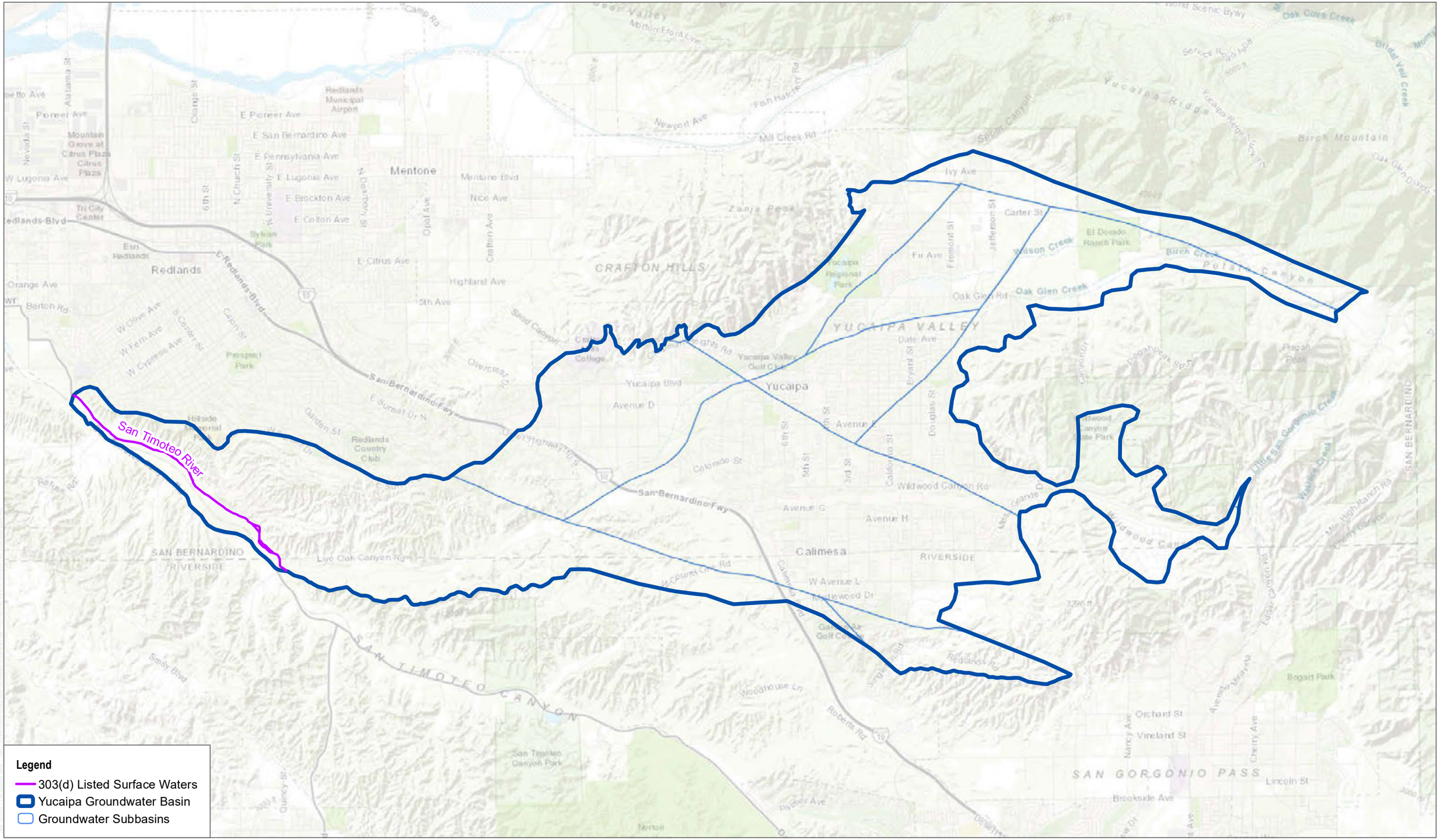

SOURCE: ESRI, RWQCB 2016

DUDEK

0 0.5 1 Miles

FIGURE 2-52

303(d) Listed Waters

Yucaipa Subbasin Groundwater Sustainability Plan

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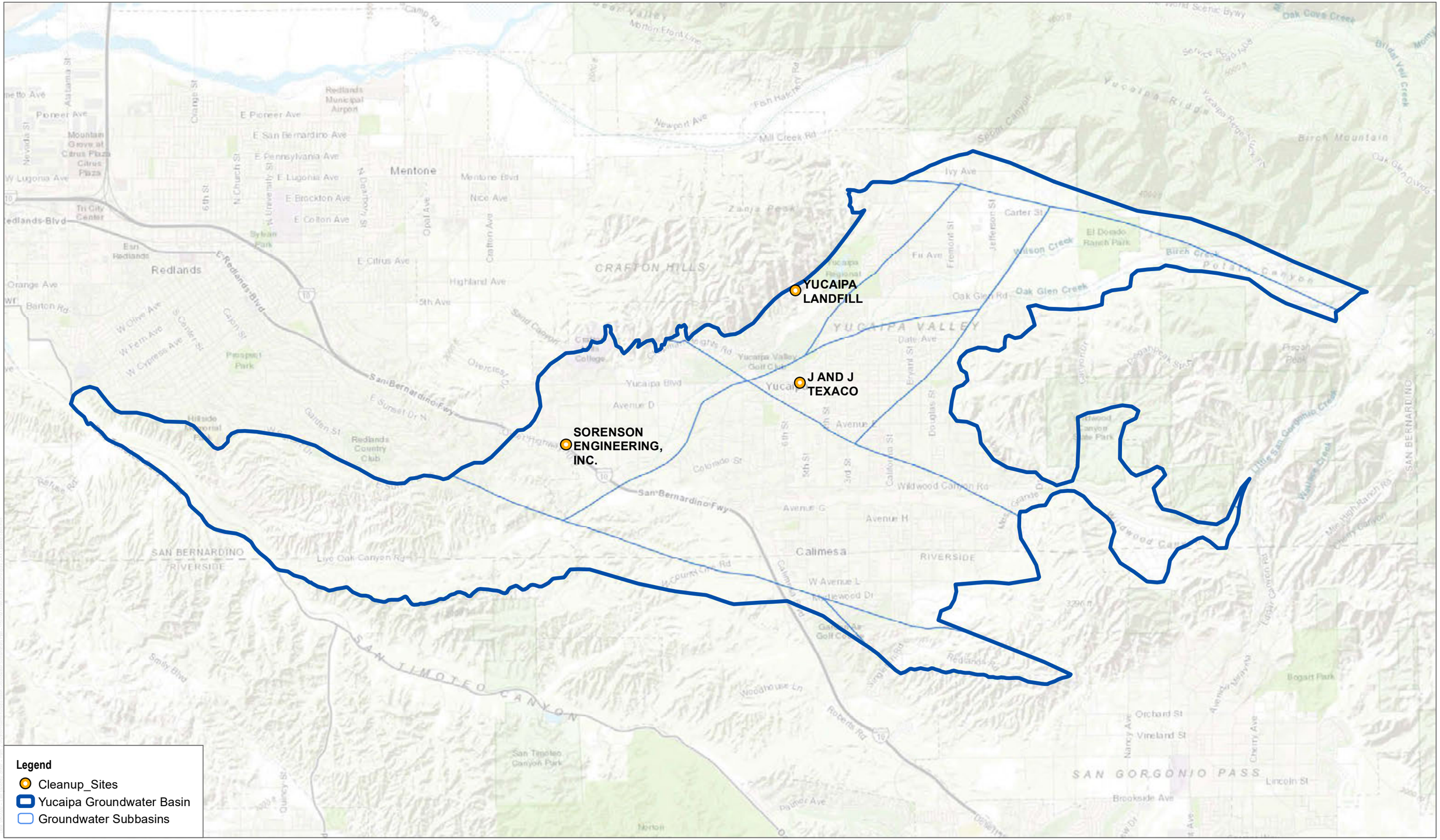

SOURCE: ESRI,

DUDEK

0 0.5 1 Miles

FIGURE 2-53

Cleanup Sites

Yucaipa Subbasin Groundwater Sustainability Plan

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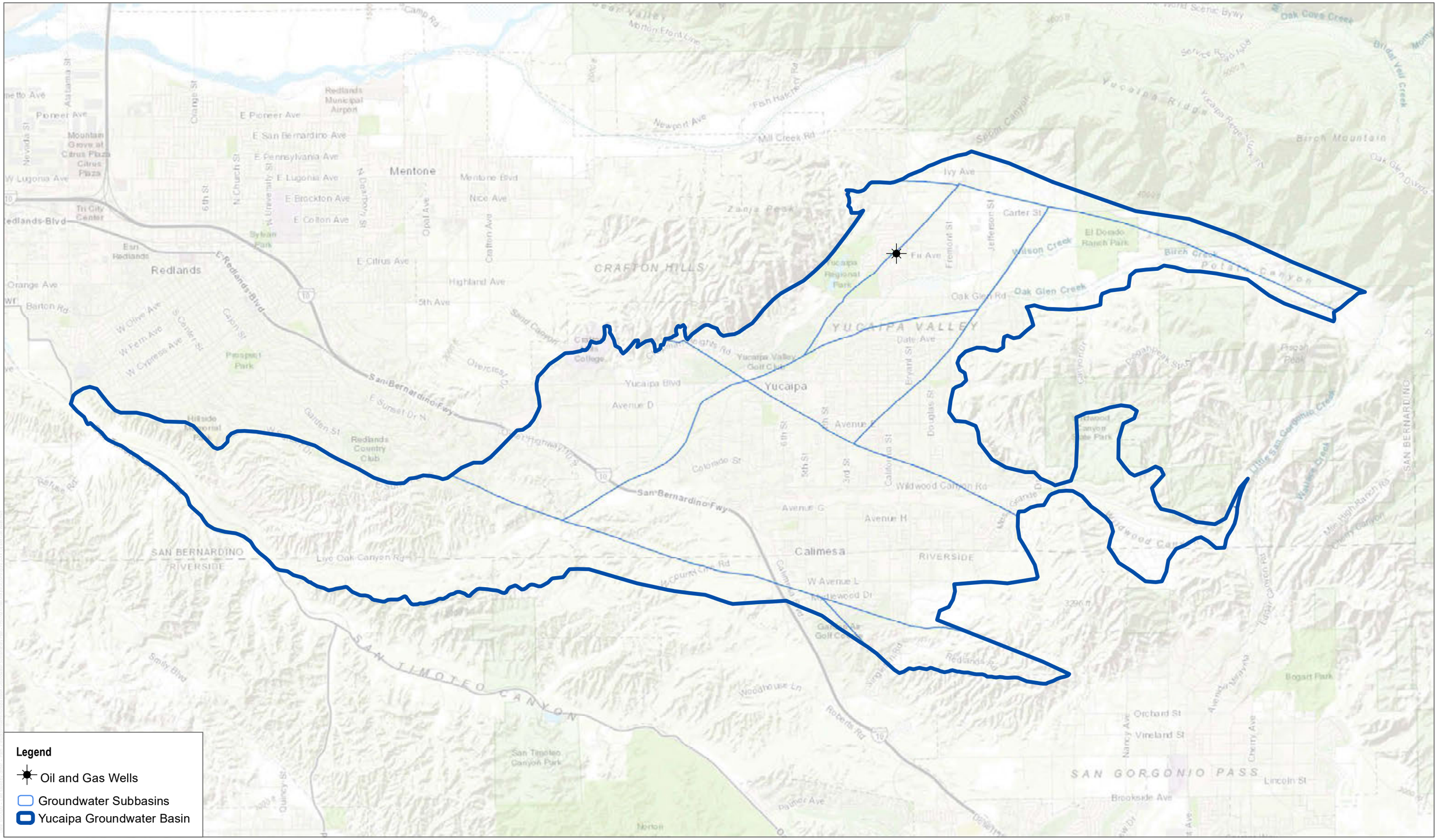

SOURCE: ESRI, DOGGR 2020

DUDEK

FIGURE 2-54

Oil and Gas Wells

Yucaipa Subbasin Groundwater Sustainability Plan

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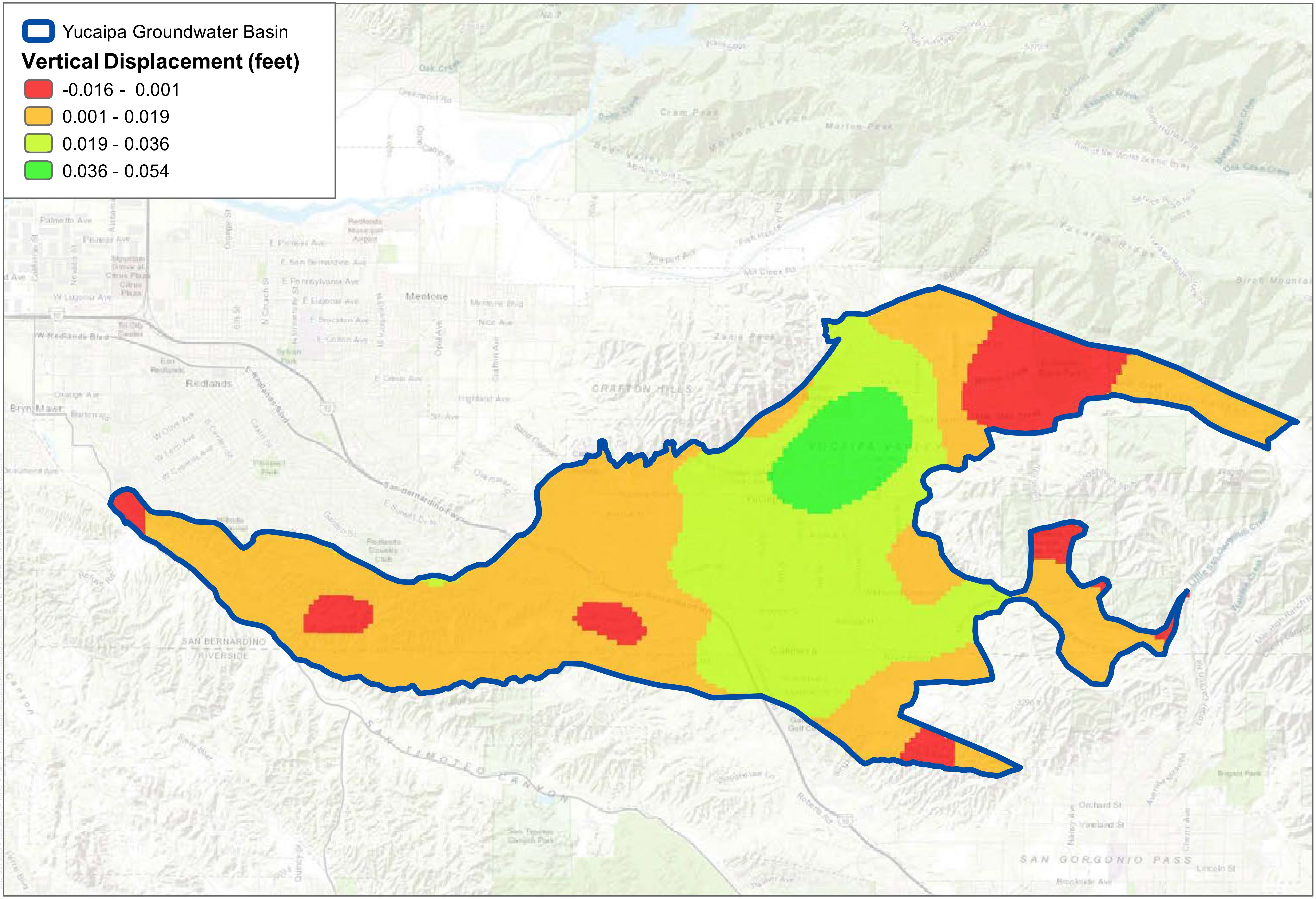

SOURCE: ESRI; SGMA TRE ALTAMIRA InSAR

DUDEK

0 0.75 1.5 Miles

FIGURE 2-55

Land Subsidence

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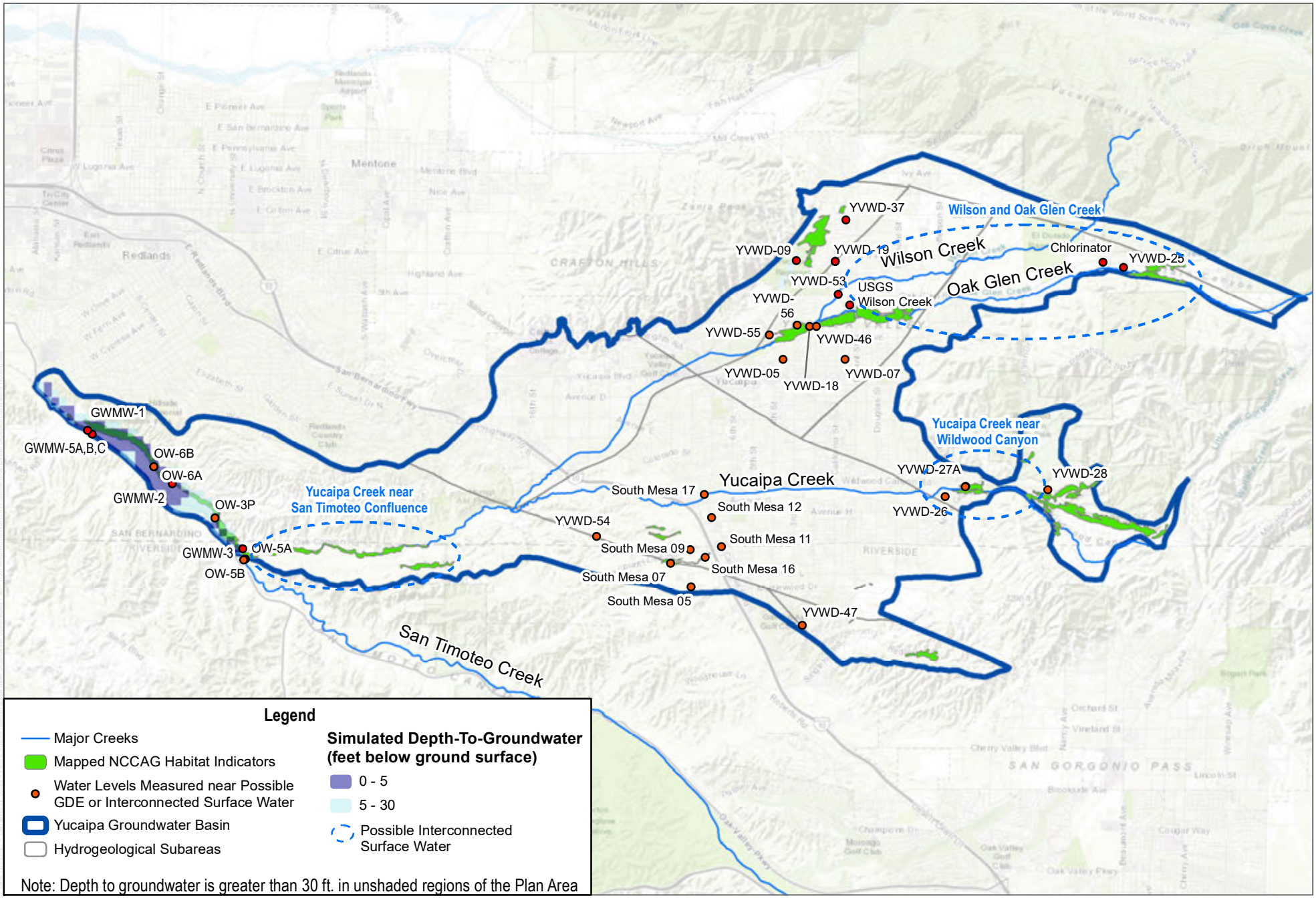

SOURCE: ESRI; DWR 2018; TNC 2019; USGS 2021

DUDEK

0 0.5 1 Miles

FIGURE 2-56

Possible Interconnected Surface Water and Mapped Groundwater Dependent Ecosystems in the Plan Area

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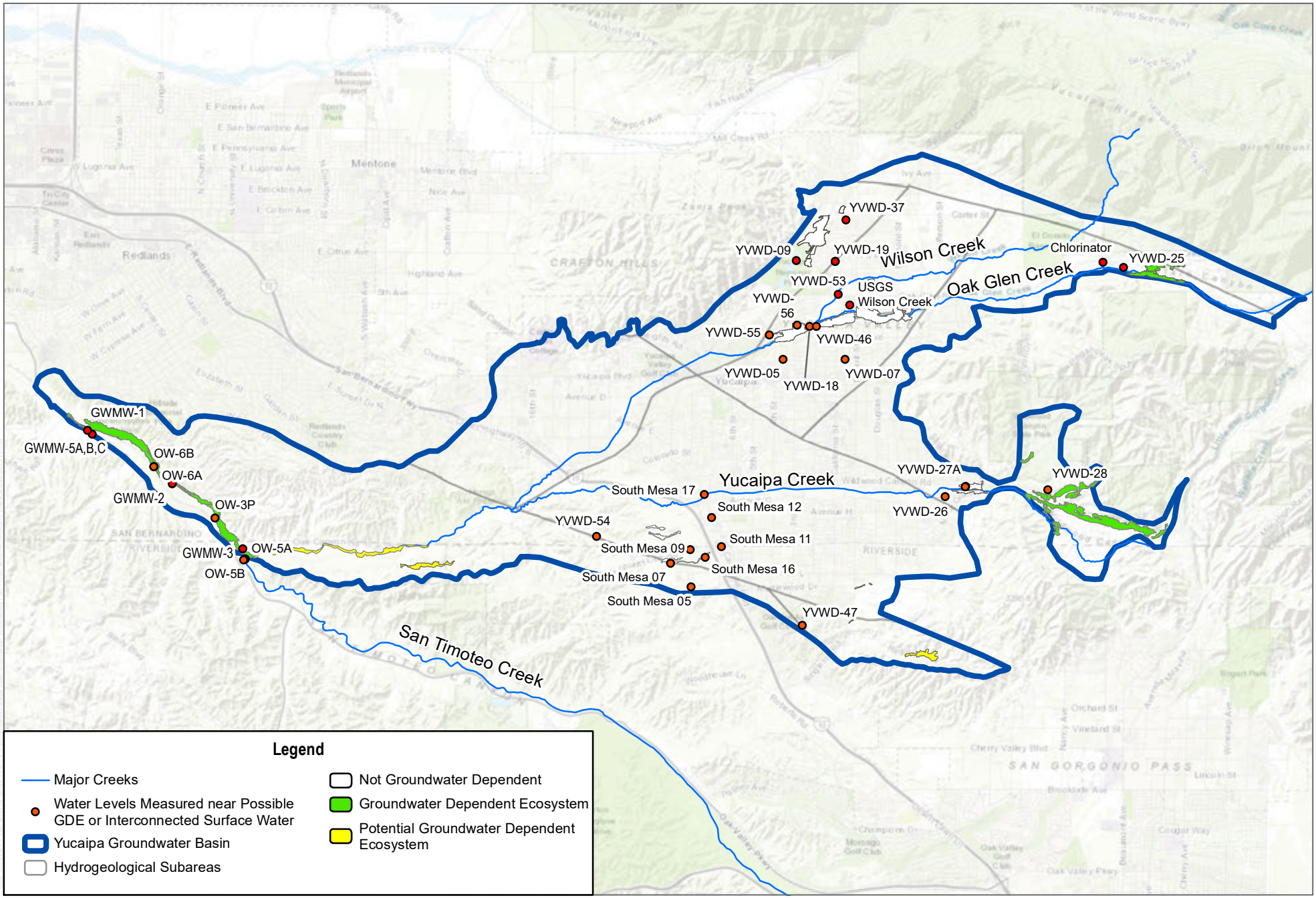

SOURCE: ESRI; DWR 2018; TNC 2019; USGS 2021

DUDEK

0 0.5 1 Miles

FIGURE 2-57

Characterization of Groundwater Dependent Ecosystems in the Plan Area

Yucaipa Subbasin Groundwater Sustainability Plan

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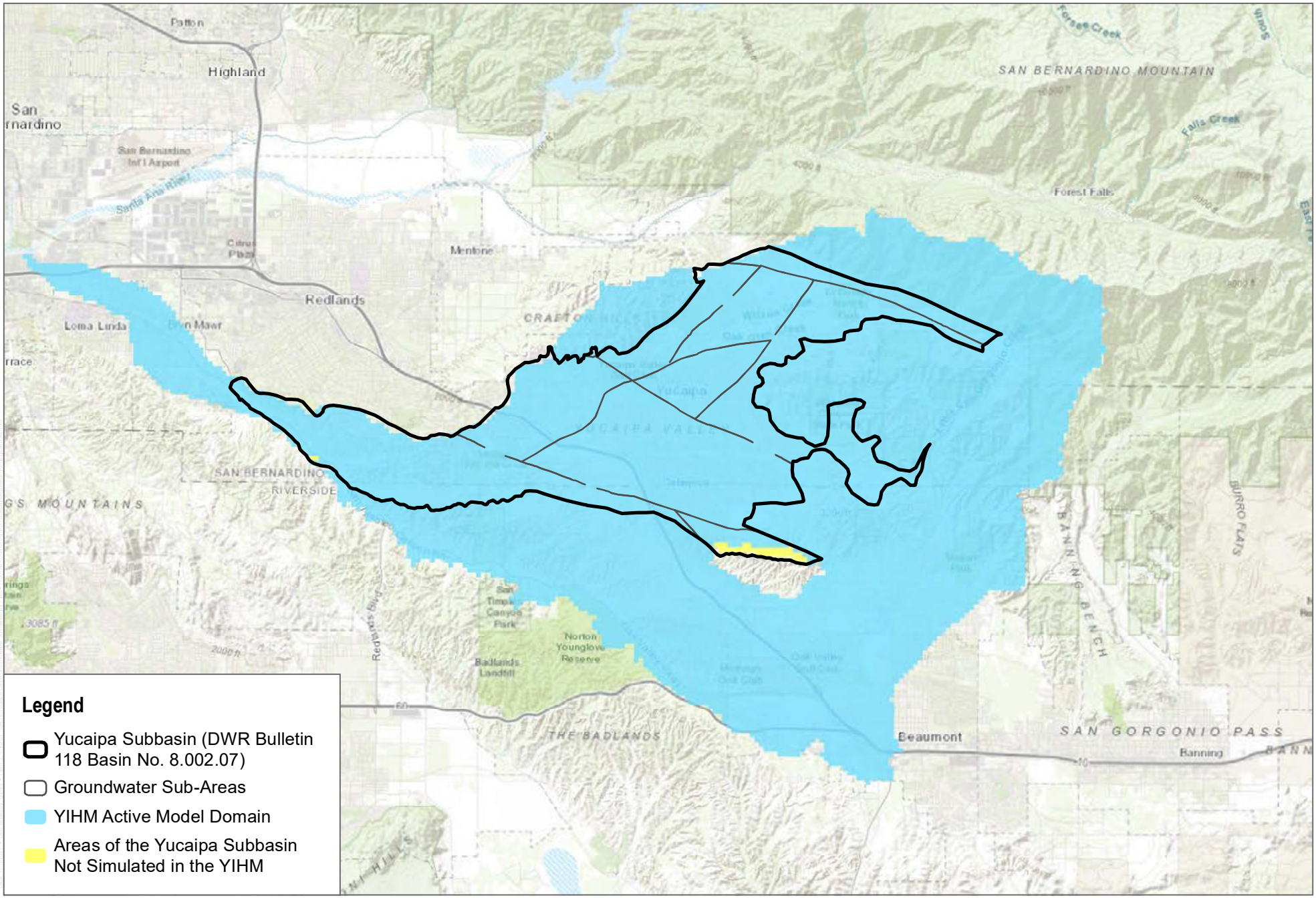

SOURCE: DWR, USGS

DUDEK

0 1 2 Miles

FIGURE 2-58

Yucaipa Integrated Hydrologic Model Active Model Domain

Yucaipa Subbasin Groundwater Sustainability Plan

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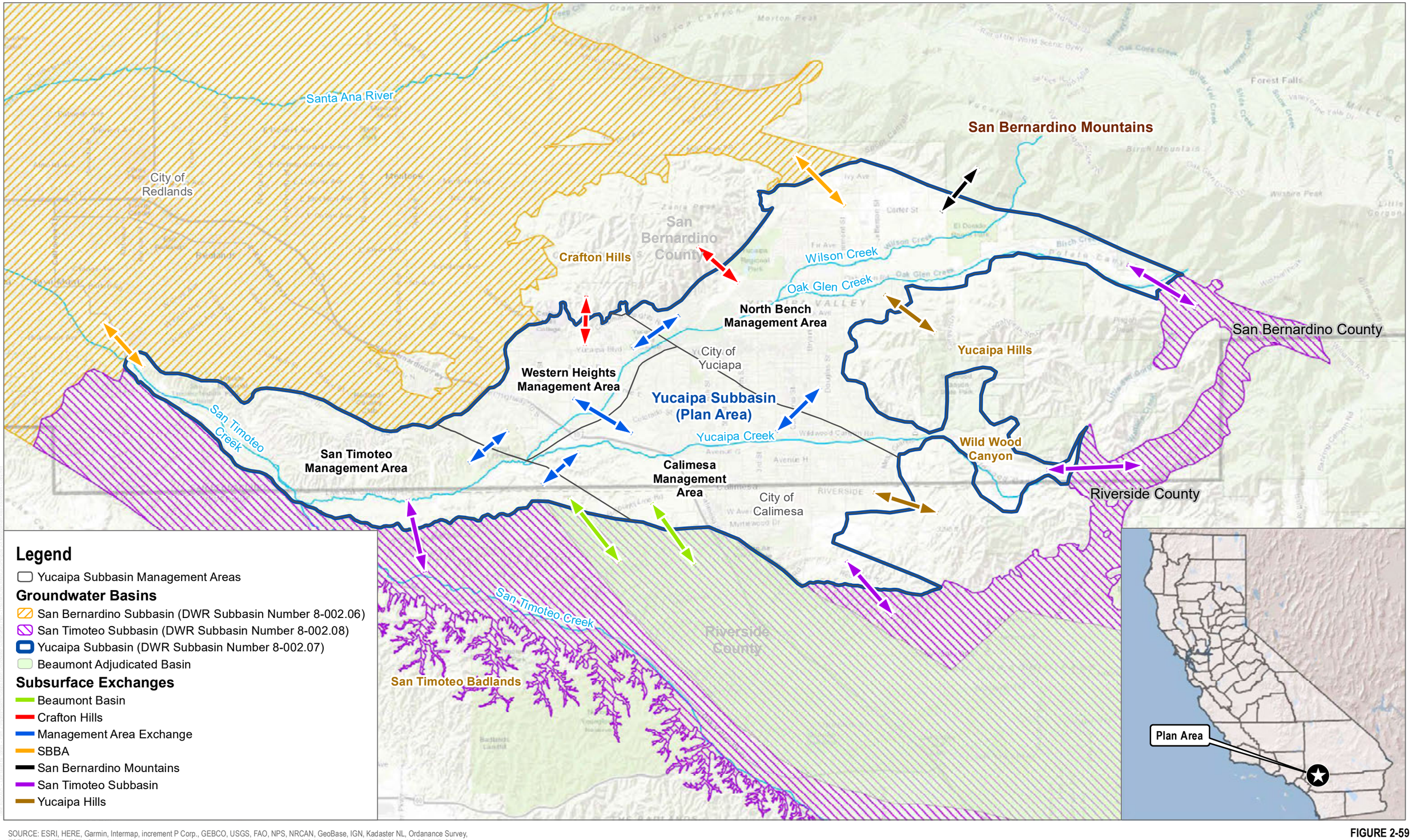

SOURCE: ESRI, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordanance Survey, ESRI Japan, METI, ESRI China (Hong Kong), swisstopo, OpenStreetMap contributors, and the GIS User Community; DWR 2015; USGS NHD 2017

DUDEK 0 0.5 1 Miles

FIGURE 2-59

Subsurface Inflows and Outflows Simulated by the YIHM

Yucaipa Subbasin Groundwater Sustainability Plan

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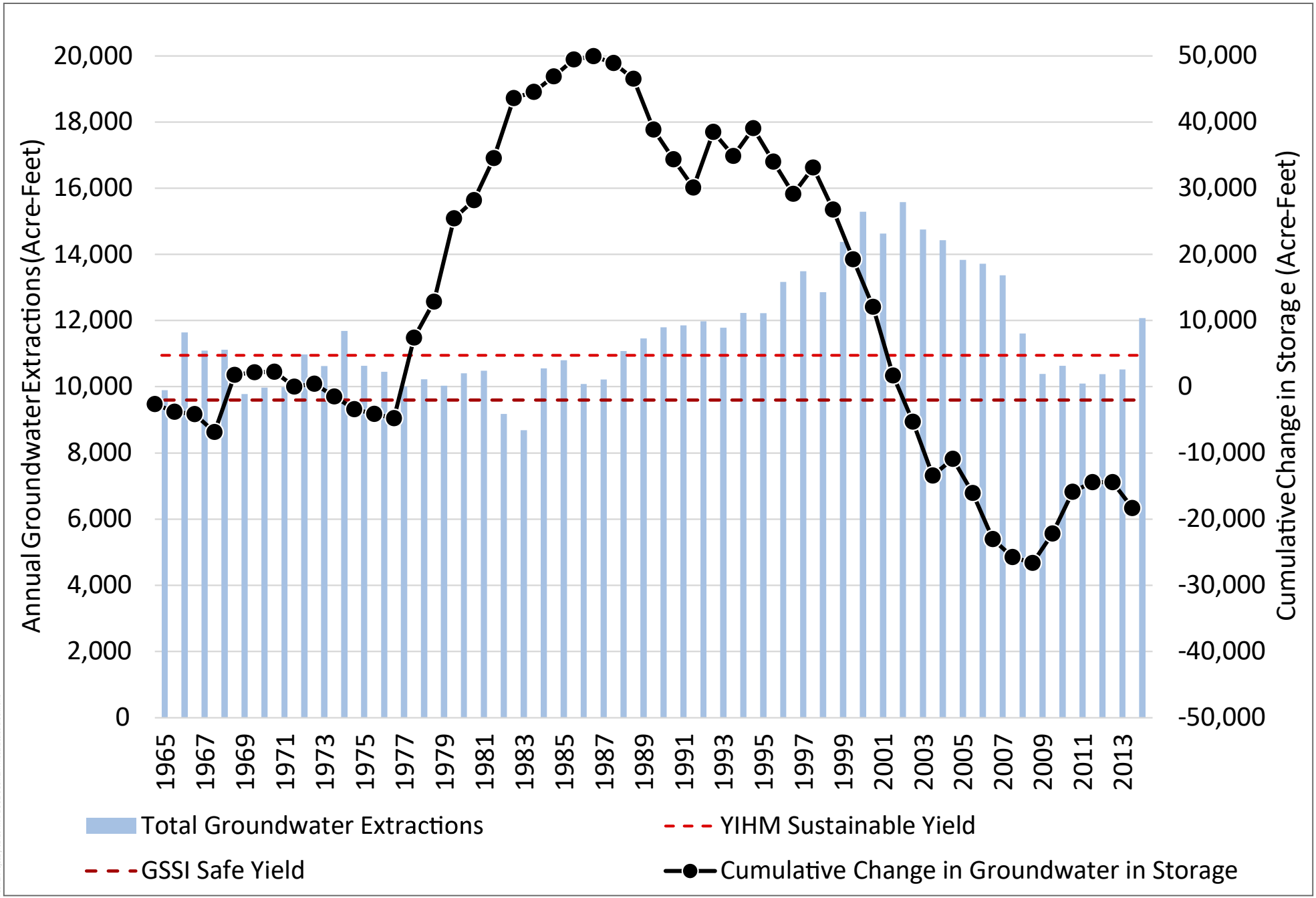

FIGURE 2-60

Historical Cumulative Change in Storage and Groundwater Production in the Yucaipa Subbasin

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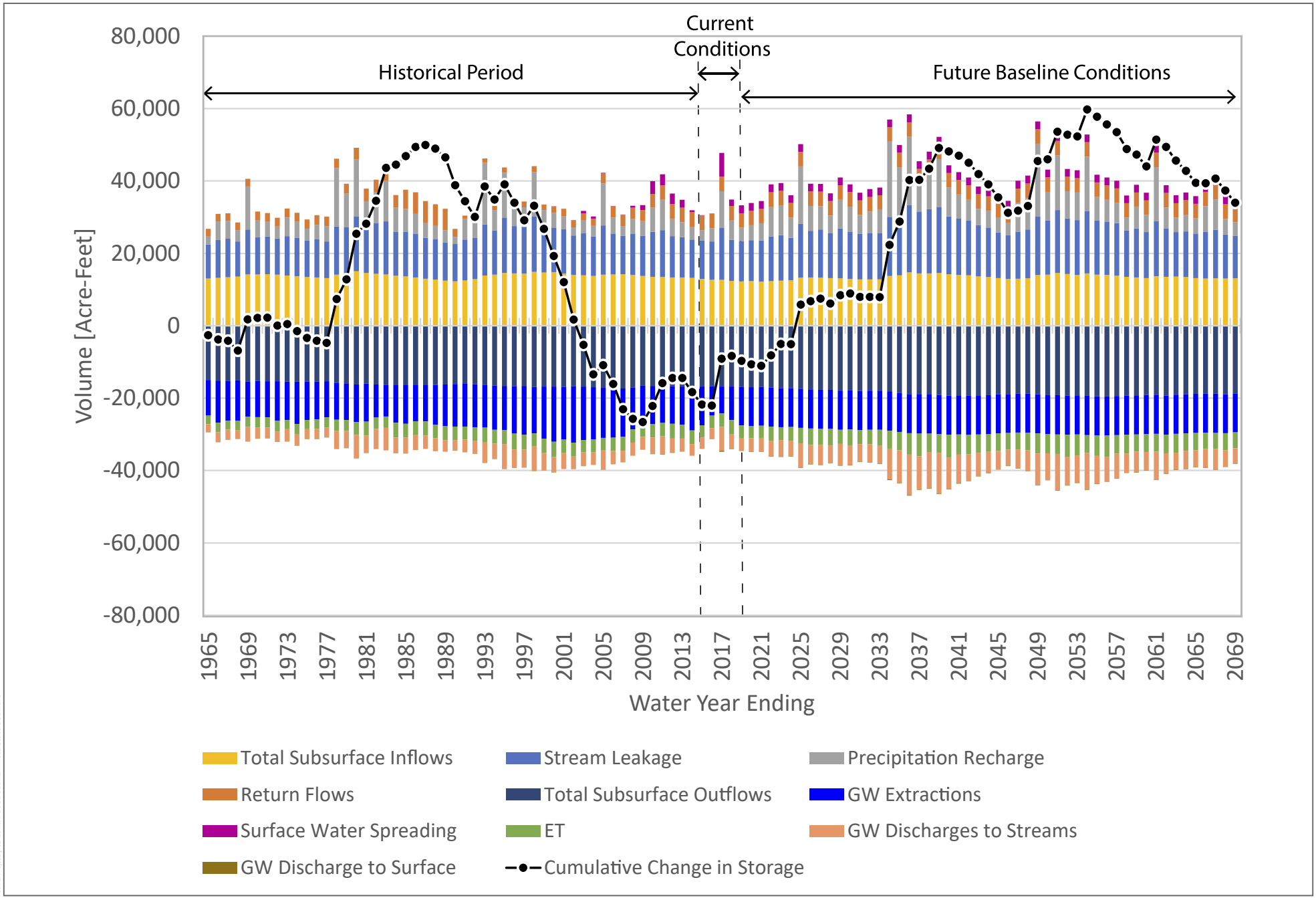

FIGURE 2-61

Historical, Current, and Future Baseline Water Budget for the Yucaipa Subbasin

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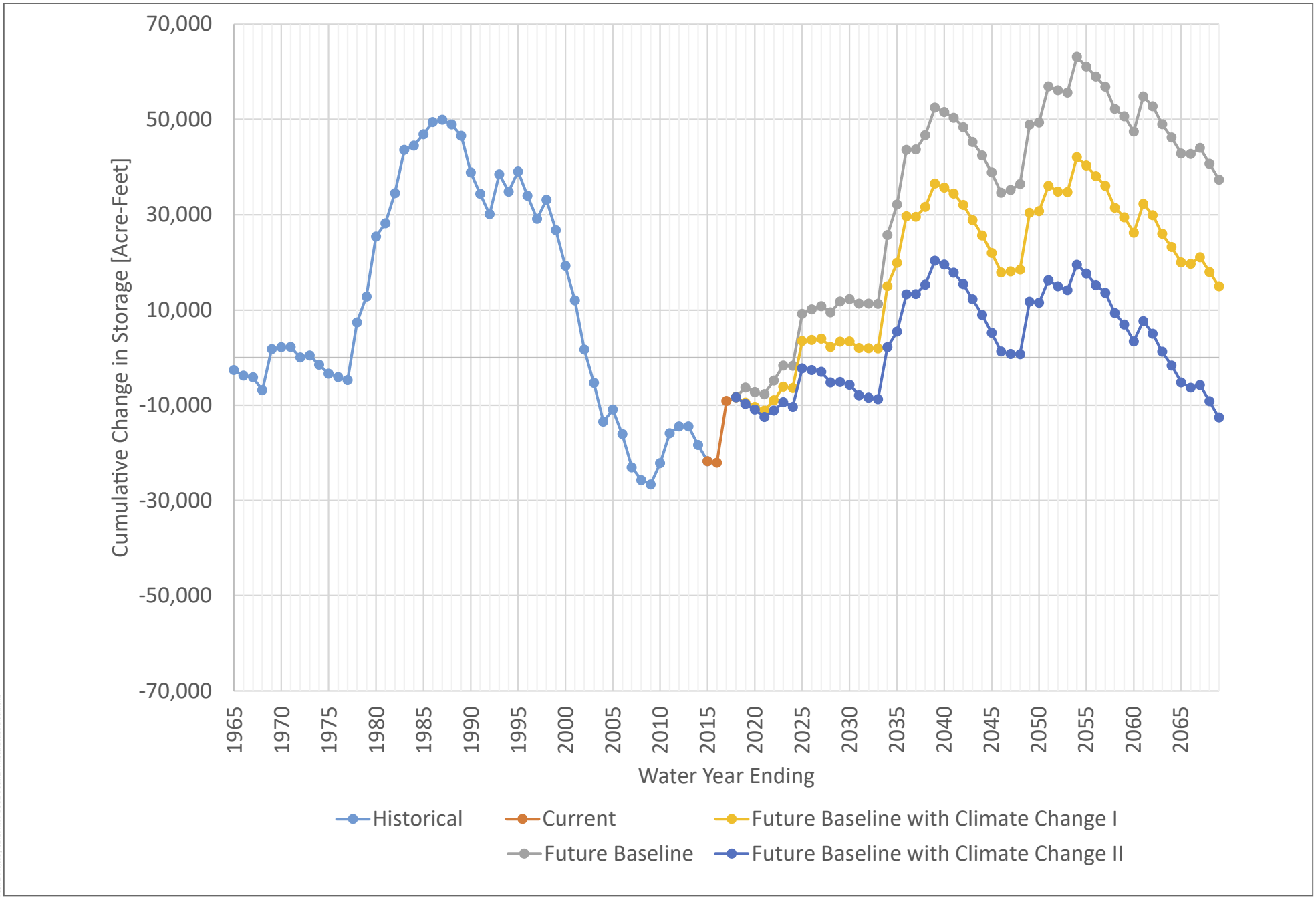

FIGURE 2-62

Historical, Current, and Projected Storage Change in the Yucaipa Subbasin

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Yucaipa Groundwater Subbasin
Management Area Boundaries
Hydrogeologic Subareas

Geologic Units (CGS 2012)

Quaternary

Qa, Young Alluvium
Qsdloc, Sedimentary Deposits of Live Oak Formation

Tertiary

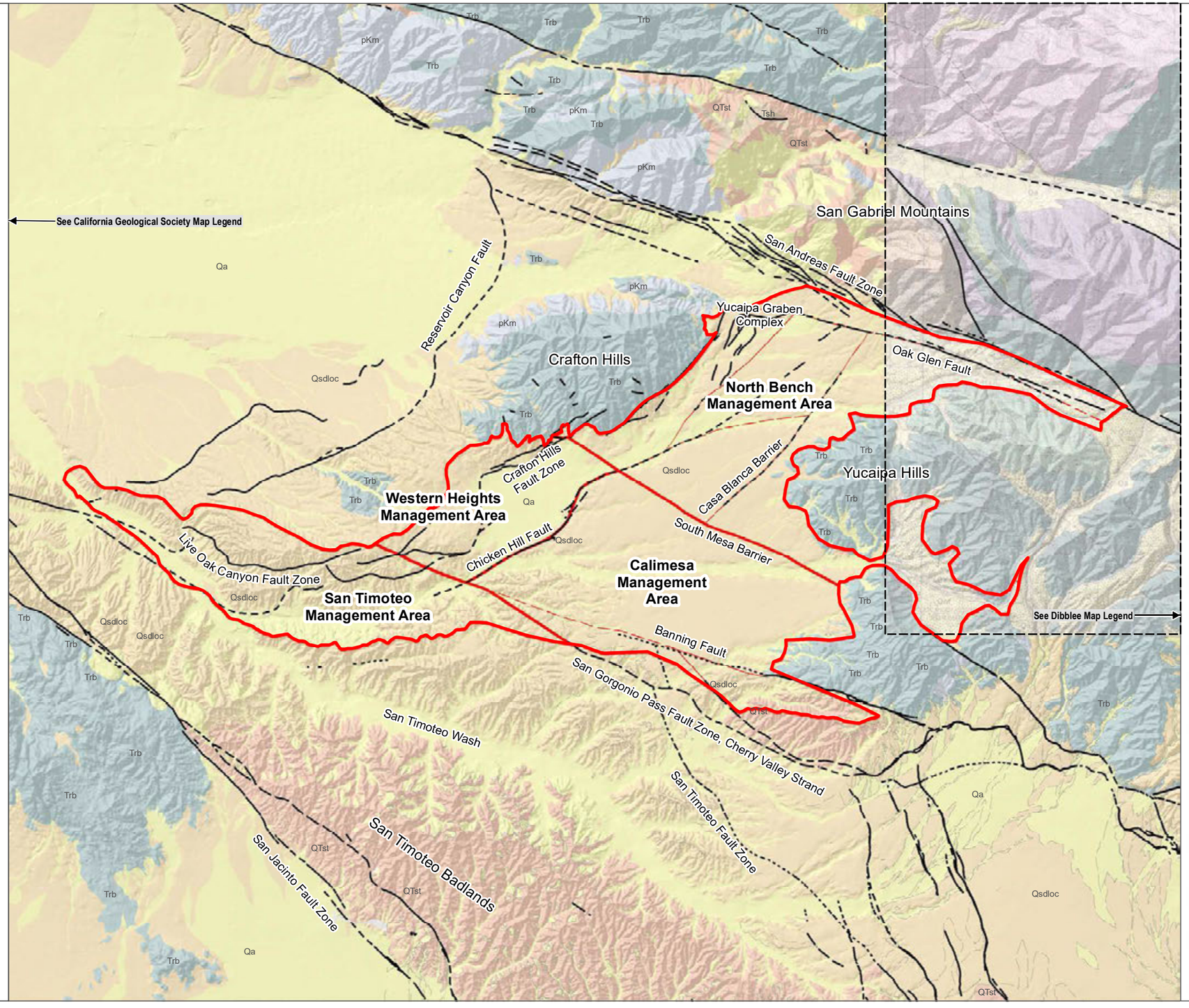
QTst, San Timoteo Formation (Middle Member)
Tsh, Mill Creek Formation
Tv, Dacite Dikes

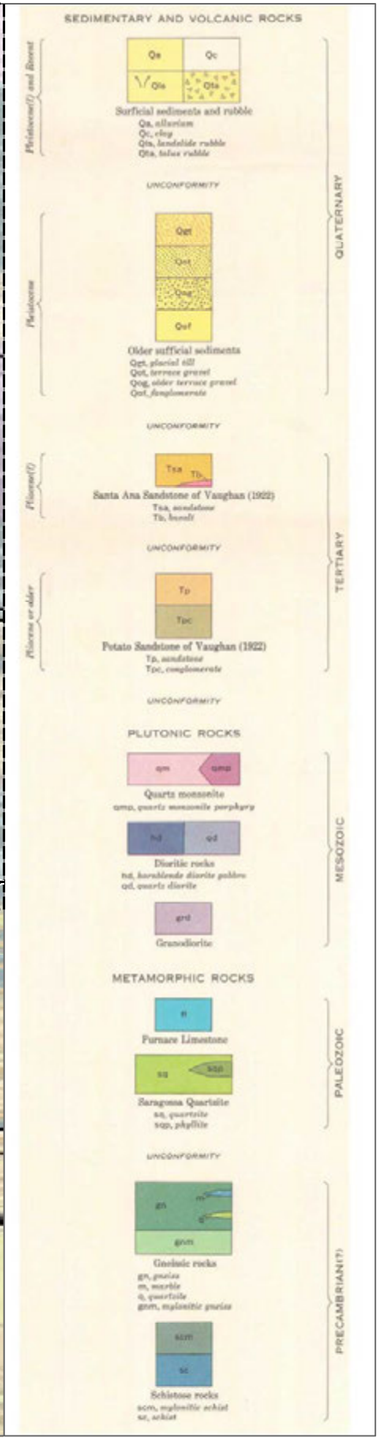
Mesozoic and Older

pKm, Cretaceous and Pre-Cretaceous Metamorphic Formations of Sedimentary and Volcanic Origin
Trb, Granitic and Other Intrusive Crystalline Rocks, San Gabriel Mountains-type

Faults and Geologic Contacts

contact, identity and existence certain, location accurate
contact, identity and existence certain, location approximate
fault, identity and existence certain, location accurate
fault, identity and existence certain, location approximate
fault, identity and existence certain, location concealed
fault, identity and existence certain, location inferred





SOURCE: CGS 2012, USGS 1999

DUDEK

0 0.5 1 2 Miles

FIGURE 2-63

Geologic Map and Management Area Boundaries in the Yucaipa Subbasin

Yucaipa Subbasin Groundwater Sustainability Plan

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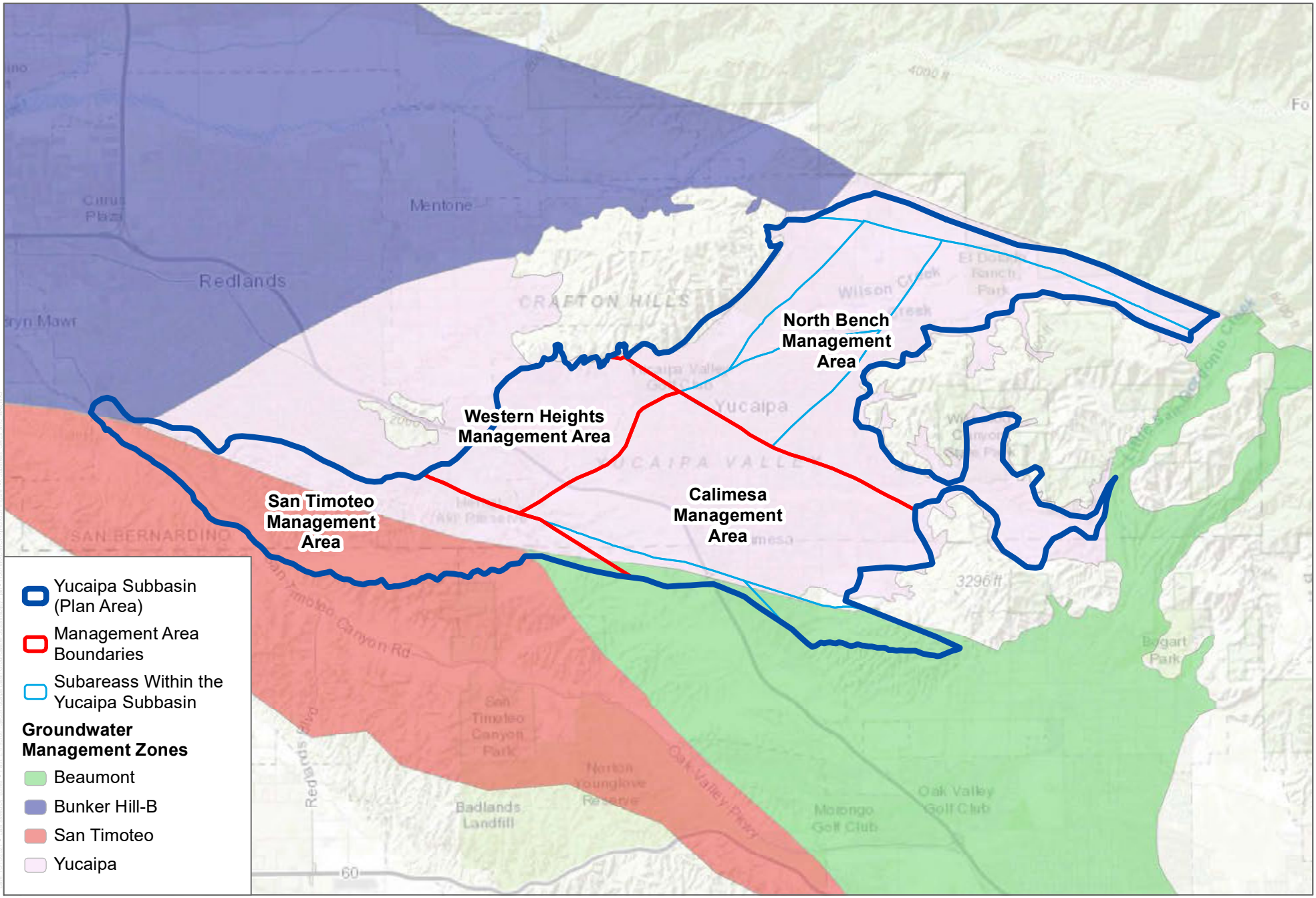

SOURCE: ESRI, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordanance Survey, ESRI Japan, METI, ESRI China (Hong Kong), swisstopo, OpenStreetMap contributors, and the GIS User Community; DWR 2015; USGS NHD 2017

FIGURE 2-64

Groundwater Management Areas, Subareas, and Groundwater Management Zones in the Yucaipa Subbasin

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Figure 2-65. Groundwater Elevations across the South Mesa Barrier

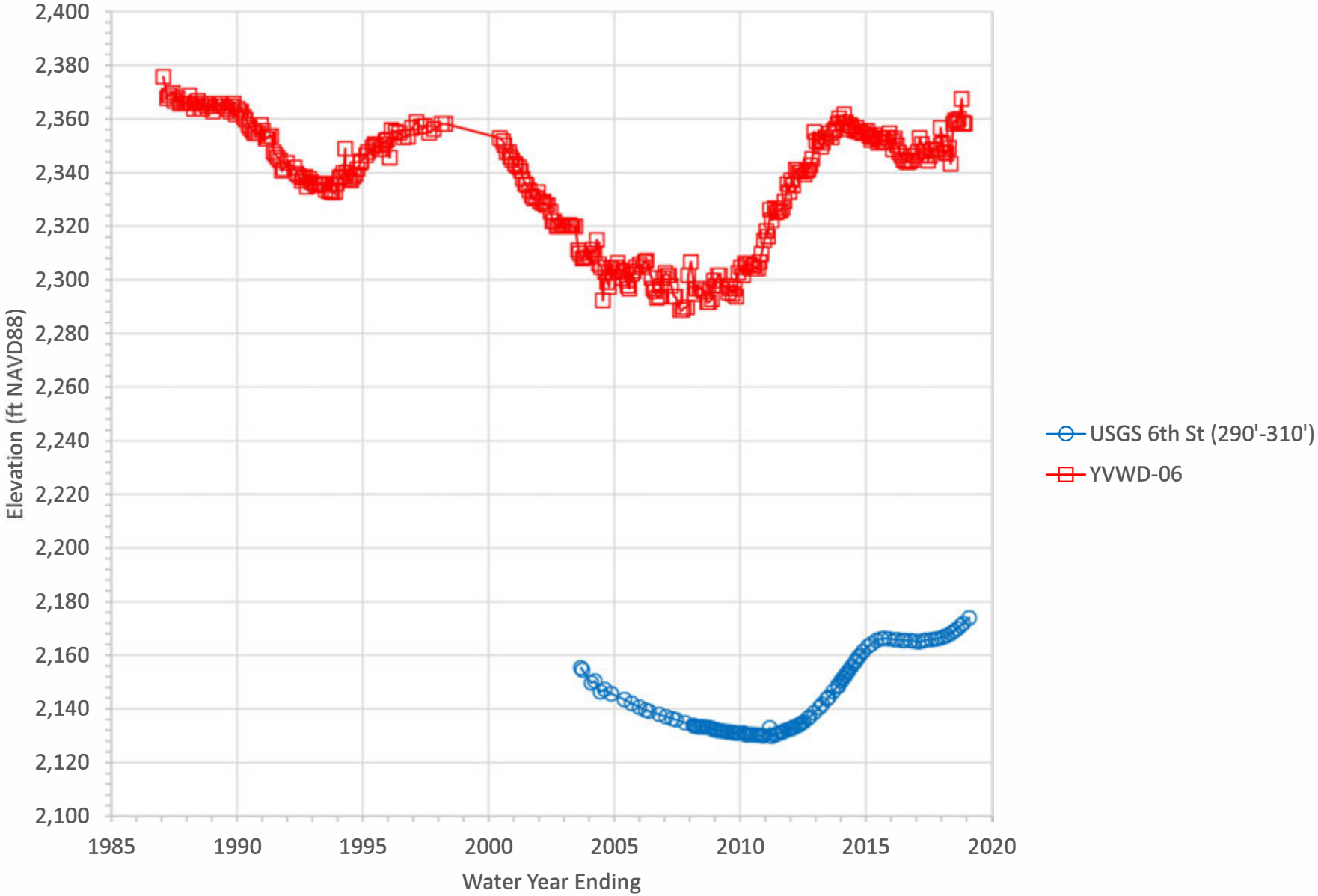

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Figure 2-66. Historical Groundwater Elevations in the North Bench Management Area

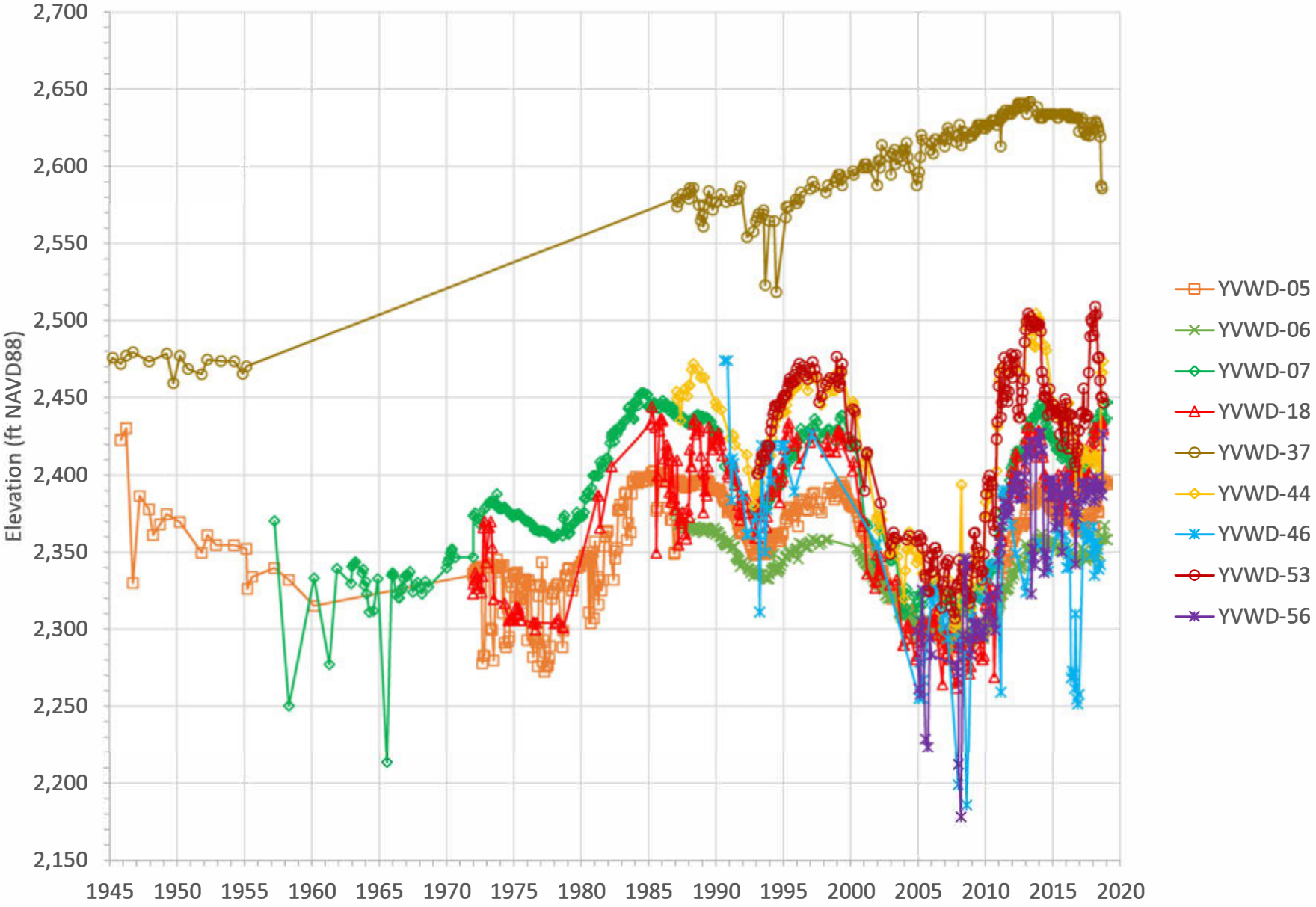

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Figure 2-67. Historical and Current Volume of Groundwater in Storage in the North Bench Management Area

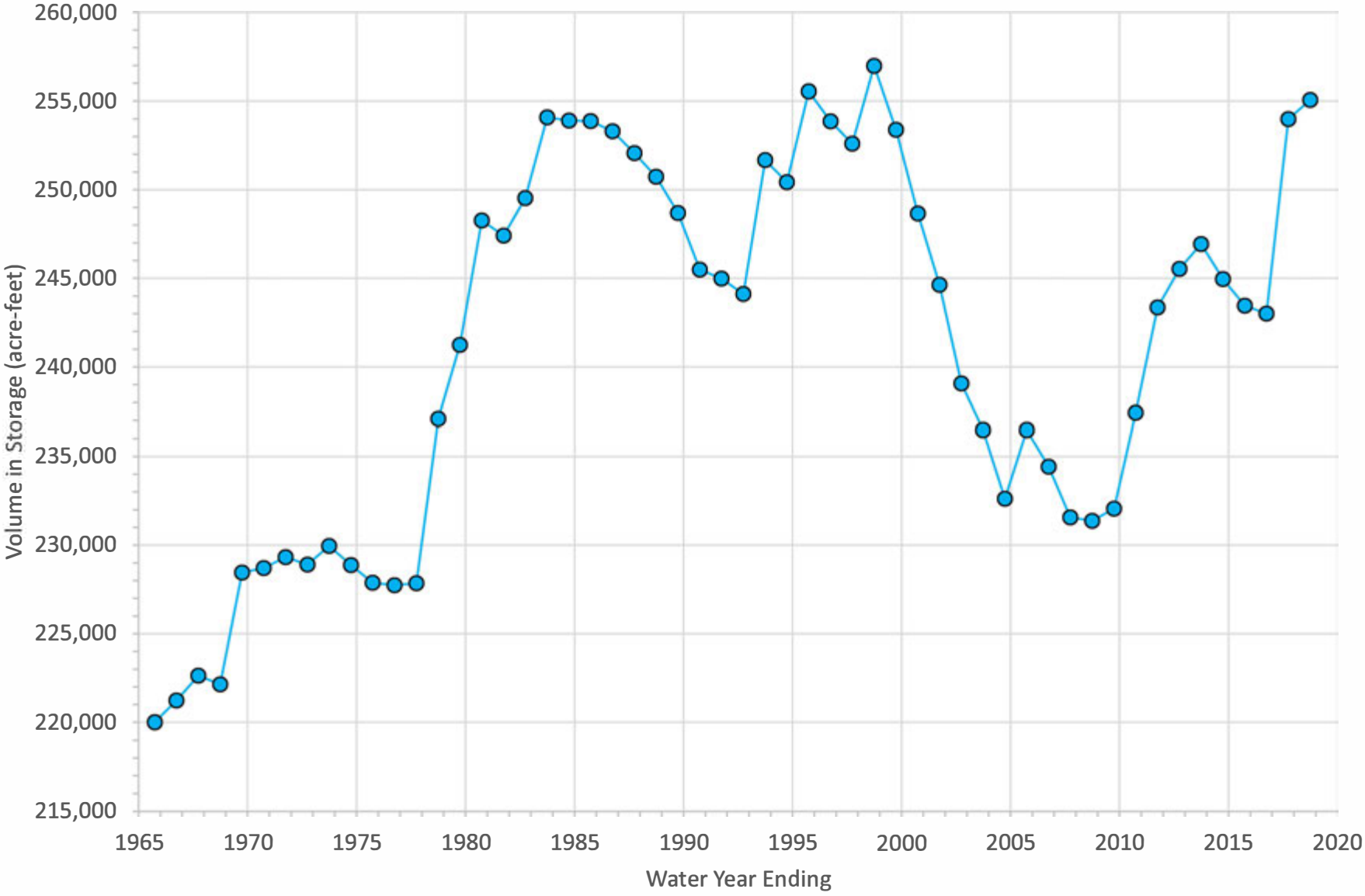

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Figure 2-68. Groundwater Elevations across the Banning Fault in the Calimesa Management Area

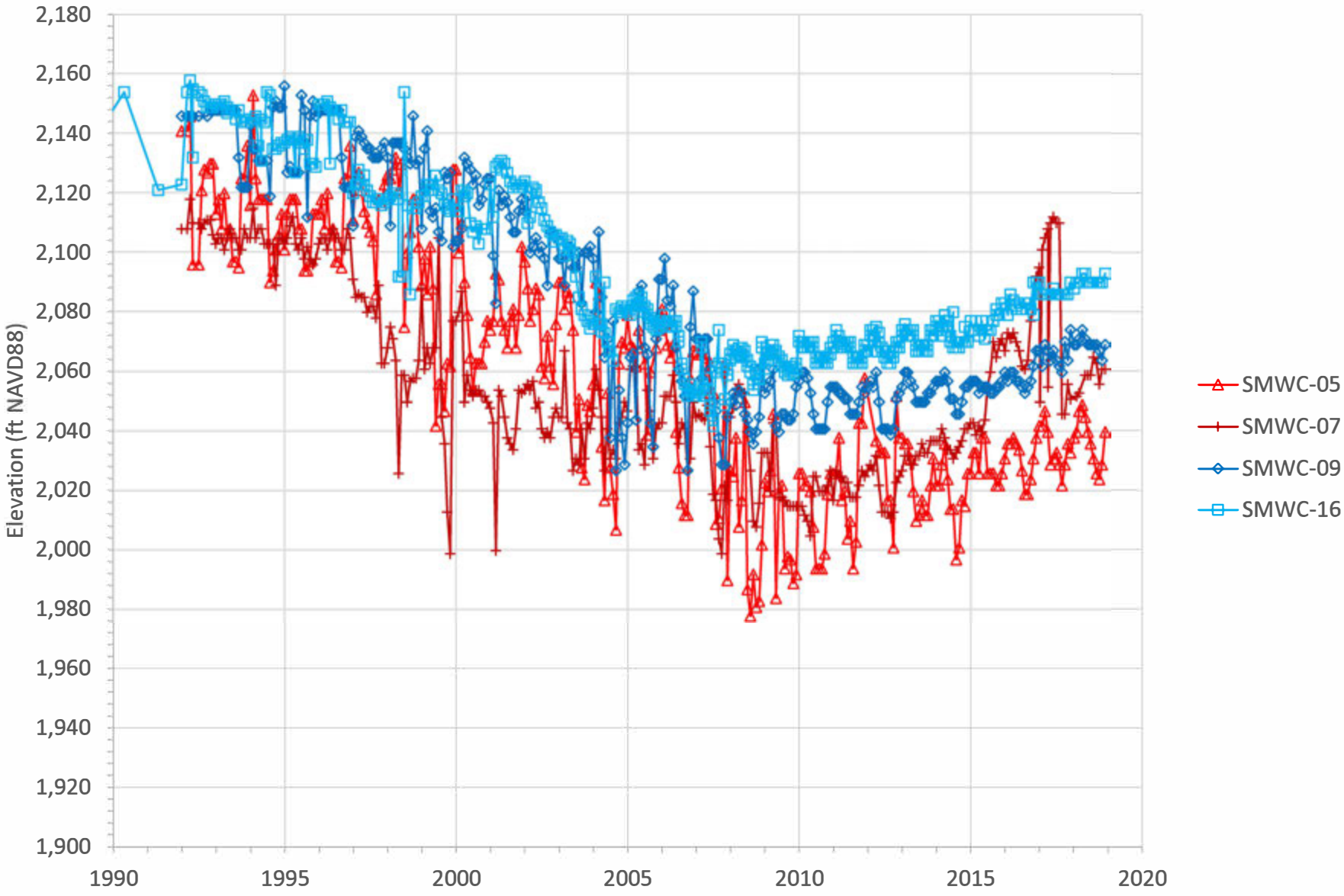

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Figure 2-69. Historical Groundwater Elevations in the Calimesa Management Area

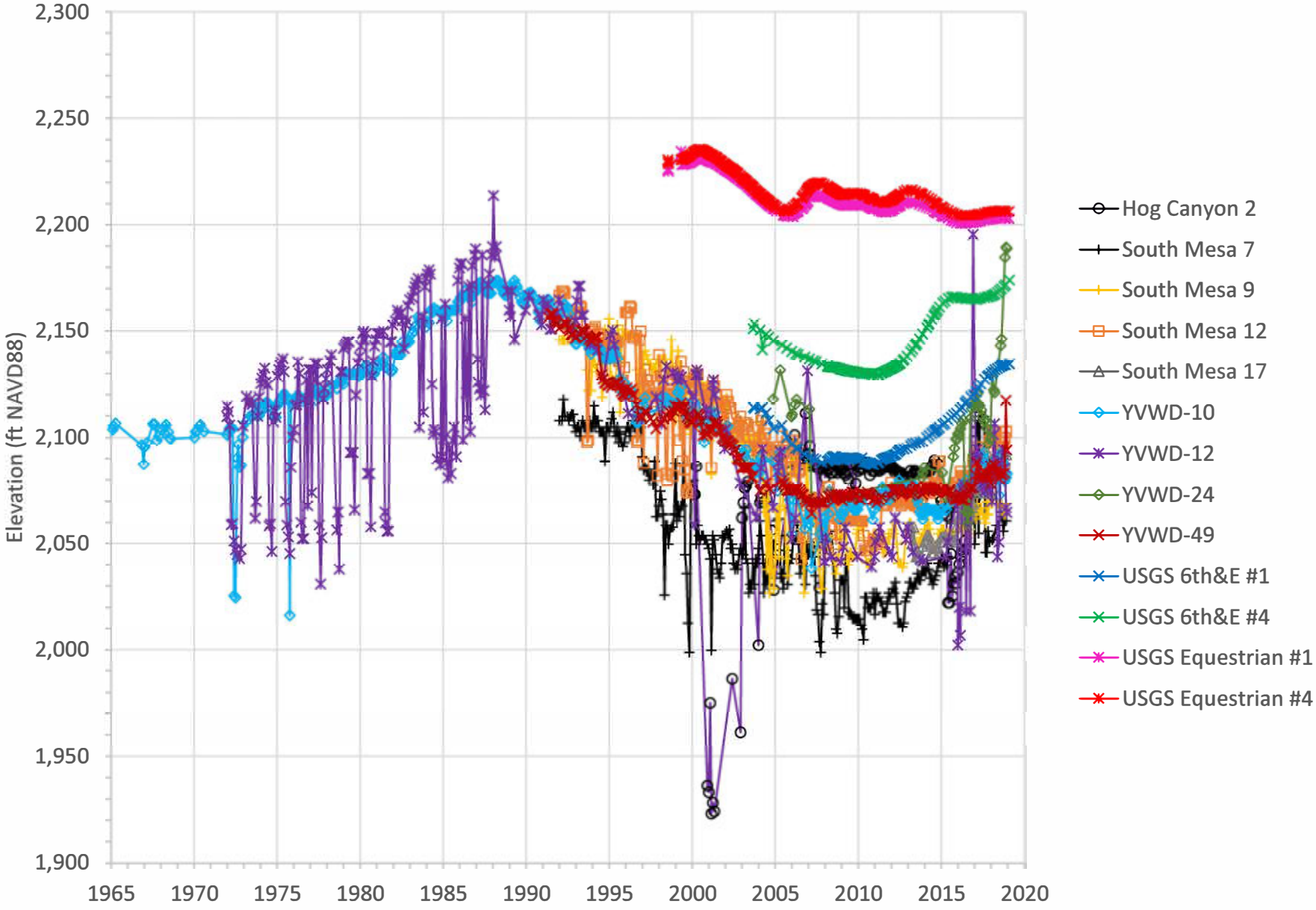

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Figure 2-70. Historical and Current Volume of Groundwater in Storage in the Calimesa Management Area

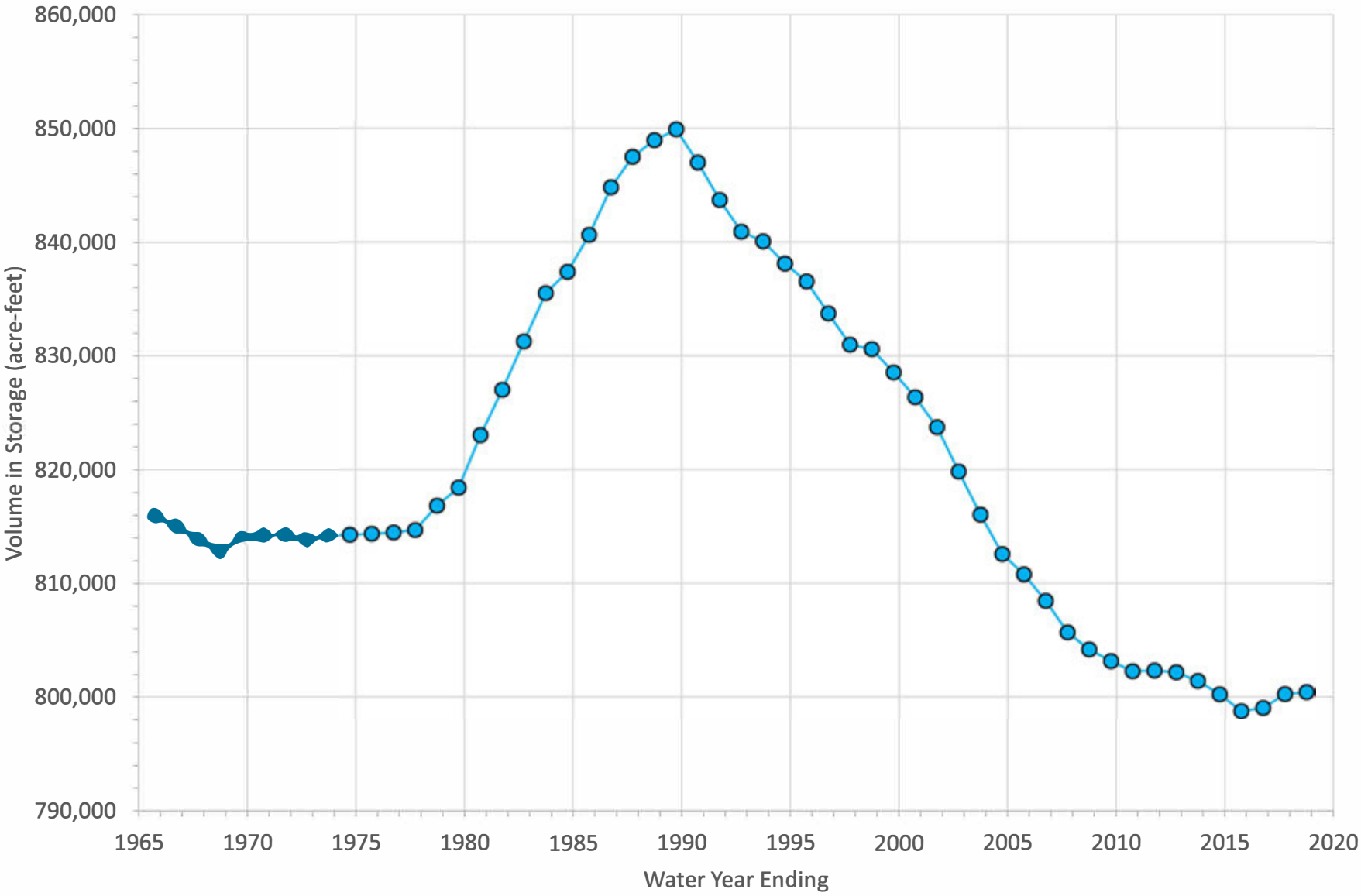

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Figure 2-71. Historical Groundwater Elevations in the Western Heights Management Area

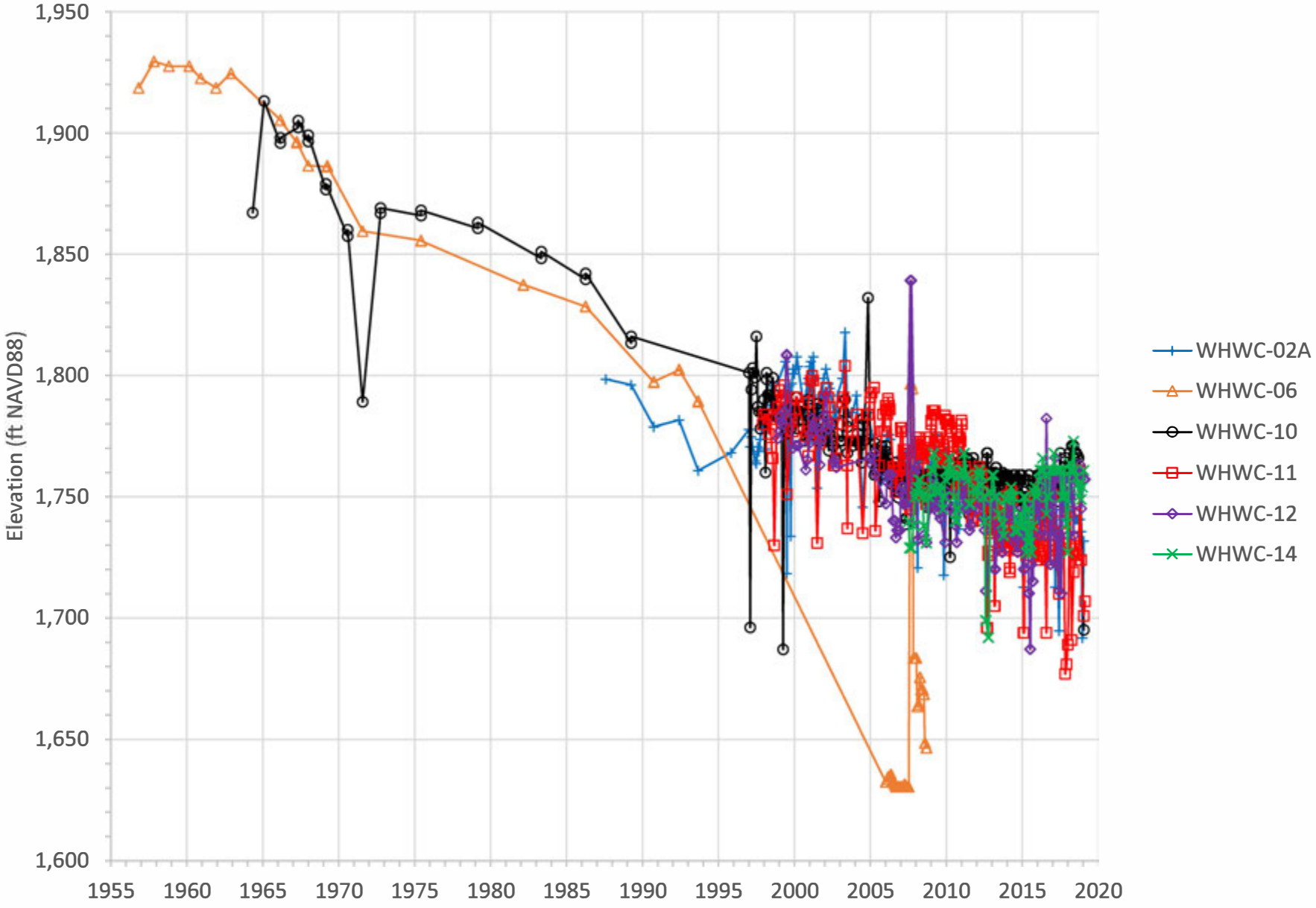

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Figure 2-72. Historical and Current Volume of Groundwater in Storage in the Western Heights Management Area

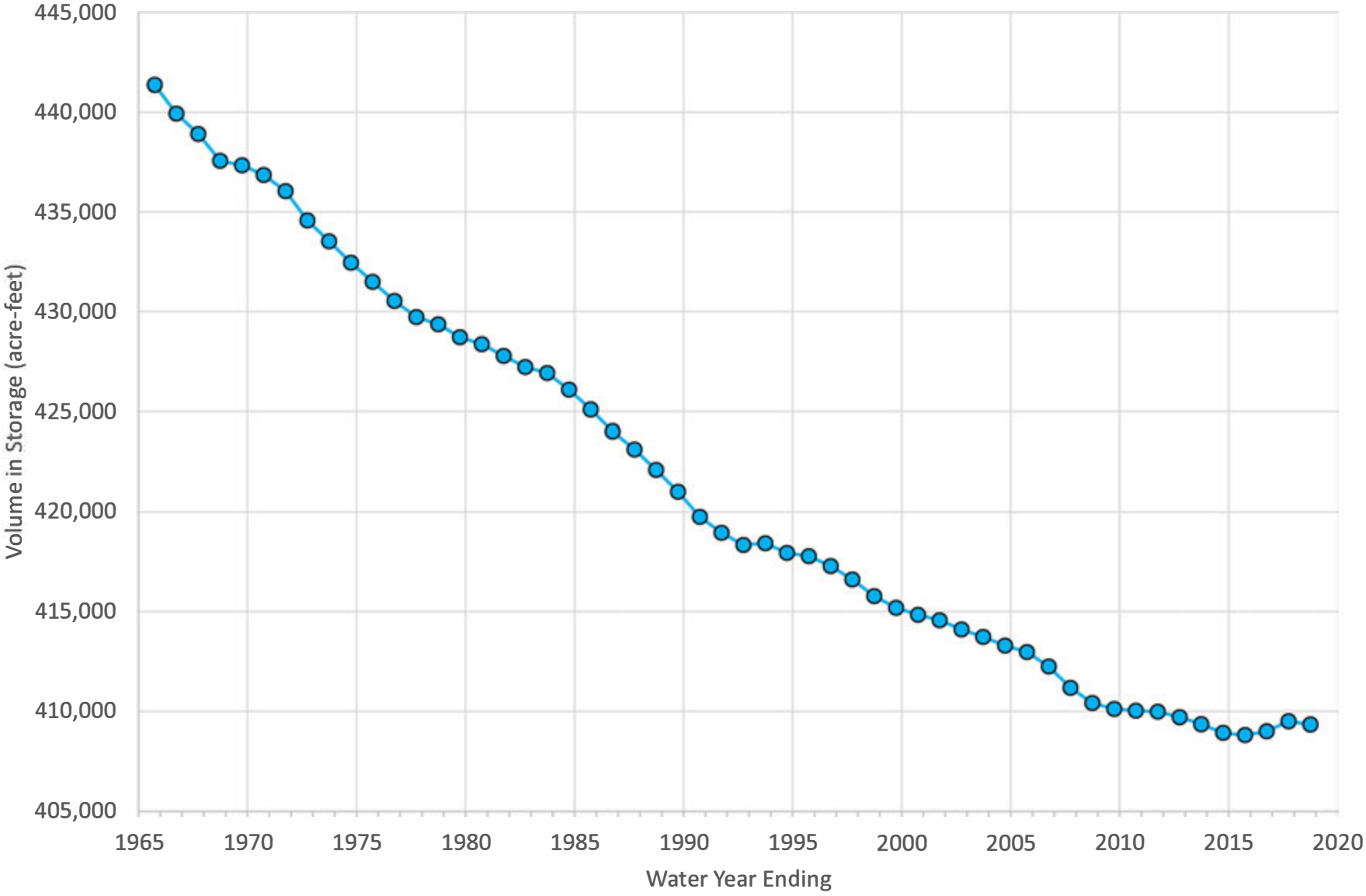

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Figure 2-73. Groundwater Elevations Measured in the San Timoteo Management Area

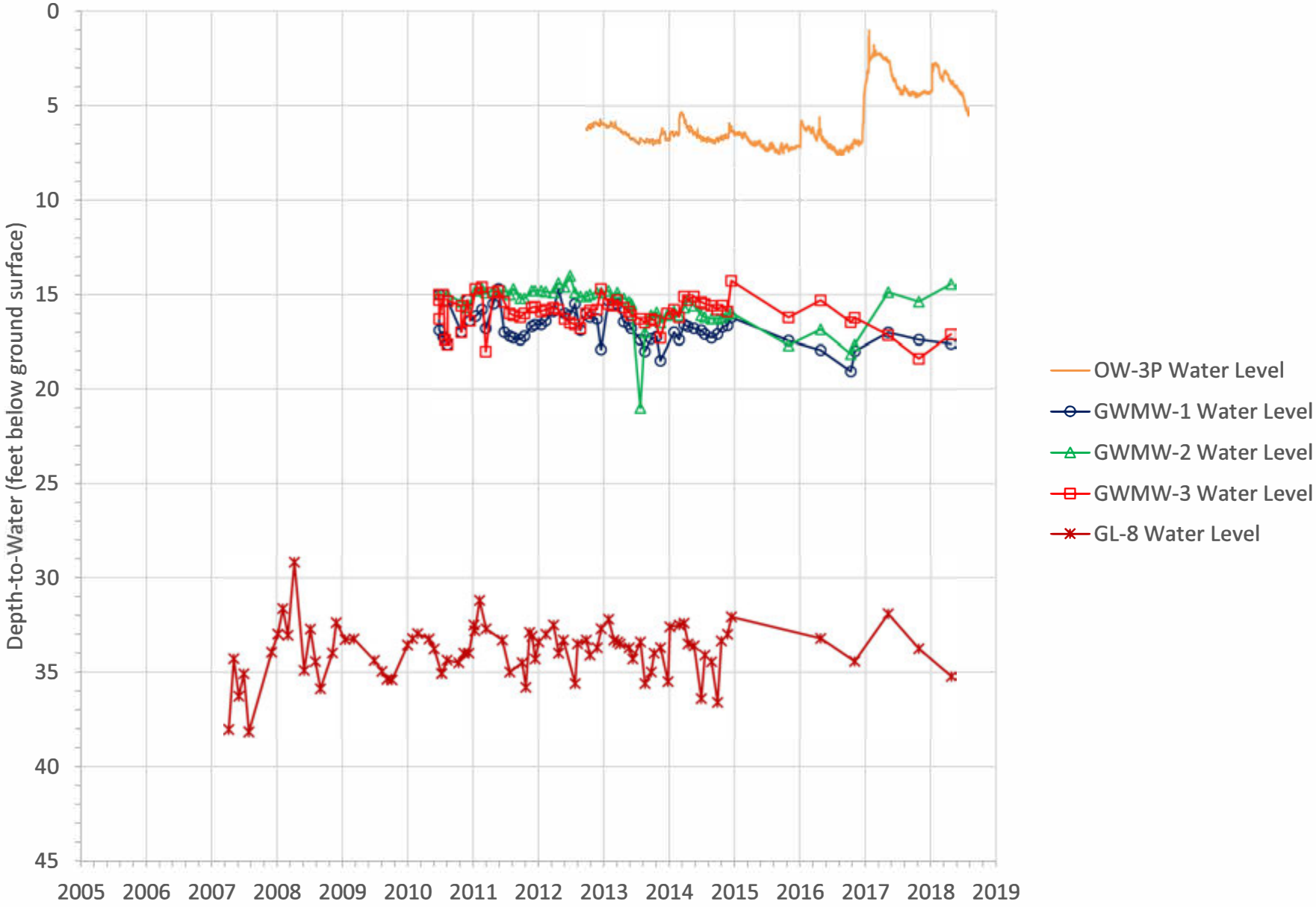

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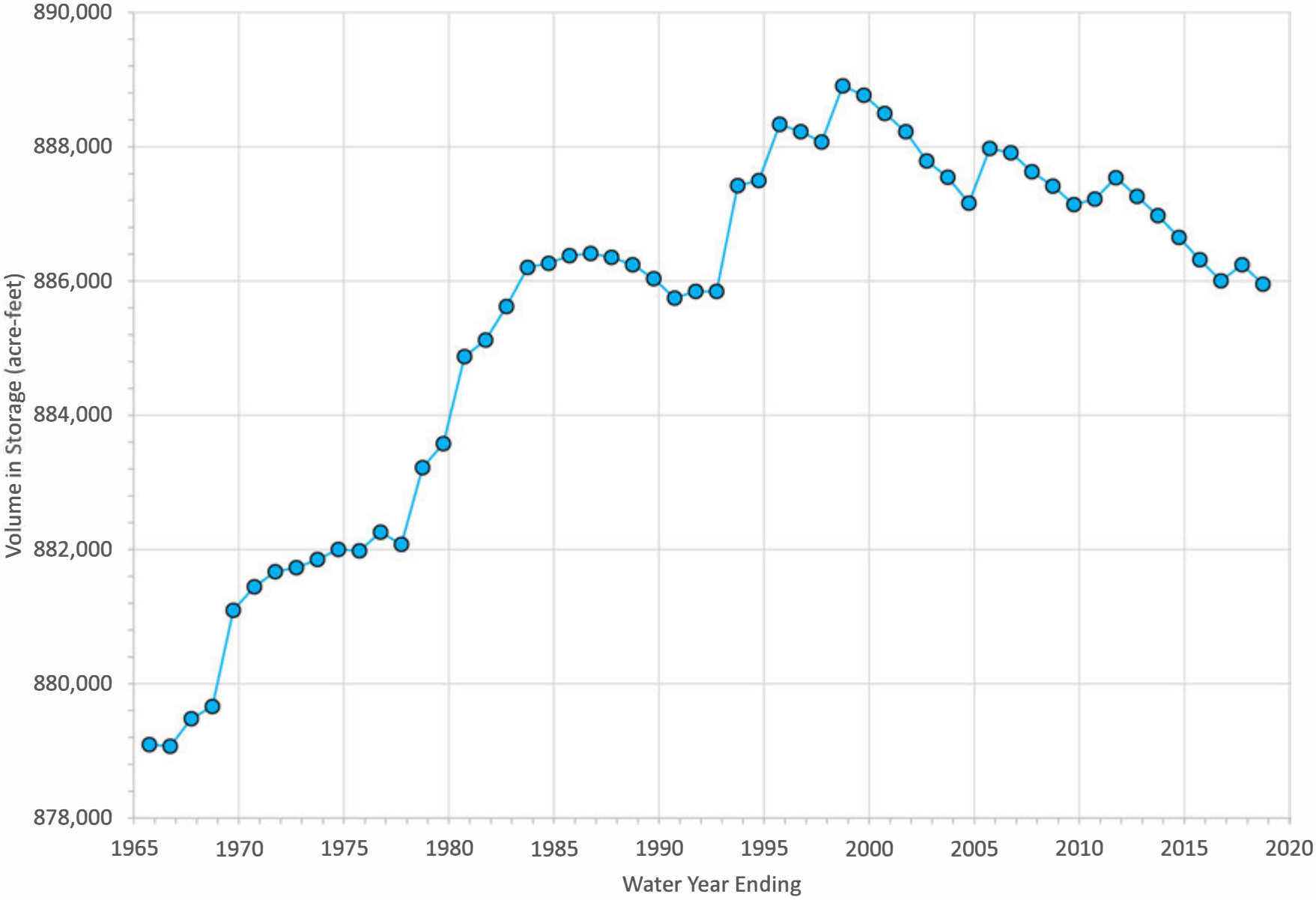
Figure 2-74. Historical and Current Volume of Groundwater in Storage in the San Timoteo Management Area



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3 Sustainable Management Criteria

3.1 Introduction to Sustainable Management Criteria

Subarticle 3 of Article 5 of the California Code of Regulations (CCR) Division 2 Chapter 1.5 (23 CCR, Sections 354.22–354.30) describes the criteria by which a Groundwater Sustainability Agency (GSA) will define conditions in a Groundwater Sustainability Plan (GSP) that constitute sustainable groundwater management. The following terms (in **bold**) were defined in the Sustainable Groundwater Management Act to guide a GSA in defining sustainability and the criteria used to evaluate whether a basin is being managed sustainably. A **sustainability goal** is defined by a GSA as a goal "that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline" (23 CCR, Section 354.24). **Undesirable results** are defined by a GSA and represent condition(s) in the basin when "significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin" (23 CCR, Section 354.26). **Minimum thresholds** are quantifiable measures or conditions in a basin that "represent a point in the basin that, if exceeded, may cause undesirable results" (23 CCR, Section 354.28). A minimum threshold is defined for each sustainability indicator applicable to the groundwater basin. **Measurable objectives** are interim milestones or quantifiable thresholds established to "achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin of the planning and implementation horizon" (23 CCR, Section 354.30). Measurable objectives shall be defined to "provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty" (23 CCR, Section 354.30).

3.2 Sustainability Goal

The sustainability goal for the Plan Area is to manage groundwater resources in a way that facilitates long-term sustainable use of groundwater in the Yucaipa Subbasin. Long-term sustainable management includes the following:

- Maintaining sufficient groundwater in storage to allow for ongoing groundwater production that meets the operational demands of South Mesa, South Mountain, Western Heights Water Company (WHWC), Yucaipa Valley Water District (YVWD), and private well users, and the regulatory commitments established in the Plan Area.
- Ensuring that groundwater production does not result in significant and unreasonable loss of groundwater-dependent ecosystems (GDEs).

The sustainability goal for the Plan Area was developed using historical groundwater elevations, groundwater in storage, and the identification of GDEs in the Plan Area as discussed in Chapter 2 of this GSP. The importation of State Water Project (SWP) water into the Yucaipa Subbasin (Subbasin) in 2003 has provided a supplemental source of water, which led to a reduction in groundwater production in the Yucaipa Subbasin. This supplemental source of water, which averaged approximately 8,000 acre-feet per year (AFY) since 2008, has led to an average reduction in groundwater production by 3,000 AFY. Consequently, groundwater levels have recovered between 50 feet in the Calimesa Management Area and 200 feet in the North Bench Management Area in the past 10 years, with the volume of groundwater in storage in the Subbasin increasing by approximately 18,000 AF. The cessation of the decline in groundwater levels observed from 1997 to 2007, and observed storage increase over the last 10 years, indicates that the Yucaipa GSA member agencies have been managing the groundwater resources in the Plan Area sustainably.

In 2017, nine agencies entered into an agreement to form the Yucaipa GSA, the GSA for the Plan Area. The nine agencies included four water purveyors (South Mesa, South Mountain, WHWC and YVWD), three municipalities (City of Calimesa, City of Redlands, and City of Yucaipa – the City Calimesa withdrew from the Yucaipa GSA in 2019), and two regionals (SBVMWD and SGPWA). The Yucaipa GSA, acting as the Yucaipa Subbasin GSA, has the authority to ensure long-term sustainable management of the groundwater resources within its jurisdiction. This authority includes adjusting groundwater production from all wells, not just municipal water supply wells in the Plan Area. The undesirable results, minimum thresholds, and measurable objectives discussed in this chapter (Sections 3.3 through 3.5) are intended to provide the metrics by which the Yucaipa GSA will decide whether pumping adjustments are necessary. The Yucaipa GSA will continue to work with stakeholders and regulatory agencies to further improve groundwater conditions within the Plan Area throughout the 50-year GSP planning and implementation horizon.

3.3 Undesirable Results

Under the Sustainable Groundwater Management Act (SGMA), undesirable results occur when groundwater conditions in the Plan Area cause significant and unreasonable effects to any of the six sustainability indicators:

- Chronic Lowering of Groundwater Levels
- Reduction of Groundwater Storage
- Degraded Water Quality
- Land Subsidence
- Depletions of Interconnected Surface Water
- Seawater Intrusion

The definition of significant and unreasonable for each of the six indicators is determined by the Yucaipa SGMA using the processes and criteria described in this GSP. The Yucaipa GSA is required to characterize undesirable results for each indicator, unless "undesirable results to one or more sustainability indicators are not present and are not likely to occur in the basin" (23 CCR, Section 354.26 [d]).

Based on the characterization of groundwater elevations, groundwater production, groundwater quality, and the hydrogeology of the principal aquifer in the Subbasin, the following sustainability indicators do not apply to the Plan Area:

- **Seawater Intrusion.** Seawater intrusion does not apply to the Plan Area because the Pacific Ocean is approximately 50 miles west of the Plan Area. The lowest elevation of the base of the principal aquifer (contact with the underlying crystalline bedrock) is 1,000 feet above North American Vertical Datum of 1988 (NAVD88), which is approximately 1,000 feet above mean sea level. Therefore, the Yucaipa Subbasin is not threatened by seawater intrusion nor the potential for seawater intrusion in the future.
- **Degradation of Water Quality**. Degradation of groundwater quality does not apply to the Plan Area as agriculture use has declined markedly since the 1950s to approximately 7% of the total land use, and the concerted efforts by the Yucaipa GSA member agencies to convert from septic systems to sanitary sewer systems has decreased nitrate and salt contributions to the aquifer. Limited contamination at some active remediation sites and the cessation of operations at the former Yucaipa Landfill have limited contamination to shallow, perched groundwater that has not impacted water quality in the principal aquifer.

The four sustainability indicators that do apply to the Yucaipa Subbasin, and which will be used to evaluate sustainable management in the Subbasin, include (1) chronic lowering of groundwater levels, (2) reduction of groundwater storage, (3) land subsidence, and (4) interconnected surface water. Descriptions of the undesirable results applicable to these four sustainability indicators are provided in Sections 3.3.1 through 3.3.6. Each section describes the cause of groundwater conditions throughout the Plan Area that would lead to undesirable results and the potential effects of undesirable results on the beneficial uses and users of groundwater in the Plan Area.

The criteria used to define groundwater conditions at which undesirable results occur is described in Section 3.3.7. These criteria are based on a quantitative combination of minimum threshold exceedances for each sustainability indicator.

3.3.1 Chronic Lowering of Groundwater Levels

Chronic lowering of groundwater levels indicating a depletion of supply is an undesirable result applicable to the Plan Area. The primary cause leading to chronic lowering of groundwater levels is groundwater production in excess of natural and artificial recharge over a period that contains both wet and dry water years. Chronic lowering of groundwater levels is also associated with a reduction of groundwater storage, potential significant and unreasonable effects to GDEs and land subsidence.

A chronic lowering of groundwater levels was observed in the Calimesa Management Area from 1988 to 2007 when annual groundwater production exceeded the estimated sustainable yield of 4,955 AFY in this management area (Figure 2-69). The average groundwater level in 1988 was approximately 2,180 feet above NAVD88. The average groundwater level in 2007 was approximately 2,060 feet above NAVD88, a decline of approximately 120 feet over 19 years at a rate of 6.3 feet per year. A chronic lowering of groundwater levels was observed in the Western Heights Management Area from the late 1960s to 2008 when annual groundwater production exceeded the estimated sustainable yield of 1,760 AFY for the management area (Figure 2-71). Groundwater levels declined from approximately 1,900 feet above NAVD88 in 1965 to approximately 1,750 feet above NAVD88 in 2010, a rate of decline of approximately 5.6 feet per year. The chronic lowering of groundwater levels observed in these two management areas occurred in periods with wet water years having annual precipitation ranging from 167% to 231% of mean annual rainfall (Figure 2-35).

Groundwater levels in the North Bench Management Area fluctuated in response to the climatic variations observed between wet and dry water year types. However, groundwater levels markedly declined from 1999 to 2007 when groundwater production exceeded the estimated sustainable yield of 3,940 AFY for the North Bench Management Area, a period when six of the nine water years were characterized as dry and critically dry water year types (Figure 2-66). During this period, groundwater levels fell from an average 2,450 feet above NAVD88 to 2,300 feet above NAVD88, a rate of decline of approximately 18 feet per year. Groundwater levels after 2007 recovered to levels observed in 1999 or higher as the importation of SWP water supplemented the water supply in the Plan Area and groundwater production subsequently declined to less than the estimated sustainable yield of 3,940 AFY for the North Bench Management Area.

There are no municipal supply wells in the San Timoteo Management Area. Groundwater levels in San Timoteo Canyon are shallow and sustain the riparian GDE along San Timoteo Creek. A deeper, confined aquifer unit is artesian. No chronic lowering of groundwater levels has been observed in the San Timoteo Management Area.

Chronic lowering of groundwater levels may impact beneficial uses of groundwater in the Plan Area. Chronic lowering of groundwater levels may impact well operations in the Subbasin and cause undesirable results if groundwater levels drop to elevations below which:

- The volume of groundwater available in storage is insufficient to meet public water supply demands.
- Subsidence that substantially interferes with land use is induced.
- Depletion of interconnected surface water that leads to a decline of the water table that threatens GDEs.

Well construction information, production history, and historical water levels were used to develop sustainable management criteria for the Calimesa, North Bench, San Timoteo, and Western Heights Management Areas. The minimum thresholds defined for the Calimesa, North Bench, and Western Heights Management Areas were based on the condition when groundwater elevations declined below a drought buffer established for each management area (Section 3.4, Minimum Thresholds). Therefore, the criterion used to define undesirable results associated with a chronic lowering of groundwater levels is a groundwater elevation measured below a drought buffer at a network of representative monitoring points (RMPs). The undesirable result defined for the San Timoteo Management Area was based on the condition when shallow groundwater levels supporting GDEs fell below 30 feet below ground surface (bgs) as a result of pumping from the principal aquifer.

Groundwater elevations that decline below a drought buffer or to levels that threaten GDEs are lower than historical low water levels. However, groundwater elevations that drop below historical low water levels may be required to ensure ongoing beneficial use of groundwater for municipal supplies. The sustainability criteria established in this GSP allow for groundwater levels to fall below the historical lows observed in the four management areas in the Plan Area, but under such conditions the Yucaipa GSA will implement management actions to reduce the net loss of groundwater from the management areas by reducing groundwater extractions, supplement the groundwater supply with other sources of water (e.g., SWP water, recycled water, increased stormwater capture for recharge), or a combination of both (Section 4.2, Management Actions).

3.3.2 Reduction of Groundwater Storage

Significant and unreasonable reduction of groundwater storage is an undesirable result applicable to the Plan Area. Reduction of groundwater storage is associated with a chronic lowering of groundwater levels, and potential significant and unreasonable effects to GDEs and land subsidence. The primary cause for a reduction of groundwater storage is groundwater production in excess of natural and artificial recharge during a period containing both wet and dry water years. Significant and unreasonable reduction of groundwater storage would impact beneficial uses and users of groundwater in the Plan Area by limiting the volume of groundwater available for municipal, private and agricultural uses.

Groundwater elevations in the Plan Area will be used to evaluate whether significant and unreasonable reduction of groundwater storage occurs. Groundwater elevations, and the corresponding volume of groundwater storage, have either stabilized or increased in the Plan Area since 2007 with the importation of SWP water as a supplemental water supply and subsequent reduction in groundwater production (see Section 2.7). The Yucaipa Integrated Hydrologic Model (YIHM) indicates that groundwater management from 2009 to 2014 resulted in an increase in groundwater storage of approximately 8,300 AF in the Yucaipa Subbasin.

Under projected operations, groundwater in storage is estimated to increase by approximately 23,300 AF to 42,300 AF under the Future Baseline and Future Baseline with Climate Change I scenarios, or decrease by approximately 4,200 AF under the Future Baseline with Climate Change II scenario over the 50-year planning and implementation horizon for this GSP (see Section 2.8.7).

Well construction information, production history, and historical water levels were used to develop sustainable management criteria for the Western Heights, North Bench, Calimesa and San Timoteo Management Areas to indicate when significant and unreasonable reduction of groundwater in storage would occur. The criterion used to define an undesirable result associated with reduction of groundwater storage for each management area is when groundwater levels fall below a drought buffer established for each management area. Groundwater elevations that

represent the condition below the drought buffer are lower than historical low water levels. However, reduction of groundwater storage beyond that previously experienced in the Plan Area may be required to maintain operational flexibility to ensure ongoing beneficial use of groundwater.

3.3.3 Land Subsidence

Land subsidence resulting from groundwater withdrawal is an undesirable result applicable to the Plan Area. Groundwater levels that fall below historical low levels may cause subsidence because groundwater acts to reduce the effective stress needed to maintain pore-structures in the aquifer. As groundwater levels decline, pressure on the aquifer matrix increases, which may cause the pore-structure to collapse, causing the land surface to subside. Land subsidence resulting from groundwater withdrawals that substantially interferes with surface land uses has the potential to impact beneficial uses and users of groundwater in the Plan Area by negatively impacting surface infrastructure including roads, pipelines, and buildings.

Historical records of land subsidence in the Plan Area do not indicate that land subsidence resulting from past groundwater production from the principal aquifer has caused an undesirable result. Land subsidence data obtained from the SGMA Data Portal (sgma.water.ca.gov) indicated a range of subsidence for the Plan Area from 0.0 feet to 0.054 feet, or 0.65 inches, from June 2015 to October 1, 2018 (Figure 2-55). This does not constitute a significant and unreasonable vertical displacement of land surface that "substantially interferes with surface land uses and may lead to undesirable results" (23 CCR, Section 354.28[c][5]). Land subsidence observed in the Plan Area was attributed to past geological activity and displacement (Section 2.7.7). For instance, land displacement data obtained from a GPS station located at the Crafton Hills College in the Western Heights Management Area from January 1996 through September 2018 indicated a positive displacement of 0.18 feet (Figure 3-1, 31-Day Running Average of Vertical Displacement Measured at the Crafton Hills College). This displacement represents a possible uplift of the Crafton Hills as a result of tectonic activity associated with the Crafton Hills Fault Zone. No land subsidence associated with groundwater production was indicated by this GPS station.

Because the minimum thresholds established in Section 3.4 are based on groundwater elevations at or below the historical low groundwater elevations observed in the Plan Area, there exists the potential for land subsidence to occur should groundwater levels fall below the historical lows over a long period. Subsidence related to declining groundwater levels as a result of groundwater withdrawals cannot be directly measured in the Plan Area, so the minimum thresholds established for the chronic lowering of groundwater levels will be used as a surrogate for direct measurements of land subsidence. Should groundwater levels fall below the historical lows and persist at such a level for more than 12 months, then the Yucaipa GSA will refer to the InSAR data set included in the SGMA Data Portal and periodically obtain future data to compare to the baseline dataset compiled from June 2015 to October 1, 2018. This evaluation will determine if land subsidence has occurred as a result of groundwater withdrawals from the principal aquifer (Section 2.7.7).

3.3.4 Depletions of Interconnected Surface Water

Loss of interconnected surface water is an undesirable result that may be applicable to the Plan Area if groundwater level declines result in a significant and unreasonable reduction in the rate of the volume of surface water caused by groundwater production and/or the loss of GDEs. Observation wells set in the principal aquifer in the reach of San Timoteo Creek in the Plan Area are under artesian conditions, indicating an upward hydraulic gradient, and are interconnected to surface water and groundwater. There are no municipal water supply wells operating in the San

Timoteo Creek area. There are two known irrigation supply wells. Historical groundwater elevations measured at observation wells and one of the irrigation wells indicate that groundwater elevations have been consistent. Any future new production from the principal aquifer in the San Timoteo Creek area will include aquifer testing to evaluate whether such production will cause a significant and unreasonable depletion in surface water flow.

The NCCAG dataset reviewed for this GSP identified 37 habitats within the Plan Area that consist of common phreatophytes. These habitats were grouped into "GDE Evaluation Units" based on the locations of the habitats. Three GDE Evaluation Units were identified as having GDEs within the Plan Area (Section 2.7.8). These habitats lie along the banks of Oak Glen Creek in the northern part of the Oak Glen subarea, Wildwood Canyon Creek in the southeastern part of the Oak Glen subarea, and San Timoteo Creek in the Live Oak subarea (Figure 2-56). The GDEs adjacent to Oak Glen Creek and Wildwood Canyon Creek occur along the upstream reaches of these creeks. The GDE located along San Timoteo Creek is located downstream of its confluence with Yucaipa Creek. Other GDE Evaluation Units were characterized as either potential GDEs or ecosystems not dependent on groundwater.

Groundwater level declines have the potential to negatively impact the GDEs along the banks of Oak Glen Creek, Wildwood Canyon Creek, and San Timoteo Creek. These GDEs cover an area of approximately 268 acres. A significant and unreasonable loss of GDE habitat may occur if there is a long-term decline in groundwater levels below 30 feet bgs. Historical groundwater level data collected at shallow groundwater observation wells completed adjacent to Oak Glen Creek and San Timoteo Creek have demonstrated seasonal fluctuations in response to major precipitation events and subsequent runoff. Long-term trends in groundwater levels have been stable. The San Timoteo Habitat Monitoring Program (see Section 1.5.1.2) includes a management action to maintain shallow groundwater at 10 feet bgs, which is more stringent and protective of the GDE habitat than the 30 feet bgs characterizing undesirable results.

The GDEs located in the upper elevations of Wildwood Canyon and Oak Glen are sustained by shallow groundwater not influenced by pumping. The remaining potential GDEs in the Plan Area are not adjacent to current groundwater production wells, and groundwater levels in the vicinity of these potential GDEs are not known. Because the potential GDEs are not located near existing or currently planned groundwater extraction wells, it is not anticipated that they will be impacted by future extractions within the Plan Area. However, in the event that future groundwater production is planned within a mile of a potential GDE, additional investigations will be performed to identify whether the potential GDE relies on groundwater, and whether the planned production may negatively impact the potential GDE. If the potential GDE is found to rely on groundwater and planned production may impact groundwater levels in the vicinity of the potential GDE, sustainability criteria related to the depletion of interconnected surface water will be established to protect against the significant and unreasonable loss of GDE habitat.

3.3.5 Degraded Water Quality

Impacts to groundwater supplies as a result of degradation of groundwater quality is not an undesirable result applicable to the Plan Area. The Yucaipa GSA member agencies have implemented programs to reduce the use of fertilizers, self-generating water softeners, and septic systems to improve groundwater quality, while at the same time increasing the capacities of wastewater treatment facilities to reduce TDS and nitrate concentrations of tertiary treated effluent (i.e., recycled water) discharged to surface waters and used for irrigation purposes (Section 2.7.4).

YVWD implemented a program in the 1980s and 1990s to provide sanitary sewer service throughout the Yucaipa Subbasin, which included an incentive program to abandon septic systems and connect to a collector sewer main. YVWD issued an ordinance to prohibit the use of self-generating water softeners. The goal of these two efforts was

to reduce the concentrations of TDS and nitrate in the wastewater directly to the Subbasin via septic systems and to the sanitary sewer systems. Some septic systems remain in the Western Heights Management Area, but wastewater flows from those systems impact groundwater quality in a shallow, perched aquifer and have not impaired water quality in the principal aquifer.

Agricultural use in the Plan Area has declined from a peak in the 1930s and 1940s (approximately 4,000 AFY) to approximately 400 AFY in the 2000s over 7% of the land use in the Plan Area. Other occurrences of groundwater quality degradation were localized and confined to shallow groundwater in a perched zone in the Western Heights subarea and at the former Yucaipa Landfill in the Crafton subarea (Section 2.7.5). Contamination observed in the shallow groundwater at these locations has not impaired water quality in the principal aquifer.

The Regional Board adopted order number R8-2014-0005 in 2014, an amendment to the Basin Plan that revised the maximum benefit commitments in the Yucaipa, San Timoteo and Beaumont GMZs. The Yucaipa GMZ includes the North Bench, Western Heights and most of the Calimesa (area north of the Banning Fault) Management Areas. The San Timoteo GMZ includes the San Timoteo Management Area and a portion of the Live Oak and Singleton hydrogeological subareas in the Calimesa Management Area (Figure 2-64). The maximum benefit water quality objectives established for TDS and nitrate (as N) for these GMZs were defined as the water quality objectives in the Basin Plan.

YVWD has implemented reverse osmosis and denitrification treatment processes at the WRWRF that have markedly reduced TDS and nitrate concentrations in the tertiary treated effluent (i.e., recycled water) discharged to San Timoteo Creek or served via YVWD's recycled water distribution system. The implementation of RO and denitrification treatment at the YVWD WRWRF facility has reduced the TDS and nitrate concentrations in recycled water to an average <300 mg/L and 2.8 mg/L, respectively. The maximum benefit water quality objectives (and Basin Plan water quality objectives) for TDS and nitrate (as N) are 370 mg/L and 5.0 mg/L, respectively, in the Yucaipa GMZ. The maximum benefit water quality objectives (and Basin Plan water quality objectives) for TDS and nitrate (as N) in the San Timoteo GMZ are 400 mg/L and 5.0 mg/L, respectively. The application of recycled water for irrigation purposes has not increased TDS and nitrate (as N) concentrations in the principal aquifer.

In summary, concerted efforts by the Yucaipa GSA member agencies to improve water quality by removing septic systems and connecting users to sanitary sewer systems, increasing wastewater treatment capacities and implementing advanced treatment technologies, along with a marked reduction in water use for agricultural purposes, has improved water quality throughout the Subbasin. Water quality issues only occur in localized areas (e.g., former Yucaipa landfill, active remediation of shallow groundwater in the Western Heights Management Area) that have not impacted water quality in the principal aquifer. Therefore, there are no water quality issues that may affect the long-term supply and beneficial uses of groundwater produced from the principal aquifer.

3.3.6 Seawater Intrusion

The Plan Area is approximately 50 miles inland and approximately 1,300 feet higher in elevation at its lowest point to the Pacific Ocean. Because operations in the Plan Area do not impact groundwater elevations near the coast, seawater intrusion is not defined as an undesirable result in the Plan Area.

3.3.7 Defining Undesirable Results

Groundwater conditions in the Plan Area are currently monitored with a network of 77 wells (Table 3-1; Section 3.6, Monitoring Network). In total, 36 of these wells were selected as RMPs for the Plan Area (Section 3.6.5, Representative Monitoring). The Plan Area is divided into four Management Areas: North Bench, Calimesa, Western Heights, and San Timoteo (Section 2.9). Eight YVWD wells and two USGS wells (Wilson Creek nested wells) were selected as the RMPs for the North Bench Management Area. Four YVWD wells, four South Mesa wells, one South Mountain well, and four USGS wells (two from the 6th Street and two from the Equestrian Park nested wells) were selected as the RMPs for the Calimesa Management Area. Five WHWC wells and two USGS wells (Dunlap nested wells) were selected as the RMPs for the Western Heights Management Area. The San Timoteo Management Area does not currently have municipal supply wells operating within it but does include six shallow groundwater observation wells that have been designated as RMPs to evaluate conditions relative to the GDEs identified within it (Table 3-2).

The 36 wells selected to evaluate the sustainable management criteria in the North Bench, Calimesa, Western Heights, and San Timoteo Management Areas will be used to measure static groundwater levels to characterize conditions in the four management areas. Although groundwater elevation measurements will continue to be collected from the broader monitoring network, minimum thresholds used to assess whether the Plan Area is experiencing undesirable results were only selected at the 36 RMPs.

Undesirable results in the Plan Area will be identified by comparing groundwater elevation measurements from these 36 RMPs to their respective minimum thresholds for the applicable sustainability indicators established in each management area. Undesirable results related to chronic declines in groundwater levels and significant and unreasonable loss of groundwater storage because of groundwater withdrawals from the principal aquifer will be evaluated for each management area using the 36 RMPs. The undesirable results related to significant and unreasonable loss of surface water interconnection in the San Timoteo Management area will be evaluated using groundwater levels measured at five shallow observation wells owned by YVWD and one private irrigation well. An undesirable result is characterized when groundwater elevations at 50% or more of the RMPs in a management area for two consecutive years decline below their associated minimum threshold levels. Section 4.2 details the management actions that will be implemented when conditions decline below the measurable objective and minimum threshold in each management area.

Table 3-1. Wells in the Groundwater Monitoring Network for the Yucaipa Subbasin

Well ID	State Well Number (from DWR)	Latitude	Longitude	Well Owner	Well Use Type	Well Status	Management Area	Hydrogeological Subarea	GSP Monitoring Network	Groundwater Elevation Data Collection	Groundwater Quality Data Collection	Groundwater Production Data Collection
Chicken Hill	—	34.02536	−117.078245	South Mountain	Irrigation	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
Chlorinator	—	34.054666	−116.982175	YVWD	Monitoring	Active	North Bench	Oak Glen	Yes	Yes	No	No
GL-8	—	34.019697	−117.189954	Private Owner	Irrigation	Active	San Timoteo	Live Oak	Yes	Yes	No	No
GWMW-1	02S03W14xxx	34.023129	−117.19702	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No
GWMW-2	02S03W14xxx	34.01425	−117.179388	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No
GWMW-3	02S03W04xxx	34.002819	−117.16431	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No
GWMW-5A	02S03W04xxx	34.0235	−117.197459	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No
GWMW-5B	02S03W04xxx	34.0235	−117.197459	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No
GWMW-5C	02S03W04xxx	34.0235	−117.197459	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No
Hog Canyon 2	02S02W10B002S	34.017388	−117.077507	South Mountain	Irrigation	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
South Mesa 01	02S02W14xxx	33.995246	−117.056387	South Mesa	Municipal	Inactive, Measure Only	Calimesa	Live Oak	Yes	Yes	No	No
South Mesa 04	02S02W14R03	33.989679	−117.055096	South Mesa	Municipal	Active	Outside Subbasin	Outside Subbasin	Yes	No	No	Yes
South Mesa 05	02S02W15H	33.996753	−117.069131	South Mesa	Municipal	Active	Calimesa	Live Oak	Yes	Yes	Yes	Yes
South Mesa 07	02S02W15A03	34.000936	−117.073543	South Mesa	Municipal	Active	Calimesa	Live Oak	Yes	Yes	Yes	Yes
South Mesa 09	02S02W15A04	34.003344	−117.069334	South Mesa	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
South Mesa 11	02S02W14C01	34.003878	−117.062745	South Mesa	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
South Mesa 12	02S02W11M01	34.00902	−117.064891	South Mesa	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
South Mesa 16	02S02W14D01	34.002029	−117.066197	South Mesa	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
South Mesa 17	02S02W11xxx	34.013077	−117.066467	South Mesa	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
USGS 6th St #1 (870′–930′)	02S02W02F02	34.02676944	−117.0608778	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No
USGS 6th St #2 (730′–750′)	02S02W02F03	34.02676944	−117.0608778	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No
USGS 6th St #3 (500′–540′)	02S02W02F04	34.02676944	−117.0608778	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No
USGS 6th St #4 (380′–400′)	02S02W02F05	34.02676944	−117.0608778	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No
USGS 6th St #5 (290′–310′)	02S02W02F06	34.02676944	−117.0608778	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No
USGS Dunlap #1 (1010′–1050′)	02S02W04L02	34.0249778	−117.0970917	USGS	Monitoring	Active	Western Heights	Western Heights	Yes	Yes	No	No
USGS Dunlap #2 (830′–850′)	02S02W04L03	34.0249778	−117.0970917	USGS	Monitoring	Active	Western Heights	Western Heights	Yes	Yes	No	No
USGS Dunlap #3 (590′–610′)	02S02W04L04	34.0249778	−117.0970917	USGS	Monitoring	Active	Western Heights	Western Heights	Yes	Yes	No	No
USGS Dunlap #4 (440′–460′)	02S02W04L05	34.0249778	−117.0970917	USGS	Monitoring	Active	Western Heights	Western Heights	Yes	Yes	No	No
USGS Dunlap #5 (230′–250′)	02S02W04L06	34.0249778	−117.0970917	USGS	Monitoring	Active	Western Heights	Western Heights	Yes	Yes	No	No
USGS Equestrian Park #1 (830′–850′)	02S02W12H01	34.01291667	−117.0363917	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No

Table 3-1. Wells in the Groundwater Monitoring Network for the Yucaipa Subbasin

Well ID	State Well Number (from DWR)	Latitude	Longitude	Well Owner	Well Use Type	Well Status	Management Area	Hydrogeological Subarea	GSP Monitoring Network	Groundwater Elevation Data Collection	Groundwater Quality Data Collection	Groundwater Production Data Collection
USGS Equestrian Park #2 (635′–655′)	02S02W12H02	34.01291667	−117.0363917	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No
USGS Equestrian Park #3 (510′–530′)	02S02W12H03	34.01291667	−117.0363917	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No
USGS Equestrian Park #4 (380′–400′)	02S02W12H04	34.01291667	−117.0363917	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No
USGS Wilson Creek #1 (820′–840′)	01S02W36A02S	34.046825	−117.0358778	USGS	Monitoring	Active	North Bench	Gateway	Yes	Yes	No	No
USGS Wilson Creek #2 (640′–660′)	01S02W36A03	34.046825	−117.0358778	USGS	Monitoring	Active	North Bench	Gateway	Yes	Yes	No	No
USGS Wilson Creek #3 (500′–520′)	01S02W36A04S	34.046825	−117.0358778	USGS	Monitoring	Active	North Bench	Gateway	Yes	Yes	No	No
USGS Wilson Creek #4 (350′–370′)	01S02W36A05S	34.046825	−117.0358778	USGS	Monitoring	Active	North Bench	Gateway	Yes	Yes	No	No
WHWC-06	02S02W03E01	34.030084	−117.082361	WHWC	Municipal	Inactive	Western Heights	Western Heights	Yes	Yes	No	No
WHWC-09	02S02W04R01	34.022838	−117.087701	WHWC	Municipal	Inactive	Western Heights	Western Heights	Yes	Yes	No	No
WHWC-10	02S02W05K01	34.026377	−117.108623	WHWC	Municipal	Active	Western Heights	Western Heights	Yes	Yes	Yes	Yes
WHWC-11	02S02W04G04	34.027037	−117.093769	WHWC	Municipal	Active	Western Heights	Western Heights	Yes	Yes	Yes	Yes
WHWC-12	02S02W04J03	34.026399	−117.088647	WHWC	Municipal	Active	Western Heights	Western Heights	Yes	Yes	Yes	Yes
WHWC-14	02S02W04Lxx	34.02535	−117.097185	WHWC	Municipal	Active	Western Heights	Western Heights	Yes	Yes	Yes	Yes
WHWC-02A	02S02W04G03	34.029065	−117.093859	WHWC	Municipal	Inactive; Measure Only	Western Heights	Western Heights	Yes	Yes	Yes	Yes
Y-13	—	34.0465	−117.057	County of San Bernardino	Monitoring	Active	North Bench	Crafton	Yes	Yes	Yes	No
Y-21	—	34.0446	−117.058	County of San Bernardino	Monitoring	Active	North Bench	Crafton	Yes	Yes	Yes	No
Y-22	—	34.0444	−117.06	County of San Bernardino	Monitoring	Active	North Bench	Crafton	Yes	Yes	Yes	No
Y-29	—	34.0449	−117.0611	County of San Bernardino	Monitoring	Active	North Bench	Crafton	Yes	Yes	Yes	No
YRP-EX1 (YRP-PZ1)	—	34.050759	−117.03081	SBVMWD	Monitoring	Active	North Bench	Gateway	Yes	Yes	Yes	No
YRP-EX2 (YRP-PZ2)	—	34.044864	−117.030476	SBVMWD	Monitoring	Active	North Bench	Wilson Creek	Yes	Yes	Yes	No
YRP-PZ3	—	34.014110	−117.018992	SBVMWD	Monitoring	Active	North Bench	Oak Glen	Yes	Yes	Yes	No
YVWD-02	02S02W11B01S	34.015932	−117.058511	YVWD	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
YVWD-05	01S02W36N001S	34.037156	−117.049895	YVWD	Municipal	Inactive – Monitoring Well	North Bench	Wilson Creek	Yes	Yes	No	No
YVWD-06	02S02W01F001S	34.026767	−117.044495	YVWD	Municipal	Inactive – Monitoring Well	North Bench	Wilson Creek	Yes	Yes	No	No
YVWD-07	01S02W36R001S	34.03722	−117.036785	YVWD	Municipal	Inactive – Monitoring Well	North Bench	Wilson Creek	Yes	Yes	No	No
YVWD-09	01S02WS5M1S	34.054618	−117.047336	YVWD	Municipal	Inactive – Monitoring Well	North Bench	Crafton	Yes	Yes	No	No

Table 3-1. Wells in the Groundwater Monitoring Network for the Yucaipa Subbasin

Well ID	State Well Number (from DWR)	Latitude	Longitude	Well Owner	Well Use Type	Well Status	Management Area	Hydrogeological Subarea	GSP Monitoring Network	Groundwater Elevation Data Collection	Groundwater Quality Data Collection	Groundwater Production Data Collection
YVWD-10	02S02W11D01S	34.015967	−117.069083	YVWD	Municipal	Inactive – Monitoring Well	Calimesa	Calimesa	Yes	Yes	No	No
YVWD-12	02S02W11B02S	34.018738	−117.06019	YVWD	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
YVWD-13	01S01W32C01S	34.048028	−117.008331	YVWD	Municipal	Inactive	North Bench	Oak Glen	Yes	Yes	No	No
YVWD-14	01S01W32A01S	34.046973	−116.999753	YVWD	Municipal	Active	North Bench	Oak Glen	Yes	Yes	Yes	Yes
YVWD-16	01S01W33E02S	34.0425	−116.996	YVWD	Municipal	Active	Outside Subbasin	Outside Subbasin	Yes	No	No	Yes
YVWD-18	01S02W36F01S	34.042922	−117.044347	YVWD	Municipal	Active	North Bench	Gateway	Yes	Yes	Yes	Yes
YVWD-24	02S02W11A01S	34.018067	−117.055283	YVWD	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes
YVWD-25	01S01W27I01S	34.053821	−116.977864	YVWD	Municipal	Active	North Bench	Oak Glen	Yes	Yes	Yes	Yes
YVWD-27	02S01W08F01S	34.014848	−117.01104	YVWD	Municipal	Active	North Bench	Oak Glen	Yes	Yes	Yes	Yes
YVWD-27A	02S01W08F02S	34.014711	−117.011137	YVWD	Monitoring	Active	North Bench	Oak Glen	Yes	Yes	No	No
YVWD-28	02S01W09G01S	34.0144	−116.994	YVWD	Municipal	Abandoned/ Capped	North Bench	Oak Glen	Yes	Yes	No	No
YVWD-37	01S02W25A01S	34.061818	−117.036858	YVWD	Municipal	Active	North Bench	Crafton	Yes	Yes	Yes	Yes
YVWD-43	01S01W19P001S	34.06314	−117.026002	YVWD	Municipal	Inactive – Monitoring Well	North Bench	Gateway	Yes	Yes	No	No
YVWD-44	01S02W36A03S	34.046549	−117.036751	YVWD	Municipal	Active	North Bench	Gateway	Yes	Yes	Yes	Yes
YVWD-46	01S02W36G05S	34.042926	−117.042911	YVWD	Municipal	Active	North Bench	Wilson Creek	Yes	Yes	Yes	Yes
YVWD-48	02S02W24L02S	33.9799	−117.046	YVWD	Municipal	Active	Outside Subbasin	Outside Subbasin	Yes	No	No	Yes
YVWD-49	02S02W03J001S	34.025913	−117.07187	YVWD	Municipal	Inactive – Monitoring Well	Calimesa	Calimesa	Yes	Yes	No	No
YVWD-53	01S02W25R04S	34.048641	−117.0384	YVWD	Municipal	Active	North Bench	Gateway	Yes	Yes	Yes	Yes
YVWD-55	01S02W35H03S	34.041256	−117.052936	YVWD	Municipal	Active	North Bench	Gateway	Yes	Yes	Yes	Yes
YVWD-56	01S02W36F02S	34.043191	−117.046995	YVWD	Municipal	Active	North Bench	Gateway	Yes	Yes	Yes	Yes
YVWD-61	02S01W15F01S	34.0009	−116.975	YVWD	Municipal	Active	Outside Subbasin	Outside Subbasin	Yes	No	No	Yes

Notes: DWR = California Department of Water Resources; GSP = Groundwater Sustainability Plan; South Mountain = South Mountain Water Company; YVWD = Yucaipa Valley Water District; South Mesa = South Mesa Water Company; USGS = U.S. Geological Survey; WHWC = Western Heights Water Company; SBVWMD = San Bernardino Valley Municipal Water District.

Table 3-2. Representative Monitoring Points in the Yucaipa Subbasin

Well ID	State Well Number (from DWR)	Latitude	Longitude	Well Owner	Well Use Type	Well Status	Management Area	Hydrogeological Subarea	GSP Monitoring Network	Groundwater Elevation Data Collection	Groundwater Quality Data Collection	Groundwater Production Data Collection	RMP
GWMW-1	02S03W14xxx	34.023129	−117.19702	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No	Yes
GWMW-2	02S03W14xxx	34.01425	−117.179388	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No	Yes
GWMW-3	02S03W04xxx	34.002819	−117.16431	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No	Yes
GWMW-5A	02S03W04xxx	34.0235	−117.197459	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No	Yes
GWMW-5B	02S03W04xxx	34.0235	−117.197459	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No	Yes
GWMW-5C	02S03W04xxx	34.0235	−117.197459	YVWD	Monitoring	Active	San Timoteo	Live Oak	Yes	Yes	Yes	No	Yes
Hog Canyon 2	02S02W10B002S	34.017388	−117.077507	South Mountain	Irrigation	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes	Yes
South Mesa 07	02S02W15A03	34.000936	−117.073543	South Mesa	Municipal	Active	Calimesa	Live Oak	Yes	Yes	Yes	Yes	Yes
South Mesa 09	02S02W15A04	34.003344	−117.069334	South Mesa	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes	Yes
South Mesa 12	02S02W11M01	34.00902	−117.064891	South Mesa	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes	Yes
South Mesa 17	02S02W11xxx	34.013077	−117.066467	South Mesa	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes	Yes
USGS 6th St #1 (870′–930′)	02S02W02F02	34.02676944	−117.0608778	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No	Yes
USGS 6th St #4 (380′–400′)	02S02W02F05	34.02676944	−117.0608778	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No	Yes
USGS Dunlap #2 (830′–850′)	02S02W04L03	34.0249778	−117.0970917	USGS	Monitoring	Active	Western Heights	Western Heights	Yes	Yes	No	No	Yes
USGS Dunlap #4 (440′–460′)	02S02W04L05	34.0249778	−117.0970917	USGS	Monitoring	Active	Western Heights	Western Heights	Yes	Yes	No	No	Yes
USGS Equestrian Park #1 (830′–850′)	02S02W12H01	34.01291667	−117.0363917	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No	Yes
USGS Equestrian Park #4 (380′–400′)	02S02W12H04	34.01291667	−117.0363917	USGS	Monitoring	Active	Calimesa	Calimesa	Yes	Yes	No	No	Yes
USGS Wilson Creek #1 (820′–840′)	01S02W36A02S	34.046825	−117.0358778	USGS	Monitoring	Active	North Bench	Gateway	Yes	Yes	No	No	Yes
USGS Wilson Creek #4 (350′–370′)	01S02W36A05S	34.046825	−117.0358778	USGS	Monitoring	Active	North Bench	Gateway	Yes	Yes	No	No	Yes
WHWC-10	02S02W05K01	34.026377	−117.108623	WHWC	Municipal	Active	Western Heights	Western Heights	Yes	Yes	Yes	Yes	Yes
WHWC-11	02S02W04G04	34.027037	−117.093769	WHWC	Municipal	Active	Western Heights	Western Heights	Yes	Yes	Yes	Yes	Yes
WHWC-12	02S02W04J03	34.026399	−117.088647	WHWC	Municipal	Active	Western Heights	Western Heights	Yes	Yes	Yes	Yes	Yes
WHWC-14	02S02W04Lxx	34.02535	−117.097185	WHWC	Municipal	Active	Western Heights	Western Heights	Yes	Yes	Yes	Yes	Yes
WHWC-02A	02S02W04G03	34.029065	−117.093859	WHWC	Municipal	Inactive, Measure Only	Western Heights	Western Heights	Yes	Yes	Yes	Yes	Yes
YVWD-06	02S02W01F001S	34.026767	−117.044495	YVWD	Municipal	Inactive – Monitoring Well	North Bench	Wilson Creek	Yes	Yes	No	No	Yes
YVWD-07	01S02W36R001S	34.03722	−117.036785	YVWD	Municipal	Inactive – Monitoring Well	North Bench	Wilson Creek	Yes	Yes	No	No	Yes
YVWD-10	02S02W11D01S	34.015967	−117.069083	YVWD	Municipal	Inactive – Monitoring Well	Calimesa	Calimesa	Yes	Yes	No	No	Yes

Table 3-2. Representative Monitoring Points in the Yucaipa Subbasin

Well ID	State Well Number (from DWR)	Latitude	Longitude	Well Owner	Well Use Type	Well Status	Management Area	Hydrogeological Subarea	GSP Monitoring Network	Groundwater Elevation Data Collection	Groundwater Quality Data Collection	Groundwater Production Data Collection	RMP
YVWD-12	02S02W11B02S	34.018738	−117.06019	YVWD	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes	Yes
YVWD-24	02S02W11A01S	34.018067	−117.055283	YVWD	Municipal	Active	Calimesa	Calimesa	Yes	Yes	Yes	Yes	Yes
YVWD-25	01S01W27I01S	34.053821	−116.977864	YVWD	Municipal	Active	North Bench	Oak Glen	Yes	Yes	Yes	Yes	Yes
YVWD-28	02S01W09G01S	34.0144	−116.994	YVWD	Municipal	Abandoned/ Capped	North Bench	Oak Glen	Yes	Yes	No	No	Yes
YVWD-37	01S02W25A01S	34.061818	−117.036858	YVWD	Municipal	Active	North Bench	Crafton	Yes	Yes	Yes	Yes	Yes
YVWD-46	01S02W36G05S	34.042926	−117.042911	YVWD	Municipal	Active	North Bench	Wilson Creek	Yes	Yes	Yes	Yes	Yes
YVWD-49	02S02W03J001S	34.025913	−117.07187	YVWD	Municipal	Inactive – Monitoring Well	Calimesa	Calimesa	Yes	Yes	No	No	Yes
YVWD-53	01S02W25R04S	34.048641	−117.0384	YVWD	Municipal	Active	North Bench	Gateway	Yes	Yes	Yes	Yes	Yes
YVWD-56	01S02W36F02S	34.043191	−117.046995	YVWD	Municipal	Active	North Bench	Gateway	Yes	Yes	Yes	Yes	Yes

Notes: DWR = California Department of Water Resources; GSP = Groundwater Sustainability Plan; RMP = representative monitoring point; YVWD = Yucaipa Valley Water District; South Mountain = South Mountain Water Company; South Mesa = South Mesa Water Company; USGS = U.S. Geological Survey; WHWC = Western Heights Water Company.

3.4 Minimum Thresholds

This section describes the minimum thresholds established for chronic lowering of groundwater levels, reduction of groundwater storage, land subsidence, and interconnected surface water/groundwater for each management area. Minimum thresholds for degradation of water quality and seawater intrusion are not established in this GSP (see Sections 3.3.5 and 3.3.6).

3.4.1 North Bench Management Area

The North Bench Management Area comprises the Triple Falls Creek, Oak Glen, Gateway, Crafton, and Wilson Creek hydrogeological subareas and includes municipal water supply wells owned and operated by YVWD. Minimum thresholds for this management area were established for chronic lowering of groundwater levels, reduction of groundwater storage, land subsidence, and depletion of interconnected surface water. The minimum threshold for interconnected surface water was established to protect GDEs that were identified in Wildwood Canyon and the upper elevations of the Oak Glen subarea near the Triple Falls Creek subarea (Figure 2-57). No other GDEs, potential GDEs, or interconnected surface waters were identified in the other four subareas in the North Bench Management Area.

The undesirable result applicable to the chronic lowering of groundwater levels, reduction in groundwater storage, and land subsidence is the condition when the volume of groundwater in storage falls below a drought buffer established in this management area. Using the YIHM, the drought buffer was based on the simulated decline in storage from the 1984 WY to the 1992 WY, a period when the volume of groundwater in storage declined approximately 10,000 AF (Figure 3-2, Drought Buffer in the North Bench Management Area). During this period, the average annual rainfall in the Subbasin was 14 inches, or 88% of normal. This period included three "dry" and three "below normal" water year types, with one "normal" water year type and two "above normal" water year types (Figure 2-3). Groundwater levels declined 50 to 75 feet from 1984-1992 (Figure 2-66). Pumping averaged approximately 2,600 AFY, which was approximately 66% of the estimated sustainable yield of 3,940 AFY (Figure 3-3, Historical and Current Volume of Groundwater in Storage in the North Bench Management Area). This period was selected because groundwater elevations declined when pumping was below the estimated sustainable yield, which was more of a function of climate than groundwater withdrawals.

The Yucaipa GSA identified a decline of 10,000 AF from storage over a 9-year period as a significant and unreasonable decline in the storage of groundwater in this management area. The drought buffer provides a reasonable margin of operational flexibility under adverse conditions, by allowing for changes to groundwater production or the implementation of projects and/or programs to prevent a net loss of groundwater that results in the undesirable result of the volume in storage declining below the drought buffer.

The bottom of the drought buffer was established at the historical low in the volume in storage at 220,000 AF (Figure 3-4, Minimum Threshold and Measurable Objective in the North Bench Management Area). **The minimum threshold is established at the historical low for groundwater in storage at 220,000 AF.** The top of the drought buffer is at a volume in storage of 230,000 AF, 10,000 AF above the minimum threshold. This represents the measurable objective (Section 3.5.1) and provides operational flexibility to implement management actions and/or programs to prevent undesirable results when conditions decline below the minimum threshold. The RMPs identified for the North Bench Management Area are: USGS Wilson Creek nested wells No. 1 and No. 4, YVWD-06, YVWD-07, YVWD-37, YVWD-46, YVWD-53, and YVWD-56 (Figure 3-5, Representative Monitoring Points). Static groundwater levels measured at these wells will be used to characterize conditions in this management area. The simulated groundwater levels at these wells at the end of the 1965 WY, which represented the historical low in groundwater in storage, or the minimum threshold, ranged from 2,276 to 2,529 feet above NAVD88 (Table 3-3).

The simulated static groundwater elevations at the end of the 2018 WY (i.e., the current condition) ranged from 2,381 to 2,602 feet above NAVD88 (Table 3-3). Corresponding static groundwater elevations measured at the RMPs ranged from 2,357 to 2,578 feet above NAVD88 (Table 3-3). The YIHM tended to overestimate the groundwater elevations at the RMPs by an average 48 feet. Therefore, the groundwater elevations at each RMP that represent the minimum threshold in the North Bench Management Area are the simulated groundwater elevations corrected by the differences between the simulated and measured groundwater elevations in September 2018. The minimum threshold groundwater elevations at the RMPs range from 2,209 to 2,504 feet above NAVD88 (Table 3-3).

Table 3-3. Groundwater Elevations Pertaining to the Measurable Objective and Minimum Threshold in the North Bench Management Area

RMP	Simulated Groundwater Elevation at Sep. 30, 1965 (ft NAVD88)	Simulated Groundwater Elevation at Sep. 30, 2018 (ft NAVD88)	Measured Groundwater Elevation near Sep. 30, 2018 (ft NAVD88)	Measured – Simulated Groundwater Elevation at Sep. 2018 (feet)	Groundwater Elevations at the Minimum Threshold (ft NAVD88)	Groundwater Elevations at the Measurable Objective (ft NAVD88)
YVWD-06	2,276.74	2,381.26	2,359.99	−21.27	**2,255.47**	**2,276.91**
YVWD-07	2,276.08	2,472.12	2,435.42	−36.70	**2,239.38**	**2,318.07**
YVWD-37	2,528.67	2,602.40	2,577.64	−24.75	**2,503.91**	**2,527.68**
YVWD-46	2,329.04	2,477.14	2,357.42	−119.73	**2,209.32**	**2,228.73**
YVWD-53	2,341.22	2,472.20	2,446.53	−25.67	**2,315.55**	**2,337.17**
YVWD-56	2,329.10	2,475.09	2,415.23	−59.86	**2,269.24**	**2,291.03**
USGS Wilson Creek No. 1 (820′–840′)	2,354.52	2,507.52	2,453.24	−54.28	**2,300.24**	**2,329.25**
USGS Wilson Creek#4 (350′–370′)	2,357.at 38	2,515.57	2,475.28	−40.29	**2,317.09**	**2,349.27**
Average	2,349.09	2,487.91	2,440.09	−47.82	**2,301.27**	**2,332.26**

Notes: RMP = representative monitoring point; ft NAVD88 = feet above the North American Vertical Datum of 1988.

3.4.1.1 Chronic Lowering of Groundwater Levels

Groundwater elevations in the North Bench Management Area are influenced by climate. Groundwater elevations markedly increased following periods with "above normal" and "wet" water year types, and markedly declined during periods with "below normal" and "critically dry" water year types. Groundwater elevations at the RMPs declined approximately 170 feet at a rate of approximately 21 feet per year from 1999 to 2007, a period when pumping in the management area exceeded the estimated sustainable yield of 3,940 AFY (Figure 3-6, Historical Groundwater Elevations and Pumping in the North Bench Management Area). The declining trend in groundwater levels ceased in 2008 when YVWD increased its importation of SWP water from approximately 3,500 AF in 2007 to 7,300 AF in 2008, which subsequently led to a decline in groundwater production by YVWD from 4,800 AF in 2007 to 3,800 AF in 2008. Groundwater production in the North Bench Management Area averaged approximately 3,600 AFY from 2008 to 2018 (Figure 3-6).

Predicted groundwater elevations calculated using the YIHM indicate that future operations in the North Bench Management Area with pumping constrained to the estimated sustainable yield of 3,940 AFY will result in groundwater elevations remaining above the minimum threshold (Figures 3-7 to 3-14). The YIHM predicts that groundwater elevations in the Future Baseline and Future Baseline with Climate Change I and II (i.e., 2030 and 2070 change factors) scenarios will increase from 2018 to peak levels in 2040 (climate scenarios similar to the wet 1978-1983 period), and then generally decline in all three scenarios after 2040. The climate record from 1984 to 2012 was used to simulate climatic conditions from 2041 through 2069, when the median annual precipitation was 84% of the mean annual and this period included more "dry" and "critically dry" water year types than the earlier climatic record from 1962 to 1983 that was used to simulate conditions from 2019 to 2040.

The Future Baseline and Future Baseline with Climate Change I and II scenarios predict that groundwater elevations at the end of the 2069 WY will range from approximately 135 feet to 158 feet higher than the minimum threshold levels established at each RMP (Figures 3-7 to 3-14).

Over the 50-year planning and implementation horizon, the groundwater elevation minimum threshold allows for groundwater extractions to exceed historical levels while protecting against long-term aquifer supply depletion. Historical production from 1999 to 2007 averaged 5,200 AFY, which led to a groundwater level decline of 21 feet per year. If, beginning with the current condition, pumping increased from the estimated sustainable yield of 3,940 AFY to an average of 5,200 AFY, then this historical rate may be sustained for approximately 6 years before groundwater levels fall to the minimum threshold established at an average elevation of 2,301 feet above NAVD88 (Table 3-3).

3.4.1.2 Reduction of Groundwater Storage

The YIHM indicated a net increase of approximately 35,000 AF in groundwater storage from 1965 to 2018 (Figure 2-67). As demonstrated by the fluctuating groundwater levels observed in the management area since 1965, increases in groundwater storage occurred following periods with "above normal" and "wet" water year types, and declined during periods dominated by "below normal" and "critically dry" water year types. Marked increases in storage occurred from the 1977 WY through 1983 WY, and during the 2017 WY when the area experienced predominantly "above normal" to "wet" water year types.

The YIHM predicts, with pumping constrained to the estimated sustainable yield of 3,940 AFY of the management area, a net increase in the volume of groundwater in storage of 2,250 AF (Future Baseline with Climate Change II scenario) to 12,200 AF (Future Baseline scenario) from the current condition (Figure 3-15, Predicted Volume in Storage by the Future Baseline and Future Baseline with Climate Change I and II Scenarios in the North Bench Management Area). A peak volume in storage is predicted between 275,000 AF and 285,500 AF in the 2039 WY, followed by a general declining trend to the end of the 2069 WY (Figure 3-15). The volume in storage is not predicted to fall below the minimum threshold of 220,000 AF, or the measurable objective of 230,000 AF, during the 50-year planning and implementation horizon.

A decline in groundwater elevation from the current level to the minimum threshold represents a net decline in groundwater storage of approximately 35,000 AF (Figure 3-15). The minimum threshold represents a volume in storage at approximately 220,000 AF, which is 86% of the volume in storage (255,000 AF) estimated under current conditions. This analysis indicates that maintaining an average aquifer saturation that is at least 86% of current conditions will protect against long-term aquifer supply depletion and provide necessary operational flexibility for municipal and private groundwater users.

3.4.1.3 Land Subsidence

The minimum threshold established to assess chronic lowering of groundwater levels and reduction of groundwater storage is the historical low groundwater elevation. Long-term declines below the historical low groundwater elevation may introduce the potential for future land subsidence. DWR has designated the Plan Area has having a medium to low risk for future land subsidence (DWR 2014). The subsurface geology below the historical low groundwater elevation of 2,301 feet above NAVD88 is, based on driller's logs for the YVWD wells, characterized as having relatively thin, discontinuous lenses of clay interbedded between thicker layers of coarse-grained sand and gravel (Appendix 3-A). This presents a low risk for future subsidence, and land subsidence related to groundwater withdrawal was not induced when historical water levels were lower than current water levels. No interference or damage to infrastructure and surface land uses were observed in 2007 and 2008 when groundwater elevations at this time were comparable to the historical lows simulated at the end of the 1965 WY (Figure 2-66; Table 3-3).

The minimum threshold for chronic declines in groundwater level and reduction of groundwater storage were adopted for land subsidence as well. The use of the groundwater elevation minimum threshold as a surrogate for land subsidence will be reviewed with each 5-year GSP evaluation to ensure that they adequately protect the Plan Area from experiencing undesirable results related to land subsidence. Each 5-year GSP evaluation will include InSAR data obtained from the SGMA Data Portal, which will be compared to previous InSAR data (including the baseline dataset collected from 2015 to 2018) to evaluate potential land subsidence as a result of groundwater levels falling below historical lows in the principal aquifer.

3.4.1.4 Depletion of Interconnected Surface Water

Surface water flows in the upper reaches of Wilson Creek and Oak Glen are ephemeral (Section 2.3). Groundwater level measurements indicate that surface water and groundwater along the upper reach of Oak Glen Creek in the northeast section of the North Bench Management Area may experience periods of interconnectedness, but these conditions are not persistent. Groundwater elevations decline downgradient of this area to depths that have historically ranged from 22 to 200 feet bgs. These measurements indicate that surface water and groundwater are not interconnected downgradient of YVWD-25 (Figure 2-56).

GDEs were identified along Wildwood Canyon Creek near Wildwood Canyon State Park, and the upper elevations of the Oak Glen subarea near the Triple Falls Creek subarea (Figure 2-56). No other GDEs and no potential GDEs were identified in the other four hydrogeological subareas in the North Bench Management Area. Wells YVWD-25 and YVWD-28 are identified as RMPs to characterize and assess groundwater conditions in the areas of the GDEs.

3.4.1.4.1 Oak Glen Creek near the Triple Falls Creek Subarea

Groundwater levels are measured at two wells within 1 kilometer (0.6 miles) of the mapped habitats in this part of the management area: YVWD-25 (screened 45 to 55 feet bgs) and the Chlorinator Well, a groundwater observation well (unknown screen interval). Historical static water levels at YVWD-25 have ranged from 7 feet bgs to 43 feet bgs (Figure 3-16, Depths-to-Groundwater at the Chlorinator Well and YVWD-25 in the North Bench Management Area). Static groundwater levels measured at the Chlorinator well since January 1987 have ranged from 13 feet bgs to 60 feet bgs (Figure 3-16). Since 2015, the average depth-to-water measured at the Chlorinator well was approximately 49 feet bgs. The chlorinator well is not an RMP at this time because the well construction details are unknown. This well may be considered an RMP when the screen interval is determined and water levels measured at this well represent shallow groundwater conditions.

YVWD-25 has produced an average 270 AFY since 2001 (Figure 2-20). Between 2001 and 2013, the normalized difference vegetation index (NDVI) and normalized difference moisture index (NDMI) increased; this increase was correlated with above average annual precipitation for this 12-year period (Section 2.7.8). The fact that NDVI and NDMI increased between 2001 and 2013, a period when YVWD-25 was actively producing approximately 270 AFY, suggests that continued production at YVWD-25 at current extraction rates will not adversely impact the health of these mapped habitats.

YVWD-25 is designated as an RMP to evaluate conditions at the GDE mapped in this area of the North Bench management area. The minimum threshold to protect GDEs in the North Bench Management Area is the condition when the shallow groundwater table sustaining the GDE falls below 30 feet bgs for 2 consecutive years. Additionally, under such conditions, an analysis of the NDVI and NDMI trends over the same 2 years will be conducted to confirm whether the decline in groundwater level below the minimum threshold correlates with a declining trend in NDVI and NDMI. If a correlation is found between declining groundwater level (as a result of groundwater extractions more than the historical average of 270 AFY) and NDVI and NDMI, then the net removal of groundwater from the area will be reduced until groundwater levels recover above the minimum threshold for two consecutive years.

If future groundwater extractions planned in this region are expected to exceed historical extractions in the region, additional field work will be required to characterize the impact that proposed pumping rates will have on the habitats along Oak Glen Creek near the Triple Falls Creek subarea. This would include installing one or more shallow groundwater observation wells screened from the historical high groundwater level to approximately 35 feet bgs. Groundwater elevation data collected from the shallow groundwater observation well(s) will be analyzed to evaluate whether the local habitat is sustained by shallow groundwater (<30 feet bgs) and will be used to evaluate potential influences by nearby pumping in the principal aquifer.

3.4.1.4.2 Wildwood Canyon State Park

The mapped habitats in this part of the management area predominantly border Wildwood Canyon Creek, but also extend south into undeveloped lands that border the local residential community (Figure 2-56). NDVI moderately increased across the majority of this habitat between 2009 and 2018, while NDMI moderately decreased. During this period, annual precipitation was generally lower than the 33-year average of 14 inches between 1985 and 2018.

Static groundwater levels have been measured within 1 kilometer (0.6 miles) of this habitat at YVWD-28 since May 2004. The static depths-to-water measured at this well have ranged from 36 feet bgs to 8 feet bgs (Figure 3-17, Static Depths-to-Groundwater at YVWD-28 in the North Bench Management Area). There are no active groundwater extraction wells (YVWD has not pumped groundwater since 2007) within 1 kilometer of this habitat that may impact future health of the Coast Live Oak.

YVWD-28 is designated as an RMP to evaluate conditions at the GDE mapped in this area of the North Bench management area. The minimum threshold to protect GDEs in the North Bench Management Area is the condition when the shallow groundwater table sustaining the GDE falls below 30 feet bgs for 2 consecutive years. Additionally, under such conditions, an analysis of the NDVI and NDMI trends over the same 2 years will be conducted to confirm whether the decline in groundwater level below the minimum threshold correlates with a declining trend in NDVI and NDMI. If a correlation is found between declining groundwater level (as a result of groundwater extractions more than the historical average) and NDVI and NDMI, then the net removal of groundwater from the area will be reduced until groundwater levels recover above the minimum threshold for 2 consecutive years.

If future extractions planned in this region are expected to exceed historical extractions, additional field work will be required to characterize the impact that proposed pumping rates will have on the habitats along Wildwood Canyon Creek. This would include installing one or more shallow groundwater observation wells screened from the historical high groundwater level to approximately 35 feet bgs. Groundwater elevation data collected from the shallow groundwater observation well(s) will be analyzed to evaluate whether the local habitat is sustained by shallow groundwater (<30 feet bgs), and will be used to evaluate seasonal fluctuations and potential influences by nearby pumping in the principal aquifer.

3.4.1.5 Degradation of Water Quality

No minimum threshold relative to the significant and unreasonable degradation of water quality was established for the North Bench Management Area. Only one groundwater remediation program is active in the management area: the former Yucaipa landfill. Groundwater contamination is located in the shallow alluvial aquifer unit above the principal aquifer, which has not been influenced by contamination originating at the landfill.

YVWD implemented a program to replace septic systems in the management area with sanitary sewer services that subsequently led to a marked decline in contributions of nitrate and TDS to groundwater. YVWD implemented reverse osmosis and denitrification treatment at the WRWRF, which produces tertiary treated wastewater for recycled water purposes. The recycled water includes concentrations of TDS and nitrate below the maximum benefits water quality objectives established in the 2014 Basin Plan Amendment (Section 2.7.4).

3.4.1.6 Seawater Intrusion

The North Bench Management Area is approximately 53 miles northeast of the Pacific Ocean and is, at its lowest elevation, approximately 2,300 feet above NAVD88, which is approximately 2,300 feet above mean sea level. No minimum threshold was established for the North Bench Management Area with regard to seawater intrusion.

3.4.2 Calimesa Management Area

The Calimesa Management Area comprises the Calimesa and Singleton subareas, and the upper northeast portion of the Live Oak subarea (Figure 2-63). This management area includes municipal water supply wells owned and operated by YVWD and South Mesa. South Mountain owns and operates two irrigation supply wells that supply water to the Crafton Hills community college that is partly in the northern section of the Western Heights Management Area. A minimum threshold for this management area was established for chronic lowering of groundwater levels, reduction of groundwater storage, and land subsidence. No GDEs were identified in this management area (Section 2.7.8). One potential GDE was identified in the Singleton subarea (Section 2.7.8).

The undesirable result identified for the Calimesa Management Area is the condition when groundwater in storage falls below a drought buffer established in this management area. Using the YIHM, the drought buffer was based on the simulated decline in storage from the 1995-WY to the 2004 WY, a period when the volume of groundwater in storage declined approximately 26,000 AF (Figure 3-18, Drought Buffer in the Calimesa Management Area). This period was selected because the management area experienced the highest rate of decline in storage at 2,600 AFY over the 50-year historical period. Groundwater production from the management area from the 1995 WY to the 2004 WY averaged approximately 6,600 AFY, which was approximately 133% of the estimated sustainable yield of 4,955 AFY (Figure 3-19, Historical and Current Volume of Groundwater in

Storage in the Calimesa Management Area). During this period, the average annual rainfall in the Subbasin was 15 inches, or 96% of normal. This period included five "dry" and one "critically dry" water year types, with two "above normal" and two "wet" water year types (Figure 2-3). Groundwater levels declined approximately 50 feet from 1994 to 2004 (Figure 2-69).

The Yucaipa GSA identified a decline of 26,000 AF from storage over a 10-year period as a significant and unreasonable decline in the storage of groundwater in this management area. The drought buffer provides a reasonable margin of operational flexibility under adverse conditions, by allowing for changes to groundwater production or the implementation of projects and/or programs to prevent a net loss of groundwater that results in the undesirable result of the volume in storage declining below the drought buffer.

The drought buffer begins at the historical low in volume in storage at 798,700 AF and ends 26,000 AF below that mark at 772,700 AF (Figure 3-20, Minimum Threshold and Measurable Objective in the Calimesa Management Area). Undesirable results were not experienced at the historical low storage condition in that groundwater supply was not impacted. **The minimum threshold is established at the bottom of the drought buffer at 772,700 AF.** The RMPs for the Calimesa Management Area are: South Mesa wells 7, 9, 12 and 17; YVWD wells YVWD-10, YVWD-12, YVWD-24, and YVWD-49; South Mountain well Hog Canyon 2, and the USGS 6th Street #1 and #4 and Equestrian Park #1 and #4 nested wells (Figure 3-5). Static groundwater levels measured at the RMPs will be used to evaluate conditions against the minimum threshold and measurable objective related to the undesirable results of chronic lowering of groundwater levels, reduction of groundwater storage, and land subsidence.

3.4.2.1 Chronic Lowering of Groundwater Levels

Groundwater elevations in the Calimesa Management Area experienced a declining trend from 1988 to 2007 (Figure 2-69). Groundwater levels declined at an approximate rate of 6.1 feet per year during that period. Groundwater production from the management area in that period averaged 6,100 AFY, which is above the estimated sustainable yield of 4,955 AFY. The declining trend in groundwater levels ceased in 2008 when YVWD markedly increased its importation of SWP water as a supplemental water source. Subsequently, YVWD reduced its groundwater production in the management area from an annual average 3,400 AFY (1988-2007) to 2,100 AFY from 2008 to 2018 (Figure 3-21, Annual Groundwater Production and Historical Groundwater Elevations in the Calimesa Management Area). South Mesa has averaged an annual groundwater production rate of 2,000 AFY from the management area from 1988 to 2018 (Figure 3-21). South Mountain has averaged 100 AFY from 2008 to 2018 (Figure 3-21). The average annual production from the management area from 2008 to 2018 was approximately 4,400 AFY, which is below the estimated sustainable yield of 4,955 AFY. Consequently, groundwater elevations in the management area have either stabilized or been recovering since 2008 (Figure 3-21).

The static measured groundwater elevations in the Calimesa Management Area at the end of the 2018 WY (i.e., the current condition) ranged from 2,056 to 2,207 feet above NAVD88 (Table 3-4). The simulated groundwater elevations at the end of the 2018 WY ranged from 2,012 to 2,193 feet above NAVD88 (Table 3-4). The differences between the observed and simulated groundwater levels ranged from −15.9 to 64.8 feet, or an average of 19.3 feet, meaning the YIHM tended to underestimate groundwater elevations in the Calimesa Management Area. To associate groundwater levels at each RMP to the minimum threshold, the YIHM was used to simulate conditions at the minimum threshold. The simulated groundwater elevations at the minimum threshold for each RMP range from 1,912 to 2,164 feet above NAVD88 (Table 3-4). Applying the difference between measured and simulated groundwater levels at the end of the

2018 WY, the minimum threshold established at 772,700 AF in storage is represented by groundwater elevations at the RMPs that range from 1,959 to 2,177 feet above NAVD88 (Table 3-4).

Projected water levels calculated using the YIHM indicate that future operations in the Calimesa Management Area with pumping constrained to the estimated sustainable yield of 4,955 AFY will result in groundwater elevations remaining above the minimum threshold (Figures 3-22 to 3-34). The Future Baseline scenario predicts that groundwater elevations at the RMPs will increase by the end of the 2069 WY by approximately 2 to 38 feet (Figures 3-22 to 3-34). The Future Baseline with Climate Change I scenario predicts that groundwater elevations, on average, will be comparable to levels observed at the end of the 2018 WY (Figures 3-22 to 3-34). The Future Baseline with Climate Change II scenario predicts that groundwater elevations, on average, will be approximately 22 feet below the 2018 WY levels (Figures 3-22 to 3-34). Predicted groundwater elevations will not decline below the minimum threshold at any of the RMPs.

Over the 50-year planning and implementation horizon, the groundwater elevation minimum threshold allows for groundwater extractions to exceed historical levels while protecting against long-term aquifer supply depletion. Historical production from 1988 to 2007 averaged 6,100 AFY, which led to a groundwater level decline of 6.1 feet per year (Figure 3-21). If, beginning with the current condition, pumping increased from the estimated sustainable yield of 4,955 AFY to an average of 6,100 AFY, then this historical rate may be sustained for approximately 12 years before groundwater levels fall to the average minimum threshold established at 2,044 feet above NAVD88.

3.4.2.2 Reduction of Groundwater Storage

The YIHM indicated a net decrease of approximately 16,000 AF in groundwater storage from 1965 to 2018 (Figure 2-70). From 1965 to 1977, the volume in storage remained consistent at approximately 814,000 AF when rainfall averaged 104% of normal annual precipitation and pumping averaged 4,800 AFY, or 97% of the estimated sustainable yield (Figure 3-19). From 1978 to 1989, the volume in storage increased approximately 35,000 AF when rainfall averaged 118% of normal annual precipitation and pumping averaged 4,900 AFY, or 99% of the estimated sustainable yield. (Figure 3-19). From 1990 to 2008, groundwater production averaged 6,100 AFY (or 123% of the estimated sustainable yield) and the YIHM calculated a net loss of approximately 46,000 AF. The historical low in the volume of groundwater in storage was simulated at the end of the 2015 WY at 798,700 AF. Since the historical low in the volume of groundwater in storage, the management area has recovered approximately 1,700 AF (Figure 3-19).

Simulation results of future projected conditions using the YIHM indicate that the volume in storage is expected to remain above the minimum threshold throughout the 50-year planning and implementation horizon (Figure 3-35, Predicted Volume in Storage by the Future Baseline and Future Baseline with Climate Change I and II Scenarios in the Calimesa Management Area). The YIHM predicted a net increase of 7,500 AF in the volume in storage by the end of the 2069 WY in the Future Baseline scenario, and net decreases of 1,500 AF and 14,000 AF for the Future Baseline with Climate Change I and II scenarios, respectively (Figure 3-35).

The decline in groundwater elevation from the current level to the minimum threshold represents a net decline in groundwater storage of approximately 27,700 AF (Figure 3-20). The volume in groundwater storage at the minimum threshold is approximately 772,700 AF, which is 97% of the current volume in storage at 800,400 AF. The reduction in groundwater storage to 772,700 AF would be an undesirable result. Groundwater elevations that result in a reduction in groundwater storage of approximately 27,700 AF from the current condition are lower than the historical low groundwater levels. This analysis indicates that maintaining an average aquifer saturation that is at

least 97% of current conditions will protect against long-term aquifer supply depletion and provide necessary operational flexibility for municipal and private groundwater users.

3.4.2.3 Land Subsidence

The minimum threshold static groundwater elevation established to assess chronic lowering of groundwater levels and reduction of groundwater storage is lower than the historical low observed between 2010 and 2015, and therefore introduces the potential for future land subsidence. DWR has designated the Plan Area has having a medium to low risk for future land subsidence (DWR 2014). The subsurface geology below the historical low groundwater elevation of 2,097 feet above NAVD88 is, based on driller's logs for the South Mesa and YVWD wells, characterized as having relatively thin, discontinuous lenses of clay interbedded between thicker layers of coarse-grain sand and gravel (Appendix 3-A). This presents a low risk for future subsidence, and land subsidence related to groundwater withdrawal was not induced when historical water levels were lower than current water levels. No interference or damage to infrastructure and surface land uses were observed when the historical lows in groundwater elevations were observed in this management area.

The minimum threshold for chronic declines in groundwater level and reduction of groundwater storage were adopted for land subsidence as well. The use of the groundwater elevation minimum threshold as a surrogate for land subsidence will be reviewed with each 5-year GSP evaluation to ensure that they adequately protect the Plan Area from experiencing undesirable results related to land subsidence. Each 5-year GSP evaluation will include InSAR data obtained from the SGMA Data Portal, which will be compared to previous InSAR data (including the baseline dataset collected from 2015 to 2018) to evaluate potential land subsidence as a result of groundwater levels falling below historical lows in the principal aquifer.

Table 3-4. Groundwater Elevations Pertaining to the Measurable Objective and Minimum Threshold in the Calimesa Management Area

Representative Monitoring Point	Simulated Groundwater Elevation at Sep. 30, 2015 (ft NAVD88)	Measured Static Groundwater Elevation at Sept. 30, 2015 (ft NAVD88)	Measured – Simulated Groundwater Elevation at Sep. 2015 (feet)	Simulated Groundwater Elevation at Sep. 30, 2018 (ft NAVD88)	Measured Groundwater Elevation near Sep. 30, 2018 (ft NAVD88)	Measured – Simulated Groundwater Elevation at Sep. 2018 (feet)	Simulated Groundwater Elevations at the Minimum Threshold (ft NAVD88)	Estimated Measured Groundwater Elevationsat the Minimum Threshold (ft NAVD88)	Measured Groundwater Elevations at the Measurable Objective (ft NAVD88)
Hog Canyon 2	2,053.55	2,067.13	13.57	2,079.54	2,090.13	10.59	2,009.74	**2,021.82**	**2,067.13**
South Mesa 07	2,063.24	2,039.73	−23.51	2,071.67	2,055.73	-15.93	2,001.86	**1,982.14**	**2,039.73**
South Mesa 09	2,014.06	2,052.70	38.64	2,011.53	2,066.70	55.17	1,911.67	**1,958.58**	**2,052.70**
South Mesa 12	2,067.87	2,068.46	0.59	2,079.01	2,095.74	16.73	2,009.61	**2,018.27**	**2,068.46**
South Mesa 17	2,067.34	2,050.77	−16.57	2,079.49	2,088.77	9.28	2,009.94	**2,006.30**	**2,050.77**
USGS 6th St #1 (870′–930′)	2,073.38	2,107.94	34.56	2,086.58	2,133.89	47.31	2,017.67	**2,058.61**	**2,107.94**
USGS 6th St #4 (380′–400′)	2,150.61	2,165.27	14.66	2,154.56	2,170.93	16.37	2,112.19	**2,127.70**	**2,165.27**
USGS Equestrian Park #1 (830′–850′)	2,193.59	2,201.62	8.03	2,193.29	2,203.28	9.99	2,164.36	**2,173.37**	**2,201.62**
USGS Equestrian Park #4 (380′–400′)	2,190.36	2,205.51	15.15	2,190.21	2,206.59	16.38	2,161.10	**2,176.87**	**2,205.51**
YVWD-10	2,068.33	2,065.84	−2.49	2,081.09	2,087.74	6.65	2,012.08	**2,014.16**	**2,065.84**
YVWD-12	2,068.67	2,071.38	2.70	2,081.33	2,094.66	13.33	2,012.25	**2,020.26**	**2,071.38**
YVWD-24	2,069.97	2,099.36	29.39	2,081.30	2,146.06	64.76	2,014.56	**2,061.63**	**2,099.36**
YVWD-49	2,068.54	2,070.64	2.11	2,081.55	2,082.24	0.69	2,012.63	**2,014.03**	**2,070.64**
Average	2,088.42	2,097.41	8.99	2,097.78	2,117.11	19.33	2,034.59	**2,048.75**	**2,097.41**

Note: ft NAVD88 = feet above the North American Vertical Datum of 1988.

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3.4.2.4 Depletion of Interconnected Surface Water

No GDEs or interconnected surface water bodies were identified in the Calimesa Management Area. One potential GDE was identified in the Singleton subarea, located in the southeastern corner of the management area (Section 2.7.8). No existing wells are within 1 kilometer (0.6 miles) of the potential GDE, so no water levels have been measured to characterize the depth to groundwater. The natural community of this potential GDE has not been impacted by historical groundwater extractions from the principal aquifer, so no minimum threshold was established relative to this undesirable result.

If future extractions planned in this region are expected to exceed historical extractions in the region, additional field work will be required to characterize the impact that proposed pumping rates will have on the potential GDE in the Singleton subarea. This would include installing one or more shallow groundwater observation wells screened from the historical high groundwater level to approximately 35 feet bgs. Groundwater elevation data collected from the shallow groundwater observation well(s) will be analyzed to evaluate whether the local habitat is sustained by shallow groundwater (<30 feet bgs) and will be used to evaluate seasonal fluctuations and potential influences by nearby pumping in the principal aquifer. Additionally, a spring survey is recommended for the upstream reach of the drainage above the potential GDE. Spring flow may be another potential source of water to the GDE, which may be influenced by groundwater production in the principal aquifer. If spring flow is identified, then a surface water flow monitoring program will be implemented to monitor spring flow should a new production well be installed within 1 kilometer (0.6 miles) of the potential GDE.

3.4.2.5 Degradation of Water Quality

No minimum threshold relative to the significant and unreasonable degradation of water quality was established for the Calimesa Management Area. There are no active groundwater remediation programs in the management area.

YVWD implemented a program to replace septic systems in the management area with sanitary sewer services that subsequently led to a marked decline in contributions of nitrate and TDS to groundwater. YVWD implemented reverse osmosis and denitrification treatment at the WRWRF, which produces tertiary treated wastewater for recycled water purposes. The recycled water includes concentrations of TDS and nitrate below the maximum benefits water quality objectives established in the 2014 Basin Plan Amendment (Section 2.7.4).

3.4.2.6 Seawater Intrusion

The Calimesa Management Area is approximately 51 miles northeast of the Pacific Ocean and approximately 2,000 feet above NAVD88 at its lowest elevation, which is approximately 2,300 feet above mean sea level. No minimum threshold was established for the Calimesa Management Area with regard to seawater intrusion.

3.4.3 Western Heights Management Area

The Western Heights Management Area comprises the Western Heights hydrogeological subarea and includes all municipal water supply wells owned and operated by WHWC (Figure 2-63). The USGS installed one nested observation well, identified as the Dunlap Acres well, approximately 55 feet from WHWC-14. A minimum threshold for this management area was established for chronic lowering of groundwater levels, reduction of groundwater

storage, and land subsidence. No GDEs and no potential GDEs were identified in this management area. Therefore, no sustainable management criteria were established for the depletion of interconnected surface water in this management area.

The undesirable result associated with chronic lowering of groundwater levels, reduction in groundwater storage, and land subsidence is the condition when groundwater levels fall below a drought buffer established in this management area. The drought buffer was based on the simulated decline in storage from the 1983 WY to the 1992 WY, a period when the volume of groundwater in storage declined approximately 10,000 AF (Figure 3-36, Drought Buffer in the Western Heights Management Area). This period was selected to define a drought buffer because the management area experienced the highest rate of decline in storage at 900 AFY over the 50-year historical period. Groundwater production from the 1983 WY to the 1992 WY averaged approximately 2,500 AFY, which was approximately 142% of the estimated sustainable yield of 1,760 AFY (Figure 3-37, Annual Groundwater Production and Historical Groundwater Elevations in the Western Heights Management Area). During this period, the average annual rainfall in the Subbasin was 16 inches, or 101% of normal. This period included three "dry" and three "below normal" water year types, with two "above normal" and one "wet" water year types (Figure 2-3). Groundwater levels declined approximately 35 feet from 1982 to 1992 (Figure 3-37).

The Yucaipa GSA identified a decline of 10,000 AF from storage over a 10-year period as a significant and unreasonable decline in the storage of groundwater in this management area. The drought buffer provides a reasonable margin of operational flexibility under adverse conditions, by allowing for changes to groundwater production or the implementation of projects and/or programs to prevent a net loss of groundwater that results in the undesirable result of the volume in storage declining below the drought buffer.

The drought buffer begins at the historical low in volume in storage at 408,800 AF and ends 10,000 AF below that mark at 398,800 AF (Figure 3-38, Minimum Threshold and Measurable Objective in the Western Heights Management Area). Undesirable results were not experienced at the historical low storage condition in that groundwater supply was not impacted. **The minimum threshold is established at 398,800 AF.** The RMPs for the Western Heights Management Area are WHWC wells WHWC-2A, WHWC-10, WHWC-11, WHWC-12, and WHWC-14, and the USGS Dunlap Acres nested monitoring wells No. 2 and No. 4 (Figure 3-5). Static groundwater elevations measured at these wells will be used to evaluate conditions against the minimum threshold and measurable objective related to the undesirable results of chronic lowering of groundwater levels, reduction of groundwater storage, and land subsidence.

3.4.3.1 Chronic Lowering of Groundwater Levels

Groundwater elevations in the Western Heights Management Area experienced a long-term declining trend from the mid-1960s to 2015 (Figure 2-71). Groundwater levels declined at an approximate rate of 3.2 feet per year during that period. The cause of the long-term declining trend was groundwater production that exceeded the estimated sustainable yield of 1,760 AFY (Figure 3-37). The declining trend in groundwater levels ceased in 2015 when WHWC increased its purchase of supplemental water from YVWD in 2016 and, subsequently, WHWC reduced groundwater production from an average 2,300 AFY (1990–2015) to 1,600 AFY (2016–2018), a rate less than the estimated sustainable yield (Figure 3-39, Groundwater Production and Supplemental Water Purchased in the Western Heights Management Area).

The current average static groundwater elevation in the Western Heights Management Area is 1,753 feet above NAVD88 (Table 3-5). This is approximately 11 feet higher than the average static groundwater elevation of 1,742 feet above NAVD88 measured at the historical low condition between the RMPs in September 2015 (Table 3-5). The YIHM was used to simulate conditions at the minimum threshold. The simulated groundwater elevations at the minimum threshold for each RMP range from 1,705 to 1,713 feet above NAVD88 (Table 3-5). On average, the YIHM overestimated groundwater elevations in the Western Heights Management Area by approximately 5.3 feet between 2015 and 2018. Therefore, the minimum threshold will be characterized by measured groundwater elevations at the RMPs that range from 1,695 to 1,714 feet above NAVD88 (Table 3-5). The average groundwater elevation between the RMPs representing the minimum threshold is 1,705 feet above NAVD88.

Projected groundwater elevations calculated by the YIHM indicate that future operations in the Western Heights Management Area with pumping constrained to the estimated sustainable yield of 1,760 AFY will result in groundwater level increases from 2019 to 2070. Under the Future Baseline scenario, and the Future Baseline with Climate Change I and II (i.e., 2030 and 2070 climate change factors) scenarios, the YIHM predicts that groundwater elevations will increase at rates of approximately 1.5 foot per year (ft/yr), 1.2 ft/yr, and 0.8 ft/yr, respectively. Groundwater elevations are projected to be approximately 73 feet, 59 feet, and 39 feet higher than the groundwater elevations observed in September 2018 (Figures 3-40 to 3-46). Projected groundwater elevations at the RMPs will be above the groundwater elevations characterizing the minimum threshold in the management area.

Over the 50-year planning and implementation horizon, the groundwater elevation minimum thresholds allow for groundwater extractions to exceed historical levels while protecting against long-term aquifer supply depletion. Historical production at an average 2,500 AFY from 1966 to 2015 led to a groundwater level decline of approximately 2.7 feet per year. If, beginning with the current condition, pumping increased from the estimated sustainable yield of 1,760 AFY to the historical average of 2,500 AFY, then this historical rate may be sustained for approximately 18 years before groundwater levels fall to the minimum threshold established at an average elevation of 1,705 feet above NAVD88.

3.4.3.2 Reduction of Groundwater Storage

The YIHM indicated a net decrease of approximately 32,500 AF in groundwater storage from 1965 to 2018 (Figure 2-72). In this period, the average annual rate of groundwater production from the management area was approximately 2,400 AFY. Groundwater production was, on average, 136% of the estimated sustainable yield of 1,760 AFY. The rate of groundwater production consistently exceeded the natural recharge over this period despite the relatively wet periods observed from 1978-1983, 1993-1998, 2005, and 2011 (Figure 2-3). The decline in storage stopped in 2016 when WHWC markedly increased its purchase of supplemental water from YVWD, which subsequently led to a decline in groundwater production to below the estimated sustainable yield (Figures 3-37 and 3-39).

Simulation results of future projected conditions using the YIHM indicate that the volume in storage will, by the end of the 50-year planning and implementation horizon, increase by approximately 19,000 AF to 29,000 AF above the minimum threshold (Figure 3-47, Predicted Volume in Storage by the Future Baseline and Future Baseline with Climate Change I and II Scenarios in the Western Heights Management Area).

The decline in groundwater elevation from the current level to the minimum threshold represents a net decline in groundwater storage of approximately 10,500 AF (Figure 3-38). The volume in groundwater storage at the minimum threshold is approximately 398,800 AF, which is 97% of the current volume in storage at 409,300 AF. The reduction

in groundwater storage to 398,800 AF would be an undesirable result. Groundwater elevations that result in a reduction in groundwater storage of approximately 10,500 AF from the current condition are lower than the historical low groundwater levels. This analysis indicates that maintaining an average aquifer saturation that is at least 97% of current conditions will protect against long-term aquifer supply depletion and provide necessary operational flexibility for municipal and private groundwater users.

3.4.3.3 Land Subsidence

The minimum threshold static groundwater elevation established to assess chronic lowering of groundwater levels and reduction of groundwater storage is lower than the historical low condition, and therefore introduces the potential for future land subsidence. DWR has designated the Plan Area has having a medium to low risk for future land subsidence (DWR 2014). The subsurface geology below the average historical low groundwater elevation of 1,742 feet above NAVD88 is, based on driller's logs for the WHWC wells, characterized as having relatively thin, discontinuous lenses of clay interbedded between thicker layers of coarse-grained sand and gravel (Appendix 3-A). This presents a low risk for future subsidence, and land subsidence related to groundwater withdrawal was not induced when historical water levels were lower than current water levels.

Groundwater elevations declined from 1996 to the historical low observed in 2015, a period when the GPS station located at Crafton Hills College indicated a net increase in vertical displacement (Figure 3-1). No significant and unreasonable land subsidence that would substantially interfere with land surface uses or infrastructure was experienced during this period. Despite no occurrence of land subsidence due to past groundwater withdrawals, there is a potential for land subsidence when groundwater levels fall below the historical low condition. Therefore, the minimum threshold for chronic declines in groundwater level and reduction of groundwater storage were adopted for land subsidence as well. The use of the groundwater elevation minimum threshold as a surrogate for land subsidence will be reviewed with each 5-year GSP evaluation to ensure that they adequately protect the Plan Area from experiencing undesirable results related to land subsidence. Each 5-year GSP evaluation will include InSAR data obtained from the SGMA Data Portal, which will be compared to previous InSAR data (including the baseline dataset collected from 2015 to 2018 – a time when groundwater levels were recovering from the historical lows) to evaluate potential land subsidence as a result of groundwater levels falling below historical lows in the principal aquifer.

3.4.3.4 Depletion of Interconnected Surface Water

No GDEs, potential GDEs, or interconnected surface waters were identified in the Western Heights Management Area, so no minimum threshold was established relative to this undesirable result.

3.4.3.5 Degradation of Water Quality

No minimum threshold relative to the significant and unreasonable degradation of water quality was established for the Western Heights Management Area. Active groundwater remediation programs in the Western Heights Management Area are addressing shallow groundwater contamination issues in a perched aquifer hydraulically disconnected from the underlying principal aquifer. Water quality at the active WHWC municipal supply wells has not been influenced by groundwater contamination observed in the shallow perched aquifer (see Section 2.7.5).

WHWC continues to participate in the Maximum Benefits Monitoring Program and submits groundwater level and groundwater quality (i.e., TDS and nitrate concentrations) data to YVWD, the acting data manager for the Maximum Benefits Monitoring Program, which is included in annual reports submitted to the RWQCB.

3.4.3.6 Seawater Intrusion

The Western Heights Management Area is approximately 50 miles northeast of the Pacific Ocean and approximately 1,700 feet above NAVD88. No minimum threshold was established for the Western Heights Management Area with regard to seawater intrusion.

3.4.4 San Timoteo Management Area

The San Timoteo Management Area comprises the portion of the Live Oak hydrogeological subarea that is not in the Calimesa Management Area (Figure 2-63). There are no municipal water supply wells in this management area. There are two known private agricultural supply wells in the lower portion of the management area on the westside of San Timoteo Creek. One of the wells, GL-8, supplies water to the citrus groves located near the well. The other agricultural well, the Knight Well, is used to irrigate a small field adjacent to the San Timoteo Creek. YVWD installed shallow groundwater observation wells to monitor groundwater elevations in San Timoteo Canyon. Some of these wells were set approximately 15 to 20 feet below grade and were screened to monitor fluctuations in the shallow groundwater table near San Timoteo Creek.

A minimum threshold for this management area was established for the GDEs identified along San Timoteo Creek. At this time, no sustainability criteria are established for the other sustainability indicators because there are no existing municipal water supply wells that extract groundwater from the principal aquifer. If a water purveyor plans to install and operate a municipal water supply well and produce from the principal aquifer, then the water purveyor must investigate the potential influences of pumping from the principal aquifer on the shallow groundwater table sustaining the GDEs identified along San Timoteo Creek and the potential GDEs identified along Yucaipa Creek upstream of its confluence with San Timoteo Creek. Additionally, the average long-term groundwater production from the principal aquifer in the San Timoteo Management Area will be held at or below the estimated sustainable yield of 325 AFY.

The undesirable result identified for the San Timoteo Management Area is the condition when the shallow groundwater table sustaining the GDEs falls below 30 feet bgs as a result of groundwater production from the principal aquifer. Static groundwater levels measured at YVWD shallow wells OW-3P, OW-6A and OW-6B indicated a water table above 10 feet bgs (Figure 3-48, Groundwater Elevations and Sustainability Criteria for the San Timoteo Management Area). These wells no longer exist, but were previously screened from 5 to 20 feet bgs. Deeper wells GWMW-1, GWMW-2, and GWMW-3, which are screened approximately 45 to 70 feet bgs, each had static groundwater elevations at 15 to 20 feet bgs. These groundwater elevations, or hydraulic heads, measured approximately 25 to 30 feet higher than the top of their respective well screens indicate that the alluvial aquifer is confined (Figure 3-49, Historical Groundwater Elevations Measured in the San Timoteo Management Area).

YVWD installed a deeper nested well, GWMW-5, near GWMW-1 with three well casings set at 120 to 140 feet bgs (GWMW-5A), 285 to 305 feet bgs (GMWMW-5B), and 340 to 360 feet bgs (GWMW-5C). Static groundwater elevations at the shallowest well, GWMW-5A, ranged between 15 and 25 feet bgs, and between ground surface and 5 feet bgs at GWMW-5B (Figure 3-50, Groundwater Elevations at Nested Well GWMW-5 in the San Timoteo Management Area). The deepest well, GWMW-5C, has been artesian, with flow continuously discharged to land surface. The static groundwater elevations observed at these nested wells indicated an upward vertical hydraulic gradient estimated at 0.115 feet per foot.

The RMPs for the San Timoteo Management Area are GWMW-1, GWMW-2, GWMW-3, GWMW-5A, GWMW-5B, and GWMW-5C (Figure 3-5).

3.4.4.1 Chronic Lowering of Groundwater Levels

At this time, no minimum threshold is established for the chronic lowering of groundwater levels in the San Timoteo Management Area. Static depths-to-water measured at the GL-8 agricultural well ranged from 29.17 to 38.16 feet bgs (average of 33.88 feet bgs) from 2006 to 2018 (Figure 3-49). The groundwater level dropped to an average 99.73 feet bgs when the well pumped groundwater, but subsequent groundwater level measurements when the well was idle indicated full recovery to previously observed static levels at approximately 34 feet bgs. There was no chronic lowering of groundwater levels in the principal aquifer.

The well construction and groundwater production details for the GL-8 well are unknown. The Yucaipa SGMA will request the installation of a flow meter and installation of a dedicated pressure transducer, if feasible, at GL-8 to begin recording pumping data and measuring water level data on an hourly frequency. If a water purveyor plans to install a water supply well in this management area to produce water from the principal aquifer, then aquifer testing and instrumentation of the new well, plus increased monitoring at existing wells (e.g., GL-8, GWMW-5A, GWMW-5B, GWMW-5C) will be conducted to evaluate the potential influences of pumping by the new well on other wells and the shallow groundwater sustaining the GDEs in proximity.

3.4.4.2 Reduction of Groundwater Storage

Static groundwater levels measured at GL-8, GWMW-1, GWMW-2 and GWMW-3 have been consistent since 2010, indicating no significant and unreasonable reduction in groundwater storage (Figure 3-49). At this time, no minimum threshold is established for a reduction in groundwater storage.

The YIHM predicted a net increase in groundwater in storage of approximately 4,200 to 1,600 AF by the end of the 50-year planning and implementation horizon for the Future Baseline and Future Baseline with Climate Change I scenarios, respectively (Figure 3-51, Predicted Volume in Storage by the Future Baseline and Future Baseline with Climate Change I and II Scenarios in the San Timoteo Management Area). The YIHM predicted a net decrease of 1,600 AF for the Future Baseline with Climate Change II scenario (Figure 3-51). No future pumping in the principal aquifer was simulated in these scenarios. The model will be updated with pumping data for GL-8 and the Knight well should their respective construction details indicate that the wells are producing groundwater from the principal aquifer.

Table 3-5. Groundwater Elevations Pertaining to the Measurable Objective and Minimum Threshold in the Western Heights Management Area

Representative Monitoring Point	Simulated Groundwater Elevation at Sep. 30, 2015 (ft NAVD88)	Measured Groundwater Elevation near Sep. 30, 2015 (ft NAVD88)	Measured – Simulated Groundwater Elevation at Sep. 2015 (feet)	Simulated Groundwater Elevation at Sep. 30, 2018 (ft NAVD88)	Measured Groundwater Elevation near Sep. 30, 2018 (ft NAVD88)	Measured – Simulated Groundwater Elevation at Sep. 2018 (feet)	Simulated Groundwater Elevations at the Minimum Threshold (ft NAVD88)	Groundwater Elevations at the Minimum Threshold (ft NAVD88)	Groundwater Elevations at the Measurable Objective (ft NAVD88)
WHWC-2A	1,752.75	1,735.68	−17.07	1,756.69	1,740.68	−16.01	1,711.78	**1,695.24**	**1,735.68**
WHWC-10	1,754.44	1,750.04	−4.40	1,758.57	1,766.04	7.47	1,712.73	**1,714.26**	**1,750.04**
WHWC-11	1,747.23	1,748.93	1.70	1,748.33	1,760.93	12.60	1,705.09	**1,712.24**	**1,748.93**
WHWC-12	1,751.15	1,747.11	−4.04	1,749.20	1,757.11	7.91	1,706.91	**1,708.84**	**1,747.11**
WHWC-14	1,752.21	1,726.90	−25.31	1,754.80	1,749.90	−4.90	1,711.23	**1,696.12**	**1,726.90**
USGS Dunlap #2 (830′–850′)	1,753.21	1,748.40	−4.81	1,756.60	1,754.85	−1.75	1,712.25	**1,708.97**	**1,748.40**
USGS Dunlap #4 (440′–460′)	1,753.18	1,740.32	−12.86	1,756.46	1,743.89	−12.57	1,712.25	**1,699.54**	**1,740.32**
Average	1,752.03	1,742.48	−9.54	1,754.38	1,753.34	−1.04	1,710.32	**1,705.03**	**1,742.48**

Note: ft NAVD88 = feet above the North American Vertical Datum of 1988.

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3.4.4.3 Land Subsidence

At this time, no minimum threshold for land subsidence was established for the San Timoteo Management Area because there are no known existing water supply wells producing water from the principal aquifer, there is an upward vertical hydraulic gradient to where deep observation wells screened in the principal aquifer are artesian, and shallow groundwater levels have been consistently above 30 feet bgs.

3.4.4.4 Depletion of Interconnected Surface Water

GDEs were identified along the reach of San Timoteo Creek from its confluence with Yucaipa Creek downstream to where the flood control basins installed by SBCFCD begin (Figure 2-56). These GDEs were identified based on shallow groundwater levels observed at the water table observation wells OW-3P, OW-6A and OW-6B (Figure 3-48), and the vertical hydraulic gradient observed at the nested well, GWMW-5 (Figure 3-50). Potential GDEs were identified on the lower reach of Yucaipa Creek running 2.6 miles upstream from near its confluence with San Timoteo Creek. These GDEs were identified as potential GDEs due to the lack of groundwater level data in the area to confirm whether the GDEs were dependent on shallow groundwater.

If future extractions from the principal aquifer are planned in this region, then additional field work will be required to evaluate the potential influence of pumping on the shallow groundwater table sustaining the GDEs along San Timoteo Creek and the potential GDEs along Yucaipa Creek. The evaluation would include installing one or more shallow groundwater observation wells screened from the historical high groundwater level to approximately 35 feet bgs. Groundwater elevation data collected from the shallow groundwater observation well(s) will be analyzed to evaluate whether the potential GDEs along Yucaipa Creek are sustained by shallow groundwater (<30 feet bgs) and will be used to evaluate seasonal fluctuations and potential influences by pumping in the principal aquifer.

3.4.4.5 Degradation of Water Quality

No minimum threshold relative to the significant and unreasonable degradation of water quality was established for the San Timoteo Management Area.

3.4.4.6 Seawater Intrusion

The San Timoteo Management Area is approximately 48 miles northeast of the Pacific Ocean and approximately 1,300 feet above NAVD88, which is approximately 1,300 feet above mean sea level. No minimum threshold was established for the San Timoteo Management Area with regard to seawater intrusion.

3.5 Measurable Objectives

Measurable objectives are "specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin" (23 CCR, Section 351, Definitions). Based on the sustainability goal (Section 3.2) and undesirable results (Section 3.3) in the Plan Area, measurable objectives were set for chronic declines in groundwater levels, reduction of groundwater in storage, land subsidence and depletion of interconnected surface water.

3.5.1 North Bench Management Area

A measurable objective was established in the North Bench Management Area to sustainably manage the groundwater resource currently and into the future by the Yucaipa GSA. **The measurable objective was established at a volume in storage of 230,000 AF**, which is 10,000 AF above the minimum threshold (Figure 3-4). The measurable objective represents the condition when the groundwater resource in the management area is managed sustainably and no undesirable results are experienced. It also represents the top end of the drought buffer. The drought buffer provides the Yucaipa GSA operation flexibility where management actions and/or programs may be implemented to prevent undesirable results should conditions fall below the minimum threshold. The measurable objective is below current conditions and projections by the YIHM indicate that future conditions will not approach the measurable objective (Figure 3-15).

3.5.1.1 Chronic Lowering of Groundwater Levels

The groundwater elevations at the RMPs that correspond to the measurable objective for the North Bench Management Area range from 2,229 to 2,528 feet above NAVD88 (Table 3-3). Since the 2007 WY, groundwater levels have exhibited an increasing trend because of the importation of SWP water as a supplemental source of water and the subsequent reduction in groundwater production by YVWD to below the estimated sustainable yield for the North Bench Management Area (Figure 3-6). Current groundwater levels in the management area are approximately 100 feet above the measurable objective.

Future predictions of groundwater elevations at each RMP in the management area by the YIHM will remain above the measurable objective (Figures 3-7 to 3-14). If, however, groundwater elevations fall below the measurable objective, the Yucaipa GSA will implement actions and/or programs to avoid the undesirable result of groundwater elevations declining below the drought buffer. The groundwater level difference of approximately 30 feet between the measurable objective and the minimum threshold provides a reasonable margin of operational flexibility under adverse conditions, by allowing for changes to groundwater production or the implementation of projects and/or programs to prevent a net loss of groundwater from the management area before groundwater levels fall to the minimum threshold.

3.5.1.2 Reduction of Groundwater Storage

The measurable objective defined for the chronic lowering of groundwater levels (Section 3.5.1.1) applies to the reduction of groundwater storage. The groundwater elevations at the RMPs that correspond to the measurable objective range from 2,229 feet above NAVD88 to 2,528 feet above NAVD88 (Table 3-3). This marks the condition when approximately 230,000 AF of groundwater is in storage, which is approximately 90% of the volume in storage under current conditions.

Future predictions of the volume in storage by the YIHM, with groundwater production constrained to the estimated sustainable yield of 3,940 AFY, indicate a net increase in storage over the 50-year planning and implementation horizon. The volume in storage in the management area at the end of the 2069 WY will range from approximately 257,000 AF to 267,000 AF, or 27,000 AF to 37,000 AF above the measurable objective (Figure 3-15). The measurable objective also marks the beginning of the drought buffer, which allows an operational flexibility of 10,000 AF for the Yucaipa GSA to implement actions and/or programs to avoid undesirable results should conditions decline to the minimum threshold (i.e., the bottom of the drought buffer).

3.5.1.3 Land Subsidence

The measurable objective defined for the chronic lowering of groundwater levels at an average elevation of 2,332 feet above NAVD88 is approximately 30 feet above the minimum threshold, or historical low (Table 3-3). The measurable objective defined at this average elevation provides operational flexibility to implement actions and/or programs to avoid undesirable results should groundwater elevations fall below the minimum threshold. Land subsidence may be induced if the average static groundwater level declines below the historical low level for a long period of time. Static groundwater level measurements at the RMPs for this management area will act as a surrogate for direct measurements of land subsidence as a function of groundwater withdrawals from the principal aquifer. InSAR data obtained from the SGMA Data Portal will be compared to previous InSAR data (including the baseline dataset collected from 2015 to 2018) to evaluate potential land subsidence as a result of groundwater levels falling below historical lows in the principal aquifer.

3.5.1.4 Depletion of Interconnected Surface Water

One measurable objective related to the protection of GDEs is defined for the North Bench Management Area, which corresponds to a shallow groundwater level measured at 20 feet bgs. This measurable objective is 10 feet higher than the minimum threshold, which provides a reasonable margin of operational flexibility under adverse conditions by allowing for changes to groundwater production (if demonstrated to influence shallow groundwater) or the implementation of projects and/or programs before groundwater levels fall to an elevation at which an undesirable result would occurs.

If future extractions planned in this region are expected to exceed historical extractions in the region, additional field work may be required to characterize the potential impact that proposed pumping rates will have on the habitats along Oak Glen Creek and Wildwood Canyon Creek. This would include installing one or more shallow groundwater observation wells screened from the historical high groundwater level to approximately 35 feet bgs. Groundwater elevation data collected from the shallow groundwater observation well(s) will be analyzed to evaluate whether the local habitat is sustained by shallow groundwater (<30 feet bgs).

3.5.1.5 Degradation of Water Quality

No measurable objectives were established relative to the significant and unreasonable degradation of water quality for the Western Heights Management Area.

3.5.1.6 Seawater Intrusion

No measurable objectives were established relative to seawater intrusion for the Western Heights Management Zone.

3.5.2 Calimesa Management Area

A measurable objective was established in the Calimesa Management Area to sustainably manage the groundwater resource currently and into the future by the Yucaipa GSA. **The measurable objective was established at the historical low volume in storage of 798,700 AF**, which is 26,000 AF above the minimum threshold (Figure 3-20). The measurable objective represents the condition when the groundwater resource in the management area is managed sustainably and no undesirable results are experienced. It also represents the beginning of the drought buffer (Figure 3-20). The

drought buffer provides the Yucaipa GSA operational flexibility where management actions and/or programs may be implemented to prevent undesirable results should conditions fall below the minimum threshold.

3.5.2.1 Chronic Lowering of Groundwater Levels

The groundwater elevations at the RMPs that correspond to the measurable objective for the Calimesa Management Area are based on the historical low conditions, which range from 2,040 to 2,206 feet above NAVD88 (Table 3-4). Groundwater levels have exhibited an increasing trend since the historical low because of the importation of SWP water as a supplemental source of water and the subsequent reduction in groundwater production by YVWD, which led to a decline in the total production in the Calimesa Management Area to below the estimated sustainable yield of 4,955 AFY (Figures 2-69 and 3-19).

Future predictions of groundwater elevations in the management area by the YIHM indicate that groundwater levels will be above the measurable objective in the Future Baseline and Future Baseline with Climate Change I scenarios, but will fall below the measurable objective under the Future Baseline with Climate Change II scenario at the end of the 50-year planning and implementation horizon (Figures 3-22 to 3-34).

When the groundwater elevation falls below the measurable objective, the Yucaipa GSA will implement actions and/or programs to avoid the undesirable result of groundwater elevations declining below the drought buffer (Section 4.2.1). The drought buffer provides a reasonable margin of operational flexibility under adverse conditions, by allowing for changes to groundwater production or the implementation of projects and/or programs to prevent undesirable results.

3.5.2.2 Reduction of Groundwater Storage

The measurable objective defined for the chronic lowering of groundwater levels (Section 3.5.2.1) applies to the reduction of groundwater storage. The groundwater elevations at the RMPs that correspond to the measurable objective range from 2,040 feet above NAVD88 to 2,206 feet above NAVD88 (Table 3-4). This marks the condition when approximately 798,700 AF of groundwater is in storage. The measurable objective is approximately 1,700 AF below the current condition and marks the upper level of the drought buffer. The drought buffer provides operational flexibility for the Yucaipa GSA to implement actions and/or programs to avoid undesirable results should conditions decline to the minimum threshold (i.e., the bottom of the drought buffer).

The YIHM indicates that future conditions, with groundwater production constrained to the estimated sustainable yield of 4,955 AFY, will fluctuate above and below the measurable objective depending on climate (Figure 3-35). The Future Baseline scenario indicates that the volume in storage will be approximately 807,900 AF, which is 7,500 AF above the current condition. The Future Baseline with Climate Change I and II scenarios indicate that from the 2058 WY to 2069 WY, a period represented by the relatively dry period observed from 2002 to 2013, the volume in storage will approach the measurable objective or decline below the measurable objective by 12,000 AF, respectively (Figure 3-35).

3.5.2.3 Land Subsidence

The groundwater elevations representing the measurable objective are the historical lows in groundwater elevations observed between 2010 and 2015. There is no potential for land subsidence when groundwater elevations are at or above the measurable objective. However, land subsidence may be induced if the static groundwater levels

measured at the RMPs decline below the historical low condition (i.e., the beginning of the drought buffer) for a long period of time. Static groundwater level measurements at the RMPs for this management area will act as a surrogate for direct measurements of land subsidence as a function of groundwater withdrawals from the principal aquifer. InSAR data obtained from the SGMA Data Portal will be compared to previous InSAR data (including the baseline dataset collected from 2015 to 2018) to evaluate potential land subsidence as a result of groundwater levels falling below historical lows in the principal aquifer.

3.5.2.4 Depletion of Interconnected Surface Water

No measurable objectives are defined relative to the significant and unreasonable effect of depleting interconnected surface water in the management area. No GDEs were identified in the Calimesa Management Area. One potential GDE was identified in the Singleton subarea. If a new water supply well is installed within 1 kilometer (0.6 miles) of this potential GDE and pumping from the principal aquifer lowers shallow groundwater levels that sustain the GDE, then sustainability criteria will be developed to prevent an undesirable result related to the significant and unreasonable decline in the shallow water table that may cause adverse impacts to the GDE.

3.5.2.5 Degradation of Water Quality

No measurable objectives were established relative to the significant and unreasonable degradation of water quality for the Calimesa Management Area.

3.5.2.6 Seawater Intrusion

No measurable objectives were established relative to seawater intrusion for the Calimesa Management Zone.

3.5.3 Western Heights Management Area

A measurable objective was established in the Western Heights Management Area to sustainably manage the groundwater resource currently and into the future by the Yucaipa GSA. **The measurable objective was established at a volume in storage of 408,800 AF**, which is the historical low in volume in storage observed in 2015 (Figure 3-38). The measurable objective represents the condition when the groundwater resource in the management area is managed sustainably and no undesirable results are experienced. It also represents the beginning of the drought buffer (Figure 3-38). The drought buffer provides the Yucaipa GSA operation flexibility where management actions and/or programs may be implemented to prevent undesirable results should conditions fall below the minimum threshold.

3.5.3.1 Chronic Lowering of Groundwater Levels

The groundwater elevations at the RMPs that correspond to the measurable objective for the Western Heights Management Area are based on the historical low groundwater levels, which range from 1,727 to 1,750 feet above NAVD88 (Table 3-5). Groundwater levels have exhibited an increasing trend since the historical low because WHWC purchases supplemental water from YVWD that, subsequently, decreases the groundwater production from the management area.

The YIHM predicts that groundwater elevations under the Future Baseline and Future Baseline with Climate Change I and II scenarios will be higher than the measurable objective by approximately 39 to 80 feet at the end of the 50-year planning and implementation horizon (Figures 3-40 to 3-46). If groundwater elevations fall below the measurable objective, the Yucaipa GSA will implement actions and/or programs to avoid the undesirable result of groundwater elevations declining below the drought buffer (Section 4.2.1). The drought buffer provides a reasonable margin of operational flexibility under adverse conditions, by allowing for changes to groundwater production or the implementation of projects and/or programs to prevent undesirable results.

3.5.3.2 Reduction of Groundwater Storage

The measurable objective defined for the chronic lowering of groundwater levels (Section 3.5.3.1) apply to the reduction of groundwater storage. The groundwater elevations at the RMPs that correspond to the measurable objective range from 1,727 to 1,750 feet above NAVD88 (Table 3-5. This marks the condition when approximately 408,800 AF of groundwater is in storage (Figure 3-38). The measurable objective is approximately 500 AF below the current condition and marks the beginning of the drought buffer. The drought buffer provides operational flexibility for the Yucaipa GSA to implement actions and/or programs to avoid undesirable results should conditions decline to the minimum threshold (i.e., the bottom of the drought buffer).

The YIHM indicates that, with groundwater production constrained to the estimated sustainable yield of 1,760 AFY, the volume of groundwater in storage will increase to approximately 9,500 AF to 19,000 AF above the measurable objective (Figure 3-47).

3.5.3.3 Land Subsidence

The measurable objective defined for the chronic lowering of groundwater levels (Section 3.5.3.1) applies to land subsidence in that static groundwater levels below the historical low level for a long period of time may induce land subsidence. Static groundwater level measurements at the RMPs for this management area will act as a surrogate for direct measurements of land subsidence as a function of groundwater withdrawals from the principal aquifer. InSAR data obtained from the SGMA Data Portal will be compared to previous InSAR data (including the baseline dataset collected from 2015 to 2018) to evaluate potential land subsidence as a result of groundwater levels falling below historical lows in the principal aquifer.

3.5.3.4 Depletion of Interconnected Surface Water

No GDEs and no potential GDEs were identified in the Western Heights Management Area, so no measurable objective was established relative to this undesirable result.

3.5.3.5 Degradation of Water Quality

No measurable objectives were established relative to the significant and unreasonable degradation of water quality in the principal aquifer for the Western Heights Management Area.

3.5.3.6 Seawater Intrusion

No measurable objectives were established relative to seawater intrusion for the Western Heights Management Zone.

3.5.4 San Timoteo Management Area

A measurable objective for this management area was established for the GDEs identified along San Timoteo Creek. At this time, no sustainability criteria were established for the other sustainability indicators because there are no existing municipal water supply wells and historical groundwater elevations indicate that private well use did not cause long-term declines in shallow groundwater levels. If a water purveyor plans to install and operate a municipal water supply well and produce from the principal aquifer, then the water purveyor must investigate the potential influences of pumping from the principal aquifer on the relationship between shallow groundwater and surface water in San Timoteo Creek and Yucaipa Creek.

3.5.4.1 Chronic Lowering of Groundwater Levels

At this time, no measurable objectives were established for the chronic lowering of groundwater levels. Static groundwater levels measured at GL-8, GWMW-1, GWMW-2 and GWMW-3 have been consistent since 2010, indicating no significant and unreasonable decline in groundwater elevations (Figure 3-49).

3.5.4.2 Reduction of Groundwater Storage

At this time, no measurable objectives were established for reduction in groundwater storage. Static groundwater levels measured at GL-8, GWMW-1, GWMW-2 and GWMW-3 have been fairly consistent since 2010, indicating no significant and unreasonable reduction in groundwater storage.

3.5.4.3 Land Subsidence

At this time, no measurable objectives for land subsidence were established for the San Timoteo Management Area because there are no existing water supply wells producing water from the principal aquifer, there is an upward vertical hydraulic gradient to where deep observation wells screened in the principal aquifer are artesian, and shallow groundwater levels have been consistently above 30 feet bgs.

3.5.4.4 Depletion of Interconnected Surface Water

One measurable objective is defined for the San Timoteo Management Area, which corresponds to a shallow groundwater level measured at 20 feet bgs (Figure 3-48). This measurable objective is 10 feet higher than the minimum threshold, and it provides a reasonable margin of operational flexibility under adverse conditions by allowing for changes to groundwater production (if demonstrated to influence shallow groundwater) or the implementation of projects and/or programs before groundwater levels fall to an elevation at which undesirable results would occur.

3.5.4.5 Degradation of Water Quality

No measurable objectives were established relative to the significant and unreasonable degradation of water quality for the San Timoteo Management Area.

3.5.4.6 Seawater Intrusion

No measurable objectives were established relative to seawater intrusion for the San Timoteo Management Area.

3.6 Monitoring Network

The objective of a monitoring network is to track and monitor parameters that demonstrate "short-term, seasonal, and long-terms trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation," (23 CCR §354.34). In order to accomplish this objective, the monitoring network must be capable of:

- Monitoring changes in groundwater and surface water conditions that may impact the beneficial uses or users of groundwater,
- Monitoring groundwater conditions relative to the sustainable management criteria, and
- Quantifying annual changes in water budget components.

The water purveyors operating in the Yucaipa Subbasin have been monitoring groundwater conditions through their respective networks of water supply and monitoring wells by collecting groundwater elevation, groundwater quality and groundwater production data since the 1920s. The current network of water supply wells and monitoring wells is capable of characterizing groundwater conditions in the Plan Area. The network will continue to be used to monitor groundwater conditions to assess long-term and short-term trends in groundwater elevations, production, and groundwater quality.

SBCFCD maintains five stream flow gauging stations in the Plan Area. These gauging stations were designed to measure peak flow events in Oak Glen Creek and Yucaipa Creek; they were not designed to measure low flows. SBCFCD reported issues with the stream flow measuring systems at three of the five locations and does not have confidence that the data collected is representative of actual flows (Section 2.3.1). The USGS has one active stream flow gauging station (110575000 located approximately 4.2 miles downstream of the farthest downstream end of the Plan Area. Flows measured at this gauging station include runoff from the San Timoteo watershed, and other drainages downstream of the watershed that contribute flow in addition to flows from the Plan Area. Flows measured at the USGS gauging station are not considered representative of surface water flow leaving the Plan Area. The unreliable low-flow data collected by the SBCFCD gauging stations was recognized as a data gap (Section 2.6.3). The Yucaipa GSA will evaluate the feasibility of installing new gauging stations, if funding becomes available, or work with SBCFCD to improve the existing stations to more accurately measure stream flows in the Plan Area.

3.6.1 Description of Existing Groundwater Network

The existing network of wells to assess groundwater conditions in the Yucaipa Subbasin includes the majority of water supply wells operated by South Mesa, South Mountain, WHWC, and YVWD. Monitoring wells installed by YVWD, the USGS and SBVMWD also provide data characterizing groundwater conditions in the Subbasin. The groundwater monitoring network includes 77 wells (Figure 3-52, Yucaipa Subbasin Groundwater Monitoring Network; Table 3-1). Groundwater elevation data is collected at 73 of these wells; water quality data is collected at 40 of these wells; and groundwater production data is collected at 31 wells. Four of the municipal wells in the monitoring network are located outside the Plan Area and supply water to the Subbasin. This water supply is

characterized as an imported groundwater supply to the Subbasin. The majority of the wells are municipal supply and monitoring wells; however, the network does include two irrigation wells operated by South Mountain. Table 3-6 presents the number and type of wells located in each management area.

Table 3-6. Types of Wells in the Existing Monitoring Network

Management Area	Municipal	Monitoring	Private/ Domestic	Agricultural/ Irrigation
All wells	41	33	0	3
Calimesa	13	9	0	2
North Bench	17	13	0	0
San Timoteo	0	6	0	1
Western Heights	7	5	0	0
Outside Subbasin	4	0	0	0

Of the 77 wells incorporated into the monitoring network, 13 lack well construction information, such as screen intervals and depths. Since there is only one principal aquifer in the Plan Area, well construction information is not critical for understanding general groundwater conditions. However, any projects implemented in the Plan Area may include the construction of new wells that may be designed to provide additional data on depth discrete groundwater conditions within the principal aquifer. Table 3-7 describes the maximum depth of the screens of the wells by production areas.

Table 3-7. Maximum Screen Depth of Wells in the Monitoring Network

Management Area	Wells with No Screening Information	Bottom of Screen (feet bgs)				
		<100	*100–300*	*300–500*	*500–1,000*	*>1,000*
Calimesa	2	0	0	6	15	1
North Bench	7	1	5	5	10	2
San Timoteo	1	3	1	2	0	0
Western Heights	1	0	1	1	5	4
Outside Subbasin	2	0	0	1	1	0
Total	**13**	**4**	**7**	**15**	**31**	**7**

Note: bgs = below ground surface.

3.6.1.1 Groundwater Monitoring

The monitoring network tracks groundwater elevations, groundwater quality, and groundwater extractions on a monthly to annual basis. The types of measurements collected at each well are divided into seven categories: Extraction, Extraction-Level, Extraction-Level-Quality, Extraction-Quality, Level, Level-Quality, and Quality (Table 3-8). The four water purveyors participate in the Maximum Benefits Monitoring Program (MBMP), which includes the collection of groundwater elevation data and water quality data from a select list of municipal and monitoring wells in the Plan Area (see Sections 1.5.1 and 2.7.4).

At a minimum for the MBMP, static groundwater level data is collected every April/May (i.e., seasonal high) and October/November (i.e., seasonal low) and groundwater quality data is collected annually or every three years. The municipal water suppliers also adhere to the provisions of Title 22 regarding water quality monitoring of municipal water supply wells. In general, TDS, chloride, and sulfate samples are collected once every three years and nitrate samples are collected annually. The water purveyors have collected groundwater level data on a monthly basis since the 1990s. Groundwater production data is collected monthly by the water purveyors.

Table 3-8. Monitoring Network Wells by Measurement Type

Management Area	Number of Wells by Measurement Types							
	Extraction	*Extraction Level*	*Extraction Level Quality*	*Extraction Quality*	*Level*	*Level Quality*	*Quality*	*Total*
Calimesa	0	0	12	0	12	0	0	24
North Bench	0	0	10	0	13	7	0	30
San Timoteo	0	0	0	0	1	6	0	7
Western Heights	0	0	5	0	7	0	0	12
Outside Subbasin	4	0	0	0	0	0	0	4
Total	**4**	**0**	**27**	**0**	**33**	**13**	**0**	**77**

3.6.1.1.1 Groundwater Elevations

Groundwater levels are measured, at a minimum, semi-annually in the spring and fall to characterize conditions at the end of the wet and dry seasons, respectively, and to evaluate hydraulic gradients in the Plan Area. The water purveyors collect groundwater elevation data on a monthly basis, and that data will be incorporated into the data management system (DMS) and reported in the annual and periodic evaluation reports as part of the implementation of the GSP. Static groundwater elevations are measured at 73 of the 77 wells (or 95%) in the monitoring network (Figure 3-53, Monitoring Network Wells Designated to Measure Groundwater Elevations). The coverage of the static groundwater level measurements by management area is summarized in Table 3-9.

Table 3-9. Well Distribution and Coverage for Water Level Measurements in the Plan Area

Management Area	First Water Level Record	No. of Wells Measured in 2018	% of Area Within 1 mile of Water Level Measurement	No. of 2018 Wells Regularly Measured between 2007 and 2017	No. of 2018 Wells Regularly Measured within the Same Quarter	No. of 2018 Wells Measured Seasonally
Calimesa	1926	24	60%	22	24	24
North Bench	1926	26	80%	25	26	26
San Timoteo	2010	6	40%	6	6	6
Western Heights	1950	10	90%	10	10	10

Table 3-9. Well Distribution and Coverage for Water Level Measurements in the Plan Area

Management Area	First Water Level Record	No. of Wells Measured in 2018	% of Area Within 1 mile of Water Level Measurement	No. of 2018 Wells Regularly Measured between 2007 and 2017	No. of 2018 Wells Regularly Measured within the Same Quarter	No. of 2018 Wells Measured Seasonally
Outside Subbasin	1956	1	N/A	1	1	1

Note: N/A = not applicable.

Based on the density of the monitoring network wells in each management area, the length of the historical record at each well, the spatial and temporal coverage of the existing monitoring network is sufficient to characterize groundwater conditions in the Plan Area. The current network will be used to demonstrate continued sustainable use of the groundwater resources in a way that is consistent with the sustainability goal.

3.6.1.1.2 Groundwater Extraction

Groundwater extraction in the Plan Area has been monitored by the four water purveyors since 1965. In 2018, 31 municipal water supply wells, or approximately 40% of the wells in the monitoring network, were monitored for groundwater extractions (Figure 3-54, Monitoring Network Wells Designated to Measure Groundwater Production). All of these wells had meters in 2018. There are two irrigation supply wells, GL-8 and Knight, in the San Timoteo management area that are not metered. The Yucaipa GSA will make attempts to contact the individual private well owners and inquire about the installation of meters at these wells and include them as additional RMPs to the San Timoteo Management Area. The coverage of groundwater extractions by management area is summarized in Table 3-10.

Table 3-10. Well Distribution and Coverage for Groundwater Production in the Plan Area

Management Area	First Extraction Record	No. of Wells with Recorded Extractions in 2018	% of Area within 1 Mile of Extraction	No. of 2018 Wells Measured between 2007 and 2017	No. of 2018 Wells Measured within the Same Quarter
Calimesa	1948	12	60%	12	12
North Bench	1965	10	80%	10	10
San Timoteo	N/A	0	N/A	0	0
Western Heights	1965	5	90%	5	5
Outside Subbasin	1956	4	N/A	4	4

Note: N/A = not applicable.

3.6.1.1.3 Groundwater Quality

Groundwater quality sampling is performed quarterly to annually. Samples are collected from active municipal supply wells that have pumped at least three casing volumes and from inactive and/or monitoring wells that were

purged at least three casing volumes using a dedicated pump or portable submersible pump. The water quality samples are collected using standardized procedures established by the various member agencies and analyzed for a variety of parameters per Title 22 requirements for municipal supply wells and the MBMP for monitoring wells (Wildermuth, 2014). Groundwater quality samples are collected at 52% of the wells in the monitoring network (Figure 3-55 and Table 3-11).

Table 3-11. Well Distribution and Coverage for Water Quality Measurements in the Plan Area

Management Area	First Water Quality Record	No. of Wells Measured in 2018	% of Area within 1 Mile of Water Quality Measurement	No. of 2018 Wells Measured between 2007 and 2017	No. of 2018 Wells Measured within the Same Quarter
Calimesa	1993	12	60%	12	12
North Bench	1994	17	80%	17	17
San Timoteo	2010	6	50%	6	6
Western Heights	1995	5	90%	5	5
Outside Subbasin	N/A	0	0%	0	0

Note: N/A = not applicable.

3.6.1.2 Surface Water Monitoring Conditions

In addition to monitoring groundwater conditions in the Plan Area, Yucaipa GSA uses surface water flow and precipitation data collected by other agencies, including the USGS and the SBCFCD, to monitor the parameters that influence groundwater recharge in the Subbasin.

3.6.1.2.1 Surface Water Flow

SBCFCD manages five stream gauges within the Plan Area (Figure 2-7). Two stream gauges are located on Yucaipa Creek, one is located on Wilson Creek upstream of the confluence with Oak Glen Creek, and two stream gauges are located on Oak Glen Creek upstream of its confluence with Yucaipa Creek. Surface water flow is also manually measured in San Timoteo Creek downstream of its confluence with Yucaipa Creek (see Section 2.3.1). These stream gauges record mean daily flow rates. These stations were designed to measure peak flow events. SBCFCD stated that for "95% of the year the creeks do not contain significant quantities of water" and, therefore, do not accurately measure flow outside of those peak events (personnel communication with SBCFCD, July 2019). SBCFCD has confidence in measurements collected at stations 3601C and 3608A, the two farthest downstream gauging stations in the Subbasin. The Yucaipa GSA will evaluate the feasibility of installing new gauging stations, if funding becomes available, or work with SBCFCD to improve the existing stations to more accurately measure stream flows in the Subbasin. No historical records exist for identifying the locations where ephemeral or intermittent flowing streams cease to flow. The Yucaipa GSA will make efforts in the first 5 years of the implementation period to identify where and when these flows cease to improve the characterization of interconnected surface water.

3.6.1.2.2 Precipitation

The precipitation monitoring program currently utilizes 17 precipitation stations managed by SBCFCD within the Plan Area and three NOAA stations with one in the Plan Area, one in the City of Redlands, and one in Beaumont (Section 2.2.1; Figure 2-1). Daily precipitation is recorded at these stations, which provides adequate temporal resolution to evaluate short-term and seasonal impacts of precipitation on groundwater conditions in the Plan Area.

Of the currently active precipitation stations in the Plan Area, the Redlands-Roth and Oak Glen stations, both maintained by SBCFCD, have the longest continuous records of daily precipitation, with measurements dating back to 1932 and 1945, respectively. The lengths of these records, plus long-term records for other stations, are adequate to evaluate long-term trends in precipitation within the Plan Area.

3.6.2 Monitoring Network Relationship to Sustainability Indicators

The existing groundwater network will be used to monitor and document changes in groundwater conditions related to the four sustainability indicators relevant to the Plan Area. This network includes the wells that have been designated as RMPs for reporting purposes to DWR. Minimum thresholds and measurable objectives were established for the RMPs. An assessment of groundwater conditions and the potential for undesirable results will be based on the conditions measured at the RMPs. The broader groundwater monitoring network, including the RMPs, will be used to document conditions in the Plan Area and provide support for recommendations and findings based on the conditions recorded at the RMPs.

3.6.2.1 Chronic Lowering of Groundwater Levels

The groundwater monitoring network must accomplish the following to adequately monitor conditions related to chronic lowering of groundwater levels:

- Track short-term, seasonal, and long-term trends in groundwater elevations.
- Characterize groundwater elevations in mid-March and mid-October for the principal aquifer.
- Record groundwater elevations at RMPs for which minimum thresholds and measurable objectives have been identified.
- Provide data from which hydraulic gradients within the principal aquifer can be calculated.

Spatial Coverage

The groundwater elevation monitoring well density in the Plan Area is approximately 2.1 wells per square mile (Figure 3-53). The highest density of wells occurs in the Western Heights (3.1 wells/sq. mi.) and Calimesa (2.3 wells/sq. mi.) management areas. The majority of wells in Western Heights Management Area are located in the central part of the management area. The majority of wells in the Calimesa Management area are located in the western half of the management area. The density of groundwater level wells in the North Bench Management and San Timoteo Management Areas are 2.1 and 1.2 wells/sq. mi., respectively (Figure 3-53).

DWR guidelines recommend a well network with a density of one observation per 16 square miles (DWR 2016a). The monitoring well density recommended by CASGEM Groundwater Elevation Monitoring Guidelines ranges from one to 10 wells per 100 square miles (DWR 2010). The density of monitoring wells in the Plan Area exceeds the guidance and provides adequate spatial coverage to assess whether the Plan Area is experiencing chronic lowering of groundwater levels.

Temporal Coverage

Groundwater elevation data will be collected, at a minimum, in the spring and fall of each year to characterize groundwater elevation conditions. Further discussion of the monitoring schedule is provided in Section 3.6.3, Monitoring Network Implementation.

3.6.2.2 Reduction of Groundwater Storage

The groundwater monitoring network must accomplish the following to monitor conditions related to reduction of groundwater storage:

- Track short-term, seasonal, and long-term trends in groundwater storage.
- Calculate year-over-year (mid-March to mid-March) changes in storage.

The requirements for evaluating a reduction in groundwater storage are similar to those for chronic lowering of groundwater levels (Section 3.3.2) because these two sustainability indicators are linked. The spatial and temporal density of groundwater elevation data necessary to evaluate a reduction in groundwater storage in the Plan Area is the same for groundwater elevation changes. The current network of wells is capable of documenting changes to both sustainability indicators.

3.6.2.3 Land Subsidence

The groundwater monitoring network must be able to track long-term trends in groundwater elevation in order to adequately monitor conditions related to land subsidence that may result from groundwater elevations falling below historical low levels for a long period of time. Groundwater elevations will be used as a surrogate for direct measurements of land subsidence in the Plan Area (see Section 3.3.3). Because fine grained sediments prone to subsidence tend to occur in thin discontinuous layers in the subsurface of the Plan Area, direct monitoring of subsidence rates is not currently required in the Plan Area. Instead, the network of groundwater monitoring wells discussed in Section 3.6.1 will be used to evaluate whether groundwater level declines in the principal aquifer to below historical lows for a long period may potentially induce land subsidence. If these conditions develop, then the Yucaipa GSA will obtain InSAR data from the SGMA Data Portal to evaluate conditions relative to the baseline (2015 to 2018) when groundwater levels in the Plan Area were recovering from historical lows.

3.6.2.4 Depletions of Interconnected Surface Water

The groundwater monitoring network includes shallow groundwater observation wells completed in San Timoteo Canyon near San Timoteo Creek, and two wells completed near confirmed GDEs in the North Bench Management Area. Groundwater elevations will be monitored at these wells to characterize seasonal conditions in the shallow aquifer, and whether pumping from the principal aquifer influences the shallow groundwater levels. Under the MBMP, surface water flows are measured manually in San Timoteo Creek on a biweekly basis and following major precipitation events. This data will be incorporated into the GSP dataset to evaluate surface water flow conditions relative to climate and groundwater conditions monitored in the San Timoteo Management Area. Other GDEs identified in the North Bench Management Area were not influenced by existing pumping conditions, but any planned new wells in proximity to these GDEs, or increases in groundwater withdrawals that exceed historical

averages, will require an investigation to determine if groundwater production from the principal aquifer will influence shallow groundwater levels that may adversely impact the GDEs.

3.6.3 Monitoring Network Implementation

3.6.3.1 Groundwater Elevation Monitoring Schedule

Following the guidance provided by DWR (DWR 2016a), groundwater elevation measurements will be collected, at a minimum, two times per year from all accessible wells in the monitoring network to characterize the spring high and fall low groundwater levels. Spring groundwater levels will be collected during the month of April and fall groundwater levels will be collected during the month of October. By collecting groundwater elevation data within a single month, the groundwater elevation data will be used to characterize groundwater conditions during the seasonal highs (i.e. spring at the end of the wet season) and lows (i.e., fall at the end of the dry season).

3.6.3.2 Groundwater Storage Monitoring Schedule

Groundwater storage is directly linked to groundwater elevation. Therefore, the groundwater elevation monitoring network and schedule will be used to monitor changes in groundwater storage.

3.6.3.3 Groundwater Production Monitoring Schedule

Groundwater production data will be collected on a monthly basis and reported as monthly totals.

3.6.4 Monitoring Protocols

To monitor groundwater conditions in the Plan Area and evaluate sustainable management of the Subbasin with an acceptable level of confidence, the Yucaipa GSA adopted and slightly modified monitoring protocols already in place for the MBMP and those recommended in the Monitoring Protocols, Standards, and Sites Best Management Practices BMP published by DWR (DWR 2016b). The GSP Regulations require that GSPs include monitoring protocols that are (1) developed according to best management practices; (2) adhere to protocols recommended by DWR, or comparable protocols, that will yield quality data; and (3) shall be reviewed at least every 5 years as part of the periodic evaluation of the GSP and modified as necessary (23 CCR, Section 352.2).

The four water purveyors operating in the Plan Area are currently participating in the MBMP, which was implemented following the 2014 amendment to the Water Quality Control Plan for the Santa Ana River Basin (RWQCB 2019). The amendment included modifications to the Maximum Benefit Salt Management Plan in the San Timoteo Watershed, and specifically modified the maximum-benefit commitments in the Beaumont, San Timoteo and Yucaipa Groundwater Management Zones (GMZs), to which the Yucaipa and part of the San Timoteo GMZs are included in the Plan Area (Figure 2-64). The draft Maximum Benefit Monitoring Report 2015 Work Plan provided monitoring protocols to collect representative groundwater and surface water data in the watershed (Wildermuth, 2014). The monitoring protocols were adopted by all participating agencies in the MBMP, which includes the four water purveyors in the Yucaipa GSA. Additionally, groundwater level data collected at the USGS groundwater nested monitoring wells, and monitoring wells installed by YVWD, SBVMWD, and the County of San Bernardino, is collected for the MBMP and will be incorporated into the groundwater level dataset for the GSP. The monitoring protocols

established for the MBMP are adopted in this GSP, plus additional protocols and reporting standards detailed in the GSP Regulations under 23 CCR, Section 352.4, Data and Reporting Standards.

3.6.4.1 Groundwater Level Monitoring

Consistent with the groundwater level monitoring program described in the MBMP Draft 2015 Work Plan and the Monitoring Protocols, Standards, and Sites BMPs, the following groundwater level monitoring protocols will be implemented by the Yucaipa GSA:

1. Static depths-to-water (DTW) will be measured, at a minimum, at all wells in the monitoring network within a 1- to 2-week period every spring (middle April) and fall (middle October) to characterize the seasonal highs and seasonal lows, respectively, in groundwater elevations in the Plan Area. The period of data collection will be centered on the middle of the month. Currently, and for the last ten years, the Yucaipa GSA member agencies have provided groundwater level data on a more frequent basis (e.g., monthly to quarterly).
2. The static DTW measurements are collected relative to an established Reference Point (RP) elevation surveyed on the well casing or other established measuring point. The elevations of the RPs are referenced to the North American Vertical Datum of 1988 (NAVD88). The elevation of the RP is accurate to within 0.5 foot. DTW measurements are accurate to 0.1 foot but will be measured to an accuracy of 0.01 when possible.
3. All groundwater level data will be recorded on standardized field monitoring forms, either paper or digital, that will be utilized by all member agencies in the Yucaipa GSA. The following information will be recorded for each groundwater level measurement:
    a. Agency name and field personnel name(s) measuring and recording the DTW measurement.
    b. Well name or other standard identifier.
    c. Type of equipment used to measure the DTW (e.g., electric sounder, steel tape, airline).
    d. A description of the measuring point (e.g., sounding tube, top of well casing, access port).
    e. Date and time of the DTW measurement.
    f. Status of the well measured (e.g., static, offline for # of hours but recovering, pumping). If the status of the well is “recovering” or “pumping”, then subsequent attempts will be made within the 1- to 2-week data collection period to measure a static DTW.
    g. Depth in feet from the RP to the groundwater level (accurate to 0.1 foot at a minimum).
    h. If the well is not accessible to collect a static DTW, then an explanation will be documented in the field form.
4. Some wells in the monitoring network are extraction wells. For these wells, the pump will be turned off for at least 24 hours before determining if the water level in the well is at a static condition. If operational constraints prevent shutting the pump off for 24 hours in April or October, a DTW measurement will not be collected at that well during the monitoring event. This will be documented in the accompanying field form for the well.
5. The equipment used to measure the DTW will be decontaminated after use at each well. This includes using a PFAS-free detergent (e.g., Alconox) and deionized water to clean the equipment.
6. Some wells in the monitoring network are instrumented with dedicated pressure transducers for higher temporal resolution monitoring. The groundwater elevation data recorded by the transducers will be downloaded on a monthly to quarterly basis.

7. All DTW data and associated information collected during the monitoring events will be processed into standard formats, checked for quality assurance and quality control (QA/QC), and uploaded to the Data Management System (DMS) within 1 week of collection. The QA/QC process will include calibrating the DTW measuring equipment prior to the monitoring event, reviewing historical DTW measurements to compare to the current measurement, and review climatic conditions or other factors that may potentially influence groundwater levels.
8. A copy of the field monitoring form and monitoring protocol to be used by the Yucaipa GSA member agencies when collecting groundwater elevation data is in Appendix 3-B.

3.6.4.2 Groundwater Production Monitoring

The four water purveyors will provide monthly production data for their respective municipal and/or irrigation wells operating in the Plan Area, and for the wells operating outside the Plan Area that provide an imported groundwater supply. As part of the GSP implementation, the Yucaipa GSA will request production data from private well users in the Plan Area. All wells are equipped with a calibrated flow meter and totalizer to gauge the instantaneous pumping rate and record the total gallons (or acre-feet) pumped. All pumping data recorded in gallons will be converted to acre-feet, as per 23 CCR, Section 352.4.

Pumping data will be recorded for each well using the standard well name or identifier, the date of record (preferably the last day of the calendar month), the instantaneous pumping rate when the total volume pumped is recorded, and operational issues or conditions during the month of record that influenced pumping (e.g., pump was offline for 2 weeks for maintenance reasons). A copy of the groundwater production monitoring record is included in Appendix 3-B. All production data and associated information will undergo QA/QC procedures (e.g., compare to previous monthly totals, well operations, DTW measurements that may indicate a change in operation) to ensure that accurate pumping information is uploaded to the DMS.

3.6.4.3 Groundwater Quality Monitoring

Even though degraded water quality is not a sustainability indicator applicable to the Plan Area, the Yucaipa GSA member agencies collect water quality data per the monitoring requirements under Title 22 for municipal water supply wells and the MBMP. The water quality data collected under these monitoring requirements will be incorporated into the DMS for this GSP and evaluated to characterize water quality conditions in the Plan Area.

Consistent with the groundwater level monitoring program described in the MBMP Draft 2015 Work Plan and the Monitoring Protocols, Standards, and Sites BMPs, the following groundwater level monitoring protocols will be implemented by the Yucaipa GSA:

1. Water quality samples will be collected at all municipal water supply wells per Title 22 regulations and at all wells included in the MBMP sampling schedule. These wells are sampled on a semi-annual basis every March/April and October/November.
2. All information pertinent to the collection of representative water quality samples will be recorded in standardized forms by the field crew collecting the sample(s). This information will include the well identifier, status of well, sampling method utilized (e.g., operation of dedicated pump, portable submersible pump), static DTW (if pump not operating), calculation of three casing volumes, duration of pumping prior

to and/or during purging process, measurements of water quality parameters (pH, temperature, electrical conductivity) and times of measurements.

3. All water quality samples will be collected in the appropriate containers supplied by the state certified analytical laboratory that will conduct the analyses. All sample containers will include a label detailing the well identifier, date/time of sample collection, name of the analytical laboratory conducting the analysis, the type of analysis, and initials of the individual(s) collecting the sample(s).
4. The water quality samples will be placed in an ice chest to be chilled and maintained at 4°C from the moment of collection to delivery to the analytical laboratory.
5. A chain-of-custody (COC) form will be filled out at the time of each sample collection. The COC will be included with the samples upon delivery to the analytical laboratory for analysis. The COC will be signed by the sampling crew and the analytical laboratory at the time of transfer.
6. The analytical laboratory will be instructed to use reporting limits that are equal to or less than the applicable water quality objectives established under the Basin Plan.
7. All water quality data, including water quality parameters recorded during the purging process, will be documented in the DMS.
8. A copy of the field monitoring form and monitoring protocol to be used by the Yucaipa GSA member agencies when collecting groundwater quality data is in Appendix 3-B.

3.6.5 Representative Monitoring

Representative monitoring points (RMPs) for each management area were selected from the wider network of municipal and monitoring wells in the Plan Area (Figure 3-5; Table 3-2). These RMPs represent point locations in their respective management areas where sustainability indicators are evaluated and were used to define the quantitative values for the minimum thresholds and measurable objectives established in Sections 3.4 and 3.5 (23 CCR, Section 354.36).

The criteria used for selection of the RMPs were:

- Municipal water supply wells active in the last 5 years to characterize groundwater production, and inactive municipal supply wells and monitoring wells to characterize static groundwater elevations
- Length of historical groundwater level and production data, where applicable, at the RMP
- Inclusion of the RMP in other monitoring programs (e.g., MBMP)
- Long-term accessibility and well ownership considerations.

Using the criteria listed above, 36 RMPs were selected from the wells in the monitoring network (Table 3-2). Groundwater elevation data is collected from the 36 RMPs (28 are single completion wells and 8 are nested wells) to characterize groundwater conditions in their respective management areas. Groundwater production data will be collected from all active wells that produced groundwater in the corresponding water year, including the RMPs. The RMPs in the San Timoteo management area are monitoring wells and do not produce water. Groundwater quality data is collected at 23 RMPs.