Wyandotte Creek
GROUNDWATER SUSTAINABILITY AGENCY

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Subject: Draft Wyandotte Creek GSP Plan Amendments – Summary of Substantive Updates

To all stakeholders and interested parties:

The Wyandotte Creek Groundwater Sustainability Agency (GSA) has completed the required Five-Year Periodic Evaluation of the Wyandotte Creek Groundwater Sustainability Plan (GSP) under Water Code § 10728.2. In conjunction with the Evaluation, the GSA has also prepared Plan Amendments to update the GSP. The draft amended GSP (redline and clean versions) is available for public review through September 30, 2026 at https://www.wyandottecreekgsa.com/.

This letter summarizes the substantive changes documented in the Plan Amendments. Administrative edits, formatting, and section renumbering are not addressed below; for the complete redline, please refer to the full document.

Groundwater Levels Sustainable Management Criteria

- Updated the Undesirable Result trigger: exceedance is now evaluated in any year type (removing the prior “non-dry year” exception), and the threshold is now 2 RMS wells or 25% of RMS wells (whichever is greater) exceeding their Minimum Threshold for two consecutive years
- Refined the Minimum Threshold methodology based on an updated domestic well risk assessment, incorporating the completed Wyandotte Creek domestic well inventory
- Revised the Measurable Objective methodology: now set to the average groundwater level recorded from October 2015 through September 2025, reflecting recent conditions
- Added a new section addressing Minimum Threshold effects on beneficial uses and users

Water Quality Sustainable Management Criteria

- Applied the same Undesirable Result update as Groundwater Levels (any year type; 2 RMS wells or 25%, whichever is greater)

Land Subsidence Sustainable Management Criteria

- No longer relies on the Groundwater Levels SMC as a proxy; land subsidence now has its own independently defined Minimum Threshold and Undesirable Result, based on InSAR subsidence monitoring data

Interconnected Surface Water Sustainable Management Criteria

- Established a new shallow Interconnected Surface Water (ISW) representative monitoring network, including new monitoring wells and stream gages near the Feather River and Honcut Creek to observe water table conditions
- New monitoring wells were installed in 2026 and are equipped with pressure transducers for continuous groundwater level and temperature monitoring, expanding the data available to address the ISW data gap identified in the previously approved 2022 GSP

Projects and Management Actions

- Reorganized the project list into Completed, In-Progress, and Other Potential Projects to reflect current status
- Thermalito Water and Sewer District Water Treatment Plant Capacity Upgrade is now complete
- Updated project details for Residential Water Conservation, Palermo Clean Water Consolidation, Agricultural Irrigation Efficiency, Regional Conjunctive Use, and Extend Orchard Replacement

Public Review Period for Draft Periodic Evaluation and Plan Amendments

The GSA welcomes public comment on these proposed amendments during the review period through September 30, 2026, as noted above. Comments may be submitted using the online comment form found at the bottom of the GSAs Periodic Evaluations and Plan Amendments webpage. All comments received will be complied and attached to the final GSP Periodic Evaluation and Plan Amendment documents for consideration by the Wyandotte Creek Advisory Committee and the Wyandotte Creek GSA Board before final adoption. The final documents and Board adoption are anticipated to occur in November.

Sincerely,

Dillon McGregor
Wyandotte Creek GSA Program Manager

Geosyntec consultants

Wyandotte Creek GROUNDWATER SUSTAINABILITY AGENCY

engineers | scientists | innovators

lwa LARRY WALKER ASSOCIATES

DRAFT Amended

GROUNDWATER SUSTAINABILITY PLAN

WYANDOTTE CREEK GROUNDWATER SUBBASIN

Prepared by

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Oroville, CA, 95965

In Consultation with

Larry Walker Associates, Inc.
~~3043 Gold Canal Drive~~1480 Drew Avenue, Suite 100
~~Rancho Cordova~~Davis, California ~~9567~~95618

~~Project Number: SAC282~~

~~December 15, 2021~~

January 31, 2027

DRAFT

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Groundwater Sustainability Plan

Wyandotte Creek Groundwater Subbasin

Prepared by

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~~December 15, 2021~~

~~Note: Drafts of Section 2, Basin Setting, and portions of Section 4, Monitoring Networks were prepared by Davids Engineering, Inc. These draft sections have been updated during~~

~~GSP development as additional information became available and modified based on responses to public comment.~~ January 31, 2027

ACKNOWLEDGEMENTS

Wyandotte Creek Groundwater Sustainability Agency
Member Agencies
City of Oroville, County of Butte, Thermalito Water and Sewer District

Wyandotte Creek Advisory Committee

Wyandotte Creek Management Committee

Cooperating Agencies

South Feather Water and Power Agency

Consultant Teams

2022 GSP ~~Completion~~
Geosyntec Consultants

~~Basin Setting Project~~
/ Davids Engineering~~, Inc.~~

2027 Amended GSP
Larry Walker Associates

Luhdorff & Scalmanini, Consulting Engineers

Projects and Management Actions

Larry Walker Associates

GEI Consultants~~, Inc.~~

~~Woodard and Curran~~

~~Facilitation~~
~~Consensus Building Institute~~

West Yost

In Remembrance of Byron Alan Clark, PE
(February 4, 1976 - April 3, 2021)
With thanks for his excellent leadership and foundational work on the Basin Setting Project for the Wyandotte Creek Subbasin GSP

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PREFACE

Development of the Wyandotte Creek Subbasin Groundwater Sustainability Plan (GSP), like many others throughout California, has coincided with one of the most severe and extensive droughts that has ever gripped the western United States. As of this writing in December 2021, as the final Wyandotte Creek Subbasin GSP is being assembled, drought conditions throughout most of California, including the Wyandotte Creek Subbasin (Subbasin), are classified as "exceptional", the most extreme classification defined by the U.S. Drought Monitor (USDM).[1] Historically, observed impacts during exceptional drought generally include: widespread water shortages, depleted surface water supplies, extremely low federal and state surface water deliveries, curtailment of water rights, extremely high surface water prices, increased groundwater pumping to satisfy water demands, dry groundwater wells, increased well drilling and deepening, increased pumping costs, wildfire, decreased recreational opportunities, and poor water quality, among other potential impacts reported by the USDM. All of these conditions are currently being experienced to some degree across California and, some of them within the Subbasin.

As of November 29, 2021, the County of Butte had received 44 reports of dry wells through the My Dry Water Supply Reporting System, and another approximately 20 from residents calling the Butte County Department of Water and Resource Conservation. While a number of the reported dry wells are in the foothills outside of the Subbasin, a handful lie within the Wyandotte Creek Subbasin. Most reported dry wells are used for domestic water supply. Counts of dry wells are likely to be low because some landowners choose not to report well problems to the county.

At the State level and as a result of the unprecedented dry conditions, Governor Gavin Newsom declared a drought emergency on April 21, 2021, which was subsequently expanded on May 10 to include new drought-impacted areas including the Sacramento-San Joaquin Delta Watershed. Most recently, on October 19, Governor Newsom issued a proclamation extending the drought emergency statewide. On August 20, the State Water Resources Control Board (SWRCB) issued surface water curtailment orders to approximately 4,500 water right holders in the Sacramento-San Joaquin Delta Watershed to protect drinking water supplies, prevent salinity intrusion into fresh water supplies, and minimize impacts to fisheries and the environment. Given the recent curtailments and an already bleak surface water supply condition, there is an increased reliance on groundwater in the region. Currently, all of California's 58 counties have declared drought emergencies, including Butte County.

The reported numbers of dry wells discussed above prompted mitigation and response actions by the county. The county is tracking the well water shortage reporting to identify localized areas where wells are going dry and/or where other groundwater issues may exist. The county is also supporting the public through local and regional programs offered through the county, such as providing an emergency potable water filling station. The county has also applied for drought relief funding through the Department of Water Resources~~.~~ (DWR or Department). At this time, prior to completion and adoption of the GSP, drought response efforts in the Subbasin are the responsibility of the county, cities, and other local agencies. At some point following adoption of

[1] The U.S. Drought Monitor (https://droughtmonitor.unl.edu/) is produced through a partnership between the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Center. Information for the State of California is available online at: https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?CA.

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the GSP, those responsibilities may be coordinated more closely with the GSA. Additional coordination with the county, cities, and local agencies would ensure preservation of public health and safety (the purview of the counties and cities) and groundwater sustainability for all beneficial users and uses (the purview of the GSA).

Technical work and related public involvement processes supporting development of the Wyandotte Creek Subbasin GSP began in earnest in 2018 and are nearing completion as of December 2021. Development of the GSP has utilized the best available science and tools, with the most sufficient and credible information and data available for the decisions being made and the time frame available for making those decisions. Current and historical groundwater conditions and water budgets have been evaluated for the Subbasin in alignment with the GSP regulations. The technical work is based primarily on historical records of surface water and groundwater conditions from 1970 through 2018 which includes the prior drought conditions from approximately 2007 to 2015, but not the current drought in 2020 to 2021.

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Unfortunately, drought conditions in 2020 and 2021 have coincided with development of the GSP, a timing that has not permitted complete evaluation and inclusion of data from these years in the GSP at this time. Due to the schedule mandated by the Sustainable Groundwater Management Act (SGMA) for completion of GSPs by January 31, 2022, it has not been possible to include conditions that have manifested due to the current drought in development of the GSP. Records of drought-related conditions in 2020 to 2021 will not be systematically compiled, quality-controlled, and made publicly available until after the Wyandotte Creek Subbasin GSP has been adopted. However, those conditions will be factored into the required GSP annual reports and particularly the periodic (five-year) evaluations as they become available.

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Ongoing management of the Subbasin under the GSP will follow an "adaptive management" strategy that involves active monitoring of Subbasin conditions and addressing any challenges related to maintaining groundwater sustainability by scaling and implementing projects and management actions (PMAs) in a targeted and proportional manner in accordance with the needs of the Subbasin. Notwithstanding the information noted above regarding the challenges with GSP preparation and the current drought, some of the planned projects contained within this GSP could be fast tracked to address impacts associated with the current drought. GSP annual reports provide an opportunity each year to review current Subbasin conditions. Using annual reporting information, the Wyandotte Creek GSA Board can assess the need for further PMAs. During the periodic five-year evaluations, the GSP will also be reviewed and revised, as needed and as more is known about the effects of current and future conditions.

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The Wyandotte Creek GSA and the stakeholders within the Subbasin recognize that this GSP is not the finish line; it is the starting line for sustainable management of the Subbasin. As conditions within the Subbasin change, the GSA is committed to an open, transparent, and all-inclusive adaptive management strategy aimed at tackling the important local issues that they face. At the heart of SGMA is the power for locals to solve local problems with local resources. All parties in the Subbasin are committed to doing just that.

The GSP was approved by the DWR in July 2023. DWR provided recommended corrective actions (or RCAs) that the Department believes will enhance the original GSP. The Department strongly encouraged completion of the recommended corrective actions and suggested incorporating all resulting changes to the GSP in future updates. During the development of the GSP, the Wyandotte Creek GSA identified data gaps and DWR suggested resolving these data gaps as part of the corrective actions. Wyandotte Creek GSA received funding through DWR's

Sustainable Groundwater Management (SGM) Round 2 Grant Program (2024-2026) to address these data gaps and to complete the accompanying 2027 GSP Periodic Evaluation required under Water Code § 10728.2 and Plan Amendments (as applicable). This amended GSP includes updates to address DWR's RCAs.

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ACRONYMS AND ABBREVIATIONS

µS/cm	microsiemens per centimeter
AB	Assembly Bill
ACS	American Community Survey
AEM	aerial electromagnetic
AFY	acre-feet per year
Agreement	Joint Powers Agreement
amsl	above mean sea level
BBGM	Butte Basin Groundwater Model
BCDWRC	Butte County Department of Water and Resource Conservation
bgs	below ground surface
BMOs	Basin Management Objectives
BMPs	Best Management Practices
C&E Plan	Communication and Engagement Plan
Cal Water	California Water Service
CASGEM	California Statewide Groundwater Elevation Monitoring
CCR	California Code of Regulations
CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
CECs	Chemicals of Emerging Concern
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CNRA	California Natural Resources Agency
CRC	California Rice Commission
CVRWQCB	Central Valley Regional Water Quality Control Board
DACs	Disadvantaged Communities
DMS	data management system
Drought Plan	Butte County Drought Preparedness and Mitigation Plan
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EPA	Environmental Protection Agency
GAMA	Groundwater Ambient Monitoring and Assessment
GDEs	Groundwater Dependent Ecosystems

GIS	geographical information systems
GQTMWP	Groundwater Quality Trend Monitoring Work Plan
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	Hydrogeologic Conceptual Model
HVA	High Vulnerability Area
iGDEs	potential groundwater dependent ecosystems
ILRP	Irrigated Lands Regulatory Program
IM	interim milestones
InSAR	Interferometric Synthetic Aperture Radar
IRWM	Integrated Regional Water Management
JPL	Jet Propulsion Laboratory
LID	Low Impact Development
MA	Management Area
MAF	million acre-feet
MCL	maximum contaminant level
mg/L	milligrams per liter
MGD	million gallons per day
MHI	median household income
MO	measurable objective
MT	minimum threshold
NASA	National Aeronautics and Space Administration
NCCAG	Natural Communities Commonly Associated with Groundwater
NEPA	National Environmental Policy Act
NR	Not yet reported
NRCS	Natural Resources Conservation Service (
OSWCR	Online System for Well Completion Reports
RMS	representative monitoring sites
SAGBI	Soil Agricultural Groundwater Banking Index
SB	Senate Bill
SBFCA	Sutter Butte Flood Control Agency
SDACs	Severely Disadvantaged Communities
SFWPA	South Feather Water and Power Agency

SGMA	Sustainable Groundwater Management Act
SI	Sustainability Indicators
SMC	sustainable management criteria
SOI	Sphere of Influence
SVWQC	Sacramento Valley Water Quality Coalition
SWRCB	State Water Resources Control Board
TAF	thousands of acre-feet
TAF/year	thousand acre-feet per year
TBD	to be decided
TDS	total dissolved solids
TNC	The Nature Conservancy
TSS	Technical Support Services
TWSD	Thermalito Water and Sewer District
URCs	Underrepresented Communities
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WAC	Wyandotte Creek Advisory Committee
WDL	Water Data Library
Wyandotte Creek Subbasin	Wyandotte Creek Groundwater Subbasin

EXECUTIVE SUMMARY

Sustainability Goal:

To ensure that groundwater is managed to provide a water supply of adequate quantity and quality to support beneficial users of groundwater including but not limited to rural areas and other communities, the agricultural economic base of the region, and environmental resource uses in the Subbasin now and in the future.

Introduction

In 2014, the California legislature enacted the Sustainable Groundwater Management Act (SGMA) in response to continued overdraft of California's groundwater resources. SGMA provides for local control of groundwater resources while requiring sustainable management of the state's groundwater basins. Under the provisions of SGMA, local agencies must establish governance of their subbasins by forming Groundwater Sustainability Agencies (GSAs) within the authority to develop, adopt, and implement a Groundwater Sustainability Plan (GSP or Plan) for the subbasin. Under the GSP, GSAs must adequately define and monitor groundwater conditions in the subbasin and establish criteria to maintain or achieve sustainable groundwater management within 20 years of GSP adoption. Within the framework of SGMA, sustainability is generally defined as long-term reliability of the groundwater supply and the absence of undesirable results.

Critical Dates for the Wyandotte Creek Groundwater Subbasin	
2022	By January 31, submit GSP to Department of Water Resources (DWR)
2027	Evaluate GSP and ~~update~~amend, if warranted
2032	Evaluate GSP and ~~update~~amend, if warranted
2037	Evaluate GSP and ~~update~~amend, if warranted
2042	Achieve sustainability for the Wyandotte Creek Subbasin

The Wyandotte Creek Groundwater Subbasin (Wyandotte Creek Subbasin) is identified by DWR as being in a medium priority subbasin. For medium priority basins, SGMA ~~requires~~required preparation of the GSP by January 31, 2022. The Wyandotte Creek GSA is the only GSA in the Wyandotte Creek Subbasin. The Wyandotte Creek GSA was formed through the execution of a Joint Powers Agreement (Agreement) by the County of Butte, City of Oroville, and the Thermalito Water and Sewer District (TWSD). The GSA Board is composed of five seats, each with equal and full voting rights, including Butte County, City of Oroville, TWSD, an agricultural groundwater user, and a domestic well user (non-agricultural).

The purpose of the Agreement was to create the Wyandotte Creek GSA to 1) to develop, adopt, and implement a GSP for the Wyandotte Creek subbasin to implement SGMA requirements and achieve the sustainability goals; and 2) involve the public and subbasin stakeholders through outreach and engagement in developing and implementing the GSP. The focus of the Agreement is to maximize local input and decision-making and address the different water demands and sustainability considerations in the urban and rural areas of the Wyandotte Creek Subbasin.

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The agreement also defines two Management Areas (MAs) within the Wyandotte Creek Subbasin: Wyandotte Creek Oroville and Wyandotte Creek South. MA refers to an area within a subbasin for which a GSP may identify different minimum thresholds (MTs), measurable objectives (MOs), monitoring, and projects and management actions based on unique local conditions or other circumstances as described in the GSP regulations. The interests and vulnerability of stakeholders and groundwater uses in these MAs vary based on the nature of the water demand (agricultural, domestic, municipal), numbers and characteristics of wells supplying groundwater, and to some degree the hydrogeology and mix of recharge sources.

SGMA requires development of a GSP that achieves groundwater sustainability in the Wyandotte Creek Subbasin by 2042. A pragmatic approach to achieving sustainable groundwater management requires an understanding of 1) historical trends and current groundwater conditions in the subbasin, based on evaluating six sustainability indicators (SIs) that include groundwater levels, groundwater storage, groundwater quality, land subsidence, depletion of interconnected streams, and seawater intrusion and 2) what must change in the future to ensure sustainability without causing undesirable results (described and defined in Chapter 3) or negatively impacting beneficial uses and users of groundwater, including groundwater dependent ecosystems (GDEs).

The GSP is organized as follows and the various components of each chapter are summarized further below:

1. Chapter 1: Plan Area. This chapter includes agency information, description of the Plan Area, and applicable programs and data sources used to prepare the GSP as well as a description of beneficial users and uses within the Basin and a summary of stakeholder communications and engagement.
2. Chapter 2: Basin Setting. This chapter discusses the Hydrogeologic Conceptual Model (HCM), groundwater conditions and water budget.
3. Chapter 3: Sustainable Management Criteria. This chapter discusses undesirable results, identifies the minimum thresholds, and measurable objectives for each of the six SIs.
4. Chapter 4: Monitoring Network. This chapter describes the methods used to monitor the SIs.
5. Chapter 5: Project Management Actions. This chapter describes projects and management actions that will achieve sustainability within the Subbasin.
6. Chapter 6: Plan Implementation. This chapter describes how the GSA will partner with other groundwater users to implement the GSP to achieve groundwater sustainability.

The GSP outlines the need to address overdraft and related conditions and has identified 15 projects for potential development that either replace groundwater use (offset) or supplement groundwater supplies (recharge) to meet current and future water demands. During the 2022-2027 implementation period, several projects received funding and were completed or began feasibility studies including the Regional Conjunctive Use Project and the Thermalito Water Treatment Plant Capacity Upgrade. In addition, the GSP also identifies five management actions that can be implemented to focus on reduction of groundwater demand. During the 2022-2027 implementation period, several management actions have completed work or begun activities.

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Although current analysis indicates that groundwater pumping offsets and/or recharge on the order of 1,000 acre-feet per year (AFY) may be required to achieve sustainability, additional efforts are needed to confirm the level of pumping offsets and/or recharge required to achieve sustainability. These efforts include collecting additional data and a review of the Wyandotte Creek Subbasin groundwater model, along with other efforts as outlined in the GSP.

In 2027, this amended GSP this amended GSP was submitted to DWR in response to the Recommended Corrective Actions (RCAs) provided in DWR's Determination Letter.[2] This amended GSP incorporates DWR's RCAs as summarized in Table ES-1. The Amended GSP updates SMCs and networks for nearly all sustainability indicators (SI). SI that previously used the groundwater level SI as a proxy have their own established networks and SMCs, including for land subsidence and stream depletions. This GSP updated key sections with new data and analysis, including interconnected surface water and groundwater dependent ecosystems. The sustainable yield has been updated to reflect updated data collection for groundwater pumping and groundwater levels through Water Year 2025. Projects and management actions have been updated based on recent efforts that have occurred since the initial adoption of the GSP in 2021.

[2] Wyandotte Creek Subbasin Determination Letter is available for download here: https://sgma.water.ca.gov/portal/gsp/preview/99

Table ES-1: Summary of DWR Recommended Corrective Actions and Amendments.

Determination Letter Page No.	GSP Section No.	GSP Section	Recommended Corrective Action (RCA)	Amendment Description
39	2.2.4.2	Basin Setting - Groundwater Quality	**RCA 1a:** Provide additional information in the GSP outlining the location and extent of contamination plumes, identifying which constituents are being monitored under various programs, and thoroughly describing ongoing remediation efforts within the Subbasin.	Explicitly listed and described all existing contamination sites and the corresponding responsible agency and/or mitigation program.
40	2.2.4.1	Basin Setting - Groundwater Quality	**RCA 1b:** Evaluate whether groundwater management actions, including production and/or replenishment under the jurisdiction of the GSA, may influence the migration of contaminant plumes.	Evaluation of water quality data did not reveal significant impacts from pumping; the GSA is currently working on a handout to give to project partners that highlights locations in the Subbasin with water quality problems that could impact project feasibility.
40	2.2.4.1	Basin Setting - Groundwater Quality	**RCA 1c:** Investigate if groundwater quality issues are adversely impacting groundwater supply and beneficial uses and provide information if there are any mitigation programs in place and the effectiveness of such programs.	Evaluation of water quality data did not reveal significant impacts from pumping; existing contamination sites with corresponding mitigation program were listed and described.
40	2.2.4.1	Basin Setting - Groundwater Quality	**RCA 1d:** Coordinate with the lead agencies overseeing these remediation sites regularly and update the Plan stating how existing groundwater quality conditions and/or remediation efforts may impact the GSA's ability to manage groundwater.	Updated description of coordination efforts regarding water quality.
40	3.3.1	Sustainable Management Criteria - Groundwater Levels - Undesirable Result	**RCA 2a:** Revise the definition of undesirable results and language pertaining to significant and unreasonable lowering of groundwater level to remove the non-dry year condition or discuss how extractions and recharge will be managed as necessary to ensure that reductions in groundwater levels or storage during dry years are offset by increases in groundwater levels or storage during other years within the sustainable	The definition of undesirable results was updated to remove the non-dry year condition; PMAs were also updated (5.2.4) to describe benefits from recent water supply reliability and recharge projects benefits.

Determination Letter Page No.	GSP Section No.	GSP Section	Recommended Corrective Action (RCA)	Amendment Description
			management criteria for the chronic lowering of groundwater levels.	
40	3.3.2	Sustainable Management Criteria - Groundwater Levels - Minimum Thresholds	**RCA 2b:** Provide information on impacts to domestic wells during projected conditions where minimum thresholds are exceeded but undesirable results do not occur and quantify domestic wells that will be impacted by the proposed minimum threshold. Furthermore, the GSA should evaluate the impacts of proposed minimum thresholds on other beneficial uses and users, such as public and small water systems and environmental users and users as the GSP does not evaluate those impacts.	Expanded data collection efforts on GDEs (2.2.7.6) and ISW monitoring (4.6); quantified impacts to domestic wells (Appendix 3-B).
40	3.3.2	Sustainable Management Criteria - Groundwater Levels - Minimum Thresholds	**RCA 2c:** Provide a description of the relationship between established minimum thresholds for the chronic lowering of groundwater levels and how they avoid undesirable results for each of the other sustainability indicators.	Changed MT approach for lowering groundwater levels to be more reflective of undesirable result definition.
40	3.5.1	Sustainable Management Criteria - Water Quality - Undesirable Result	**RCA 3:** Revise the definition of undesirable results to remove the non-dry year condition or discuss how degradation during dry period will be managed as necessary to ensure that adverse water quality conditions are offset during other periods.	The definition of undesirable results was updated.
41	3.7.1	Sustainable Management Criteria - Land Subsidence - Undesirable Result & MT	**RCA 4a:** Provide a clear, quantitative definition of when undesirable results for land subsidence may occur in the Subbasin, as required by the GSP Regulations, to support the selection of land subsidence minimum thresholds that demonstrate avoidance of undesirable results.	The definition of undesirable results was updated.

Determination Letter Page No.	GSP Section No.	GSP Section	Recommended Corrective Action (RCA)	Amendment Description
41	3.7.1	Sustainable Management Criteria - Land Subsidence - Undesirable Result & MT	**RCA 4b:** Establish sustainable management criteria for land subsidence for the Subbasin utilizing a monitoring network that directly measures land elevation change such as remote sensing data, survey monuments, or global positioning system stations.	The GSA has established annual monitoring protocol for subsidence using surveyed wells, InSAR data, and local GPS stations for ground-truthing.
41	3.8.1	Sustainable Management Criteria - ISW	**RCA 5a:** Consider utilizing the interconnected surface water guidance, as appropriate, when issued by the Department to establish quantifiable minimum thresholds, measurable objectives, and management actions.	The GSA has reviewed the guidance released to date; the guidance was taken into consideration during the Periodic Evaluation and Plan Amendment process.
41	4.6	Monitoring Networks - ISW	**RCA 5b:** Continue to fill data gaps, collect additional monitoring data, and implement the current strategy to manage depletions of interconnected surface water and define segments of interconnectivity and timing.	ISW monitoring network has been overhauled with the classification of existing wells, drilling of new shallow wells, and installation of new stream gages; new monitoring network visualized in Figure 4-4.
41	2.2.6 & 2.2.7	Basin Setting – ISW / GDE	**RCA 5c:** Prioritize collaborating and coordinating with local, state, and federal regulatory agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion within the GSA's jurisdictional area.	The GSA has collaborated with The Nature Conservancy on GDE mapping efforts and has coordinated with Northern Sacramento Valley Subbasins to develop a consistent approach to manage inter-connected surface waters. Coordination efforts are further summarized in Sections 2.2.6 and 2.2.7.
41	4.6	Monitoring Networks - ISW	**RCA 5d:** Clarify the groundwater level monitoring sites that will be used for the evaluation of depletions of interconnected surface water and provide site-specific information.	ISW monitoring network has been overhauled with the classification of existing wells, drilling of new shallow wells, and installation of new stream gages; new monitoring network visualized in Figure 4-4.

GSP Area

The Wyandotte Creek Subbasin is in Butte County within the Sacramento Valley, as shown in Figure ES-1. The Wyandotte Creek GSA jurisdictional area is defined by the boundaries of the Wyandotte Creek Subbasin in DWR's 2003 Bulletin 118 as updated in 2016 and 2018. Figure ES-2 shows the boundaries of the Wyandotte Creek Subbasin and the two MAs.

Outreach Efforts

A stakeholder engagement strategy was developed to solicit and discuss the interests of all beneficial users of groundwater in the Wyandotte Creek Subbasin and Plan Area. The strategy included monthly meetings of the Wyandotte Creek GSA Management Committees (made up of staff from the member agencies) and the Wyandotte Creek Advisory Committee (WAC), and a website where all announcements, meeting dates, times, and materials were posted.

The Wyandotte Creek GSA also prepared and implemented a Communication and Engagement Plan (C&E Plan) to encourage involvement from diverse social, cultural, and economic elements of the population of the Wyandotte Creek Subbasin, in addition to meeting SGMA requirements for intrabasin coordination.

In addition, various chapters of the GSP were available for preliminary review and comment prior to the final draft version released on December 15, 2021. Comments received on preliminary draft chapters were incorporated as deemed appropriate and helped guide and shape the final draft document.

The 2027 Amended GSP followed the same process as the 2022 GSP and was also available for review and comment by the public in 2026.

Basin Setting

The Wyandotte Creek Subbasin lies in the eastern central portion of the Sacramento Groundwater Basin. It is bounded on the west by the Feather River and Thermalito Afterbay; in the south by the Butte-Yuba County line (except for Ramirez Water District which is fully within the North Yuba Subbasin); and on the north and east by the edge of the alluvial basin as defined by DWR Bulletin 118 - Update 2003 (DWR, 2003). It is surrounded by the Butte Subbasin to the west, the Wyandotte Creek Subbasin to the north, the North Yuba Subbasin to the south and the foothills to the east (Figure ES-2). The lateral boundaries of the Wyandotte Creek Subbasin are jurisdictional in nature, and it is recognized that groundwater flows across each of the defined boundaries to some degree.

Continental sediments of the Tuscan and Laguna Formation compose the major fresh groundwater-bearing formations in the Wyandotte Creek Subbasin. The base of these continentally derived formations is generally accepted as the base of fresh water in the northern Sacramento Valley. Locally, the base of fresh groundwater fluctuates depending on local changes in the subsurface geology and geologic formational structure. The base of fresh water is known to be shallower along the eastern portion of the basin.

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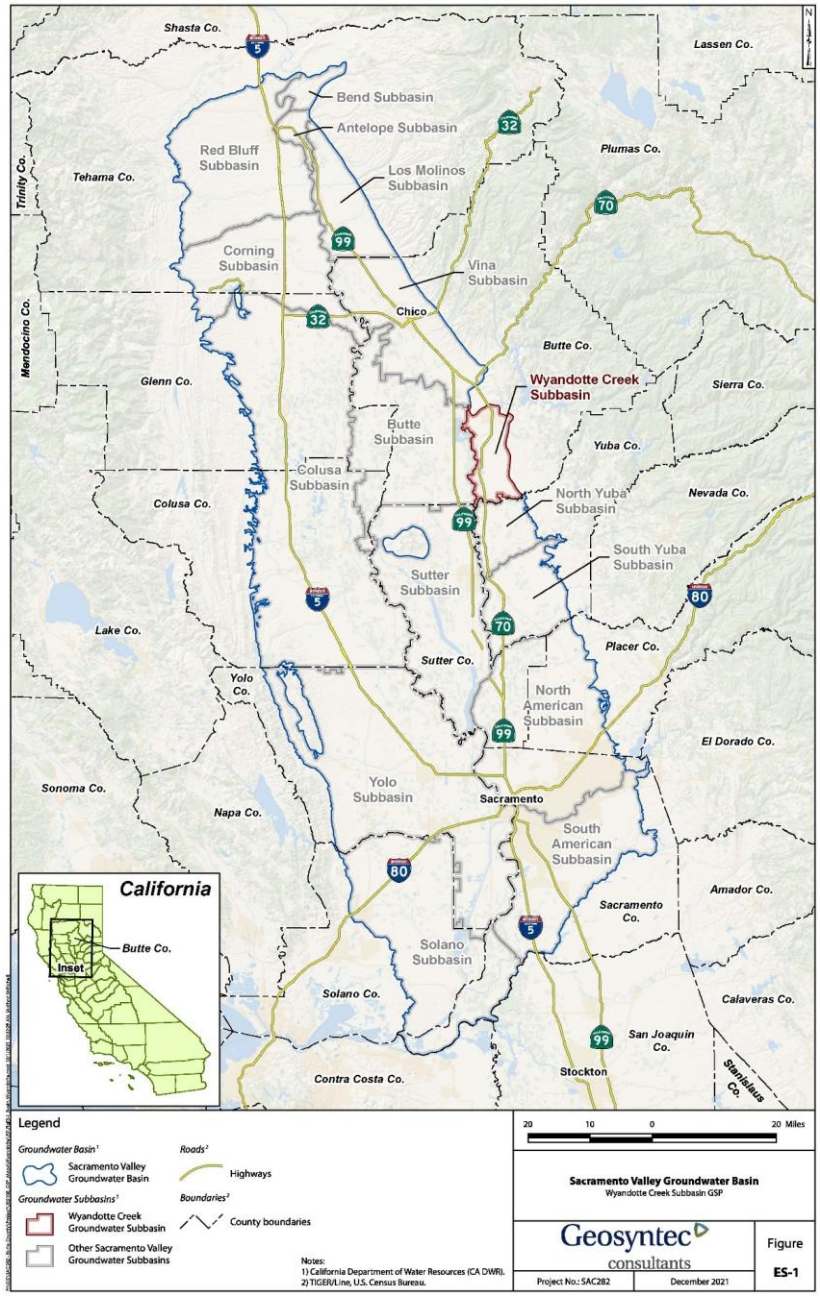

Figure ES-1 ~~placeholder page~~: Sacramento Valley Groundwater Basin

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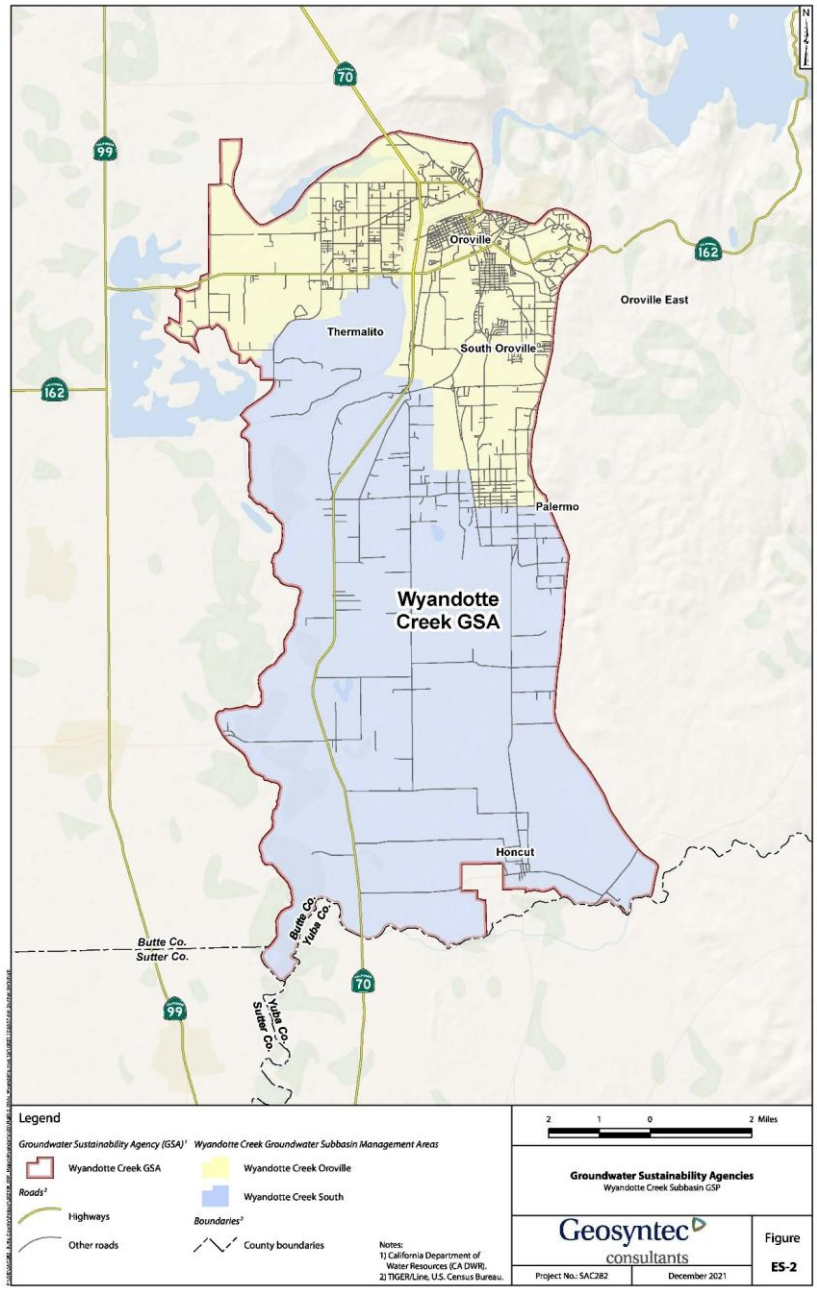

Figure ES-2 ~~placeholder page~~: Groundwater Sustainability Agencies

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Groundwater flows from the north and from foothill recharge areas in the east toward the subbasin's southeastern corner. Because of the influence of Thermalito Afterbay and the Feather River, groundwater elevations in the north are generally stable between the spring and fall observation periods, while elevations in the south tend to be lower in the fall than the spring, a pattern typical of valley floor locations distant from major sources of recharge. The location of the Wyandotte Creek Subbasin along with surface water features is shown in Figure ES-3.

Existing Groundwater Conditions

Groundwater conditions in the Wyandotte Creek Subbasin are regularly monitored and are described in reports produced by Butte County since 2001. The Wyandotte Creek GSA submits GSP annual reports to DWR, documenting the state of the groundwater basin. These documents and other reports portray a subbasin that has adequate groundwater resources to meet demands under most hydrologic conditions. However, comparison of the reports illustrates how in the period between their issuance, groundwater conditions have tightened, and as forces ranging from population growth to climate change play out, the value of well-informed water management policies and practices is likely to increase. In short, while groundwater conditions in the Wyandotte Creek Subbasin remain stable, maintaining this posture in the future may become less the result of a state of nature and more the reward for thoughtful management.

~~Groundwater~~Based on historical data and the GSP annual reports, groundwater levels in the Wyandotte Creek Subbasin indicate that groundwater elevations are relatively stable. Groundwater quality in the basin is good except in areas where anthropogenic sources have impacted the groundwater. Figure ES-4 shows the locations of known impacted groundwater from these sources.

Groundwater storage in Wyandotte Creek Subbasin is relatively stable. The Feather River and Thermalito Afterbay stabilize storage volumes by providing recharge to the Wyandotte Creek Subbasin. The total fresh groundwater in storage was estimated at about 2.1 million-acre-feet (MAF) in 2018. The amount of groundwater in storage has decreased by approximately 0.14 percent per year between 2000 and 2018. Between 2020 to 2022, the Subbasin experienced a severe drought followed by several wet and above normal years. Groundwater storage decreased during the critically dry years and recovered during the wet and above normal years (2023-2025). As such, it is highly unlikely the Wyandotte Creek Subbasin will experience conditions under which the volume of stored groundwater poses a concern. However, the depth to access that groundwater across the Wyandotte Creek Subbasin may pose a concern.

Land subsidence has not historically been an area of concern in the Wyandotte Creek Subbasin and there are no records of land subsidence caused by groundwater pumping in the Wyandotte Creek Subbasin. Seawater intrusion is not applicable to the Wyandotte Creek Subbasin due to distance from the Delta and Pacific Ocean.

Surface waters can be hydraulically interconnected with the groundwater system, where the stream baseflow is either derived from the aquifer (gaining stream) or recharged to the aquifer (losing stream). If the water table beneath the stream lowers as a result of groundwater pumping, the stream may disconnect entirely from the underlying aquifer. Within the floodplain of the Feather River there is a continuous saturated zone that connects the shallowest aquifer to the river. The connectivity between shallow and deeper aquifer zones will dictate the overall connectivity to the ~~River.~~

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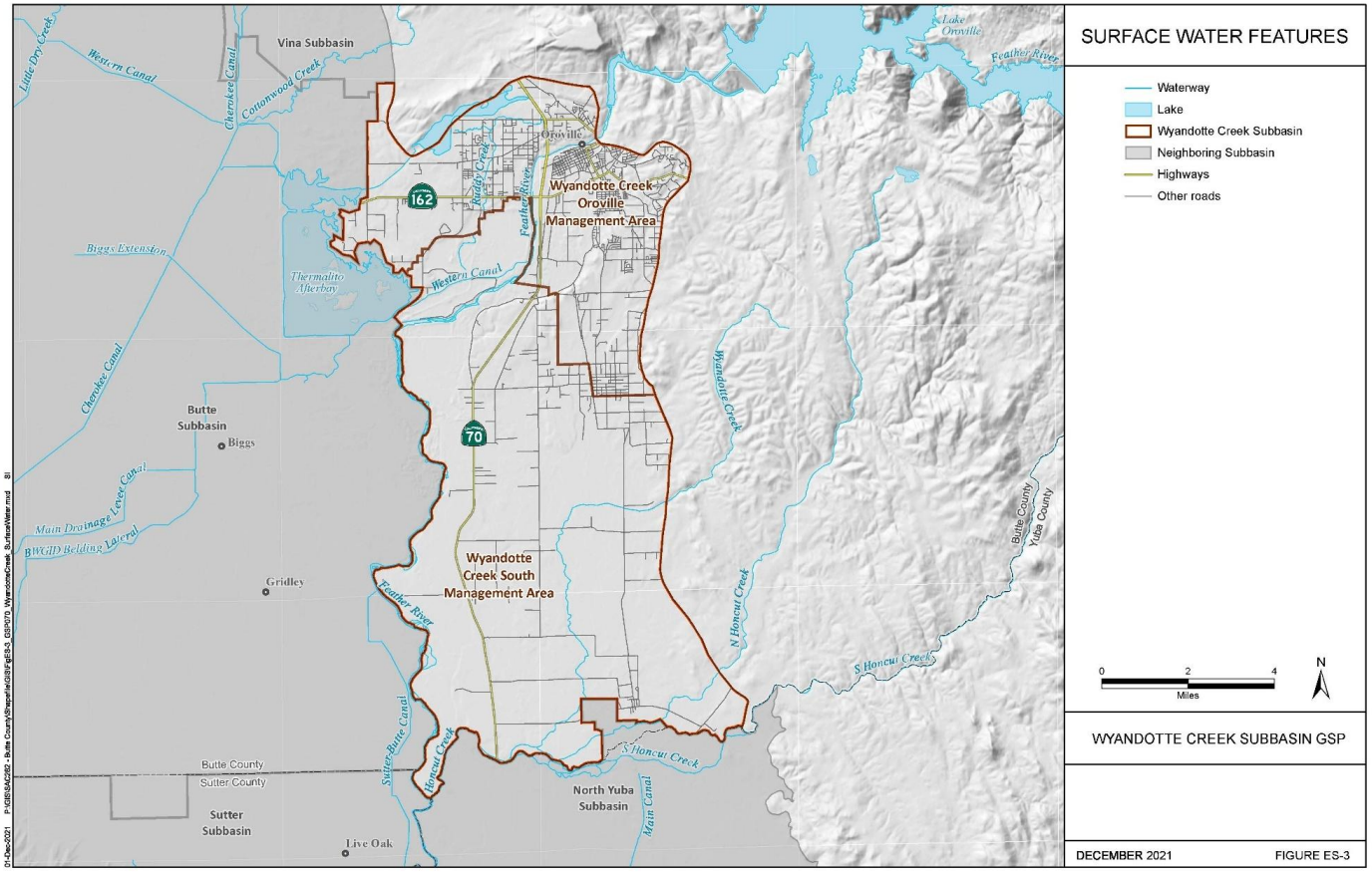

Figure ES-3 ~~placeholder page~~

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: Surface Water Features in the Wyandotte Creek Subbasin

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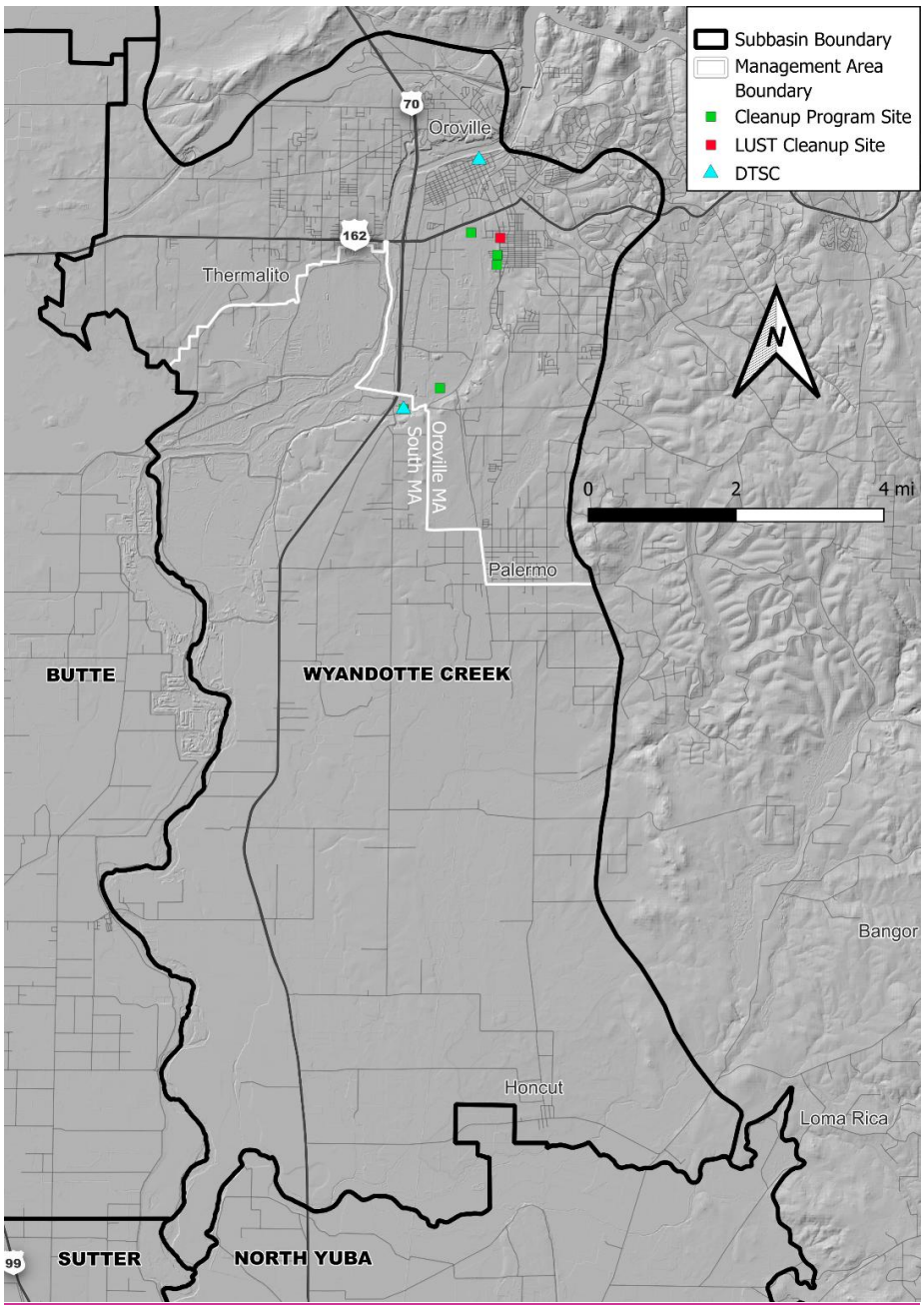
Subbasin Boundary
Management Area Boundary
Cleanup Program Site
LUST Cleanup Site
DTSC
70
Oroville
162
Thermalito
N
0
2
4 mi
South MA
Oroville MA
Palermo
BUTTE
WYANDOTTE CREEK
Bangor
Honcut
Loma Rica
99
SUTTER
NORTH YUBA

Figure ES-4 ~~placeholder page~~: Active Contamination Remediation Sites

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In the upland areas outside of the Feather River floodplain, there are creeks that flow seasonally and dry up in late summer or are dry for an entire year during dry conditions. In this case, the upland creeks may not be influenced by "high groundwater connectivity" and the presence of an undesirable result is not clear cut with respect to surface water depletion. The streams dry up regardless of the groundwater condition, and streams that are already dry are not considered interconnected surface water. However, the upland streams are an important source of recharge to the aquifer, so the health of these stream channels and their adjacent riparian zones is important to groundwater sustainability. This has been identified as a data gap and will be addressed as part of the GSP implementation.

Potential impacts of the depletion of interconnected surface water were discussed by stakeholders during technical discussions covering the fundamentals of groundwater-surface water interactions and mapping analysis of potential groundwater dependent ecosystems ~~(iGDEs) prepared by Butte County Department of Water and Resource Conservation (BCDWRC).~~ Potential impacts identified by stakeholders were:

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- Disruption to GDEs
- Reduced flows in rivers and streams supporting aquatic ecosystems and water right holders
- Streamflow changes in upper watershed areas outside of the Wyandotte Creek GSA boundary
- Water table depth dropping below the maximum rooting depth of Valley Oak (*Quercus lobata*) or other deep-rooted tree species
- Cumulative groundwater flow moving toward the Feather River from both the Wyandotte Creek Subbasin and surrounding GSAs on both the east and west side of the river

The Wyandotte Creek Subbasin acknowledges that overall function of the riparian zone and floodplain is dependent on multiple components of the hydrologic cycle that may or may not have relationships to groundwater levels in the principal aquifer. For example, hydrologic impacts outside of the Wyandotte Creek Subbasin, such as upper watershed development or fire-related changes in run-off, could result in impacts to streamflow, riparian areas, or GDEs that are completely independent of any connection to groundwater use or conditions within the Wyandotte Creek Subbasin.

Sustainable Management Criteria

SGMA introduces several terms to measure sustainability. The sustainability goal is the culmination of conditions resulting in a sustainable condition (absence of undesirable results) within 20 years. The sustainability goal for the Wyandotte Creek Subbasin is:

> *to ensure that groundwater is managed to provide a water supply of adequate quantity and quality to support beneficial users of groundwater including but not limited to rural areas and other communities, the agricultural economic base of the region, and environmental resource uses in the Subbasin now and in the future.*

SIs refer to any of the effects caused by groundwater conditions occurring throughout the Wyandotte Creek Subbasin that, when significant and unreasonable, cause undesirable results. The six SIs identified by DWR are:

1. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon
2. Significant and unreasonable reduction of groundwater storage
3. Significant and unreasonable seawater intrusion
4. Significant and unreasonable degraded water quality
5. Significant and unreasonable land subsidence that substantially interferes with surface land uses
6. Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

Undesirable results are the significant and unreasonable occurrence of conditions that adversely affect groundwater use in the Wyandotte Creek Subbasin, including reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses of the Wyandotte Creek Subbasin's groundwater. Categories of undesirable results are defined through the SIs.

MT are numeric values for each SI and are used to define when undesirable results occur. Undesirable results occur if MTs are exceeded in an established percentage of sites in the Wyandotte Creek Subbasin's representative monitoring network. MO are a specific set of quantifiable goals for the maintenance or improvement of groundwater conditions. The margin of operational flexibility is the range of active management between the MT and the MO. Interim milestones (IM) are targets set in 5-year increments over the implementation period of the GSP offering a path to sustainability. Figure ES-5 illustrates these terms using the groundwater level SI.

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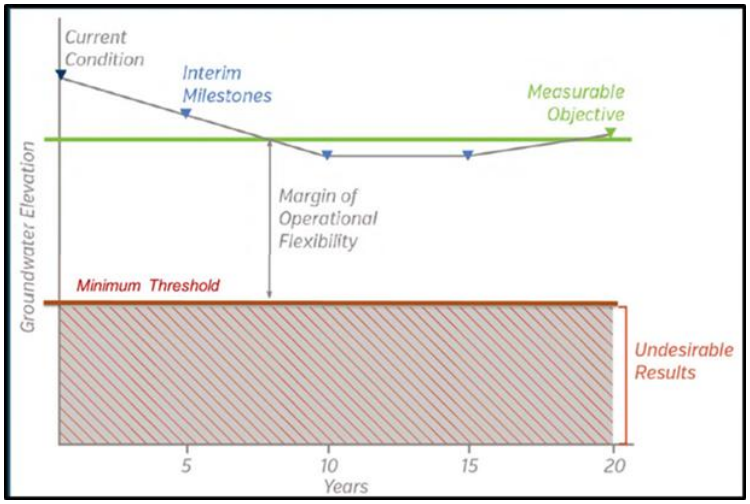

Figure ES-5: Illustration of Terms Used for Describing Sustainable Management Criteria Using the Groundwater Level Sustainability Indicator

A total of ~~nine~~ten representative monitoring site (RMS) wells were identified for measurement of groundwater levels in the Wyandotte Creek Subbasin and six representative wells were identified for groundwater quality monitoring. The GSP uses groundwater quality data as a basis for evaluating conditions from saline water below the fresh water and uses groundwater level data as the basis for evaluating conditions for groundwater levels, groundwater storage, and subsidence. The GSP has identified a data gap for development of sustainable management criteria (SMC) for depletion of interconnected surface waters and has provided a framework for evaluation of this SI. ~~However, for~~For this GSP, the SMC developed for ~~groundwater levels are used as a proxy for~~ interconnected surface water ~~in an interim manner~~is preliminary until data gaps are further addressed. ~~As such, the representative monitoring wells described above provide the basis for measuring the five relevant SIs across the Wyandotte Creek Subbasin.~~

MTs and MOs were developed for each of the representative wells. Figure ES-6 shows a typical relationship of the MTs, MOs, and historical groundwater level data for a sample groundwater level representative monitoring well.

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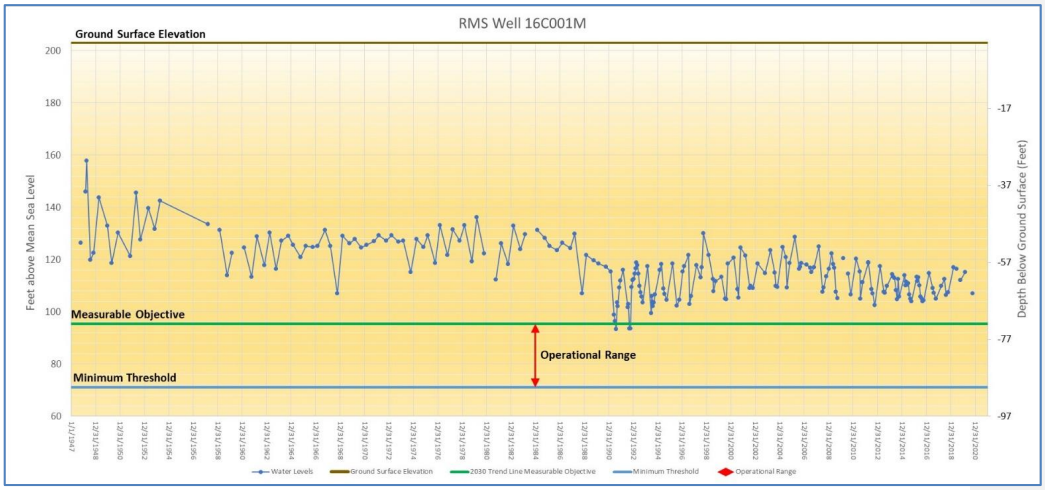
RMS Well 16C001M
Ground Surface Elevation
Measurable Objective
Operational Range
Minimum Threshold
Feet above Mean Sea Level
Depth Below Ground Surface (Feet)
200
180
160
140
120
100
80
60
-17
-37
-57
-77
-97
Water Levels
Ground Surface Elevation
2030 Trend Line Measurable Objective
Minimum Threshold
Operational Range

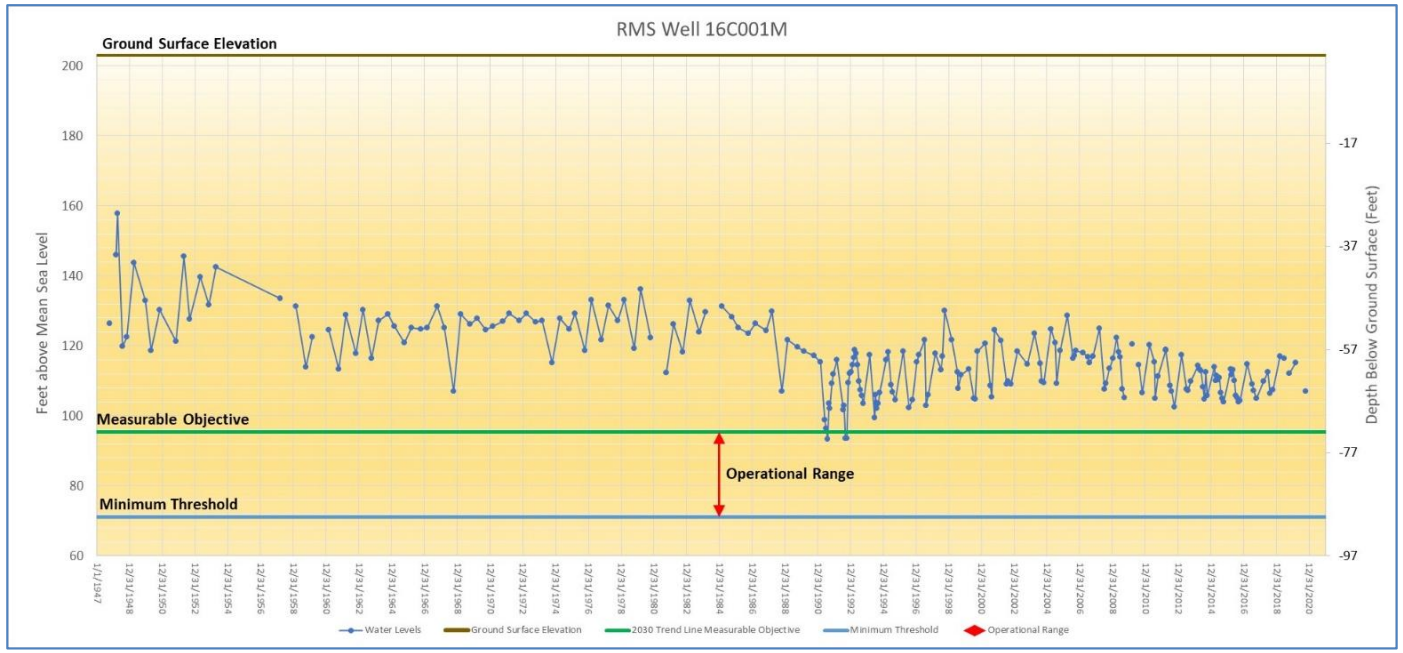

Figure ES-6: Representative Monitoring Site for Groundwater Levels with Relationship of Measurable Objectives, Minimum Thresholds, and Operational Range

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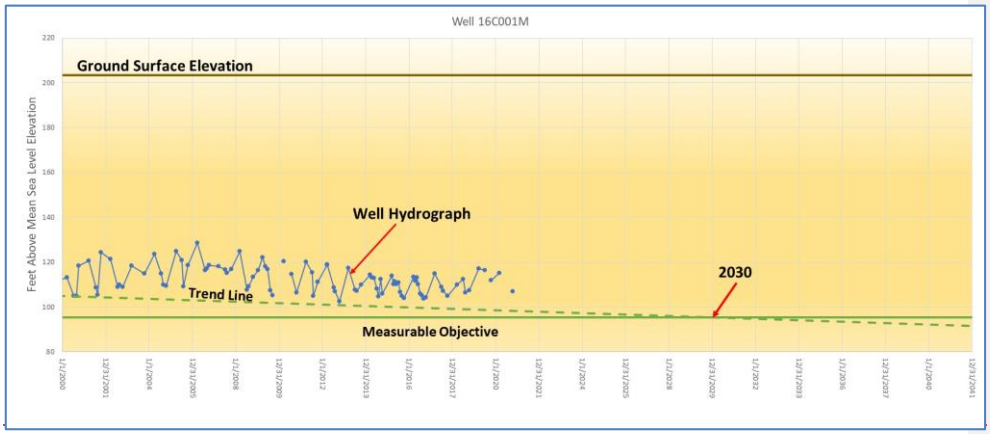
MTs for groundwater levels were developed ~~with reference~~ to protect shallow domestic ~~well depths. The MT for all representative~~ wells within the Subbasin. Representative monitoring site (RMS) wells were selected to be representative of groundwater conditions for domestic wells. The MT for all RMS wells was ~~based on the 15th percentile of total well depth for domestic wells completed after 1980. The DWR database used for information on total depths of~~ set to the deeper value of two criteria:

- Criterion 1: Set to protect 95 percent of all shallow domestic wells ~~is not always accurate or precise, nor is it known which of the wells in the database~~within each RMS Zone, and
- Criterion 2: Set to a specified buffer distance below the historic low; the buffer is either the range of historically measured groundwater levels or 20 feet, whichever is shallower.

Criterion 2 ensures adequate operational flexibility in periods of drought. During the 2022-2027 implementation period, the domestic well inventory was enhanced and the new dataset was used to update the domestic well risk assessment and SMCs. At the updated MTs, approximately 38 of the 360 (or 11%) active domestic wells in the Subbasin are ~~in use or have been abandoned or replaced. As such, the GSP~~at risk of going dry. The GSA is working closely with Butte County's Drought Resilience Planning efforts to mitigate against wells going dry due to declining groundwater levels. Additionally, the GSA has identified ~~these data~~a PMA, as ~~a data gap that will be further investigated~~discussed in Section 5.3.2, to mitigate against dry wells as ~~part of the GSP implementation.~~needed.

~~To establish~~ The MO was set equal to the ~~MO, the water level hydrograph of observed~~average groundwater level recorded from October 1st, 2015, through September 30th, 2025.

IM for groundwater levels are set at ~~each RMS well was evaluated. The historical record at these locations shows cyclical fluctuations of groundwater level over a four- to seven~~five-year ~~cycle. The~~ intervals between 2022 and 2042. Since the MO for groundwater levels ~~at each RMS well was set at the trend line for the dry periods (since 2000) of observed short-term climatic cycles extended to 2030. Figure ES-7 shows an example of this trend line~~reflect current conditions and is set as a target for ~~an RMS well. Table ES-1 shows the MTs and MOs~~future conditions, all IM for groundwater levels ~~at each of the~~ are equal to the MO. Table ES-2 presents the groundwater level sustainable management criteria for RMS wells.



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~~Figure ES-7: Illustration of Long-Term Trend Using Historical Water Levels Extended to 2030 for Development of Measurable Objective~~

Table ES-~~1~~2: Groundwater Levels Sustainable Management Criteria by Representative Monitoring Site in Feet Above Mean Sea Level

RMS Well ID	Domestic Well Count	Well Type	MT	MO	IM		
					2027	2032	2037
Wyandotte Creek Subbasin – Oroville Management Area							
16Q001M[3]	~~85~~41	~~133~~Shallow	~~134~~108	~~133~~139	~~133~~139	139	139
32P001M[2]	~~78~~64	~~107~~Shallow	~~108~~88.8	~~106~~128	~~106~~128	128	128
~~CWS~~PWS-03[1, 2]	~~10~~21	~~133~~Shallow	~~135~~94	~~132~~131	~~132~~131	131	131
Wyandotte Creek Subbasin – South Management Area							
13B002M[3]	~~35~~14	~~47~~Deep	~~48~~11	~~46~~58	~~46~~58	58	58
22B001M[2]~~09N002M~~	~~35~~32	~~49~~Shallow	~~51~~29.8	~~47~~89	~~47~~89	89	89
25N001M[3]	~~37~~23	~~52~~Shallow	~~53~~25	~~52~~61	~~52~~61	61	61
19D003M[2]	59	Shallow	33.2	72	72	72	72
08M001M[2]	~~59~~74	~~86~~Deep	~~87~~56.1	~~85~~105	~~85~~105	105	105
16C001M[3]	~~71~~74	~~95~~Both	~~96~~70	~~95~~106	~~95~~106	106	106
31F001M[2]	~~76~~48	~~99~~Shallow	~~101~~88.1	~~98~~124	~~98~~124	124	124

Notes:
[1] The MT for RMS PWSPWS-03 will be set using criterion 2 due to only having one domestic well in the RMS zone.
[2] RMS well uses criterion 2 for setting the MT.
[3] RMS well uses criterion 1 for setting the MT.

MTs and MOs for water quality were defined by considering two primary beneficial uses at risk of undesirable results related to salinity: drinking water and agriculture uses. ~~MTs are 1,600 micro-siemens per centimeter (µS/cm) for each representative monitoring well, consistent with the upper limit of the California Secondary Maximum Contaminant Level (MCL) for electrical conductivity. MOs are 900 µS/cm for each representative monitoring well, consistent with the California Secondary MCL for electrical conductivity.~~There are several water quality standards for irrigated agriculture, which all recognize that total salt is an important criterion to determine the suitability of water for irrigation. Salinity can affect plant water availability and yield. Typical ranges for irrigation water for EC are 0 to 3,000 µS/cm. The California Department of Health Services has established the preferred agricultural water quality level of specific conductance less than 700 µS/cm. Therefore, the MO is set to 700 µs/cm to maintain irrigated agriculture sensitivity level for salinity to protect agricultural usage.[3] This is consistent with the Butte County Basin Management Objectives (BMO) defined in the Butte County Code of Ordinances. The Butte County BMO Program expired upon the adoption of the 2022 GSP. The MT is set to the recommended secondary maximum contaminant level of 900 µs/cm, or the

[3] Artiola, Janick F., Ian L. Pepper, Mark Brusseau. Environmental Monitoring and Characterization. Table 9.4, pg 148

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measured historical high, to ensure safe drinking water (State Water Resources Control Board, 2017).

Data needed to develop the SMC for interconnected surface waters includes definition of stream reaches and associated priority habitat, streamflow measurements to develop profiles at multiple time periods, ~~and~~ measurements of groundwater levels directly adjacent to stream channels, first water bearing aquifer zone, and deeper aquifer zones~~.~~, and estimates of volumes, location and timing of surface water depletion. These data are ~~not~~only partially available and are still a data gap for the GSP. Between 2022 and 2027, new groundwater wells and stream gages have been installed to address the data gap. Further evaluation of this SMC is needed to avoid undesirable results to aquatic ecosystems and GDEs~~.~~ as applicable. To that end, an Interconnected Surface Water SMC framework has been developed for the GSP. ~~As such,~~Preliminary SMCs have been drafted for ~~this~~the current 2027 Amended GSP ~~the~~, with the goal of collecting additional data for five more years to fill remaining data gaps. RMS wells were selected using existing wells considered representative of ISW connected to the upper (or shallow) aquifer system. Preliminary ISW SMCs were set to a specified buffer distance below the historic low; the buffer is either the range of historically measured groundwater levels ~~SMC~~or 20 feet, whichever is shallower. Finalized SMCs are ~~used by proxy and the MT and MO for interconnected surface water is the same as~~ scheduled to be developed for ~~groundwater levels~~the 2032 periodic evaluation, or as guidance is issued, to account for the rate of stream depletion.

The MTs and MOs for groundwater levels are also used for ~~the land subsidence and~~ groundwater storage SIs~~, as both are strongly linked to groundwater levels.~~. The groundwater levels MTs are found to be protective of ~~land subsidence and~~ groundwater storage.

The MT and MOs for subsidence are based on historical subsidence trends calculated from InSAR satellite-based subsidence monitoring data. The subsidence analysis in Section 2.2.5.2 showed that the Subbasin experienced minimal subsidence historically (elastic), with a maximum value of 0.1111 feet of subsidence over five years. The MT is set to double the historical trend at 0.5 feet of subsidence over five years (or 2 feet over 20 years), and is meant to represent inelastic, or irreversible, subsidence solely due to lowering groundwater levels and may lead to undesirable results. The subsidence MO is equal to the observed maximum subsidence from InSAR data. The MO is one foot over 20 years (e.g., 0.25 feet over a 5-year period) for each of the selected InSAR pixels.

Water Budgets

The groundwater evaluations conducted as a part of GSP development have provided estimates of the historical, current, and projected groundwater budget conditions. The current analysis was prepared using the best available information and through use of the Butte Basin Groundwater Model (BBGM). The BBGM began in 1992 and has been updated over time to simulate historical conditions through ~~2018~~2024. To prepare water budges for ~~this~~the 2022 GSP, historical BBGM results for water years 2000 to 2018 have been relied upon and four additional baseline scenarios ~~have been~~were developed to represent current and projected conditions utilizing 50 years of hydrology. It is anticipated that as additional information becomes available, the model will be updated, and more refined estimates of annual pumping and overdraft can be developed.

~~Based on these analyses, at projected groundwater pumping levels, the long-term groundwater pumping offset and/or recharge required for the Wyandotte Creek Subbasin to achieve~~

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~~sustainability is approximately 1,000 AFY. Groundwater levels are expected to continue to decline based on projections of current land and water uses. Projects that offset groundwater pumping and/or increase recharge will help the Wyandotte Creek Subbasin reach sustainability.~~

The projected Wyandotte Creek Subbasin water budget was also evaluated under climate change conditions, which simulate higher demand requiring increased groundwater pumping despite more precipitation and streamflows. The climate change scenario used for the analysis was based on the 2030 and 2070 central tendency climate change datasets provided by DWR to support GSP development. The overdraft modeled under climate change conditions is simulated to increase above projected conditions without climate change~~.~~ up to 3,700 AFY. Figure ES-8 illustrates the cumulative change in groundwater storage for current and future conditions. The model will be updated and calibrated periodically to assess long-term future conditions.

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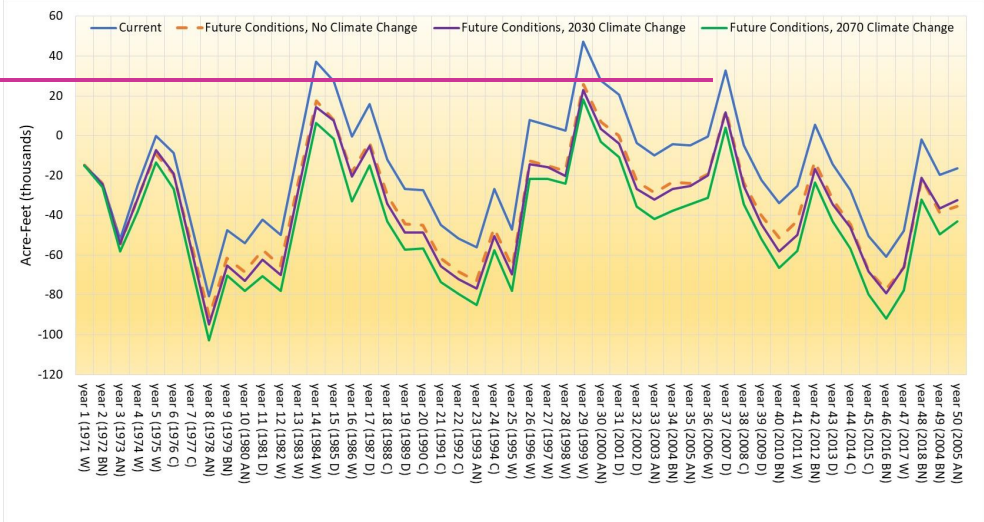

The GSA will annually evaluate and report changes in groundwater storage (i.e., assess overdraft) based on groundwater level measurements collected in the field. The ten-year (WY 2016 – 2025) average annual change in groundwater storage is +4,600 AF per year.. This suggests the Subbasin is currently sustainable and will remain sustainable in the short term. Long-term projections of up to 3,700 AF of overdraft using the model are reasonable based on our current understanding and guidance from DWR. The GSA will develop PMAs to implement as necessary to maintain sustainability.

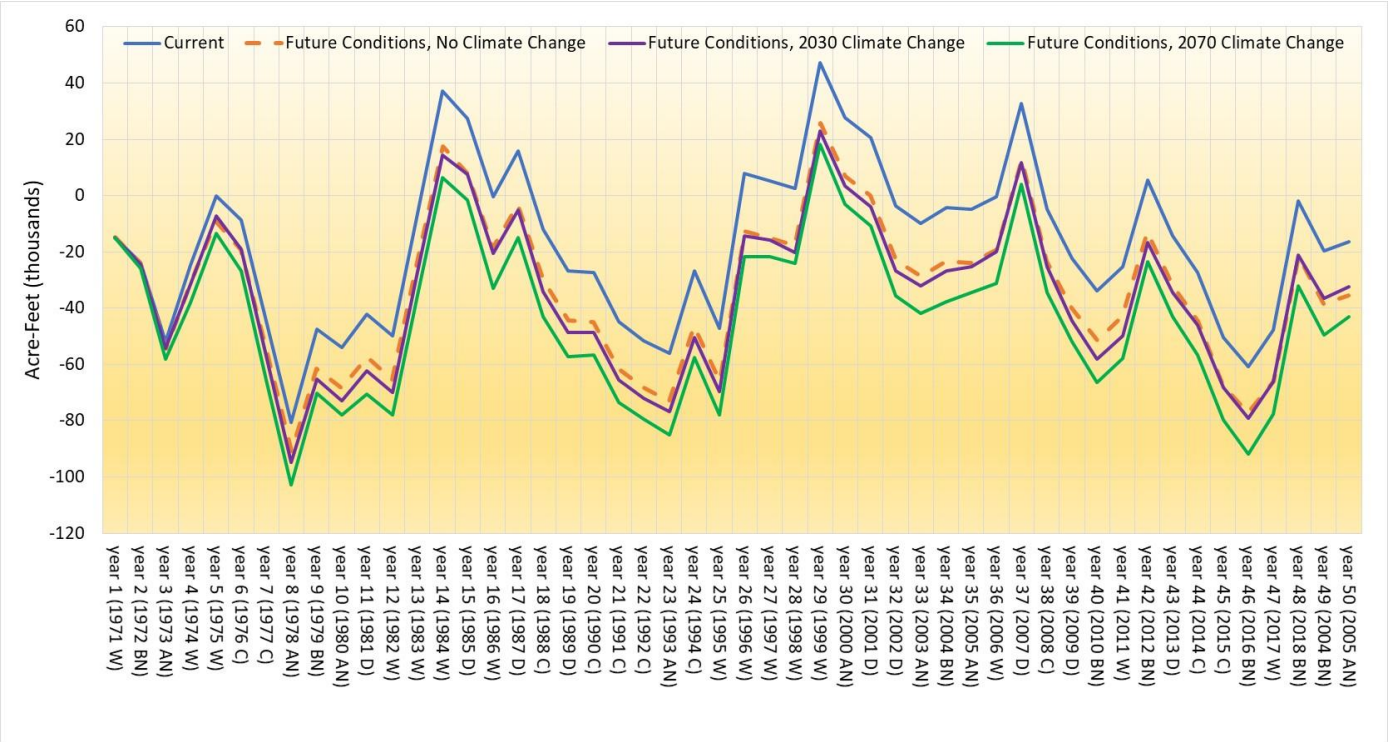

Figure ES-~~8~~7: Cumulative Change in Groundwater Storage for Current and Future Conditions Baseline Scenarios (BBGM v. 1.0)

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Monitoring Networks

The GSP outlines the monitoring networks for the six SIs. The objective of these monitoring networks is to monitor conditions across the Wyandotte Creek Subbasin and to detect trends toward undesirable results. Specifically, the monitoring network was developed to do the following:

- Monitor impacts to the beneficial uses or users of groundwater
- Monitor changes in groundwater conditions relative to MOs and MTs
- Demonstrate progress toward achieving MOs described in the GSP

There are ~~five~~ four representative monitoring networks in the Wyandotte Creek Subbasin~~:~~ including a representative network for ~~water~~groundwater levels~~; a broad network for water levels; a representative network for~~ water quality~~; a broad network for water quality; and a broad network for~~ land subsidence~~,~~ and interconnected surface water. Representative networks are used to determine compliance with the MTs~~, while the~~. These sites are selected from broader networks administered by DWR, Butte County, and other outside agencies. These broad networks collect data for informational purposes to identify trends and fill data gaps~~. The two monitoring networks for water quality~~ across the entire Subbasin / State. Sites from the broader network will ~~additionally~~ be ~~used~~re-evaluated, as needed, to ~~develop an electrical conductivity isocontour~~assess whether or not to ~~monitor for potential intrusion for underlying saline waters and water levels data will inform depletions of interconnected surface water.~~include as a RMS.

The monitoring networks were designed by evaluating data from Butte County's ~~existing~~former Basin Management Objective (BMO) program, the United States Geological Survey (USGS), and participating GSAs. The monitoring network consists largely of wells that are already being used for monitoring in the Wyandotte Creek Subbasin. Figure ES-9 shows the location of groundwater monitoring wells for the representative monitoring networks.

Wells in the monitoring networks will be measured at least on a semi-annual schedule. Historical measurements will be entered into the Wyandotte Creek Subbasin Data Management System (DMS), and future data will also be stored in the DMS. A summary of the wells in the monitoring networks is shown in ~~the table~~Table ES-3 below. There are also ~~three~~twelve stream ~~gauges~~gages monitored within the Wyandotte Creek Subbasin.

~~Summary of Monitoring Network Wells~~

Table ES-3: Summary of Monitoring Network Wells

Representative Networks	Well Count
Groundwater Level	~~9~~10
Groundwater Quality	~~8~~4
~~Broad Network~~Interconnected Surface Waters	3
~~Groundwater Levels~~	~~13~~
~~Groundwater Quality~~	~~2~~
~~Subsidence~~	~~6~~

Data Management System

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The DMS that will be used is a geographical relational database that will include information on water levels, land elevation measurements, and water quality testing. The DMS will allow the ~~GSAs~~GSA to share data and store the necessary information for annual reporting.

The DMS will be on local servers and data will be transmitted annually to form a single repository for data analysis for the Wyandotte Creek Subbasin's groundwater, as well as to allow for preparation of annual reports. ~~GSA representatives have access to data and will be able to ask for a copy of the regional DMS.~~ The DMS currently includes the necessary elements required by the regulations, including:

- Well location and construction information for the representative monitoring points (where available)
- Water level readings and hydrographs including water year type
- Land based measurements
- Water quality testing results
- Estimate of groundwater storage change, including map and tables of estimation
- Graphs with Water Year type, Groundwater Use, Annual Cumulative Storage Change

Additional items may be added to the DMS in the future as required. Data will be entered into the DMS by the GSA.

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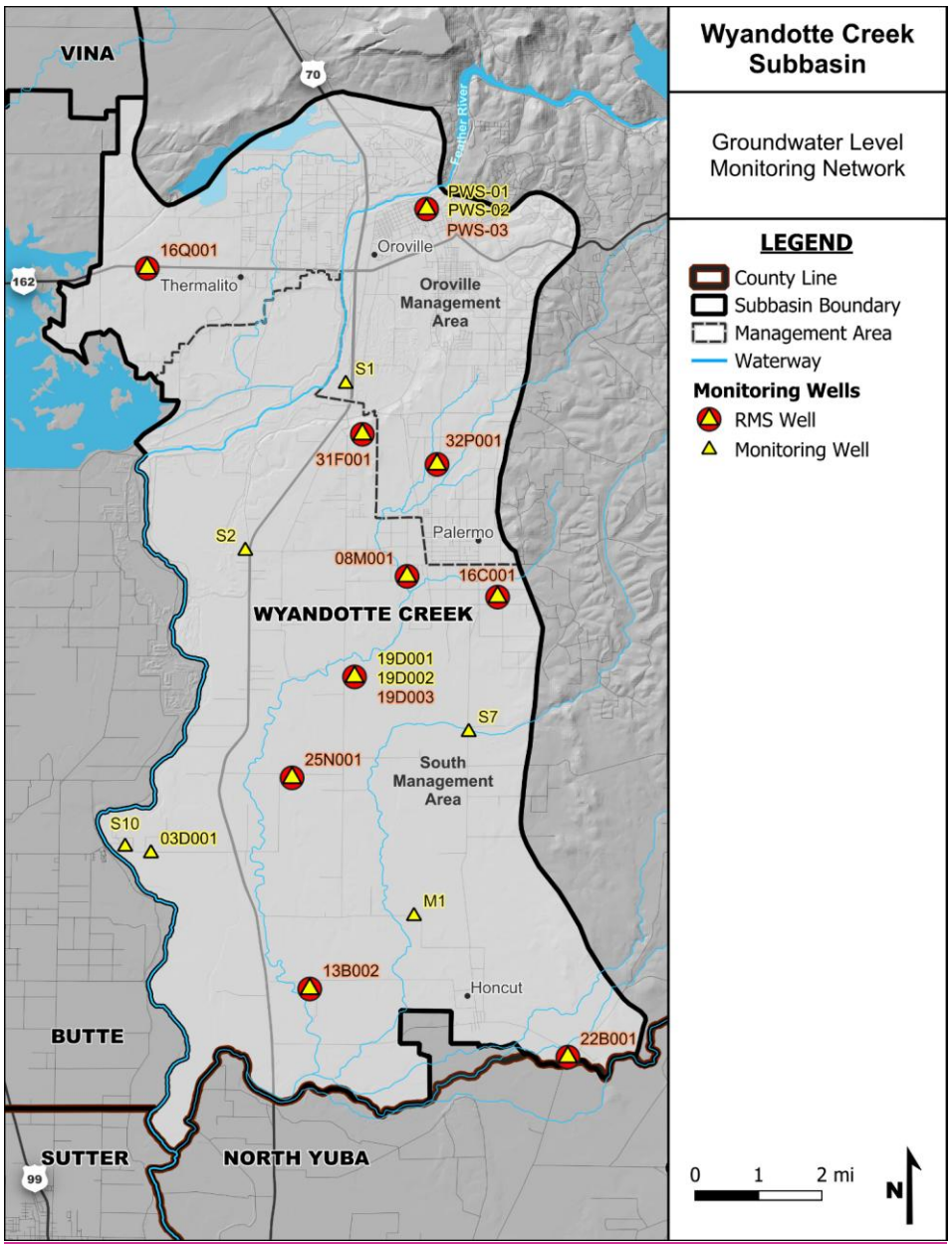

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Projects and Management Actions

Each of the projects are in various stages of development ranging from ongoing to planned to those still in the conceptual phase. Thus, each of the projects have a different level of development. The GSA will maintain a list of proposed projects and track their development status. The GSA will use this list to help secure funding as opportunities become available. Projects presented in this Plan will remain a part of the potential projects that the GSA may choose to implement, however as other projects are identified, those will be added to the list. The projects currently being considered are ~~listed below~~sorted into the following categories: Completed, In-Progress, Potential, and ~~are listed from planned to conceptual.~~Other Projects as described in GSP Sections 5.2.4, 5.2.5, 5.2.6, and 5.2.7; respectively.

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~~Planned:~~

- ~~Residential Conservation~~
- ~~Agricultural Irrigation Efficiency~~
- ~~FloodMAR~~
- ~~Oroville Wildlife Area Robinson's Riffle Project~~
- ~~Streamflow Augmentation~~

Completed:

- TWSD Water Treatment Plant Capacity Upgrade

In-Progress Projects:

- Residential Water ~~Loss Monitoring~~Conservation
- Palermo Clean Water Consolidation Project
- Regional Conjunctive Use Project

Potential Projects:

- ~~Intra-Basin Water Transfer~~
- ~~Agricultural Surface Water Supplies~~
- ~~Well Upgrades~~
- ~~Fuels Management for Watershed Health~~
- ~~Removal of Invasive Species~~

~~Conceptual:~~

- ~~Recharge Well (Injection Well)~~
- Extend Orchard Replacement

These Projects have been prioritized by the GSA for implementation. Other projects are listed in Section 5.2.7 that may be prioritized and implemented by the GSA as needed.

Management Actions

GSAs have a variety of tools to use to achieve sustainable groundwater management. Projects focus primarily on capture, use, and recharge of surface water supplies while management actions focus on groundwater demand.

Section 5.3 presents several management actions that the GSA may consider during GSP implementation. It is expected that the GSA will further develop and modify management actions in response to stakeholder input and available information. The management actions identified in this GSP include:

- General Plans Updates
- Domestic Well Mitigation
- Well Permitting Ordinance
- Landscape Ordinance
- Expansion of Water Purveyors' Service Area

The GSA has prioritized domestic well mitigation to implement as needed. Other management actions may be prioritized and implemented as needed.

Plan Implementation

~~The adoption of the GSP is official start of plan implementation for the Vina Subbasin. The GSAs~~The Wyandotte Creek Subbasin GSP is being implemented by the GSAGSA since its submission in 2022. In 2023, the GSA successfully passed a Proposition 218 process to assess landowners based on three user classes: non-irrigated, irrigated with surface water, and irrigated with groundwater. These fees fund administrative, legal, and SGMA-compliance costs. The GSA will consider alternative funding structures based on feedback from constituent members as needed.

The GSAGSA applied and received grant funding to further support the GSP implementation through new data collection and projects and management actions. The Regional Conjunctive Use Project, consisting of Intra-Basin Water Transfer and Agricultural Surface Water Supplies planning and feasibility studies, and Thermalito Water Treatment Plant Capacity Upgrade were completed. The GSA will continue their public outreach efforts and work to secure funding to implement projects and management actions. The estimated budgets and implementation schedule for the proposed projects and management actions are presented in Chapter 6.

Implementing the Wyandotte Creek Subbasin GSP will require numerous management activities that will be undertaken by the ~~GSAs~~GSA, including:

- Monitoring conditions relative to applicable SIs at specified frequency and timing
- Entering updated monitoring data into the Wyandotte Creek Subbasin DMS
- Refining the Wyandotte Creek Subbasin model and water budget planning estimates

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- Preparing annual reports summarizing the conditions of the Wyandotte Creek Subbasin and progress towards sustainability and submitting them to DWR
- ~~Updating~~Completing Periodic Evaluations of the GSP ~~once~~ every five years and submitting them to DWR
- Overseeing and monitoring projects, management actions, and collection of data identified as "data gaps" within the GSP
- Identify funding sources
- Coordinating with neighboring subbasins

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1. AGENCY INFORMATION, PLAN AREA, COMMUNICATION

1.1 Introduction and Agency Information

1.1.1 Purpose of the Groundwater Sustainability Plan

The purpose of this Groundwater Sustainability Plan (GSP) is to meet the regulatory requirements set forth in the three-bill legislative package consisting of Assembly Bill (AB) 1739 (Dickinson), Senate Bill (SB) 1168 (Pavley), and SB 1319 (Pavley), collectively known as the Sustainable Groundwater Management Act (SGMA). SGMA defines sustainable groundwater management as "management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results," which are defined by SGMA as any of the following effects caused by groundwater conditions occurring throughout the basin (Department of Water Resources [DWR], 2018a):

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon
- Significant and unreasonable reduction of groundwater storage
- Significant and unreasonable seawater intrusion
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies
- Significant and unreasonable land subsidence that substantially interferes with surface land uses
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

The Wyandotte Creek Groundwater Subbasin (Wyandotte Creek Subbasin) has been identified by DWR as a medium priority basin. The Wyandotte Creek GSP was developed to meet SGMA regulatory requirements by the January 31, 2022, deadline for high and medium priority basins while reflecting local needs and preserving local control over water resources. Requirements for the GSP are provided in California Code of Regulations Title 23, Division 2, Chapter 1.5, Subchapter 2, Article 5. Appendix 1-A provides a checklist of where to find the information required by these regulations.

The Wyandotte Creek GSP provides a path to achieve and document sustainable groundwater management within 20 years following GSP adoption, promoting the long-term sustainability of locally managed groundwater resources now and into the future. In 2027, an Amended GSP and Periodic Evaluation was submitted to DWR. The Amended GSP updated SMCs and networks for nearly all applicable sustainability indicators. Stream depletions and subsidence, that previously used the groundwater level SI as a proxy, have their own established networks and SMCs. The 2027 GSP also updated key sections with new data and analysis, including interconnected surface water and groundwater dependent ecosystems. The sustainable yield has been updated to reflect updated data collection for groundwater pumping and groundwater levels. Water budget results including estimates of groundwater pumping and change in storage, and sustainable yield will be updated in annual reporting.

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While the Wyandotte Creek GSP offers a new and significant approach to groundwater resource protection, it was developed within an existing framework of comprehensive planning efforts. Throughout the Wyandotte Creek Subbasin, several separate yet related planning efforts have occurred previously or are concurrently proceeding. In November 1996, the voters in Butte County approved "An Ordinance to Protect the Groundwater Resources in Butte County." One of the stated purposes of the ordinance was that "the groundwater underlying Butte County is a significant water resource which must be reasonably and beneficially used and conserved for the benefit of the overlying land by avoiding extractions which harm the Butte basin aquifers (includes the Wyandotte Creek Subbasin), causing exceedance of the safe yield or a condition of overdraft." Other significant reports prepared in the Wyandotte Creek Subbasin include integrated regional water management (IRWM), urban water management, habitat conservation, basin assessment, and general planning. The Wyandotte Creek GSP fits in with these prior planning efforts, building on existing local management and basin characterization. A description of prior planning efforts can be found in Section 1.2.1 of this document.

1.1.2 Sustainability Goal

A sustainability goal is the culmination of conditions resulting in a sustainable condition (absence of undesirable results) within 20 years. The sustainability goal reflects this requirement and succinctly states the GSP's objectives and desired conditions of the Wyandotte Creek Subbasin.

The sustainability goal for the Wyandotte Creek Subbasin is "to ensure that groundwater is managed to provide a water supply of adequate quantity and quality to support beneficial users of groundwater including but not limited to rural areas and other communities, the agricultural economic base of the region, and environmental resource uses in the Subbasin now and in the future."

Additional discussion of the sustainability goal can be found in Section 3: Sustainable Management Criteria.

1.1.3 Contact Information

The Wyandotte Creek Groundwater Sustainability Agency (GSA) has been tasked with submitting a single, jointly composed GSP to DWR on behalf of the entire Wyandotte Creek Subbasin. Contact information for the submitting agency and Plan Manager is provided below:

Submitting Agency:	Wyandotte Creek Groundwater Sustainability Agency 308 Nelson Avenue Oroville, California 95965 (530) 552-3591
Plan Manager:	~~Dr. Christina Buck~~Dillon McGregor, GSA Program Manager 308 Nelson Avenue Oroville, California 95965 530.552.3595 ~~cbuck@buttecounty.net~~WyandotteGSA@gmail.com

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The Plan Manager is subject to change. Updated contact will be available on the GSA's website: https://www.wyandottecreekgsa.com/.

1.1.4 Agency Information

The Wyandotte Creek GSA was formed through the execution of a Joint Powers Agreement (Agreement; Appendix 1-B) by the County of Butte, City of Oroville and Thermalito Water and Sewer District (TWSD; Figure 1-1).

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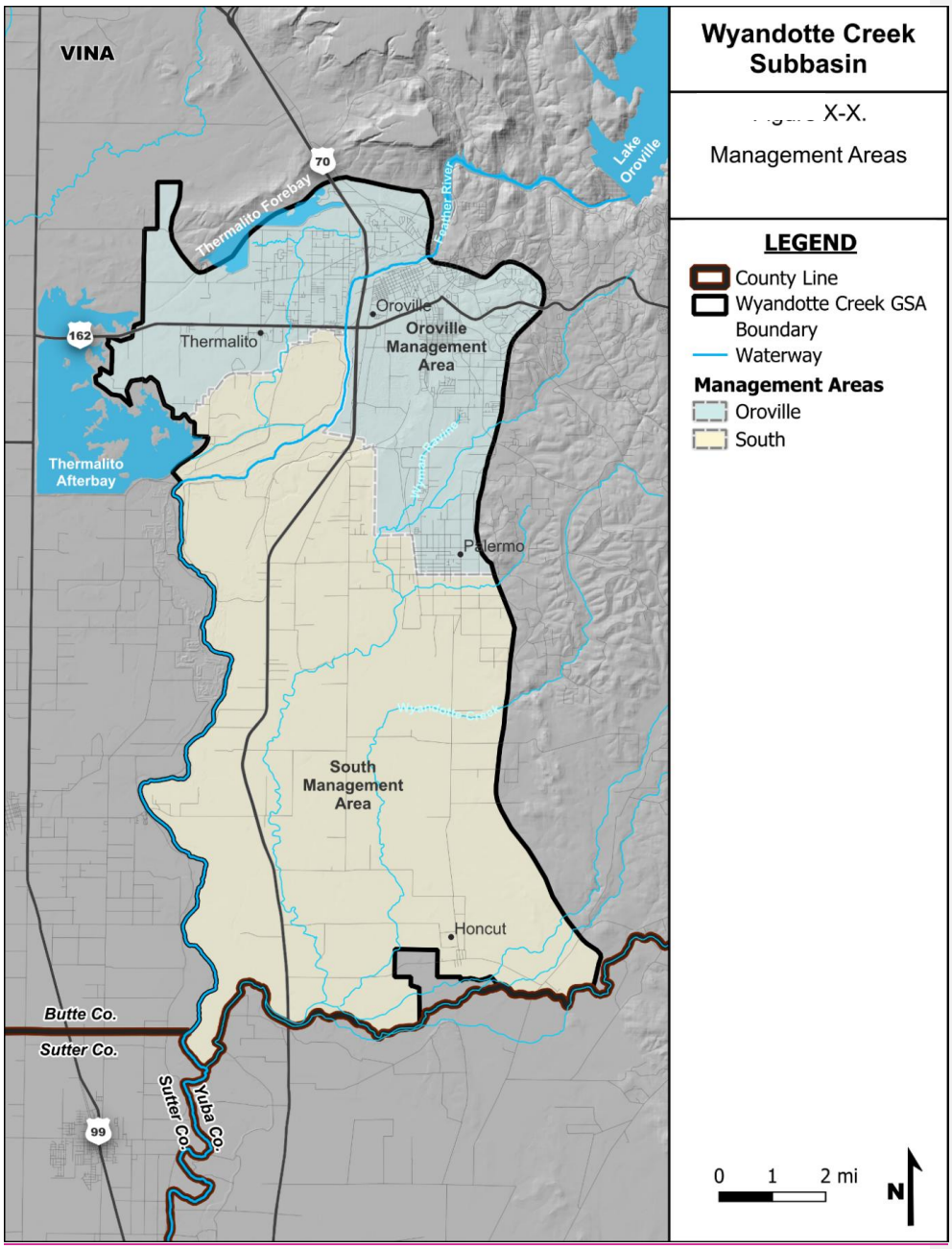

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: Groundwater Sustainability Agency with Management Areas.

The Wyandotte Creek GSA filed to be a GSA on October 24, 2018. The purpose of the Agreement was to create the Wyandotte Creek GSA to 1) to develop, adopt, and implement a GSP for the Wyandotte Creek Subbasin to implement SGMA requirements and achieve the sustainability goals; and 2) involve the public and subbasin stakeholders through outreach and engagement in developing and implementing the GSP. At the heart of the Agreement is the focus to maximize local input and decision-making and address the different water demands and sustainability considerations in the municipal and rural areas of the Wyandotte Creek subbasin.

The Wyandotte Creek GSA Board serves as the policy-making role for SGMA implementation in the Wyandotte Creek subbasin. All GSA Board meetings are subject to the Brown Act and are noticed and open to the public. The GSA Board is composed of five seats, each with equal and full voting rights, including:

1. Butte County – one seat (Member Agency)
2. City of Oroville – one seat (Member Agency)
3. TWSD – one seat (Member Agency)
4. Agricultural groundwater user – one seat (At-large Butte County Appointed Stakeholder)
5. Domestic well user (non-agricultural) – one seat (At large Butte County Board Appointed Stakeholder)

The Wyandotte Creek GSA Board as stated in the Agreement possesses the ability to exercise those powers specifically granted by the Joint Powers Act and SGMA. Additionally, the GSA has the ability to exercise the common powers of its ~~Members~~members related to the purposes of the GSA, including, but not limited to, the following:

- To designate itself as the exclusive GSA for the Wyandotte Creek Subbasin pursuant to SGMA.
- To develop, adopt and implement a GSP for the Wyandotte Creek Subbasin pursuant to SGMA.
- To adopt rules, regulations, policies, bylaws, and procedures governing the operation of the GSA and adoption and implementation of a GSP for the Wyandotte Creek Subbasin.
- To adopt ordinances within the Wyandotte Creek Subbasin consistent with the purpose of the GSA as necessary to implement the GSP and otherwise meeting the requirements of the SGMA.
- To obtain legal, financial, accounting, technical, engineering, and other services needed to carry out the purposes of this Agreement.
- To perform periodic reviews of the GSP including submittal of annual reports.
- To require the registration and monitoring of wells within the Wyandotte Creek Subbasin.
- To issue revenue bonds or other appropriate public or private debt and incur debts, liabilities, or obligations.

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- To exercise the powers permitted under Government Code section 6504 or any successor statute.
- To levy taxes, assessments, charges, and fees as provided in SGMA or otherwise provided by law.
- To regulate and monitor groundwater extractions within the Wyandotte Creek Subbasin as permitted by SGMA, provided that this Agreement does not extend to a Member's operation of its systems to distribute water once extracted or otherwise obtained, unless and to the extent required by other laws now in existence or as may otherwise be adopted.
- To establish and administer projects and programs for the benefit of the Wyandotte Creek Subbasin.
- To cooperate, act in conjunction and contract with the United States, the State of California, or any agency thereof, counties, municipalities, special districts, GSAs, public and private corporations of any kind (including without limitation, Public Utilities Commission regulated utilities and mutual water companies), and individuals, or any of them, for any and all purposes necessary or convenient for the full exercise of powers of the GSA.
- To accumulate operating and reserve funds and invest the same as allowed by law for the purposes of the GSA and to invest funds pursuant to California Government Code section 6509.5 or other applicable State Law.
- To apply for and accept grants, contributions, donations, and loans under any federal, state, or local programs for assistance in development or implementing any of its projects or programs for the purposes of the GSA.
- To acquire by negotiation, lease, purchase, construct, hold, manage, maintain, operate, and dispose of any buildings, property, water rights, works or improvements within and without the respective boundaries of the Members necessary to accomplish the purposes described herein.
- To sue and be sued in the GSA's own name.
- To exercise the common powers of its ~~Members~~members to develop, collect, provide, and disseminate information that furthers the purposes of the GSA, including but not limited to the operation of the GSA and adoption and implementation of a GSP for the Wyandotte Creek Subbasin, to the Members' legislative, administrative, and judicial bodies, as well as the public generally.
- To perform all other acts necessary or proper to carry out fully the purposes of this Agreement.

The Wyandotte Creek GSA Board aspires to seek consensus. If the Wyandotte Creek GSA Board cannot reach consensus, the Wyandotte Creek GSA Board defaults to the following voting structure.

- Quorum: A majority of the members of the Wyandotte Creek GSA Board members shall constitute a quorum for purposes of transacting business.

- Director Votes: Each member of the Wyandotte Creek GSA Board shall have one vote.
- Supermajority Voting Requirement (four affirmative votes) for the following:
  1. Bylaws adoption, modification or alteration
  2. GSP adoption, modification, alteration
  3. Adoption of assessment, charges and fees
  4. ~~Adoptions~~Adoption of regulations and ordinances
  5. Adoption or modification of annual budget, including capital projects
  6. Property acquisition (excepting rights of way)
  7. Removal of Advisory Committee Members
  8. Modifications to the composition and number of Advisory Committee Members
  9. Removal of stakeholder board seats as is consistent with the Agreement

The Wyandotte Creek GSA Board does not have the authority to limit or interfere with the respective Member Agency's rights and authorities over their own internal matters, including, but not limited to, legal rights to surface water supplies and assets, groundwater supplies and assets, facilities, operations, water management and water supply matters. The Member Agencies made no commitments by entering into the Agreement to share or otherwise contribute their water supply assets as part of the development or implementation of a GSP. Nothing in the Agreement modifies or limits a Member Agency's police powers, land use authorities, or any other authority. The Member Agencies cooperate to obtain consulting, administrative and management services needed to efficiently develop a GSP and to identify mechanisms for the management and funding commitments reasonably anticipated to be necessary for the purposes of this Agreement.

Each Member Agency (Butte County, City of Oroville and TWSD) designates a staff person (in-kind support) to participate on the Wyandotte Creek GSA Management Committee. The Management Committee receives direction from the Wyandotte Creek GSA Board, makes recommendations and generates staff reports and proposals to the Wyandotte Creek GSA Board. The Management Committee staffs the Advisory Committee and reports to the Wyandotte Creek GSA Board. The Management Committee assures that staff and other resources are provided to prepare the GSP and administer the governance for the Wyandotte Creek GSA.

The Wyandotte Creek GSA does not and will not have any employees. However, the Wyandotte Creek GSA has the power to employ consultants to fulfill the objectives and purposes of SGMA and complete a GSP. Butte County ~~is leading the development of~~provides technical ~~aspects of the GSP including contracting for professional services~~and staff support in coordination with the Management Committee and the Wyandotte Creek GSA Board. The Management Committee may form ad hoc technical working groups to provide input on technical matters pertaining to the GSP. Preparation of the Wyandotte Creek GSP and carrying out governance requires various administrative activities such as meeting management, website development and maintenance, public outreach and communication.

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The Wyandotte Creek Advisory Committee (WAC) provides input and recommendations to Wyandotte Creek GSA Board on ~~-~~GSP development and implementation as well as other items outlined in their Charter. At the time of GSP submittal, the Advisory Committee members included:

- California Water Service (Cal Water) – One representative
- Tribal representative(s) ~~—Vacant~~)
- South Feather Water and Power Agency (SFWPA) – One representative
- At-large agricultural groundwater users – Three representatives
- At-large domestic well users – ~~Vacant~~Two representatives
- At-large environmental – ~~Vacant~~One representative
- At-large business – ~~Vacant~~One representative

The Wyandotte Creek GSA Board appointed at-large members to fill Advisory Committee seats. Interested individuals from the community or organizations ~~applied~~may apply to the Wyandotte Creek GSA. At-large members must live, farm or be employed by a firm operating in the Wyandotte Creek subbasin. To inform the Wyandotte Creek GSA Board and assist in decision-making, the Advisory Committee provides recommendations that ~~were~~are included in Management Committee reports. The recommendations ~~identified~~identify areas of agreement and disagreement. The Advisory Committee ~~strived~~strives for consensus when possible, but reaching consensus is not necessary. Consensus means that everyone can at least "live with" the recommendation. When unable to reach consensus on recommendations, the Advisory Committee ~~outlined~~outlines the areas in which it does not agree, providing some explanation to inform the Wyandotte Creek GSA Board decision-making. The Wyandotte Creek GSA Board ~~considered~~considers Advisory Committee recommendations when making decisions. If that Board does not agree with the recommendations of the Advisory Committee, the Wyandotte Creek GSA Board states the reasons for its decision. The Advisory Committee is staffed by one member of each of the Member Agencies. All Advisory Committee meetings are subject to the Brown Act and are noticed and open to the public.

Updates to the Board and Committee members will be posted to the GSA's website.

1.2 Groundwater Sustainability Plan Area

This section provides a detailed description of the Wyandotte Creek Subbasin, including major streams and creeks, institutional entities, agricultural and urban land uses, locations of groundwater wells, and locations of state lands. The GSP Area document also describes existing surface water and groundwater monitoring programs, existing water management programs, and general plans in the GSP Area.

1.2.1 Summary of Jurisdictional Areas and Other Features

The Wyandotte Creek Subbasin falls within the larger Sacramento Valley Groundwater Basin (Figure 1-2). Basin designations by DWR were first published in 1952 in Water Quality Investigations Report No. 3, Ground Water Basins in California, and subsequently updated in Bulletin 118 in 1975, 1980, 2003 and draft update in 2020. As shown in Figure 1-3, the Wyandotte Creek Subbasin (Bulletin 118 Basin Number 5-021.69) is bordered to the north by

the Vina Subbasin (Bulletin 118 Basin Number 5-021.57), the Butte Subbasin (Bulletin 118 Basin Number 5-021.70) to the west; to the south by the North Yuba Subbasin (Bulletin 118 Basin Number 5-021.60) and Sutter Subbasin (Bulletin 118 Basin Number 5-021.62; and to the east by the Sierra Nevada geomorphic province.

The Wyandotte Creek Subbasin is located within Butte County. Geologic units in the Wyandotte Creek Subbasin consist of consolidated rocks and unconsolidated deposits as discussed in detail in Section 2. No adjudicated areas or areas covered by an alternative to a GSP exist within the Wyandotte Creek Subbasin.

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Figure 1-4 shows the Wyandotte Creek Subbasin's key geographic features. The Wyandotte Creek Subbasin encompasses an area of about 59,382 acres. There are two entities within the Wyandotte Creek Subbasin with land use jurisdiction: Butte County and the City of Oroville.

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Figure 1-5 shows the tribal areas within ~~in~~ the Wyandotte Creek Subbasin that includes portions of the Berry Creek Off-Reservation Trust Land, Mooretown Off-Reservation Trust Land, and Mooretown Rancheria. Figure 1-6 shows the spatial extent of Disadvantaged Communities (DACs) and Severely Disadvantaged Communities (SDACs) in the Wyandotte Creek Subbasin. DWR defines DACs as census geographies (census tracts, census block groups, and census-designated places) with an annual median household income (MHI) that is less than 80% of the statewide annual MHI. SDACs are defined as census geographies with an MHI less than 60% of the statewide annual MHI. DWR uses the most recently available 5-year American Community Survey (ACS) dataset to identify these areas. For this GSP, the 2012-2016 ACS dataset was used, establishing statewide MHI as $63,783 (CA DWR, Mapping Tools).

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Figure 1-7 shows a map of land use in the Wyandotte Creek Subbasin across four general categories: cropland, industrial, undeveloped, and urban. These categories were mapped based on categories provided by 2015 land use from the United States Department of Agriculture's (USDA) CropScape 2015 dataset.

Land use patterns in the Wyandotte Creek Subbasin are dominated by agricultural uses, including nut and fruit trees, vineyards, row crops, grazing, and forage. Throughout the Wyandotte Creek Subbasin both agricultural and urban land use rely on a combination of surface water and groundwater. Land use is primarily controlled by local agencies. Land use patterns in the low foothills to the east are dominated by native vegetation and unirrigated pasture lands (USDA, 2020).

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Crop type varies by region, with fruit and nut trees and rice fields comprising the majority of agriculture in the Wyandotte Creek Subbasin (Figure 1-8). Figure 1-9 shows a map with boundaries of federal and state public lands within the region that includes the Wyandotte Creek Subbasin.

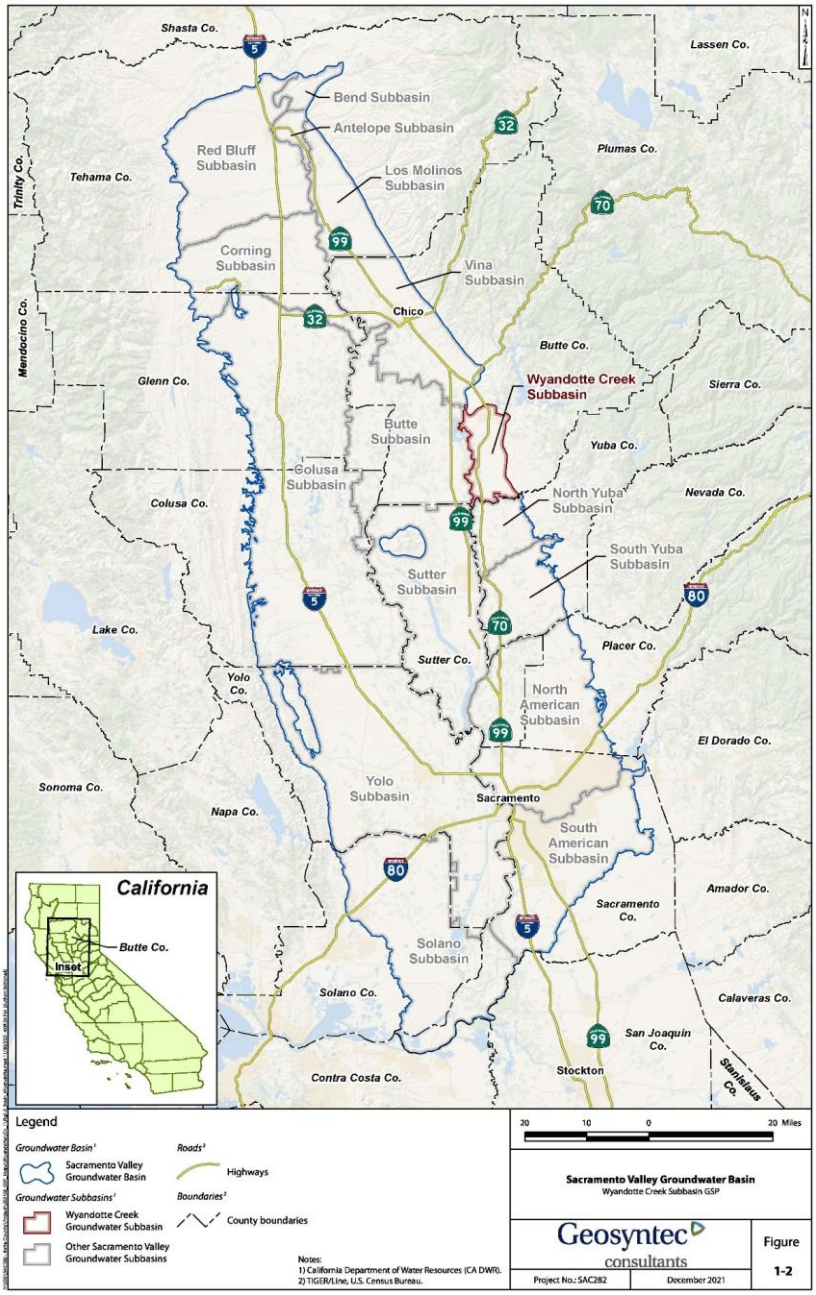
Shasta Co.
Lassen Co.
Bend Subbasin
Antelope Subbasin
Red Bluff Subbasin
Tehama Co.
Trinity Co.
Los Molinos Subbasin
Plumas Co.
Corning Subbasin
Vina Subbasin
Chico
Mendocino Co.
Glenn Co.
Butte Co.
Wyandotte Creek Subbasin
Sierra Co.
Butte Subbasin
Yuba Co.
Colusa Subbasin
Colusa Co.
North Yuba Subbasin
Nevada Co.
South Yuba Subbasin
Sutter Subbasin
Lake Co.
Placer Co.
Sutter Co.
Yolo Co.
North American Subbasin
El Dorado Co.
Sonoma Co.
Yolo Subbasin
Sacramento
Napa Co.
South American Subbasin
Amador Co.
Sacramento Co.
Solano Subbasin
Solano Co.
Calaveras Co.
San Joaquin Co.
Contra Costa Co.
Stockton
Stanislaus Co.
California
Butte Co.
Inset
Legend
Groundwater Basin[1]
Sacramento Valley Groundwater Basin
Groundwater Subbasins[1]
Wyandotte Creek Groundwater Subbasin
Other Sacramento Valley Groundwater Subbasins
Roads[2]
Highways
Boundaries[2]
County boundaries
Notes:
1) California Department of Water Resources (CA DWR).
2) TIGER/Line, U.S. Census Bureau.
20 10 0 20 Miles
Sacramento Valley Groundwater Basin
Wyandotte Creek Subbasin GSP
Geosyntec consultants
Figure 1-2
Project No.: SAC282
December 2021

Figure 1-2 ~~placeholder page~~: Sacramento Valley Groundwater Basin

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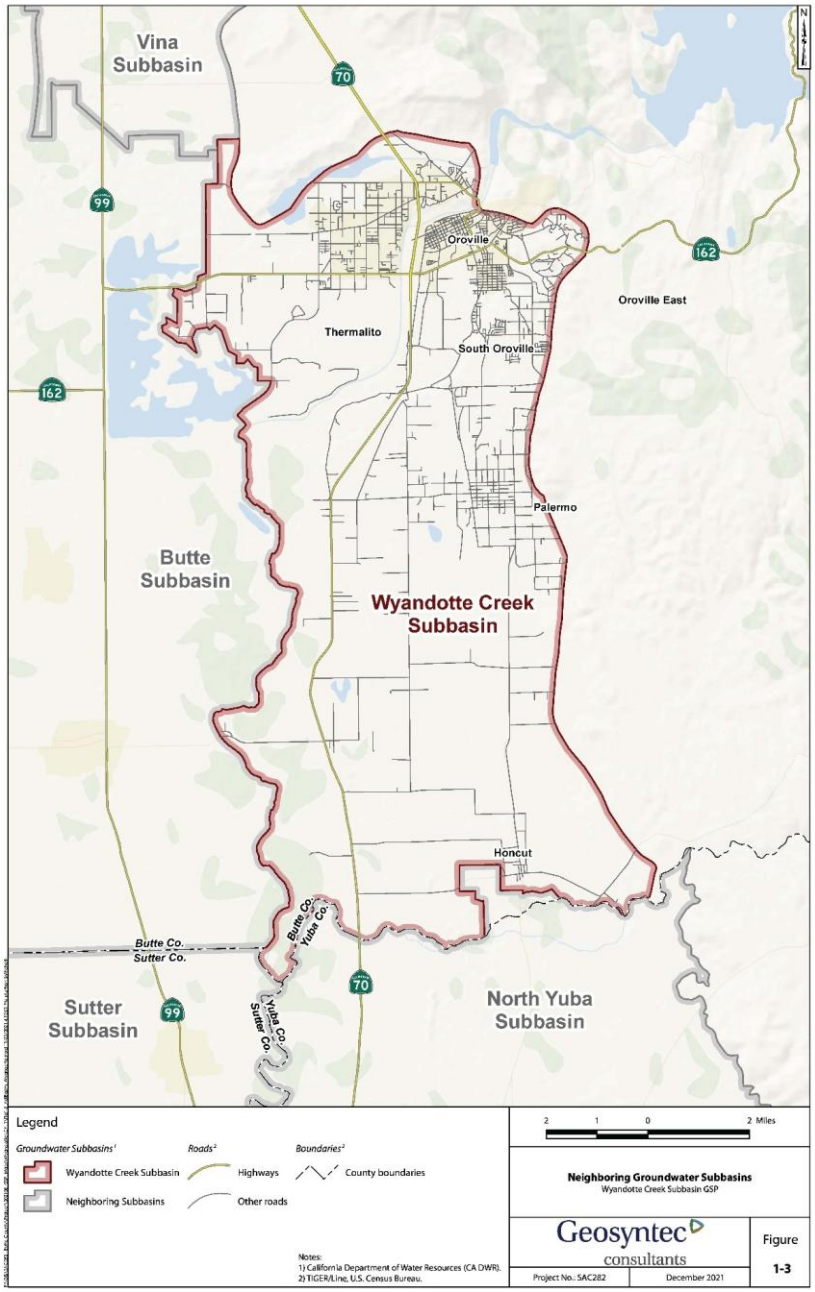

Figure 1-3 ~~placeholder page~~: Neighboring Groundwater Subbasins

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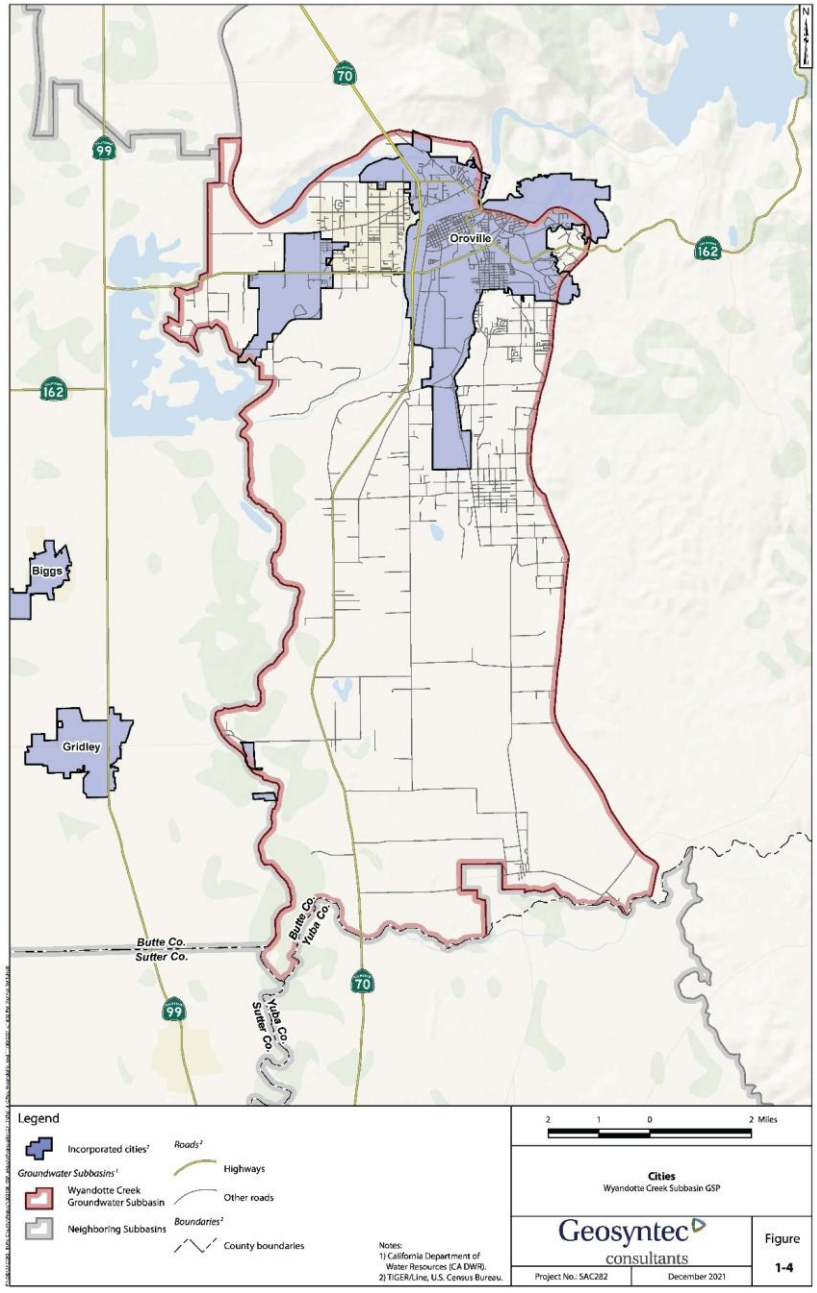

Figure 1-4 ~~placeholder page~~: Cities

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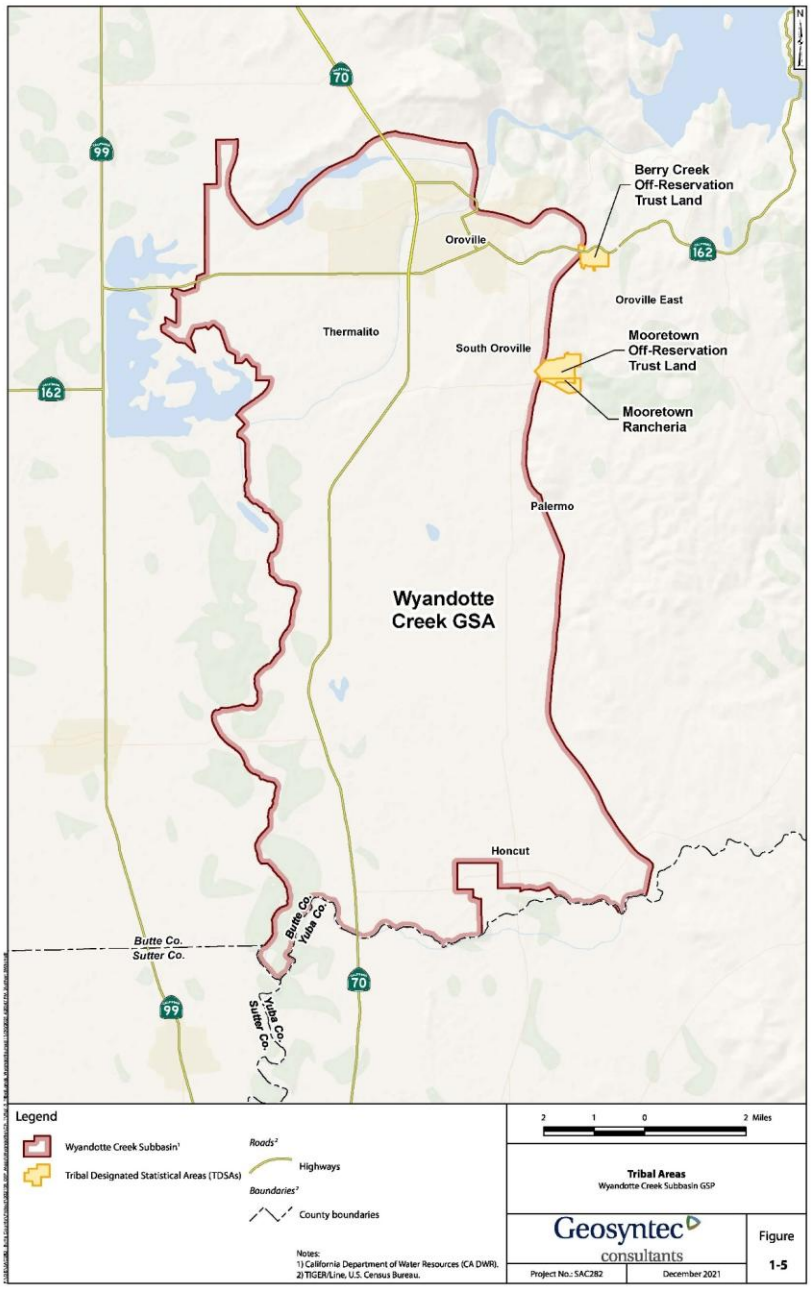

Figure 1-5 ~~placeholder page~~: Tribal Areas

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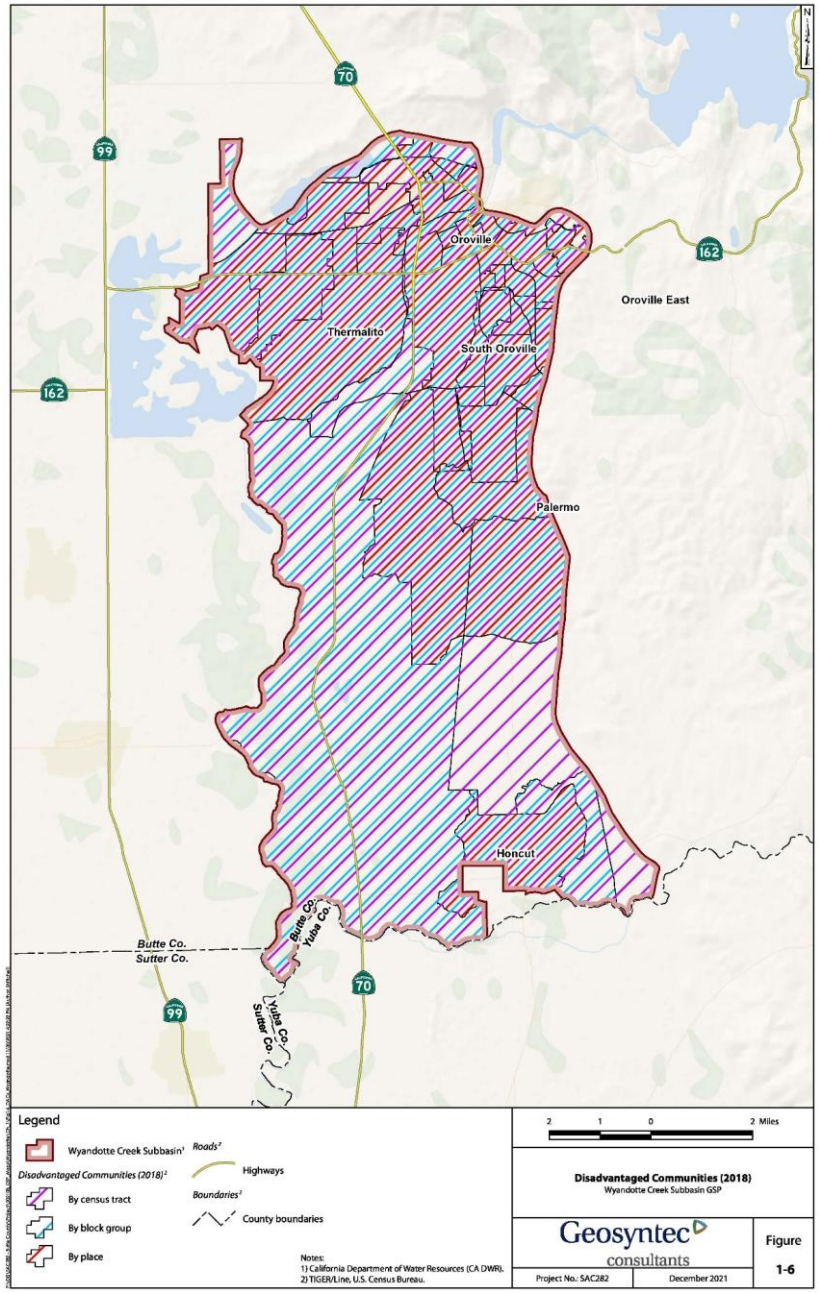

Figure 1-6 ~~placeholder page~~: Disadvantaged Communities (2018)

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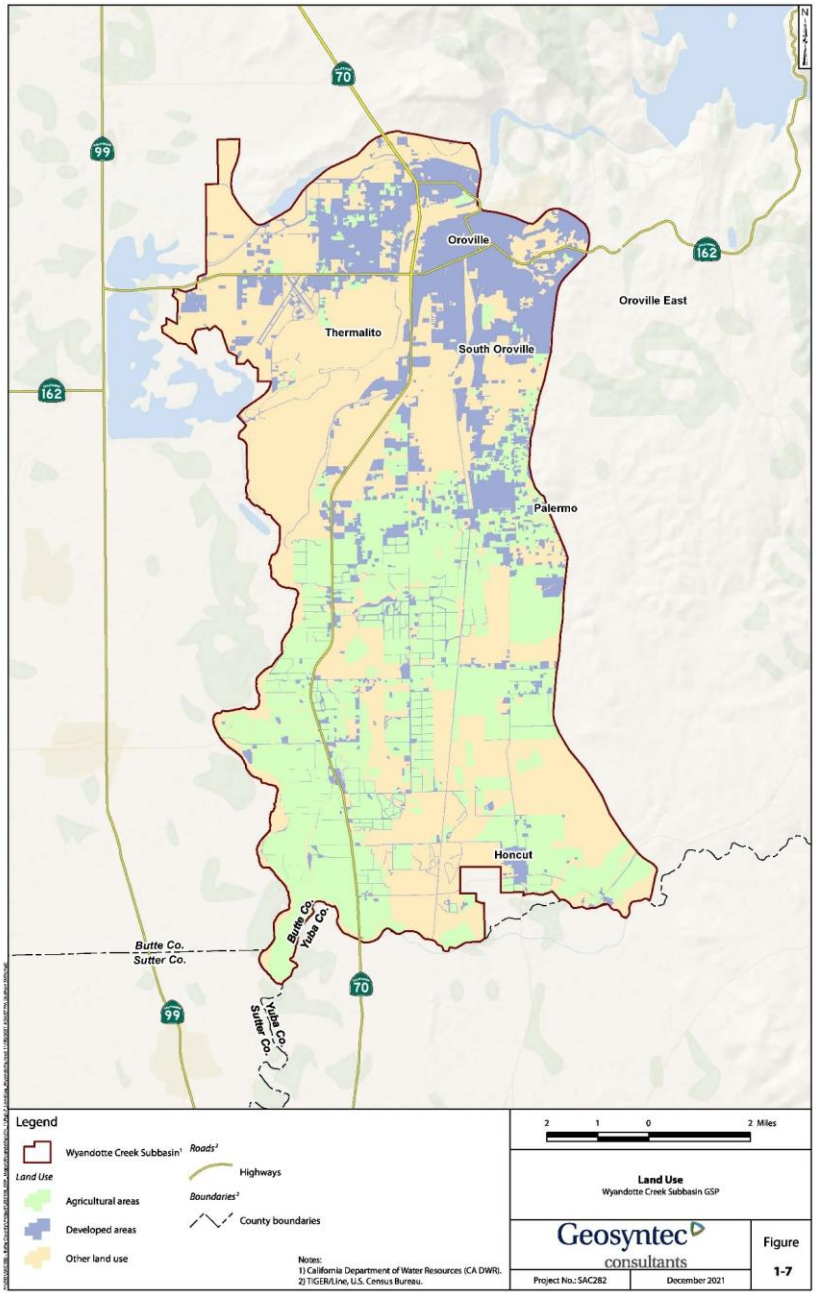
70
99
162
Oroville
Oroville East
Thermalito
South Oroville
Palermo
Honcut
Butte Co.
Sutter Co.
Butte Co.
Yuba Co.
Yuba Co.
Sutter Co.
Legend
Wyandotte Creek Subbasin
Land Use
Agricultural areas
Developed areas
Other land use
Roads
Highways
Boundaries
County boundaries
Notes:
1) California Department of Water Resources (CA DWR).
2) TIGER/Line, U.S. Census Bureau.
2 1 0 2 Miles
Land Use
Wyandotte Creek Subbasin GSP
Geosyntec consultants
Figure 1-7
Project No.: SAC282
December 2021

Figure 1-7 ~~placeholder page~~: Land Use

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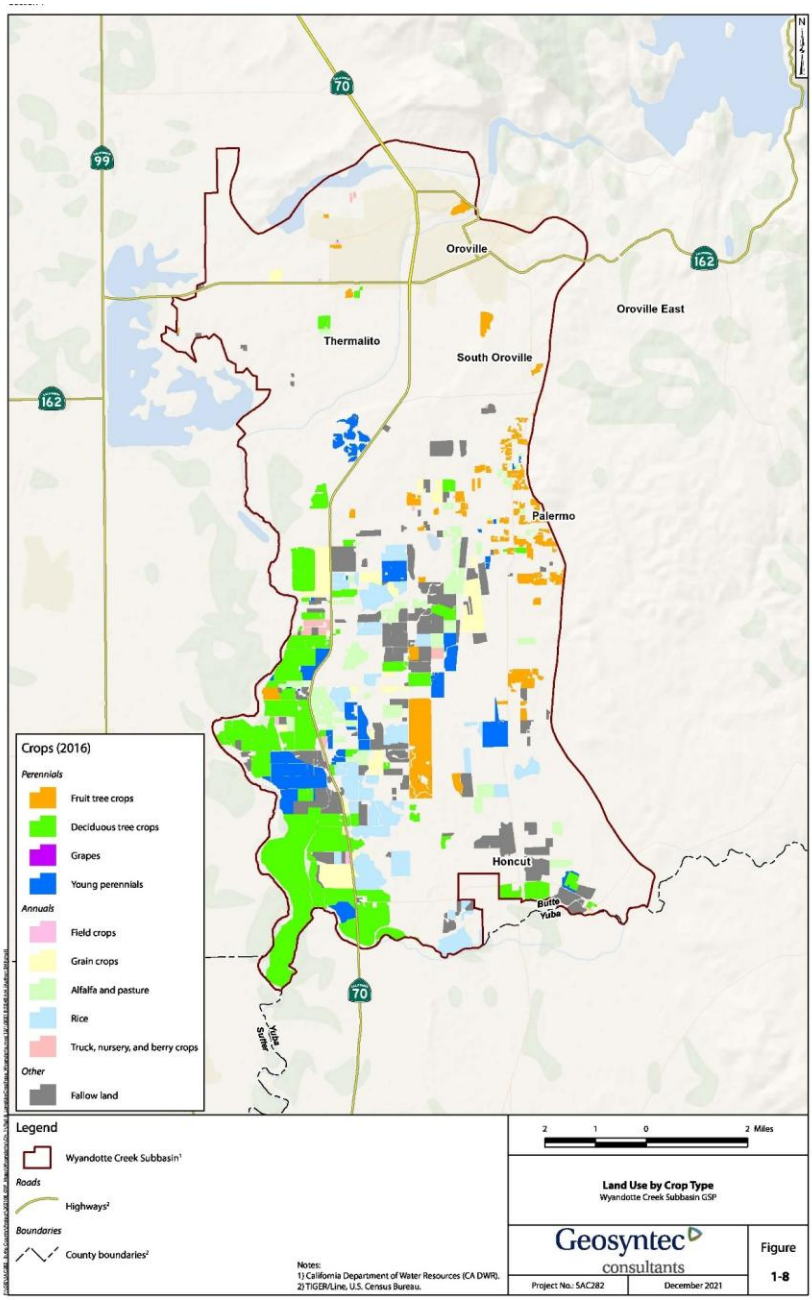
Oroville
Oroville East
Thermalito
South Oroville
Palermo
Honcut
Butte
Yuba
Sutter
70
99
162
Crops (2016)
Perennials
Fruit tree crops
Deciduous tree crops
Grapes
Young perennials
Annuals
Field crops
Grain crops
Alfalfa and pasture
Rice
Truck, nursery, and berry crops
Other
Fallow land
Legend
Wyandotte Creek Subbasin1
Roads
Highways2
Boundaries
County boundaries2
Notes:
1) California Department of Water Resources (CA DWR).
2) TIGER/Line, U.S. Census Bureau.
2 1 0 2 Miles
Land Use by Crop Type
Wyandotte Creek Subbasin GSP
Geosyntec consultants
Figure 1-8
Project No.: SAC282
December 2021

Figure 1-8 ~~placeholder page~~: Land Use by Crop Type

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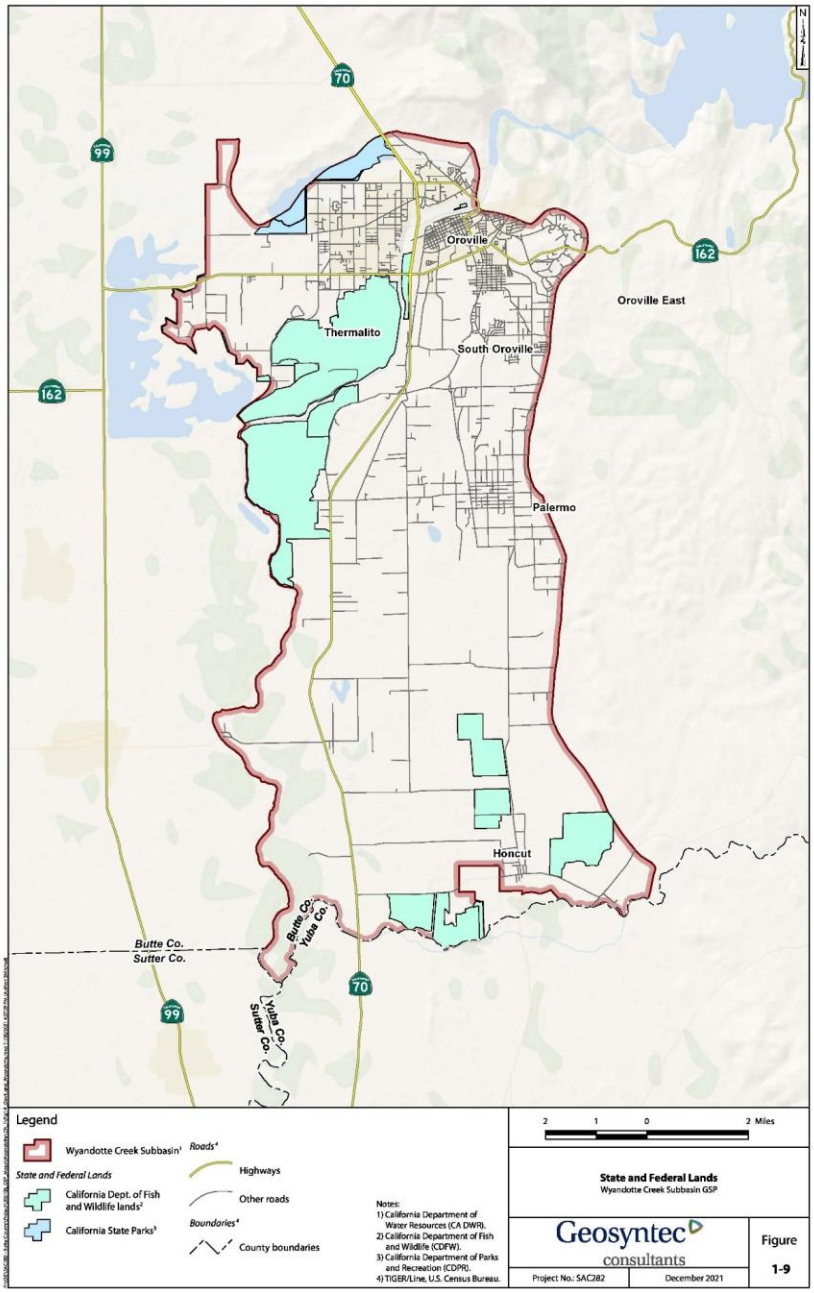
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Oroville
Oroville East
Thermalito
South Oroville
Palermo
Honcut
Butte Co.
Sutter Co.
Butte Co.
Yuba Co.
Yuba Co.
Sutter Co.
Legend
Wyandotte Creek Subbasin¹
State and Federal Lands
California Dept. of Fish and Wildlife lands²
California State Parks³
Roads⁴
Highways
Other roads
Boundaries⁴
County boundaries
Notes:
1) California Department of Water Resources (CA DWR).
2) California Department of Fish and Wildlife (CDFW).
3) California Department of Parks and Recreation (CDPR).
4) TIGER/Line, U.S. Census Bureau.
2 1 0 2 Miles
State and Federal Lands
Wyandotte Creek Subbasin GSP
Geosyntec consultants
Figure 1-9
Project No.: SAC282
December 2021

Figure 1-9 ~~placeholder page~~: State and Federal Lands

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Figure 1-10 ~~to~~through Figure 1-13 shows the density of domestic, public, industrial, and irrigation wells per square mile in the Wyandotte Creek Subbasin, as classified by the DWR Online System for Well Completion Reports (OSWCR), which is discussed in Section 1.3.5. Though there are overlaps and discrepancies in the designation of wells, domestic wells are largely private residential wells, public wells are municipal operated wells, and production wells are for irrigation, municipal, public, and industrial purposes (DWR, 2019b). Areas with few wells exist in the Wyandotte Creek Subbasin as shown in Figures 1-10 through 1-13. Wells containing groundwater level data are described further in Section 1.3.5. Community water systems, as defined by the State Water Resources Control Board (SWRCB), are wells serving 15 or more connections or more than 25 people per day.

Figure 1-14 shows locations of major rivers, streams, and creeks within the Wyandotte Creek Subbasin. The Feather River enters the subbasin in the northeast and then borders the subbasin on its western side. Other large surface water bodies bordering the subbasin include components of the Oroville Reservoir Complex including the Forebay and Thermalito Afterbay. The North, Middle, West, and South Forks of the Feather River originate outside the subbasin and together supply water to Lake Oroville with a portion of flow routed through the Thermalito Forebay and Afterbay facilities to generate hydropower and deliver irrigation water supply to the Butte Subbasin, with the remaining water returning to the Feather River. The Feather River serves as a source of municipal and irrigation supply in the subbasin through diversions by the TWSD and SFWPA.

Smaller local or ephemeral streams entering and traversing the subbasin include North Honcut Creek, Wyandotte Creek, Wyman Ravine and numerous unnamed waterways.

1.2.2 Management Areas

A Management Area (MA) refers to an area within a basin for which a GSP may identify different minimum thresholds (MTs), measurable objectives (MOs), monitoring, and projects and actions based on unique local conditions or other circumstances as described in the GSP regulations. The GSP must describe each MA, including rationale for approach and demonstrate it can be managed without causing undesirable results within or outside the MA. Two MAs, Wyandotte Creek Oroville and Wyandotte Creek South (Figure 1-1) are defined in the Wyandotte Creek Subbasin by the joint powers agreement forming the Wyandotte Creek GSA.

1.2.2.1 Definition and Reason for Creation

The Wyandotte Creek Oroville MA encompasses the area that overlies the municipal area within and adjacent to the City of Oroville. The Wyandotte Creek South MA overlies the areas of the Wyandotte Creek Subbasin south of the City of Oroville. The Wyandotte Creek GSA is the exclusive GSA for these two MAs.

Although all stakeholders have a shared interest in sustainable management of groundwater in this predominantly groundwater dependent subbasin, the landscape of beneficial users varies between MAs. Wyandotte Creek Oroville is predominantly an urban area with Cal Water providing groundwater supplies for residential and municipal use. To a very limited extent, private domestic wells provide the primary source of water to households or in some cases provide a secondary supply for outdoor water use. The Feather River enters the subbasin in the northeast and crosses this MA through the central portion.

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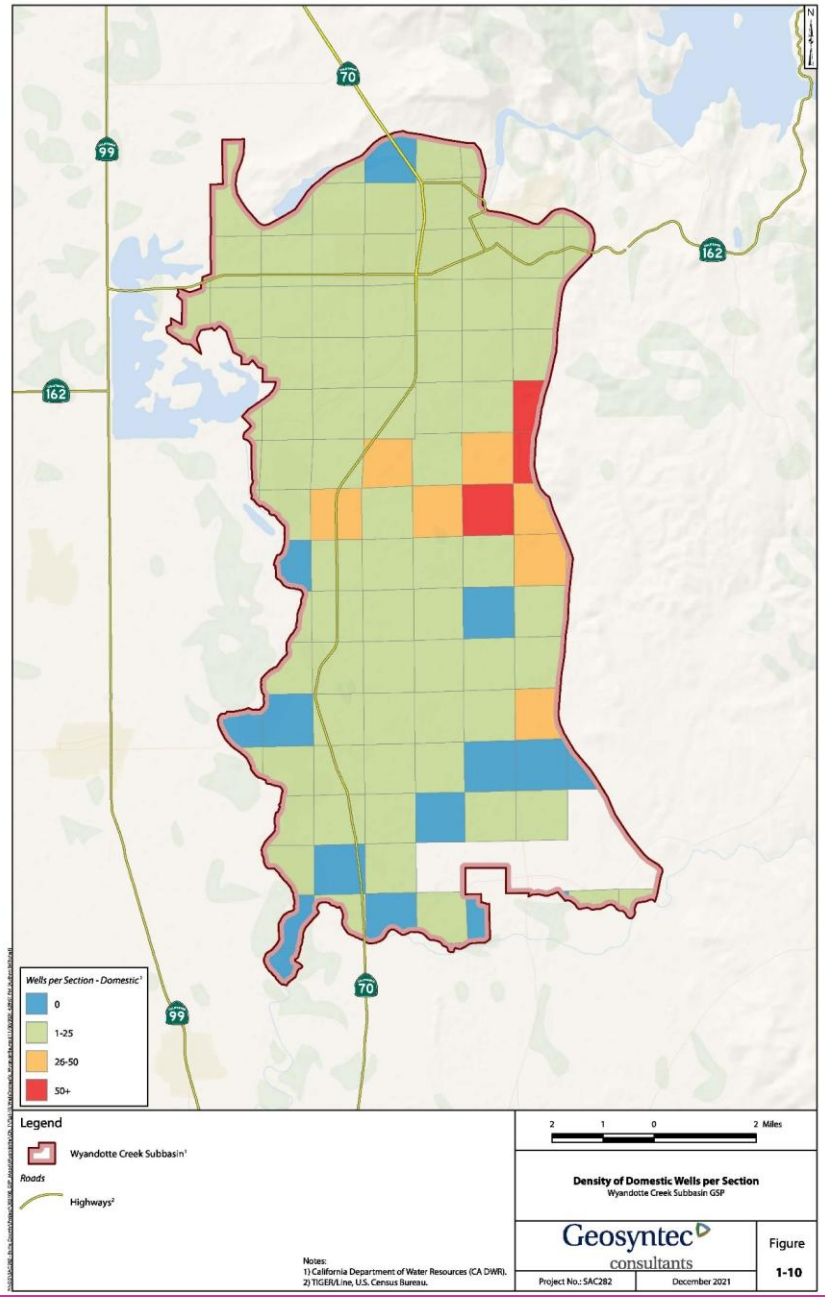

Figure 1-10 ~~placeholder page~~: Density of Domestic Wells per Section

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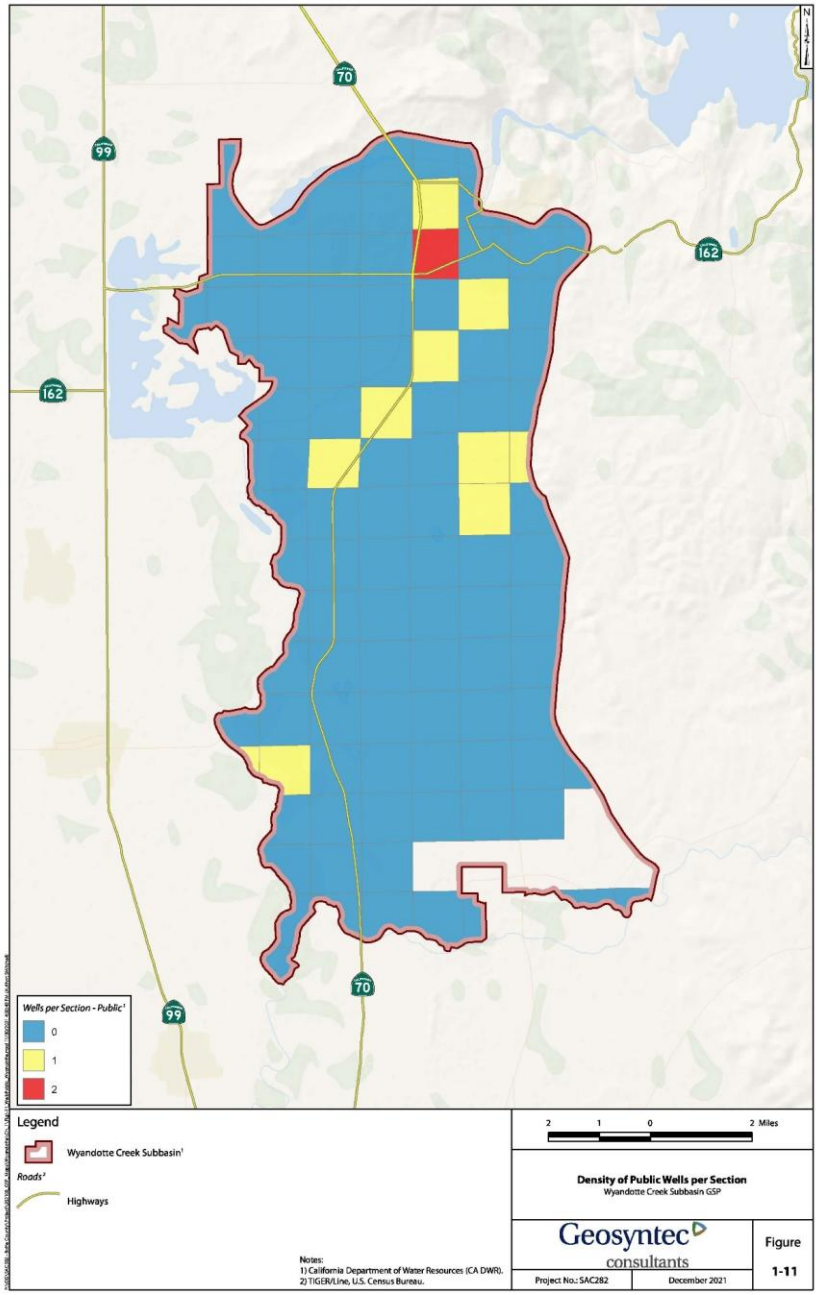

Figure 1-11 ~~placeholder page~~: Density of Public Wells per Section

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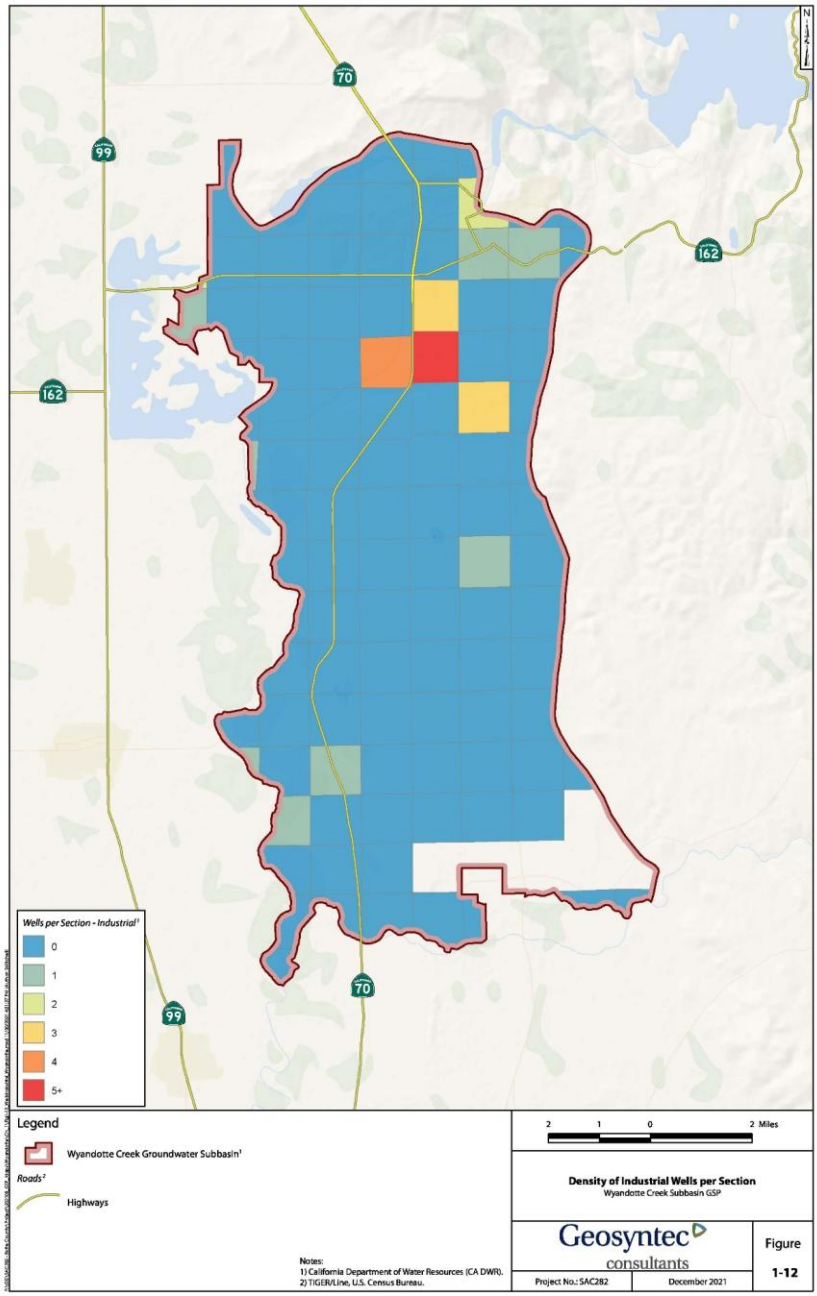

Figure 1-12 ~~placeholder page~~: Density of Industrial Wells per Section

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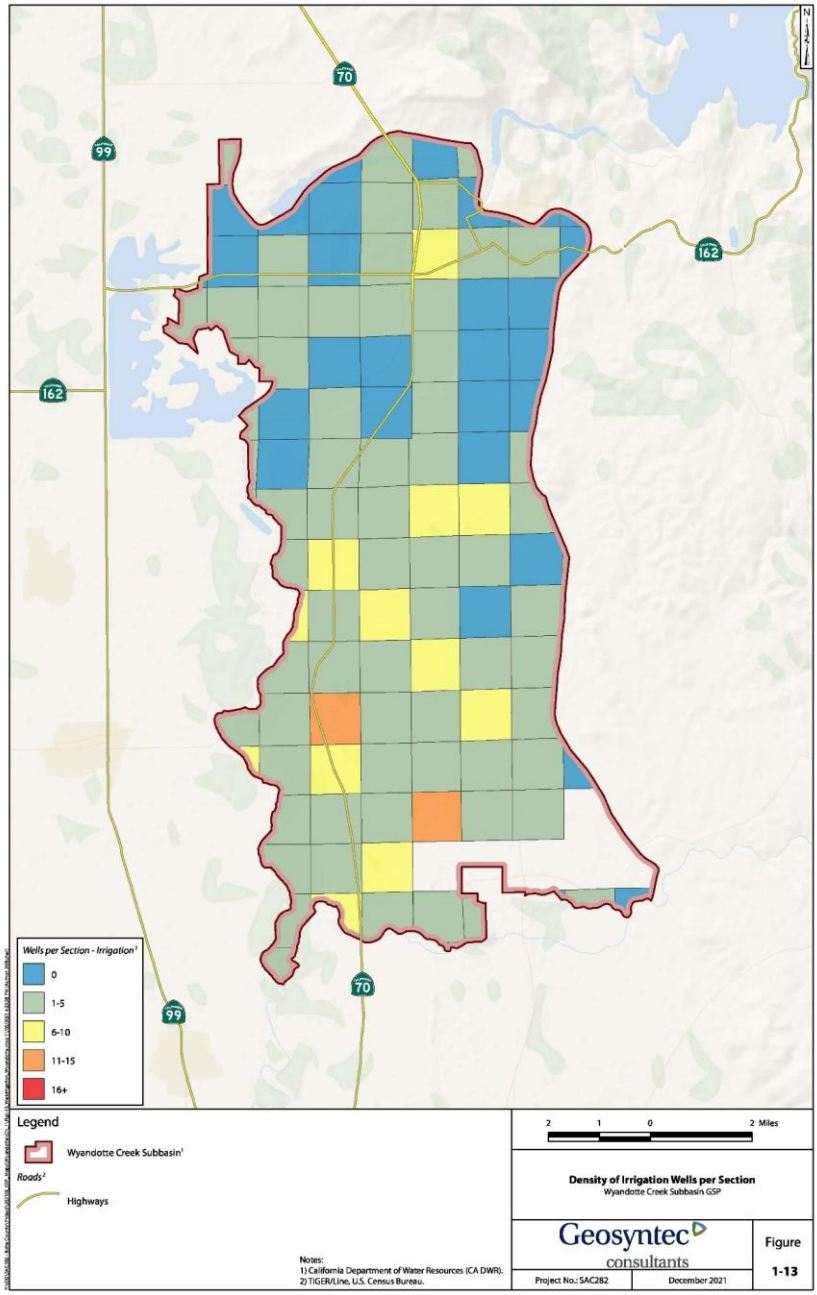

Figure 1-13 ~~placeholder page~~**: Density of Irrigation Wells per Section**

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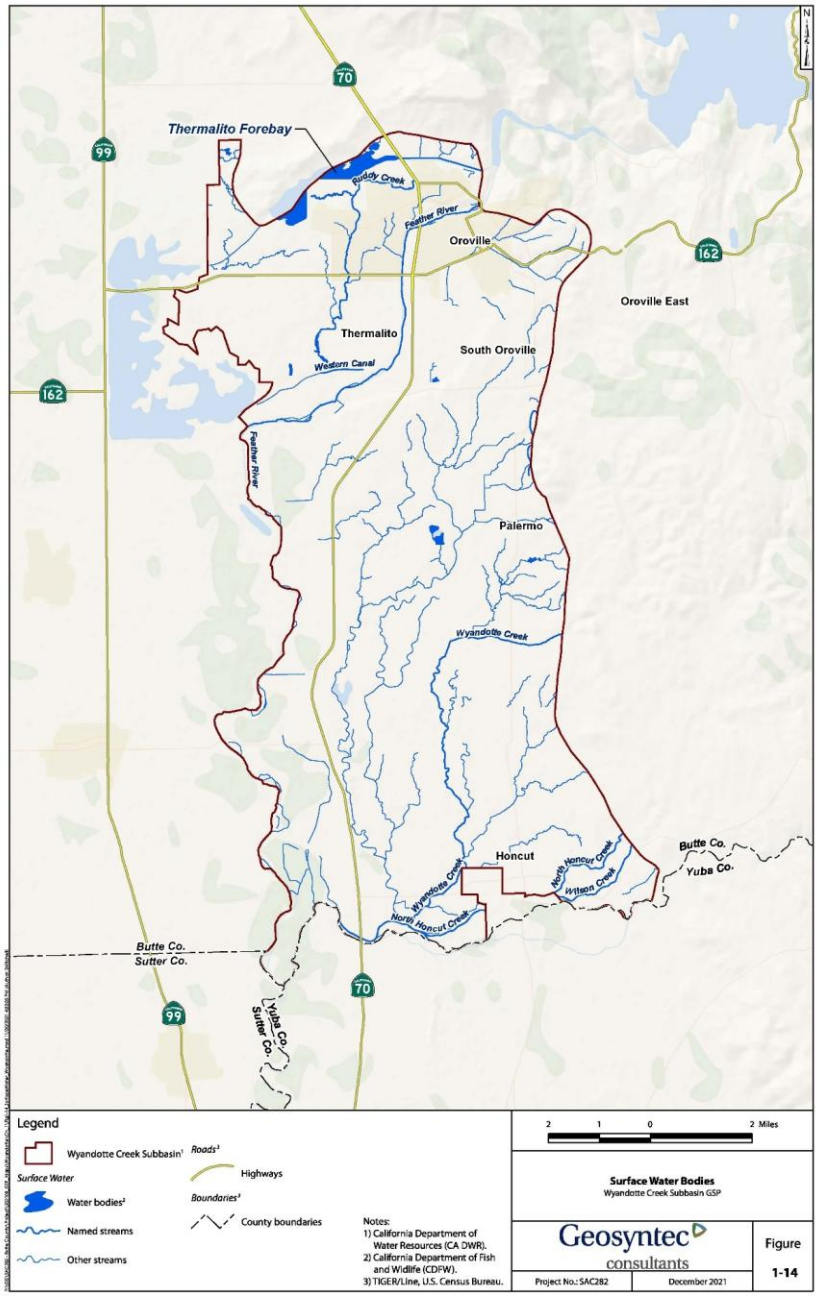

Figure 1-14 ~~placeholder page~~: Surface Water Bodies

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The Oroville Reservoir Complex including the Forebay and Thermalito Afterbay border this MA (Figure 1-13). The Feather River serves as a source of municipal and irrigation supply in the subbasin through diversions by the TWSD and SFWPA.

Wyandotte Creek South is dominated by irrigated agriculture dependent on groundwater and surface water diversions from the Feather River. Significant numbers of rural residents and ranchettes depend on groundwater typically from relatively shallow domestic wells interspersed with agricultural land uses. The Feather River enters this MA in the northeast then flows along the western boundary (Figure 1-14). Both perennial and ephemeral streams traverse Wyandotte Creek South including Honcut Creek and Wyandotte Creek.

The interests and vulnerability of stakeholders and groundwater uses in these MAs vary based on the nature of the water demand (agricultural, domestic, municipal), numbers and characteristics (i.e., depth) of wells supplying groundwater, and to some degree the hydrogeology and mix of recharge sources. The reason for creating these MAs in the Wyandotte Creek subbasin is to focus development of MTs, MOs, monitoring, and projects and actions in a way that best meets the mix of needs of the uses and users of groundwater unique to the MA. The defined MAs also allow Member Agencies to focus efforts and staff resources on development of portions of the GSP most relevant to stakeholders within their jurisdiction. These established MAs facilitate successful development and long-term implementation of the GSP by effectively targeting the needs, vulnerabilities, and opportunities of local conditions in these areas.

1.3 Management Programs

Existing management programs within the Wyandotte Creek Subbasin are described below.

1.3.1 Groundwater Management Plan

The County of Butte has a Groundwater Management Plan that covers the entire County except for areas covered by Urban Water Management Plans (UWMPs). The Butte County Groundwater Management Plan can be found at http://www.buttecounty.net/waterresourceconservation/groundwatermanagementplan

1.3.2 Urban Water Management Plans

TWSD, Cal Water, and SFWPA have prepared UWMPs.

1.3.2.1 Northern Sacramento Valley Integrated Regional Water Management Plan

Six counties, including Butte, Shasta, Tehama, Glenn, Colusa, and Sutter counties (Figure 1-15), of the Northern Sacramento Valley have been working together for over 10 years to lay the foundation for an integrated regional plan to address water-related issues such as economic health and vitality; water supply reliability; flood, stormwater, and flood management; water quality improvements; and ecosystem protection and enhancement. The counties have completed the development of a valley-wide IRWM Plan and have committed to continuing the efforts of regional water management through this plan. IRWM is a collaborative effort to enhance coordination of the water resources in a region. IRWM involves multiple agencies, stakeholders, tribes, individuals and groups to address water-related issues and offer solutions which can provide multiple benefits to the region.

~~Figure 1-15 placeholder page~~

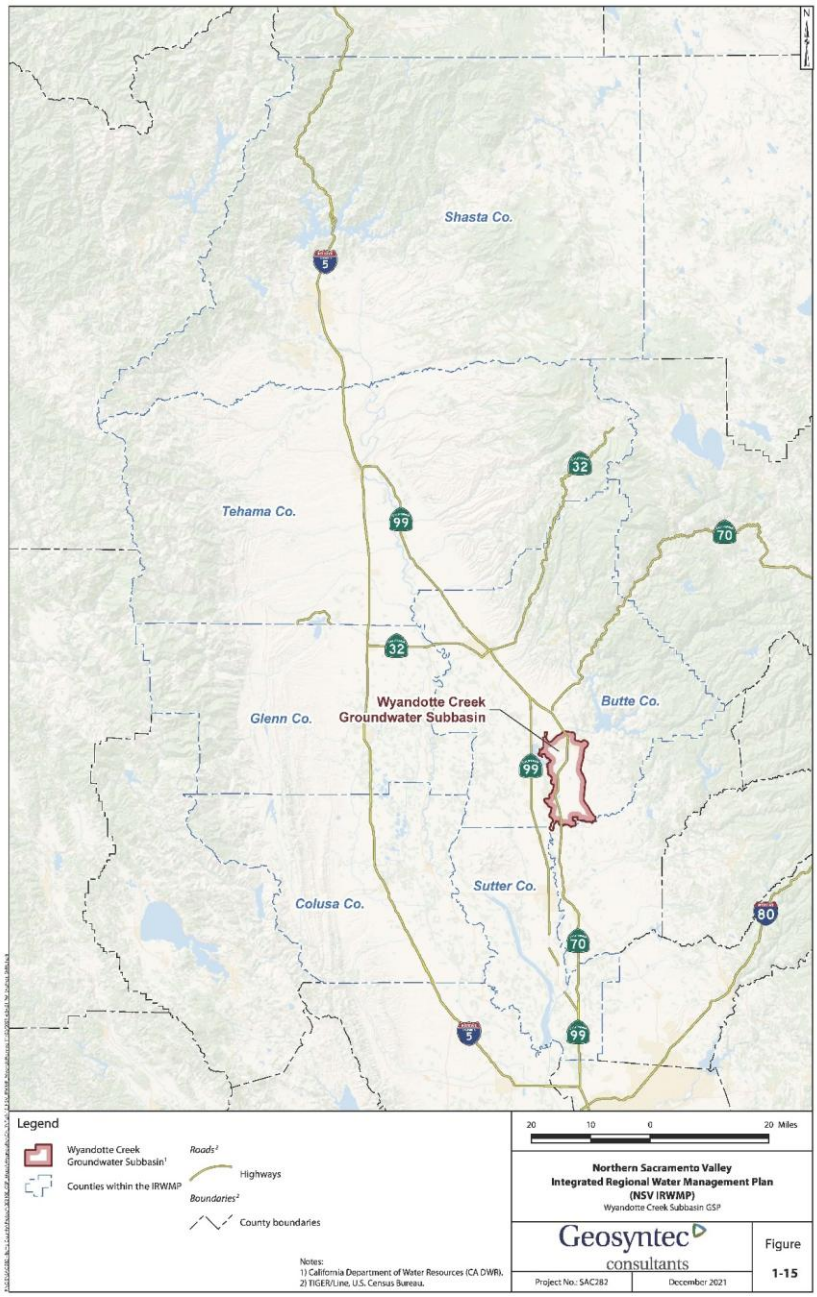

Figure 1-15: Northern Sacramento Valley Integrated Regional Water Management Plan

Representatives of the six counties are working in partnership with community stakeholders, tribes and the public to identify the water-related needs of the region. This information was used to develop goals and objectives of the IRWM Plan, and the identification of projects and programs to be included in the IRWM Plan. The IRWM Plan was adopted in April 2014 and ~~will~~updated in 2020 and better ~~position~~positions the region and local partners to receive funding for high-priority projects.

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1.3.3 Drought Management Plans

The Butte County Drought Preparedness and Mitigation Plan (Drought Plan) was adopted in 2004 and was developed to protect the County from the effects of a drought. The Drought Plan includes: an overview of Butte County's drought background; institutional framework to approach drought; a monitoring plan; a response and mitigation plan; and a discussion of water transfers during a drought. The purpose of the Drought Plan is to provide an efficient and systematic process for Butte County that results in a short- and long-term reduction in drought impacts to the citizens, economy, and environment.

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1.3.4 Conjunctive Use Programs

~~There are no conjunctive use programs in the Wyandotte Creek Subbasin.~~

The Wyandotte Creek GSA is actively working with South Feather Water and Power Agency, Thermalito Water and Sewer District, Butte County's Palermo Master Drainage Planning efforts, and local stakeholders to implement a Regional Conjunctive Use Program. The Program is further described in Section 5: Projects and Management Actions.

1.3.5 General Plans in the Plan Area

The Wyandotte Creek Subbasin is subject to the Butte County General Plan 2030 and the City of Oroville General Plan. In 2018, the Camp Fire destroyed 18,000 structures in Butte County displacing over 27,000 residents. In 2020, the North Complex Fire destroyed homes in Berry Creek, Feather Falls and other areas. While the Town of Paradise, Concow, Berry Creek and other impacted areas rebuild, many residents have relocated to other parts of Butte County. The existing General Plans may not fully account for the relocation of Camp Fire survivors. A focused accounting of changes to residential land use as a result of the Camp Fire should be conducted.

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1.3.5.1 Butte County General Plan 2030

The Butte County General Plan 2030 was adopted by the Butte County Board of Supervisors in October 2010. The General Plan 2030 identifies the goals, policies and actions governing land use in the unincorporated portions of Butte County. The General Plan 2030 reflects the community desire to conserve and enhance the legacy of their forebears, namely, sustainable development. To this end, the General Plan 2030 envisions and supports a Butte County in 2030 where:

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- Urban development will be primarily centralized within and adjacent to the existing municipal limits and larger unincorporated communities. Urban development will have efficient, reliable public facilities and infrastructure. Employment centers and a range of services will be located near residential areas so that people spend less time in their cars. Residential communities will be walkable, bicycle facilities will be provided, and there will be access to public transit.

- Small unincorporated areas will be well-planned through community-driven planning processes so that community character is preserved, and adequate public services and facilities are provided. Rural residential development will be limited and will strive to be compatible with agricultural and environmental uses and will address wildfire risks and public service's needs.
- Agriculture and open space will continue to dominate Butte County's landscape and be an important part of the County's culture and economy. Existing agricultural areas will be maintained, and an array of agricultural services will support agriculture while providing new jobs to Butte County residents.

The General Plan 2030 includes an optional Water Resources Element in addition to the mandatory elements of Land Use, Housing, Economic Development, Agriculture, Circulation, Conservation and Open-space, Health and Safety and Public Facilities and Services. In adopting the Water Resources Element, the General Plan 2030 recognized the importance and interrelationship between land use and water resources management. The General Plan 2030 Water Resources Element has six goals:

- Maintain and enhance water quality.
- Ensure an abundant and sustainable water supply to support all uses in Butte County.
- Effectively manage groundwater resources to ensure a long-term water supply for Butte County.
- Promote water conservation as an important part of a long-term and sustainable water supply.
- Protect water quality through effective storm water management.
- Improve stream bank stability and protect riparian resources.

Key Water Resources Element policies include:

- W-P1.4: Where appropriate, new development shall be Low Impact Development (LID) that minimizes impervious area, minimizes runoff and pollution and incorporates best management practices (BMPs).
- W-P2.1: The County supports solutions to ensure the sustainability of community water supplies.
- W-P2.3: Water resources shall be planned and managed in a way that relies on sound science and public participation.
- W-P2.5: The expansion of public water systems to areas identified for future development on the General Plan land use map is encouraged.
- W-P2.6: The County supports water development projects that are needed to supply local demands.
- W-P2.8: The County supports Area of Origin water rights, the existing water right priority system and the authority to make water management decisions locally to meet the county's current and future needs, thereby protecting Butte County's communities, economy and environment.

- W-P2.9: Applicants for new major development projects, as determined by the Department of Development Services, shall demonstrate adequate water supply to meet the needs of the project, including an evaluation of potential cumulative impacts to surrounding groundwater users and the environment.
- W-P3.1: The County shall continue to ensure the sustainability of groundwater resources, including groundwater levels, groundwater quality and avoidance of land subsidence, through a basin management objective program that relies on management at the local level, utilizes sound scientific data and assures compliance.
- W-P3.2: Groundwater transfers and substitution programs shall be regulated to protect the sustainability of the County's economy, communities and ecosystem, pursuant to Chapter 33 of the Butte County Code.
- W-P3.3: The County shall protect groundwater recharge and groundwater quality when considering new development projects.
- W-P4.1: Agricultural and urban water use efficiency shall be promoted.
- W-P4.2: Water conservation efforts of local Resource Conservation Districts, the Natural Resource Conservation Service and irrigation districts should be coordinated.
- W-P4.3: The County shall work with municipal and industrial water purveyors to implement water conservation policies and measures.
- W-P4.4: Opportunities to recover and utilize wastewater for beneficial purposes shall be promoted and encouraged.
- W-P4.5: The use of reclaimed wastewater for non-potable uses shall be encouraged, as well as dual plumbing that allows graywater from showers, sinks and washers to be reused for landscape irrigation in new developments.
- W-P4.6: New development projects shall adopt BMPs for water use efficiency and demonstrate specific water conservation measures.
- W-P5.2: New development projects shall identify and adequately mitigate their water quality impacts from stormwater runoff.
- W-P5.3: Pervious pavements shall be allowed and encouraged where their use will not hinder mobility.

Implementation of the Wyandotte Creek GSP will provide ~~for~~ sustainable groundwater management and is not anticipated to affect water supply assumptions in the General Plans. Information on the Butte County General Plan 2030 and related documents can be found at www.buttegeneralplan.net.

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1.3.5.2 City of Oroville

The Oroville City Council adopted the Oroville 2030 General Plan in June 2009. In March 2015, the City Council adopted a targeted update to the 2030 General Plan referred to as the "Oroville Sustainable Code Updates," which included an expansion of Mixed-Use zoning within the city, resource-efficient design to the City's Design Guidelines, and a new Climate Action Plan. This targeted update sought to strengthen the environmental, community, and economic sustainability

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of the community. The Oroville General Plan's goals, policies and actions are intended to work together to achieve the long-term vision for the city.

The Oroville General Plan seeks to promote high quality residential and commercial growth, support infill development, preserve and provide access to nature, create an appropriate transition between the urban and rural environment, and create a place people are proud to call home. To achieve the implementation of the Oroville General Plan, eight guiding principles have been adopted: livability; enhanced mobility; a vibrant local economy; natural resources and the environment; recreation; community infrastructure; health and safety; and an involved citizenry.

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The State General Plan Guidelines call for the Oroville General Plan to address all land within the City limits, land within the City's designated Sphere of Influence (SOI), and other land in unincorporated Butte County which relates to the City's planning efforts.

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Oroville General Plan Organization

State law requires the General Plan to address the subjects of land use, circulation, housing, noise, safety, conservation, and open space. Additional topics (or "elements") may be covered at the discretion of the jurisdiction, provided that they are consistent with one another. Oroville's General Plan includes the following optional elements: community design; economic development; and public facilities and services.

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Parks, Public Facilities, and Services Element

The Oroville 2030 General Plan Public Facilities and Services Element mentions that:

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"The City of Oroville does not provide water service directly. Oroville is served by three local domestic water providers: Cal Water, South Feather Power and Water, and the Thermalito Water and Sewer." The service breakdown in the General Plan for each water provider is as follows:

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- "Cal Water Oroville supplies water to a large extent of Oroville south of the Feather River, including the Historic Downtown, the closest portion of the eastern foothills and South Oroville. Currently, Cal Water Oroville has a production potential of 10.7 million gallons per day (MGD), an amount more than adequate to meet the current maximum daily water demand of 6.3 MGD for the Cal Water Oroville area. Approximately 30 percent of their water supply is drawn from groundwater pumped from four wells, with the rest coming from surface water sources including the west fork of the Feather River."
- "South Feather Water and Power Agency supplies water to the eastern and southern portions of the City and SOI." The agency has approximately 171,500-thousand-acre feet (TAF) of storage capacity "sourced from the South Fork of the Feather River and from the Yuba River system, and is stored in reservoirs at Little Grass Valley, Sly Creek, Lost Creek, Ponderosa, Miner's Ranch, and Lake Wyandotte. South Feather Water and Power Agency delivers approximately 28,000 TAF of water annually and has the capacity to treat approximately 14.5 MGD."
- "Thermalito Water and Sewer District (TWSD) serves areas of the City of Oroville to the north and west of the Feather River as well as adjacent unincorporated areas of Butte County. TWSD has rights to approximately 8,200-acre feet of surface water from Concow Lake/Wilnore Reservoir with a 3.0 MGD backup supply coming from four wells, as needed. Total water consumption is currently 2.5 MGD annually for the TWSD and is expected to grow to just over 5.0 MGD by 2025. The District's water

supply is sufficient to meet this future demand as it has secured water rights to 7.3 MGD annually."

Relevant Goals, Policies, Actions relating to water supply is provided below:

- Goal PUB-6: Provide sufficient supplies of high-quality water to City residents and businesses to serve the City in the most efficient and financially-sound manner.
- Policy P6.1: Ensure that Oroville's potable water distribution and storage system is adequately sized to serve development allowed by the General Plan, without providing excess capacity.
- Policy P6.9: Support water conservation measures by working with the water districts and water companies to implement water conservation policies and measures.
- Policy P6.10: Encourage the use of drought-resistant landscaping and the use of reclaimed wastewater for agriculture and landscape irrigation supply water. Ensure that all reclaimed wastewater complies with State wastewater treatment and reclamation regulations and standards.
- Policy P6.11: Support all efforts to encourage water conservation by Oroville residents and businesses, and public agencies, including working with water providers, to implement water conservation programs and incentives that facilitate conservation efforts.
- Policy P6.12: Continue to participate in regional groundwater basin planning efforts to determine the carrying capacity of the groundwater aquifer and ensure that future demand for water does not overdraft the groundwater supply.
- Action A6.1: Conduct a study of using reclaimed wastewater for irrigation of public landscaping and for agriculture.
- Policy P8.6: Implement all necessary measures to regulate runoff from urban uses to protect the quality of surface and groundwater.
- Action A8.6: Prepare a stormwater management plan for the City to improve the quality of surface and groundwater. The Plan should include, but not be limited to, well-defined goals, policies, and actions to:
  - Create effective partnerships with special districts, County, State and federal agencies, as well as non-profit organizations, in all aspects of plan development and implementation.
  - Ensure the long-term financial viability of the plan through appropriate budgeting and allocation of financial and staff resources towards implementation of the plan.
  - Identify clear criteria and an effective process to periodically review and evaluate the achievements of the plan and make amendments to it as needed.

Oroville Open Space, Natural Resources, and Conservation Element

The Oroville 2030 General Plan Open Space, Natural Resources, and Conservation Element acknowledges:

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"Water quality is intimately tied to water supply, since adequate uncontaminated flows significantly mitigate the presence of contaminated flows, through dilution, flushing and general availability of alternate sources." Water quality is more greatly discussed in the Public Safety and Services Element of the General Plan, however, there are still relevant goals, policies, and actions discussed in this element relevant to surface and groundwater.

Relevant Goals, Policies, Actions relating to water quality is provided below:

- Goal OPS-11: Protect water quality and quantity in creeks, lakes, natural drainages, and groundwater basins.
- Policy P11.1: Maintain the natural condition of waterways and flood plains to ensure adequate groundwater recharge and water supply where feasible, given flood control requirements.
- Policy P11.2: Minimize impermeable paving that negatively impacts surface water runoff and groundwater recharge rates.
- Policy P11.3: Protect surface and groundwater resources from contamination from runoff containing pollutants and sediment, through implementation of the Central Valley Regional Water Quality Control Board's (CVRWQCB) BMPs.
- Action A11.1: Create a comprehensive mapping of groundwater resources in the Planning Area based on existing groundwater management studies and maps and, where necessary, new groundwater mapping studies to result in comprehensive coverage of the Planning Area.

Information on the City of Oroville 2030 General Plan and related documents can be found at

https://www.cityoforoville.org/services/planning-development-services-department/planning-division/planning-documents

1.3.6 Permitting of New Wells

The construction, repair or destruction of wells is subject to permitting by the Butte County Division of Environmental Health pursuant to Chapter 23B of the Butte County Code, Water Wells. The chapter provides minimum procedures for the proper construction of water wells and for the proper destruction of abandoned wells in order to ensure that water obtained from wells within the County of Butte will be suitable for the purposes for which used and that wells constructed or abandoned pursuant to this chapter will not cause pollution or impairment of the quality of the groundwater within the county. An additional purpose is to reduce potential well interference problems to existing wells and potential adverse impacts to the environment which could be caused by the construction of new wells or the repair or deepening of existing wells where a permit is required. Important provisions of the chapter include:

- The construction, repair, reconstruction, deepening, abandonment and destruction of wells in Butte County must follow the standards in Bulletin 74-81 and its supplement bulletin 74-90, Water Well Standards, State of California.
- After July 25, 1996, the pumping capacity of a new well cannot be greater than 50 gallons per minute per acre to reasonably serve the overlying land, including contiguous parcels of land under the same ownership as the land upon which the well is located.

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- Wells can only be drilled by a person licensed to drill water wells pursuant to the provisions of Business and Professions Code section 7000 et seq. possessing a C-57 water well contractor's license required by section 13750.5 of the California Water Code.
- Domestic well owners are required to ensure that a new well will operate properly assuming a repeat of the groundwater conditions experienced during the period 1987 through 1994 in the area in which the new well is located.
- Well drillers reports must be filed with Butte County as well as with DWR.
- Notification of well permit applications are required in specific instances to adjoining landowners and/or local agencies with an adopted groundwater management plan pursuant to part 2.75 of division 6 of the California Water Code (commencing at section 10750). Landowners and/or local agencies are provided 30 days to provide comments prior to permit issuance.
- Wells with a casing diameter greater than 8 inches are required to be drilled at specific distances away from existing wells.
- In addition to well sealing requirements specified within state well standards bulletin 74-81 and bulletin 74-90, the seal shall be extended 5 feet into the first consolidated formation encountered below 15 feet to a maximum required sealing depth of 50 feet.

1.3.7 Land Use Plans Outside of the Wyandotte Creek Subbasin

The Yuba County General Plan and zoning ordinance is the only land use plan adjacent to the Wyandotte Creek subbasin. The Yuba County General Plan will not have any impact on the Wyandotte Creek GSP to achieve sustainable groundwater management. The Wyandotte Creek GSA will continue to monitor amendments to the Yuba County General Plan.

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1.4 Groundwater Level Monitoring and Data Sources

Groundwater level programs predominantly used for development of the GSP include Butte County Department of Water and Resource Conservation (BCDWRC), Cal Water, California Statewide Groundwater Elevation Monitoring (CASGEM), and the California Department of DWR Water Data Library (WDL). Each of these programs are discussed below.

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1.4.1 Butte County Department of Water and Resource Conservation

As discussed above, in November 1996, the voters in Butte County approved "AN ORDINANCE TO PROTECT THE GROUNDWATER RESOURCES IN BUTTE COUNTY." The ordinance is now codified as Chapter 33 of the Butte County Code relating to groundwater conservation. Section 3.01 of this code, Groundwater Planning Process, requires the preparation of a groundwater status report based upon the data gathered and analyzed pursuant to Section 3.02, Groundwater Monitoring. In 2000, the Butte County Board of Supervisors amended Chapter 33, the Groundwater Conservation Ordinance, to require the delivery of the Groundwater Status Report by February of each year. In 2010, the Water Commission designated the BCDWRC as the entity responsible for creating and submitting the annual report.

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In February 2004, the Butte County Board of Supervisors adopted the Groundwater Management Ordinance, which was codified as Chapter 33A of the Butte County Code. Chapter 33A calls for the establishment of a monitoring network and Basin Management Objectives (BMOs) for

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groundwater elevation, groundwater quality related to saline intrusion and land subsidence. The BMO concept was incorporated into California Water Code §10750 et. seq., as a component of AB 3030 Groundwater Management Plans. On September 28, 2004, the Butte County Board of Supervisors formally approved Resolution 04-181 adopting the countywide AB 3030 Groundwater Management Plan that includes components of the BMO program. In 2011, Chapter 33A was amended and retitled to "Basin Management Objectives" requiring a report each February describing conditions in the basin relative to established BMOs. The foregoing actions by the Board allow the consolidation of reporting of groundwater conditions from both Chapter 33 and 33A into a single report submitted by the Department on an annual basis in February. Considering new requirements of SGMA, revisions to Chapter 33A were approved in 2019 to continue the transition of groundwater management in Butte County from the BMO program to implementation of SGMA in each of the three subbasins in Butte County, including the Wyandotte Creek Subbasin. Groundwater level measurements occur 4 times per year following this program. Appendix 1-C provides the Groundwater Status Report for the ~~2020~~2025 Water Year following this program.

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1.4.2 California Statewide Groundwater Elevation Monitoring

DWR maintains several groundwater level monitoring programs, tools, and resources covering California. The CASGEM Program is DWR's primary resource for groundwater level data and has been used extensively in the development of this GSP. The CASGEM Program was authorized in 2009 by SB X7-6 to establish collaboration between local monitoring parties and DWR to collect and make public statewide groundwater elevation data. The program provides the framework for local agencies or other organizations to "assume responsibility for monitoring and reporting groundwater elevations in all or part of a basin or subbasin" (Water Code §10927). The BCDWRC is the CASGEM monitoring entity for the Wyandotte Creek Subbasin. The groundwater monitoring program discussed above for BCDWRC complies with the reporting requirements of the CASGEM program.

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1.4.3 Water Data Library

DWR's WDL contains measurements of groundwater elevations from water supply and monitoring wells monitored by numerous entities, such as DWR and local agencies. Groundwater level measurements available from the WDL are either continuously or periodically measured. Continuous measurements are provided by automatic water level measuring devices that take readings at wells; periodic measurements are manual recordings typically occurring at monthly or semi-annual time intervals. Measurements displayed through the WDL are taken through other programs, such as CASGEM. The WDL lists the organization responsible for collecting each water level measurement. The WDL water level measurements are available through the California Natural Resources Agency (CNRA) Open Data website as a bulk download, or through the WDL website on a per station basis.

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1.4.4 Online System for Well Completion Reports

The OSWCR is a DWR program used to document and compile boring or well completion records throughout California. There are as many as 2 million domestic, irrigation, and monitoring water wells in California included in this dataset, including more than 4,000 domestic wells located in the Wyandotte Creek Subbasin. However, as discussed in Section 3, Sustainable Management Criteria, the well characteristics in this database are not always accurate or precise, and, unfortunately, it is not known which of the wells in the database are in use or have been

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abandoned or replaced. When a well is constructed, modified, or destroyed, drilling contractors are required to submit a Well Completion Report to DWR for upload to the interactive OSWCR web site. OSWCR is used as a data source for wells identified for monitoring. In this GSP, the OSWCR database was used to describe the GSP area and identify sustainable management criteria (SMC).

1.5 Groundwater Quality Monitoring and Data Sources

Groundwater quality programs predominantly used for development of the GSP include BCDWRC, Sacramento Valley Water Quality Coalition (SVWQC), SWRCB Geotracker/ Groundwater Ambient Monitoring and Assessment Program (GAMA) and the DWR WDL. Each of these programs are discussed below.

1.5.1 Butte County Department of Water and Resource Conservation

As discussed in Section 1.3.4, the former BMO program ~~developed~~(Chapter 33A) implemented by Butte County ~~includes~~included groundwater quality monitoring ~~that is presented annually in~~. Although the ~~Groundwater~~ ordinance sunset, the Butte County Department of ~~Status Reports. Appendix 1-C provides the~~ Water ~~Year 2020 Groundwater Status Report summarizing the results of this~~and Resource Conservation continues to conduct groundwater quality trend monitoring~~.~~ and provides the data to GSAs within Butte County.

1.5.2 Sacramento Valley Water Quality Coalition

Because irrigated agriculture is the predominant land use in the Wyandotte Creek Subbasin, monitoring of the groundwater quality data developed through the Groundwater Quality Trend Monitoring Work Plan (GQTMWP) being implemented by the SVWQC for compliance with the Central Valley Regional Board's Irrigated Lands Regulatory Program (ILRP) is an important source of information to ~~GSAs~~the GSA in the Wyandotte Creek Subbasin. This program is implemented by California Rice Commission (CRC) that submits annual reports on groundwater quality throughout the region.

1.5.3 Geotracker/Groundwater Ambient Monitoring and Assessment

GeoTracker, operated by the SWRCB, contains records for sites that require cleanup, such as leaking underground storage tank sites, Department of Defense sites, and cleanup program sites. GeoTracker also contains records for various unregulated projects as well as permitted facilities including: ILRP, future CV-SALTS, oil and gas production, operating permitted underground storage tanks, and land disposal sites. GeoTracker receives records and data from SWRCB programs and other monitoring agencies.

The Geotracker System also contains links to GAMA. The GAMA Program is California's comprehensive groundwater quality monitoring program that was created by the SWRCB in 2000. It was later expanded by AB 599 - the Groundwater Quality Monitoring Act of 2001. AB 599 required the State Water Board, in coordination with an Interagency Task Force (ITF) and Public Advisory Committee (PAC) to integrate existing monitoring programs and design new program elements as necessary, resulting in a publicly accepted plan to monitor and assess groundwater quality in basins that account for 95% of the state's groundwater use. The GAMA Program is based on interagency collaboration with the State and Regional Water Boards, DWR, Department of Pesticide Regulations, United States Geological Survey (USGS), and Lawrence Livermore National Laboratory, and cooperation with local water agencies and well owners.

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1.5.4 Water Data Library

DWR's WDL contains groundwater quality data in addition to the groundwater level records described previously. This information includes data from discrete groundwater quality samples collected by DWR and other cooperating entities. These water quality data list the entity responsible for taking the sample but do not specify what program the sample was taken under. The WDL water quality measurements are available through the CNRA Open Data website as a bulk download, or through the WDL website on a per-station basis. WDL water quality measurements in this GSP are utilized for basin characterization but are acquired from the other programs.

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1.6 Land Subsidence

To determine whether subsidence is occurring, a land subsidence monitoring network ~~has been~~was established throughout Butte County consisting of observation stations and extensometers managed by DWR. Within the Wyandotte Creek Subbasin this network of monuments existed between 2008 to 2017 and has been replaced by data from satellite- and aircraft-based Interferometric Synthetic Aperture Radar (InSAR) from DWR. As of 2025, one GPS station continues to record vertical displacement within the Subbasin.

A summary of the historic information within the Wyandotte Creek Subbasin obtained from these networks is presented in Section 2, Basin Setting, and the monitoring network for implementation of the GSP is discussed in Section 4, Monitoring Networks.

1.6.1 DWR Subsidence Network

The historic observation stations ~~are~~were a result of DWR's efforts to establish a subsidence monitoring network across the valley to capture changes in the ground surface elevation. The observation stations ~~are~~were established monuments with precisely surveyed land surface elevations. They ~~are~~were distributed throughout the valley such that the entire county is well represented. In 2008, DWR along with numerous partners performed the initial GPS survey of the observation stations to establish a baseline measurement for future comparisons. The network was resurveyed in 2017 using similar methods and equipment as those used in the 2008 survey and results were analyzed to depict the change in elevation at each station between those years. Results of the survey are available here,

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https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub

Extensometers within Butte County but outside the Subbasin remain active. They are installed in wells or boreholes and are a more site-specific method of measuring land subsidence as they can detect changes in the thickness of the sediment surrounding the well due to compaction or expansion. These instruments can detect very slight changes in land surface elevation on a continuous basis with an accuracy of +/- 0.01 feet or approximately 3 millimeters. The three extensometers in Butte County have a period of record beginning in 2005 and were chosen by DWR based on a high likelihood of seeing subsidence in these areas if it were to occur, based on the presence of known clay and other fine-grained deposits in these areas. Data are available through July 2020 from the DWR WDL. ~~A summary of the historic information within the Wyandotte Creek Subbasin obtained from these networks is presented in Section 2, Basin Setting, and the monitoring network for implementation of the GSP is discussed in Section 4, Monitoring Networks.~~

1.6.2 Interferometric Synthetic Aperture Radar (InSAR) Satellite Data

DWR provides Interferometric Synthetic Aperture Radar (InSAR) satellite data available on their SGMA Data Viewer web map[4] and DWR WDL, including downloadable raster datasets to estimate subsidence (DWR contracted TRE Altamira to make this data available). The dataset is generated from two satellites operated by the Sentinel mission, which is part of the European Radar Observatory for the Copernicus joint initiative of the European Commission and the European Space Agency (ESA). Data calibration uses Global Navigation Satellite System (GNSS) stations within California and one GNSS station resides within Butte County near Lake Oroville. The dataset nearly covers the entire Subbasin, with some gaps in the southwest. The TRE Altamira InSAR dataset provides estimates of total vertical displacement from June 2015 to Present.

1.7 Interconnection of Databases

Several of the databases discussed above utilize the same water level or water quality data. These records often specify the monitoring entity responsible for the measurement. Although these data overlap between databases, the correlation between databases is not specified. For example, water level data in the WDL are also in CASGEM, but this link is not mentioned in WDL records. This lack of connection poses problems for gathering water level and quality data throughout California. Efforts have been made in the development of this GSP to overcome the issue related to overlap and poor correlation between databases, but the issue remains. It is recommended that agencies work together to utilize a common unique identifier to ease use of multiple datasets.

1.8 Notice and Communication (23 California Code of Regulations § 354.10)

1.8.1 Notice of Intent to Adopt GSP

A notice of intent (NOI) to adopt ~~a~~the 2022 GSP ~~was~~and amended 2027 GSP were signed by the ~~GSAs~~GSA and distributed on June 28, 2021- and December XX, 2026, respectively. The hard copies of the ~~NOI~~NOIs were mailed to cities and counties within the Wyandotte Creek Subbasin including the following:

- Butte County
- City of Oroville

Copies of the ~~NOI~~NOIs are provided in Appendix 1-B.

1.8.2 Overview

California's SGMA of 2014 requires broad and diverse stakeholder involvement in GSA activities and during the development and implementation of GSPs for groundwater basins around the state, including the Wyandotte Creek Subbasin. The intent of SGMA is to ensure successful, sustainable management of groundwater resources at the local level, success of GSP development and implementation will require cooperation by all beneficial users (defined below). Therefore, coordinated communication and consistent messaging of valid information

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[4] https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub

and facilitation of opportunities for the involvement of beneficial users will guide the path forward.

To facilitate stakeholder involvement in the GSA process, a Communication and Engagement Plan (C&E Plan) (Appendix 1-D) was created for the Wyandotte Creek GSA. The desired outcomes and goals of the C&E Plan were to achieve understanding and support for GSP adoption and implementation in consideration of the people, economy, and environment within the subbasin and in coordination with adjacent subbasins.

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Plan Goals:

1. Enhance understanding and inform the public about water and groundwater resources in the Wyandotte Creek Subbasin, the purpose and need for sustainable groundwater management, the benefits of sustainable groundwater management, and the need for a GSP.
2. Engage diverse interested parties and stakeholders and promote informed feedback from stakeholders, the community, and groundwater-dependent users throughout the GSP preparation and implementation process.
3. Coordinate communication and involvement between the GSA (Board, Stakeholder Advisory Committee and Management Committee), and other local agencies, elected and appointed officials, and the public.
4. Rely on the WAC to facilitate a comprehensive public engagement process.
5. Employ a variety of outreach methods that make public participation accessible and that encourage broad participation.
6. Respond to public concerns.
7. Provide accurate and up-to-date information.
8. Create public value and use GSA resources wisely by managing communications and engagement in a manner that is resourceful and efficient.

1.8.3 Description of Beneficial Uses and Users in the Wyandotte Creek Subbasin

SGMA calls for consideration of all interested parties that the GSA must consider when developing and implementing the GSP. GSAs must encourage the active involvement of diverse social, cultural, and economic elements of the population. Therefore, stakeholders or beneficial users are any stakeholders who have an interest in groundwater use and management in the Wyandotte Creek Subbasin. Their interest may be related to GSA activities, GSP development and implementation, and/or water access and management in general.

To assist in identifying categories of beneficial users in the Wyandotte Creek Subbasin, the C&E Plan listed broad categories of interested parties to be considered during development and implementation of the GSP. These include, but are not limited to:

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- General public
- Agricultural users of water
- Domestic well owners
- Municipal well operators

- Public water systems
- Land use planning agencies
- Environmental users of groundwater
- Surface water users
- The federal government
- California Native American tribes
- DACs and historically underrepresented groundwater users (including those served by private domestic wells or small community water systems)

Table 1-1 further identifies potential stakeholder groups and engagement purpose.

Table 1-1: Stakeholder Engagement Chart for Groundwater Sustainability Plan Development

Category of Interest	Examples of Stakeholder Groups	Engagement ~~purpose~~Purpose
General Public	• Citizens groups • Community leaders • Service clubs and professional organizations	Inform to improve public awareness of sustainable groundwater management
Private/Other users	• Private pumpers • Domestic users • School/College systems • Hospitals: Oroville Hospital	Inform and involve to minimize negative impact to these users
Urban/Agriculture users	• Water agencies: Cal Water • Colleges/Universities • Water associations • Commissions: SC-OR Sewerage Commission - Oroville Region • Water districts: TWSD; SFWPA • Mutual water companies • Resource conservation districts • Farm Bureau: Butte County Farm Bureau • Parks: Feather River Recreation and Park District	Collaborate to ensure sustainable management of groundwater
Industrial users	• Commercial and industrial self-supplier • Local trade association or group	Inform and involve to avoid negative impact to these users
Land Use Planning Agencies	• Municipalities (City, County planning departments): City of Oroville, Butte County • Regional land use agencies	Consult and involve to ensure land use policies are supporting GSPs
Environmental and Ecosystem	• Regional agencies: Butte County Resource Conservation District • Federal and State agencies: California Department of Fish and Wildlife (CDFW) • Environmental groups: Butte Environmental Council, The Nature Conservancy (TNC)	Inform and involve to sustain a vital ecosystem

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Category of Interest	Examples of Stakeholder Groups	Engagement ~~purpose~~Purpose
Economic Development	• Chambers of commerce: City of Oroville • Business groups/associations • Elected officials (Board of Supervisors, City Council) • State Assembly members • State Senators	Inform and involve to support a stable economy
Human right to water	• DACs • Small community systems • Environmental Justice Groups: Leadership Council for Justice and Accountability, Self-Help Enterprises, Community Water Center	Inform and involve to provide a safe and secure groundwater supplies to all communities reliant on groundwater~~-~~. The Butte County OEM Drought Assistance Program assists the public with dry domestic wells by providing water deliveries and/or water storage tanks.
Tribes	• Federally Recognized Tribes and non-federally recognized Tribes with Lands or potential interests in Wyandotte Creek Subbasin: Concow-Maidu Tribe of the Mooretown Rancheria, Tyme Maidu Tribe of the Berry Creek Rancheria	Inform, involve and consult with tribal government
Federal lands	• United States Bureau of Reclamation (USBR) • Bureau of Land Management	Inform, involve and collaborate to ensure basin sustainability
Integrated Water Management	• Regional water management groups (IRWM regions); Upper Feather River IRWM and the North Sacramento Valley (NSV) IRWM group • Flood agencies	Inform, involve and collaborate to improve regional sustainability

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1.8.4 Communications

1.8.4.1 Decision-making Processes

As noted above, the Wyandotte Creek Subbasin consists of one GSA for GSP ~~development~~implementation, the Wyandotte Creek GSA.

The Wyandotte Creek GSA Board is the final decision-maker for the Wyandotte Creek Subbasin. To assist in GSP development, the Wyandotte Creek GSA convened a WAC in 2020. The composition of the WAC is intended to represent the beneficial uses and users of groundwater in the Wyandotte Creek GSA. The WAC was originally organized to comprise seven at-large members appointed by the GSA Board and one member representing Cal Water Oroville, one member representing SFWPA, and tribal representatives. The at-large positions include three agricultural groundwater users, two domestic well users, and one environmental and one business association representative. During the 2022 GSP preparation there were three agricultural members, one member from Cal Water and one member from SFWPA on the WAC.

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The WAC is charged with actively engaging with the public for input and feedback. ~~The WAC has been meeting approximately monthly since its formation in December of 2020.~~

The representatives attending the GSA Management Committee meetings are designated staff from the member agencies; City of Oroville, Butte County, and TWSD. In addition to coordinating the WAC and GSA Board business, the GSA Management Committee assists the WAC in identifying and clarifying recommendations for GSP development and implementation which were presented to the GSA Board in public meetings as well as at subbasin-wide public meetings.

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1.8.4.2 Public Engagement Opportunities

There were a number of different meetings at which the public had the opportunity to engage during the GSP development and amendment process:

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- GSA Board meetings: The Wyandotte Creek GSA Board held regular public meetings, including joint meetings, to facilitate public input.
- WAC meetings.
- Public Workshops.
- Subbasin-wide Technical Advisory Committee meetings.
- Farm Bureau Water Forum meetings.
- City of Oroville.
- Regional Water Management Group.

1.8.4.3 Encouraging Active Involvement

The GSA carried out community engagement during the development of the GSP, which included meetings and presentation materials to inform the public. The GSP has been revised to incorporate public feedback. There were also activities related to encouraging involvement and building capacity for engagement. The GSA Management Committee used a variety of tools to solicit input, including maintaining an up-to-date website with announcements, calendar of events and meetings, and links to draft chapters of the GSP; establishing an interested parties list; email newsletters; and public notices. These documents encouraged and prepared community members to participate in GSP development by providing technical information as well as information about opportunities for engagement.

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As part of the 40-day public review period initiated on September 9, 2021, the GSA Management Committee worked with the numerous entities to inform them about the plan and encourage their involvement. Appendix 1-D lists the SGMA public meetings that were held throughout the GSA formation and GSP preparation process.

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1.8.4.4 Soliciting Written Comments

In addition to soliciting feedback at GSA meetings, opportunities were provided to offer written comments on the various chapters of the GSP as draft versions became available. Stakeholders could provide comments via an online comment form, letter, or email. An informal comment period began when the draft of the first chapter of the GSP was released in April 2019, and another public comment period began on the date the full draft of the GSP was released, in

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September 2021. In addition, a Public Workshop was held on October 20, 2021, to solicit written comments. All comments received via the comment form, letter, or email were provided to the WAC and Wyandotte Creek GSA Board in agenda packets for review.

The written comments and responses can be found in Appendix 1-E.

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1.8.5 Informing the Public about Groundwater Sustainability Plan Development Progress

1.8.5.1 Interested Parties List

An email distribution list of subbasin-wide stakeholders and beneficial users was developed for outreach throughout the GSP planning process. The list was maintained and updated by the Wyandotte Creek GSA Management Committee. Any interested member of the public could request to be signed up via this link: Contact Us - Wyandotte Creek GSA (wyandottecreekgsa.com)

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1.8.5.2 Distribution of Flyers

Typically, before a public meeting in the Wyandotte Creek Subbasin, an email flyer was created with key information provided. The flyer was emailed out to the Interested Party list as well as posted on Member Agency websites and various places throughout the subbasin.

1.8.5.3 Press Outreach

Press releases were issued at key junctures and decision-making points for the Wyandotte Creek Subbasin.

1.8.5.4 A Centralized Wyandotte Creek GSA Website

Throughout the planning process (and beyond) the Wyandotte Creek GSA has maintained a website with information about subbasin-wide planning efforts related to SGMA.

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The Wyandotte Creek Subbasin website contains:

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- Homepage with links to key pages within the site including a link to draft copies of the GSP
- About Us with an overview of the Wyandotte Creek GSA and SGMA
- Governance that describes the structure of the GSA, Board Members, WAC Members, Meeting Dates and Agendas, and Transparency Documents
- SGMA Overview
- Calendar of Board and WAC Meetings and Workshops
- Contact Us page for email correspondence and to register for the email list

1.8.5.5 Stakeholder Input and Responses

The engagement opportunities described above provided various avenues for stakeholders to provide input on GSP development. The matrix in Appendix 1-E summarizes the public comments received, organized by commenter, organization, chapter/section/line of comment location, comment, and location of where the comment was addressed or changed within the final draft document, as applicable.

1.9 Human Right to Water

Not formerly included in DWR's GSP checklist, but still important to address, is human right to clean water. California Water Code Section 106.3, Human Right to Water, states that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes." Private domestic well groundwater pumper representation on the Advisory Committee and community engagement via public workshops and outreach are venues through which those potentially most vulnerable to loss of clean drinking water ~~are able to~~can share information and concerns throughout the GSP development and implementation. During preparation of this GSP public meetings were held at times, locations, and in a manner~~,~~ both in-person and remotely online that supported and allowed for effective engagement of all stakeholders.

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2. BASIN SETTING

2.1 Hydrogeologic Conceptual Model

A Hydrogeologic Conceptual Model (HCM) identifies the major factors contributing to groundwater flow and movement and how different physical features and characteristics affect conditions within a subbasin. This section describes the HCM for the Wyandotte Creek Subbasin. The HCM serves as an important component of the basin setting, providing the framework for understanding groundwater conditions and water budgets.

Much of the information in this section is from existing reports detailing the hydrogeology of the Sacramento Valley and the formations making up the aquifer systems in the groundwater basin. These reports by DWR include the Geology of the Northern Sacramento Valley, 2014 (DWR, 2014), the Butte County Groundwater Inventory Analysis, 2005 (DWR, 2005), and work by Blair et al. (1991). Better understanding the hydrogeology, aquifer dynamics, and recharge paths of the aquifer systems in the Northern Sacramento Valley region is an area of active research by local agencies, DWR, and others.

2.1.1 Basin Boundaries

2.1.1.1 Lateral Boundaries

The Wyandotte Creek Subbasin lies in the eastern central portion of the Sacramento Groundwater Basin. It is bounded on the west by the Feather River and Thermalito Afterbay; in the south by the Butte-Yuba County line (except for Ramirez Water District which is fully within the North Yuba Subbasin); and on the north and east by the edge of the alluvial basin as defined by DWR Bulletin 118 - Update 2003 (DWR, 2003). It is surrounded by the Butte Subbasin to the west, the Vina Subbasin to the north, the North Yuba Subbasin to the south and the foothills to the east.

2.1.1.2 Bottom of Basin

The definable bottom of the basin is described in Bulletin 118 subbasin report (DWR, 2006) as part of the North Yuba Subbasin (which at that time included what is now the Wyandotte Creek Subbasin) as follows:

> *The [Wyandotte Creek] Subbasin aquifer system is comprised of continental deposits of Quaternary to Late Tertiary (Pliocene) age. The cumulative thickness of these deposits increases from a few hundred feet near the Sierra Nevada foothills on the east to over 1,000 feet along the western margin of the basin.*

Groundwater occurs in the heterogeneous gravel and sand layers and the base of the Laguna Formation is generally accepted as the base of fresh water (Olmsted and Davis, 1961, as cited in DWR, 2014). However non-saline water has been observed in the underlying Ione formation (Dames and Moore, 1994) and Blair and others (1991) identified the base of the Mehrten Formation as the base of fresh water in portions of the Wyandotte Creek Subbasin.

Locally, the base of fresh groundwater fluctuates depending on local changes in the subsurface geology and geologic formational structure (DWR, 2005). In the DWR 2005 report, 600 feet was used as the average base of fresh water. In contrast, in an unpublished study by Bookman -Edmonston Engineering, Inc (1992) a thickness of 200 feet was assumed for estimating groundwater storage capacity (as cited in DWR, 2006). Because of the inconclusive

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data on the location of the base of fresh groundwater, this remains an area requiring additional data to improve characterization of the aquifer system.

2.1.2 Topography, Surface Water and Recharge

2.1.2.1 Terrain and Topography

The Wyandotte Creek Subbasin lies southwest of Lake Oroville. The northeastern area of the subbasin has steeper and more varied terrain. Land surface elevation varies from approximately 90-100 feet above mean sea level (amsl) along the western edge near the Feather River and the southern edge along Honcut Creek, to over 200 feet amsl at the edge of the foothills on the eastern side. In general, the area slopes in a southwesterly direction toward the Feather River.

Figure 2-1 shows the surface topography of the Wyandotte Creek Subbasin.

2.1.2.2 Soils

The area along the Feather River is underlain by lighter textured soils characterized by high infiltration rates. These areas correspond to land uses dominated by irrigated orchards. Most remaining areas of the subbasin has soils with slow to very slow infiltration rates. Soils with slow infiltration rates or a restrictive layer are well suited for growing rice. Figure 2-2 shows the distribution of Hydrologic Soil Groups for the Wyandotte Creek Subbasin. Soils designated as C/D are lands having soils that would have been classified as having very low infiltration (Group D) but have characteristics such as natural slope or management improvements that improved their drainage relative to that of similar soils.

Based on the Digital General Soil Map of the United States, or STATSGO2, soil data for the Wyandotte Creek Subbasin, the dominant soil mapping unit within the area is Redding-Corning, which is moderately well drained and represents approximately 64.3% of the subbasin. Other prominent soils within the subbasin include Riverwash-Dumps-Cortina (13.1% of area), and Tisdale-Kilaga-Conejo (13.6% of area). Characteristics of these soils are summarized in Table 2-1. The distribution of prominent soils (e.g., "map units") in the subbasin is shown in Figure 2-3.

Table 2-1: STATSGO2 Soil Table for Wyandotte Creek Subbasin

Soil Map Unit	Percent of Area	Sum of Acres	Slope Range	Drainage
Wyandotte Creek Subbasin	100%	59,382	-	
Goulding-Auburn (s646)	0.7%	420	27.8	Well drained
Redding-Corning (s821)	64.3%	38,175	5.3	Moderately well drained
Riverwash-Dumps-Cortina (s648)	13.1%	7,783	2.6	Well drained
Stockton-Clear Lake-Capay (s824)	0.2%	108	1	Poorly drained
Sycamore-Shanghai-Nueva-Columbia (s855)	8.1%	4,822	1	Somewhat poorly drained
Tisdale-Kilaga-Conejo (s870)	13.6%	8,047	1	Well drained

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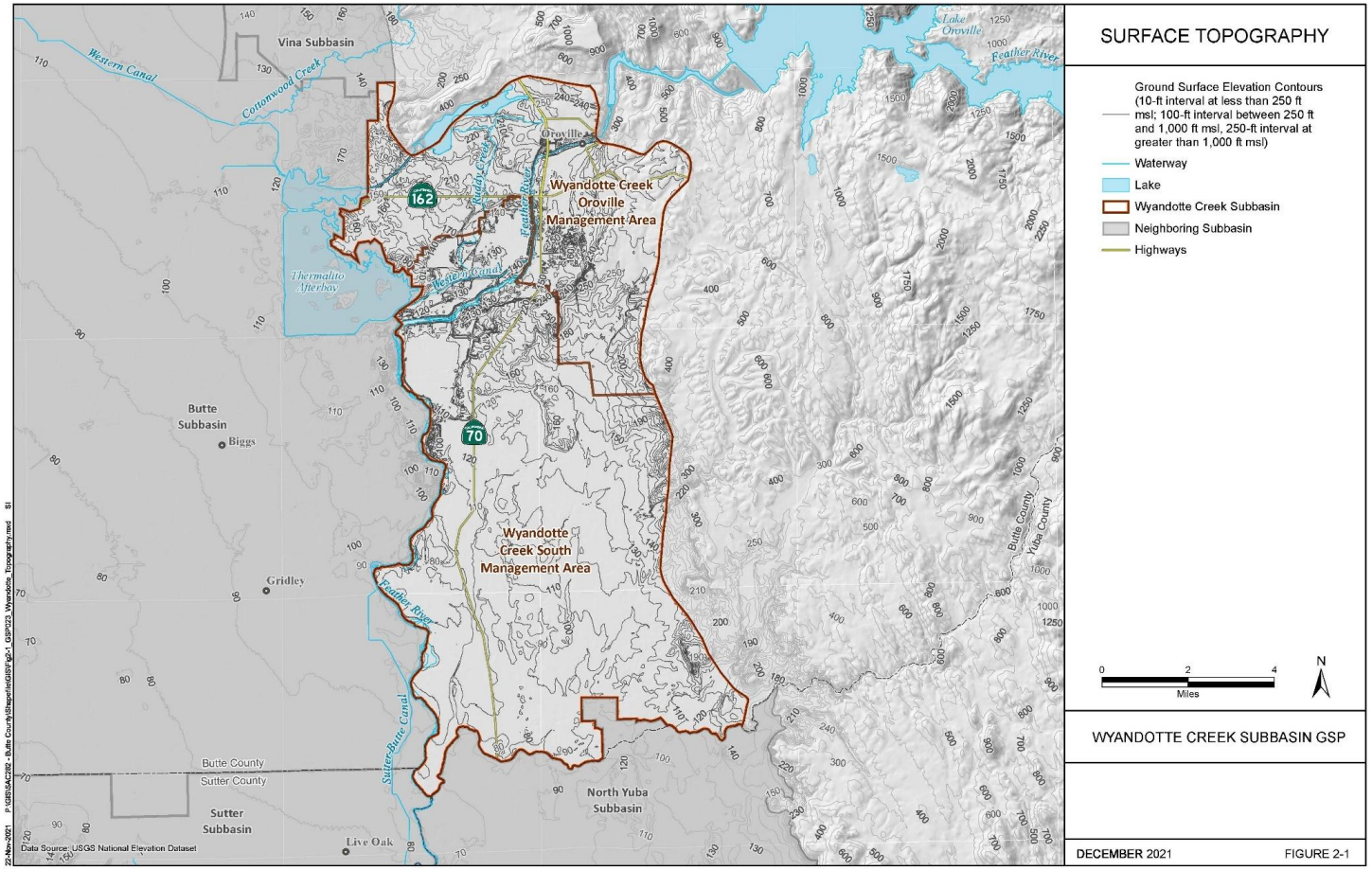

Figure 2-1 ~~placeholder page~~: Surface Topography of the Wyandotte Creek Subbasin

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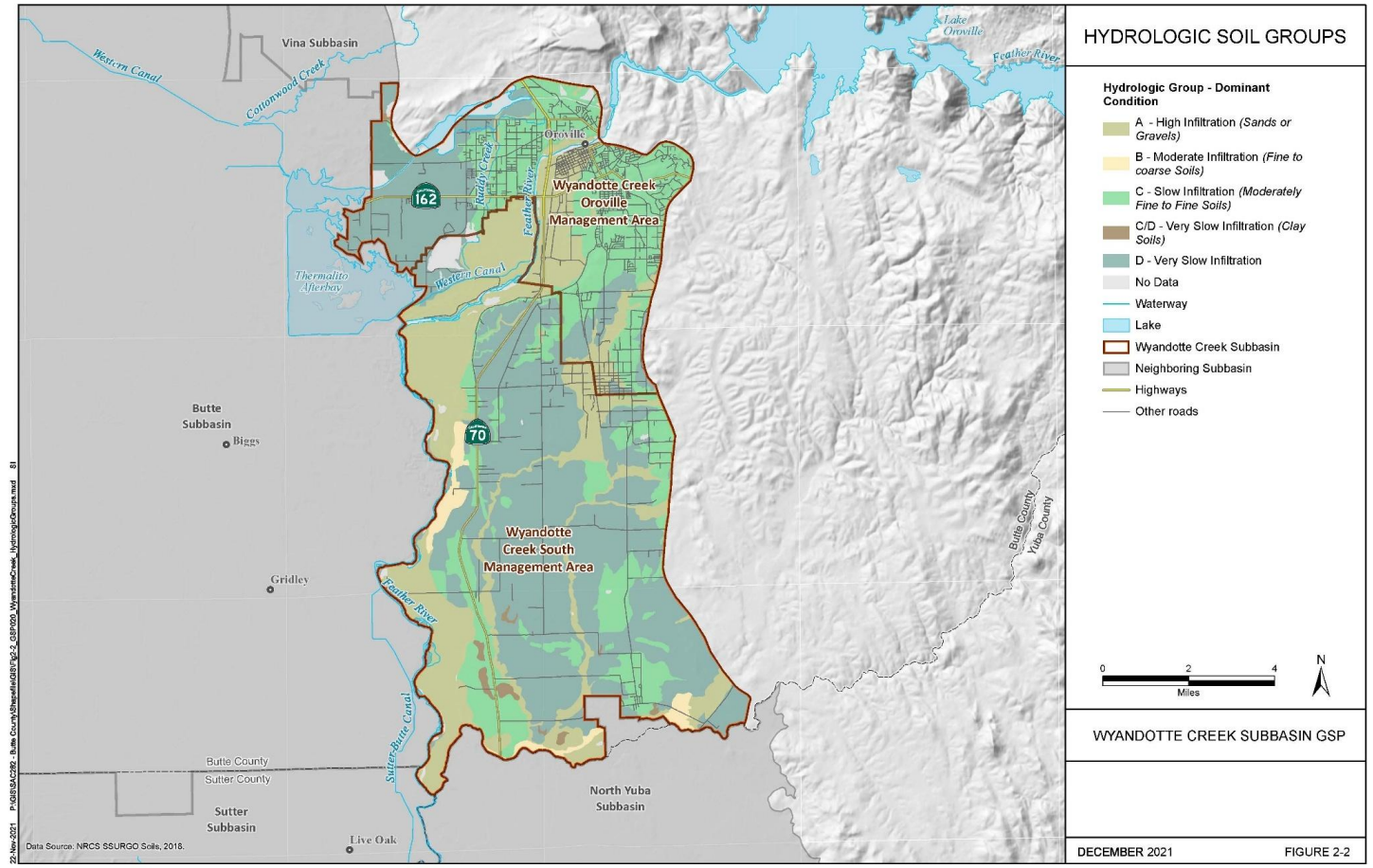

Figure 2-2 ~~placeholder page~~: Hydrologic Soil Groups

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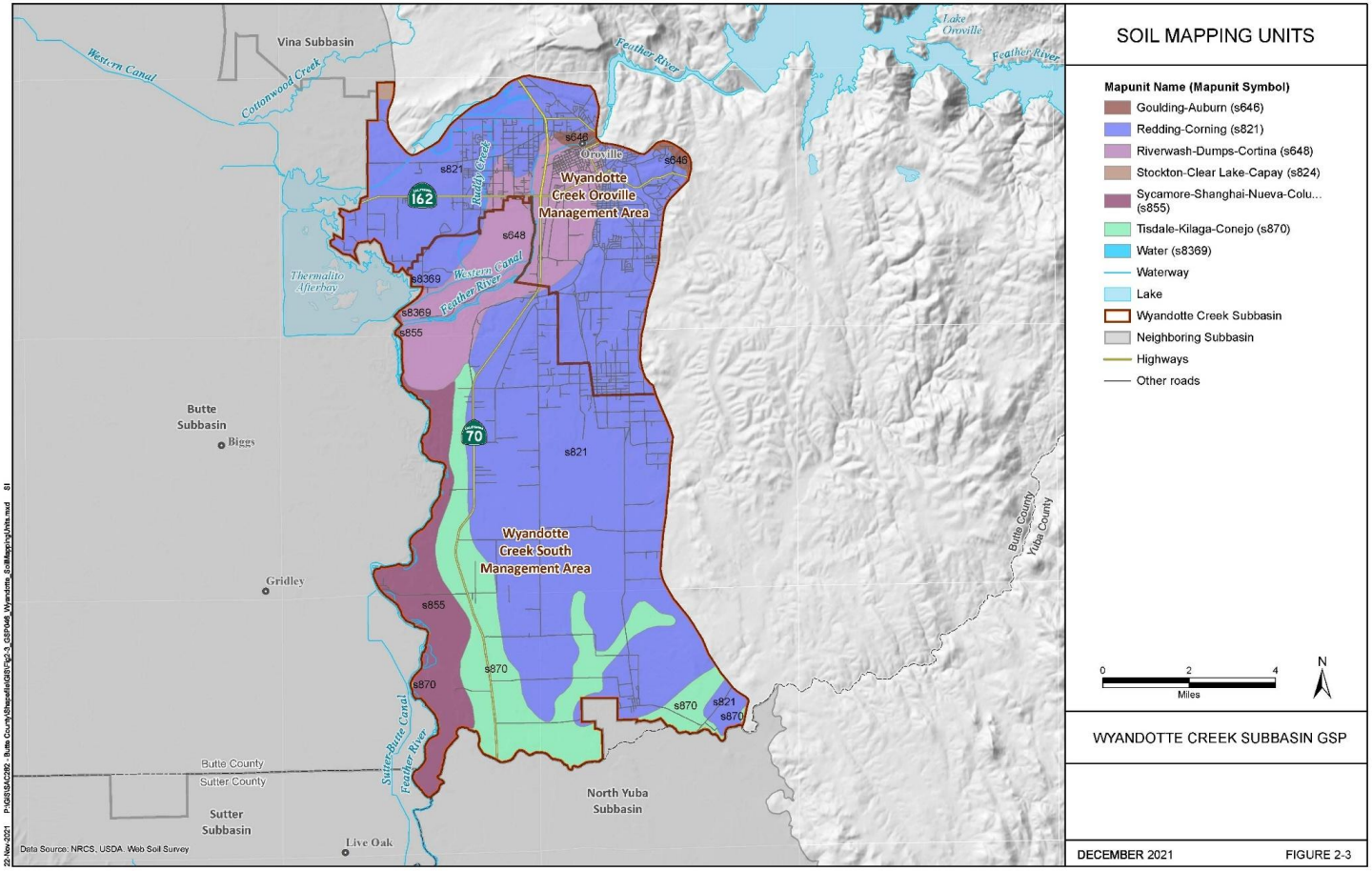
SOIL MAPPING UNITS
Mapunit Name (Mapunit Symbol)
Goulding-Auburn (s646)
Redding-Corning (s821)
Riverwash-Dumps-Cortina (s648)
Stockton-Clear Lake-Capay (s824)
Sycamore-Shanghai-Nueva-Colu... (s855)
Tisdale-Kilaga-Conejo (s870)
Water (s8369)
Waterway
Lake
Wyandotte Creek Subbasin
Neighboring Subbasin
Highways
Other roads
Vina Subbasin
Western Canal
Cottonwood Creek
Feather River
Lake Oroville
Oroville
Wyandotte Creek Oroville Management Area
Reddy Creek
Thermalito Afterbay
Butte Subbasin
Biggs
Wyandotte Creek South Management Area
Gridley
Butte County
Yuba County
Sutter-Butte Canal
Sutter County
Sutter Subbasin
North Yuba Subbasin
Live Oak
Data Source: NRCS, USDA, Web Soil Survey
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WYANDOTTE CREEK SUBBASIN GSP
DECEMBER 2021
FIGURE 2-3

Figure 2-3 ~~placeholder page~~: Soil Mapping Units

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2.1.2.3 Surface Water

The Feather River enters the subbasin in the northeast and then borders the subbasin on its western side. Other large surface water bodies bordering the subbasin include components of the Oroville Reservoir Complex including the Forebay and Thermalito Afterbay. The North, Middle, West and South Forks of the Feather River originate outside the subbasin and together supply water to Lake Oroville with a portion of flow routed through the Thermalito Forebay and Afterbay facilities to generate hydropower and deliver irrigation water supply to the Butte Subbasin, with the remaining water returning to the Feather River. The Feather River serves as a source of municipal and irrigation supply in the subbasin through diversions by the TWSD and SFWPA.

Smaller local or ephemeral streams entering and traversing the subbasin include North Honcut Creek, Wyandotte Creek, Wyman Ravine, Ruddy Creek, canals, and numerous unnamed waterways. Figure 2-4 shows prominent surface water features in the Wyandotte Creek Subbasin.

2.1.2.4 Groundwater Recharge Areas

Groundwater recharge is the downward movement of water from the surface to the groundwater system. Several water sources and mechanisms recharge the groundwater system in the Wyandotte Creek Subbasin. This includes percolation of water from rainfall, irrigation, or water bodies like the Feather River, streams and canals.

Figure 2-5 shows the relative rates of recharge as estimated by the Butte Basin Groundwater Model (BBGM v. 1.0) for the 2018 water year across the model elements (triangular areas) (BCDWRC, 2021). The model has been updated, but 2018 rates can still be considered representative for the subbasin. This is included as an indication of the variation in recharge in different areas due to the cumulative effects of varying factors including: soil characteristics, land use and irrigation water source, and precipitation. Areas with higher rates of recharge correspond in part to areas with soils having higher infiltration rates and areas receiving applied water for irrigation.

There is potential for additional recharge through management activities of flood flows or irrigation practices in the Wyandotte Creek Subbasin. The Soil Agricultural Groundwater Banking Index (SAGBI) is a suitability index for groundwater recharge on agricultural land based on five major factors: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. This dataset can serve as a starting point indication for areas conducive to natural or managed recharge. Large portions of the subbasin in its southern half received a moderately good to excellent rating in terms of being suitable for recharge (Figure 2-6). Additional considerations will be important for specific evaluation of any proposed recharge project. SAGBI data can be accessed at https:\\casoilresource.lawr.ucdavis.edu/sagbi.

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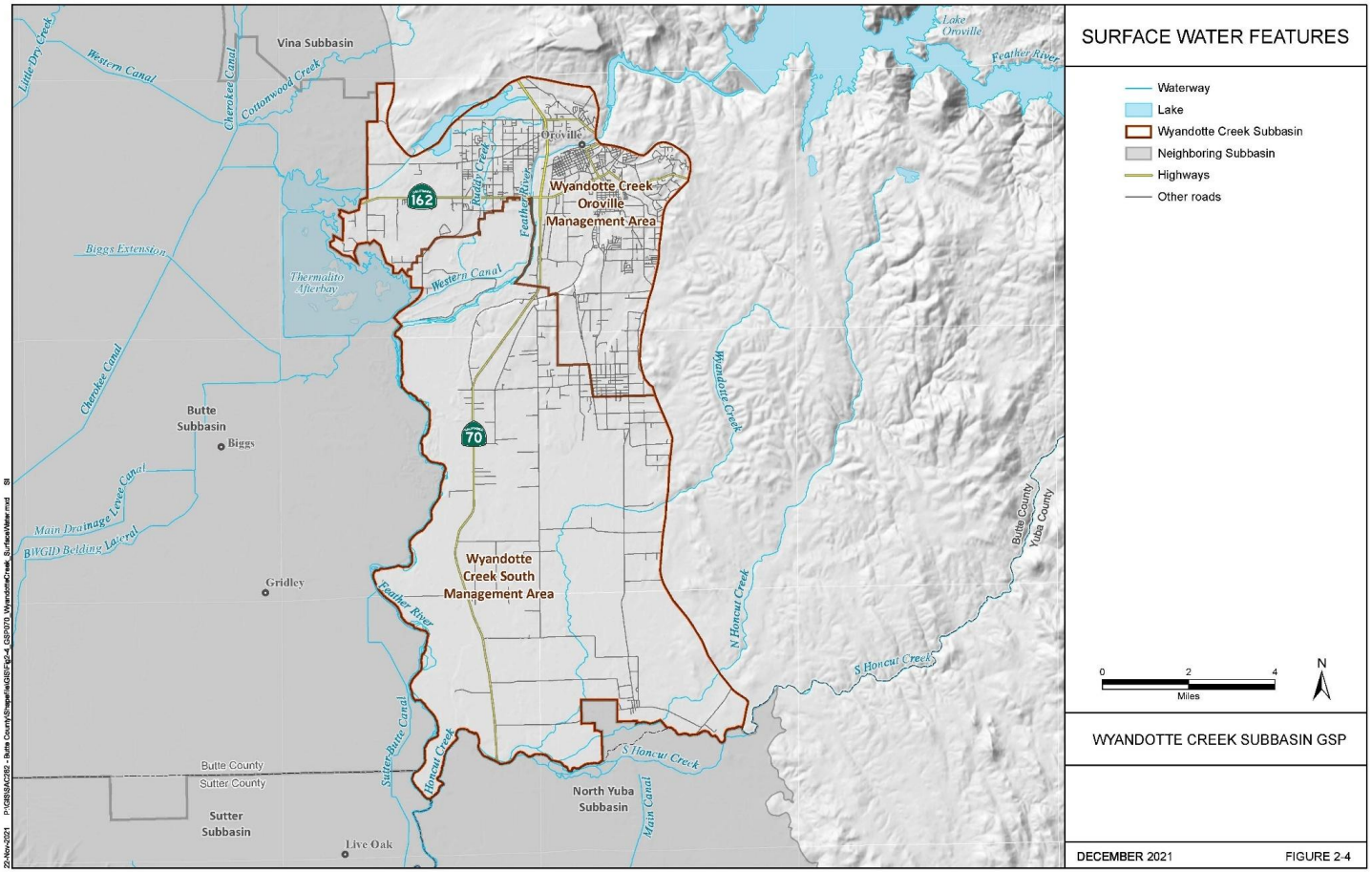

Figure 2-4 ~~placeholder page~~: Surface Water Features in the Wyandotte Creek Subbasin

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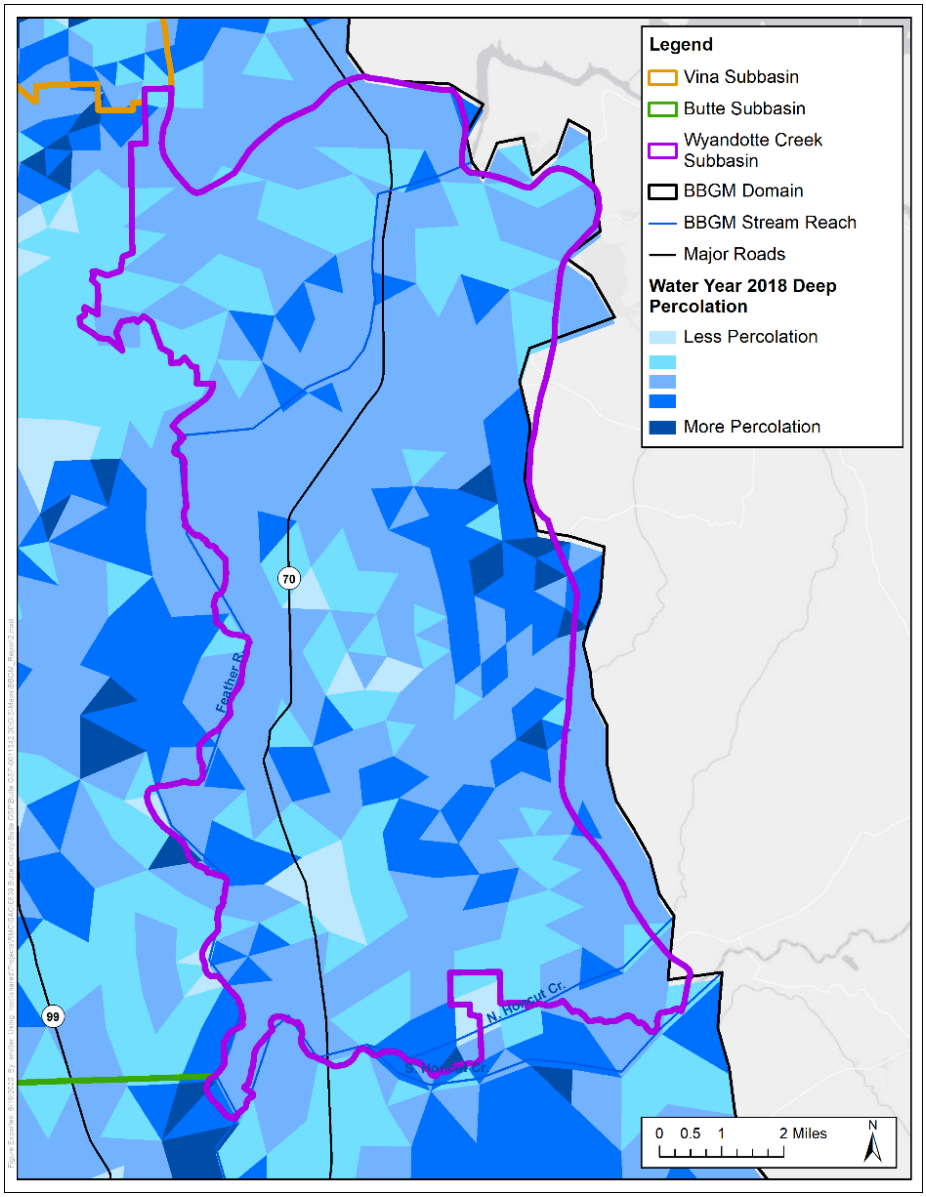

Figure 2-5: Relative Rates of Deep Percolation throughout the Wyandotte Creek Subbasin as Estimated by the Butte Basin Groundwater Model (BBGM v.1.0)

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~~Figure 2-6 placeholder page~~

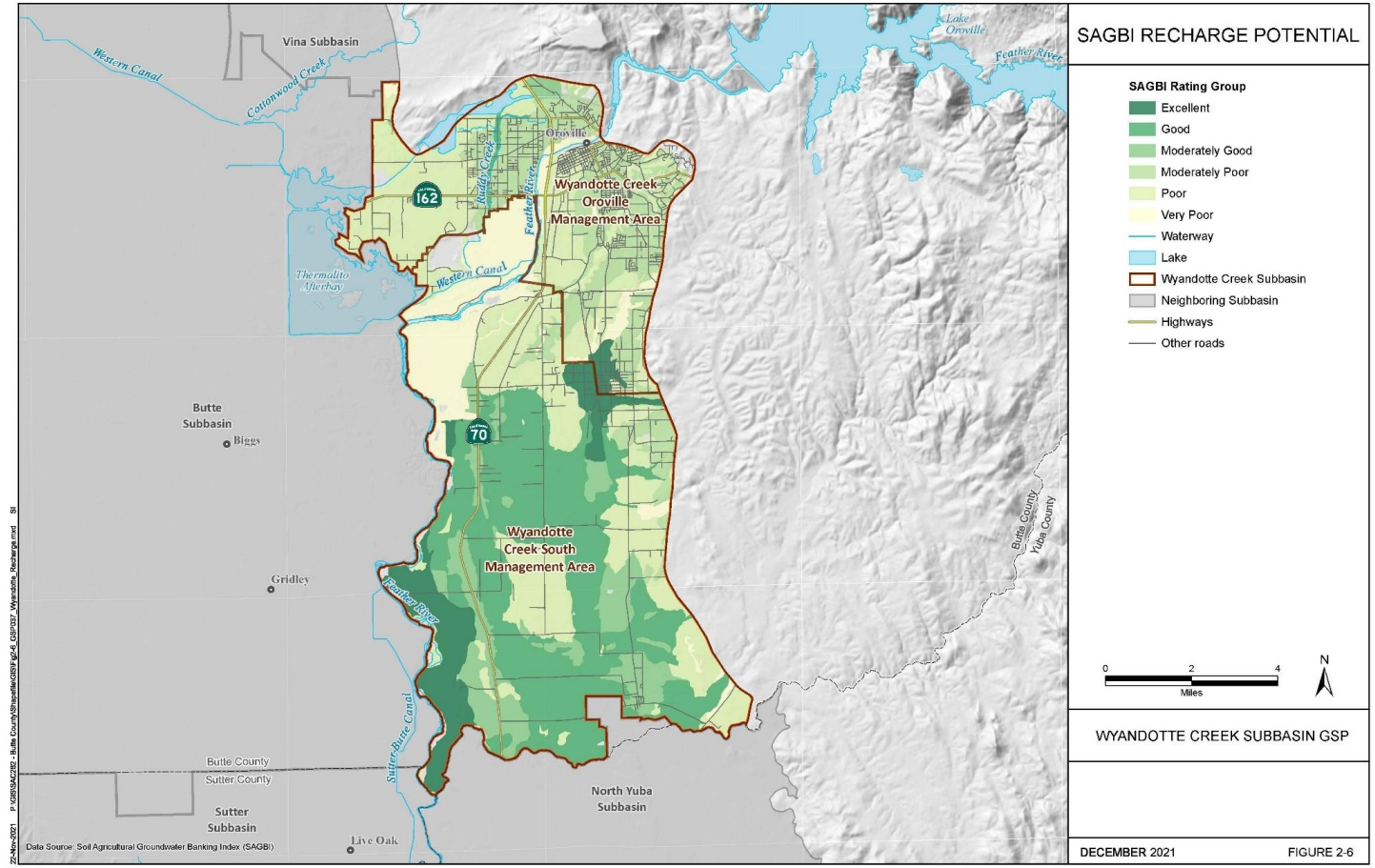

Figure 2-6: Soil Agricultural Groundwater Banking Index Recharge Potential

2.1.3 Regional Geologic and Structural Setting

An inconsistent stratigraphic nomenclature has been established for the Cenozoic deposits in the Wyandotte Creek Subbasin (Blair et al., 1991). Many of these units are defined on the basis of gold content, buried soils, and geomorphic relationships or by the introduction of distant formation names without local verification. The stratigraphy of the Wyandotte Creek Subbasin, despite being finely divided, is further complicated by a lack of continuous exposure and by the fact that many of the units have inset relationships with older formations rather than superposed, layered relationships, owing to the sedimentologic behavior of the Feather River system. Using the nomenclature developed by Blair et al. (1991) and by adhering to the stratigraphic code (North American Commission on Stratigraphic Nomenclature, 2005), three formal stratigraphic units have been differentiated in the subbasin. These include, in ascending order, the Ione Formation, Mehrten Formation (designated by others as the Tuscan Formation), and Laguna Formation (designated by others as a combination of the Alluvium, Modesto, and Riverbank Formations).

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In the Oroville area, bedrock has been encountered as shallow as 283 feet below ground surface (bgs) and has been observed in outcrop adjacent to the Memorial Park Cemetery (Dames and Moore, 1994). Moving east from these areas, bedrock has been reported to occur at depths greater than 1,000 feet.

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The regional structure of the Sacramento Valley groundwater basin consists of an asymmetrical trough tilting to the southwest with a steeply dipping western limb and a gently dipping eastern limb (Page, 1986). Older granitic and metamorphic rocks underlie the valley forming the basement bedrock on which younger marine and continentally derived sediments and volcanic rock have been deposited. Along the valley axis and west of the present-day Sacramento River, basement rock is at considerable depth, ranging from 12,000 to 19,000 feet bgs. Overlying marine and continentally derived sediments have been deposited almost continuously from the Late Jurassic period to the present. Of these deposits, older sediments in the basin were emplaced in a marine environment and usually contain saline or brackish groundwater. Younger sediments were deposited under continental conditions and generally contain fresh groundwater. Sediments thin near the margins of the basin, exposing older metamorphic and granitic rocks underlying and bounding the Sacramento Valley sediments (DWR, 2005).

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2.1.4 Geologic Formations

Groundwater occurs under both unconfined and confined conditions. Unconfined conditions are generally present in the surficial Quaternary deposits and in the Pliocene deposits that are exposed at the surface. Confined conditions exist where one or more confining layers rests above the underlying aquifer deposits.

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Figure 2-7 is the Surficial Geologic Map for the Wyandotte Creek Subbasin, produced by DWR, which shows the surface distribution of geologic units. The surface geology is composed of the Laguna Formation in the north and eastern area, alluvium along the Feather River and predominantly Riverbank and Modesto Formations in the southern half of the subbasin. Tailings are mapped along the Feather River where it traverses the subbasin. These surficial deposits together are referred to as the Laguna Formation using the nomenclature of Blair et al. (1991).

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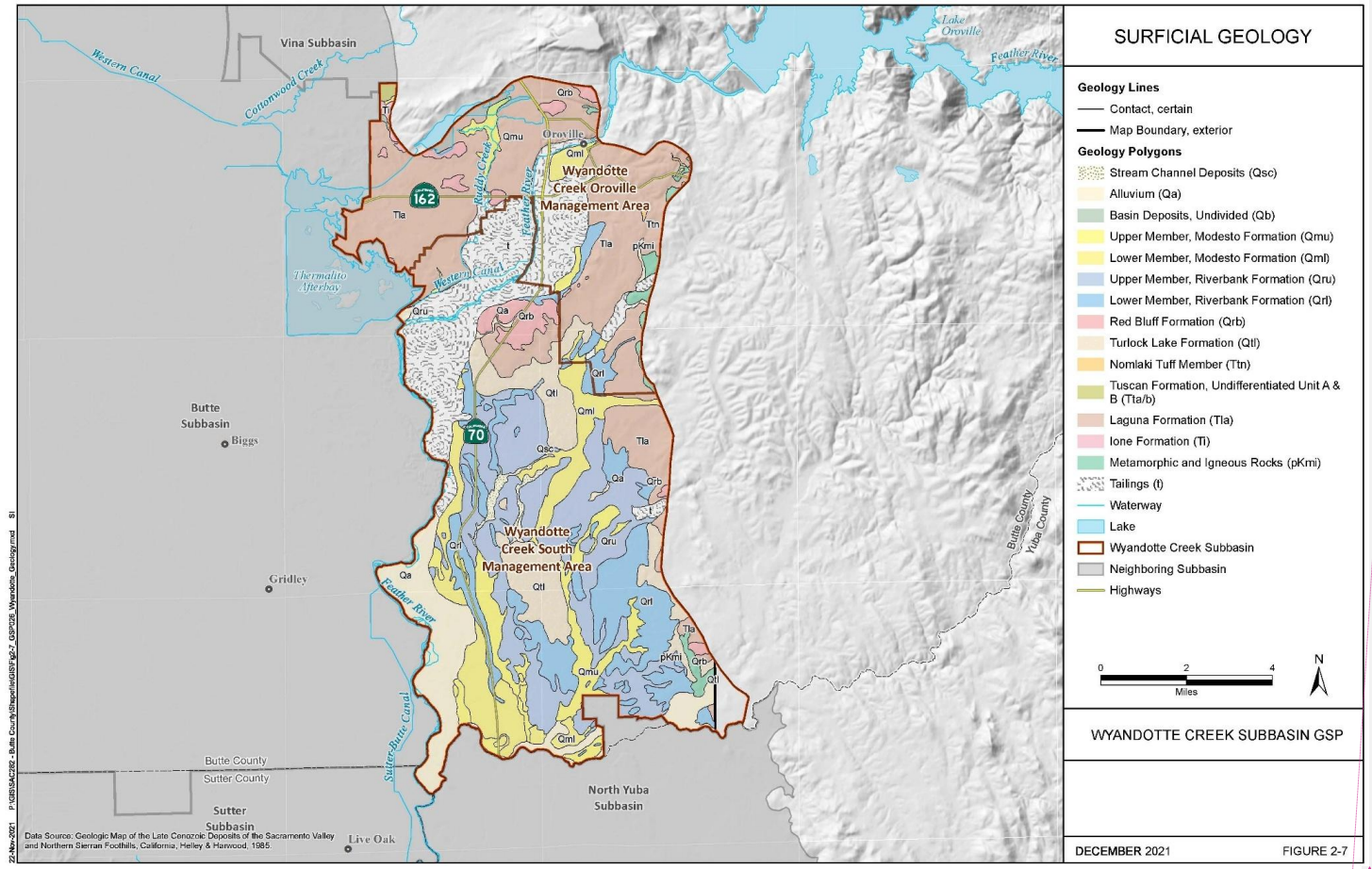

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: Surficial Geology of the Wyandotte Creek Subbasin

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The following is a discussion of groundwater producing geologic units found within the subbasin and region.

2.1.5 Groundwater Producing Formations

The majority of groundwater resources in the subbasin exist in spaces between gravel, sand, and clay particles of various formations that store and transmit water in the aquifer systems. Principal water bearing formations in the Wyandotte Creek Subbasin include the Ione, Mehrten, and Laguna Formations. These formations are discussed below.

2.1.5.1 Ione Formation

The Ione Formation is discontinuously exposed on the east side of the Sacramento Valley from near Deer Creek north of Chico to around Friant in the San Joaquin Valley (Creely, 1965 as cited in DWR, 2014). It is present in the subsurface in the Wyandotte Creek Subbasin and extends to the west toward the axis of the northern Sacramento Valley.

The Ione Formation consists of variably cemented, fine to coarse sandstone, siltstone, lignite, and claystone with variegated colors including red, yellow, white, blue, gray, orange, and black. Interbedded lenticular pebble-and-cobble "auriferous" or "greenstone" gravels are locally present and become more abundant eastwardly (Blair et al., 1991). In drill cuttings, the Ione Formation is easily identified from the overlying Mehrten Formation by its multicolored nature and volcanic-free composition.

2.1.5.2 Mehrten Formation

The Mehrten Formation includes a sequence of variably cemented, interbedded clay, sand, and gravel. This formation consists predominantly of purple volcanic debris flow deposits and interbedded water-lain fluvial deposits rich in volcanic detritus, but in many areas containing crystalline basement-derived clasts and rare tuff beds. The base of the Laguna Formation can easily be distinguished in drill cuttings where pumiceous materials of the tuff members are encountered. The reported occurrence of both channel-lain, clast supported, pebble- and cobble-gravel facies and interbedded volcanic-rich debris-flow facies in this formation suggests that debris flows related to volcanic events episodically choked the ancestral stream/river systems of the area. Blair et al. (1991) described the gravel and sand fractions, as well as many intervals of the Mehrten Formation in the Oroville area encountered in the subsurface consisting of porphyritic-dacite rock fragments and disaggregated quartz and plagioclase phenocrysts. The sand fraction of this area comprised a mixture of porphyritic-dacite rock fragments (36% to 37%), granitic rock fragments (32% to 49%), metamorphic rock fragments (4% to 7%), Quartz (10% to 19%), and feldspar (0% to 3%). This composition indicates that in the Wyandotte Creek Subbasin that the Mehrten Formation originated from the erosion of both Sierra Nevada crystalline rocks and a Mount Lassen-derived volcanic sequence.

2.1.5.3 Laguna Formation

The Laguna Formation consists of sandy gravel channel, sandy channel facies, and sandy clay to clay floodplain facies and ranges in thickness in the northern part of the subbasin from 120 feet to 220 feet. The gravel deposits occur above sharp, scoured facies and are comprised of poorly to moderately sorted, sandy, clast-supported pebbles and cobbles. In the Oroville area, the Nomlaki Tuff Member, a white, pumice-rich, water-lain vitric tuff has been placed at the base of the Laguna Formation (Blair et al., 1991). If encountered, directly underlying this member is the Mehrten Formation. Where the Nomlaki Tuff Member is not encountered, the base of the Laguna

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Formation is identified by the presence of gravel clasts and/or sand grains consisting of a composition greater than 50% andesite, andesitic basalt, and/or dacite.

The Laguna Formation was deposited by the ancestral Feather, and outside the subbasin by the Yuba, Bear, and American rivers to the south (Helley and Harwood, 1985). During the Pliocene and Pleistocene epochs, uplift of the Sierra Nevada increased the erosion of the plutonic and metamorphic rocks on the eastern side of the valley. Rivers and streams carried the eroded material westward to the valley floor, and as the water overtopped the banks, it spread out across the broad floodplains of the valley, depositing the sediments into broad alluvial fans (DWR, 2014).

2.1.6 Geologic Cross Sections

Figure 2-8A shows Airborne Electromagnetic (AEM) data profiles from the Department of Water Resources (DWR) W07 survey. It is a key which shows the orientation of geologic cross sections developed for the Wyandotte Creek Subbasin ~~and relation of these cross sections to others in the adjacent Vina and Butte subbasins. Figures~~. Figure 2-8B ~~and 2-8C are respectively~~ is the north-south ~~and east-west~~ geologic cross sections (labeled A-A' on the map) for the Wyandotte Creek Subbasin~~. The north-south section was~~, developed for this amended GSP~~, the east-west section is based on a section presented in~~. The cross-section shows three different stratigraphic units, from oldest to youngest: Ione Formation, Mehrten Formation (including the ~~DWR report Geology of~~ Nomlaki Tuff), and the ~~Northern Sacramento Valley, California (DWR, 2014).~~Laguna Formation. The Laguna Formation is representative of the shallow (or upper) aquifer zone and the Ione Formation is considered the deeper aquifer zone.

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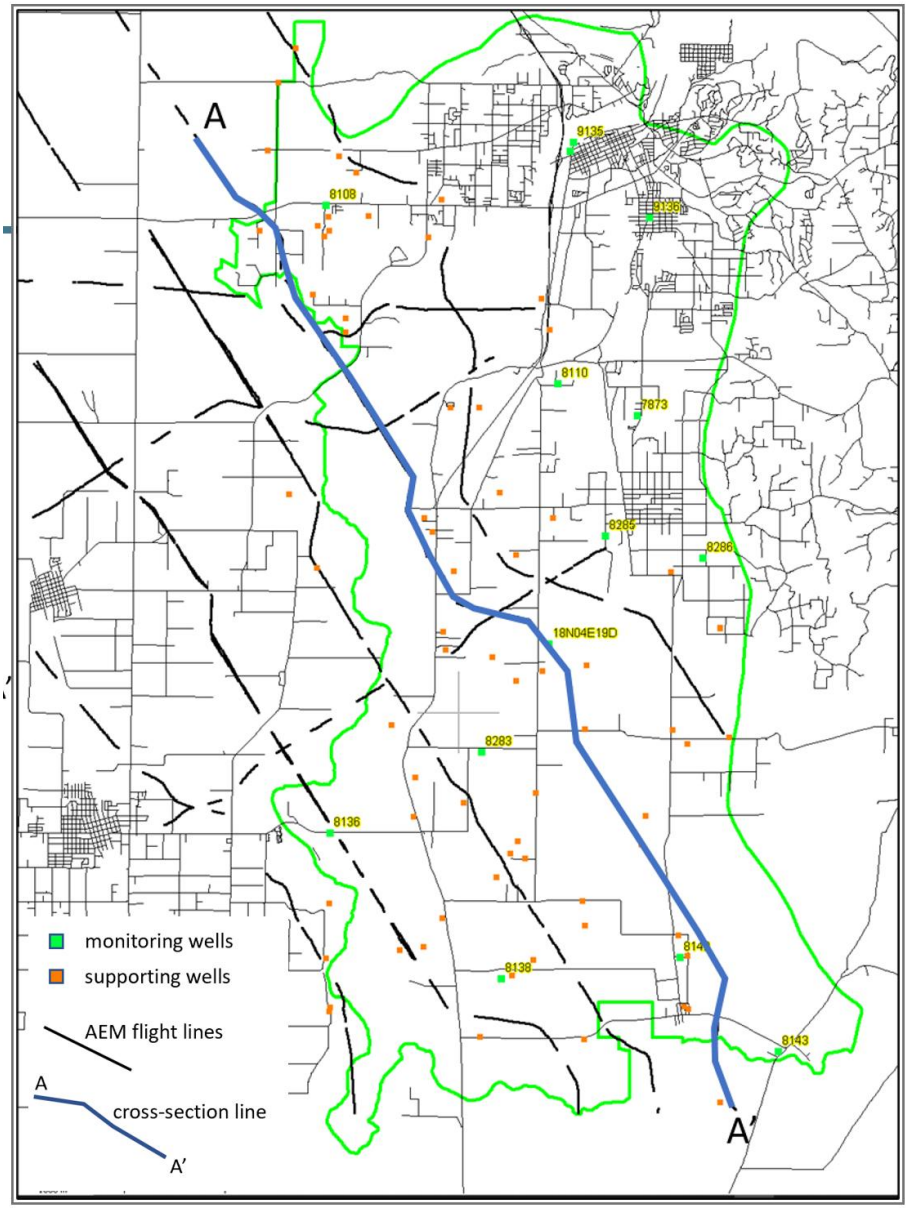

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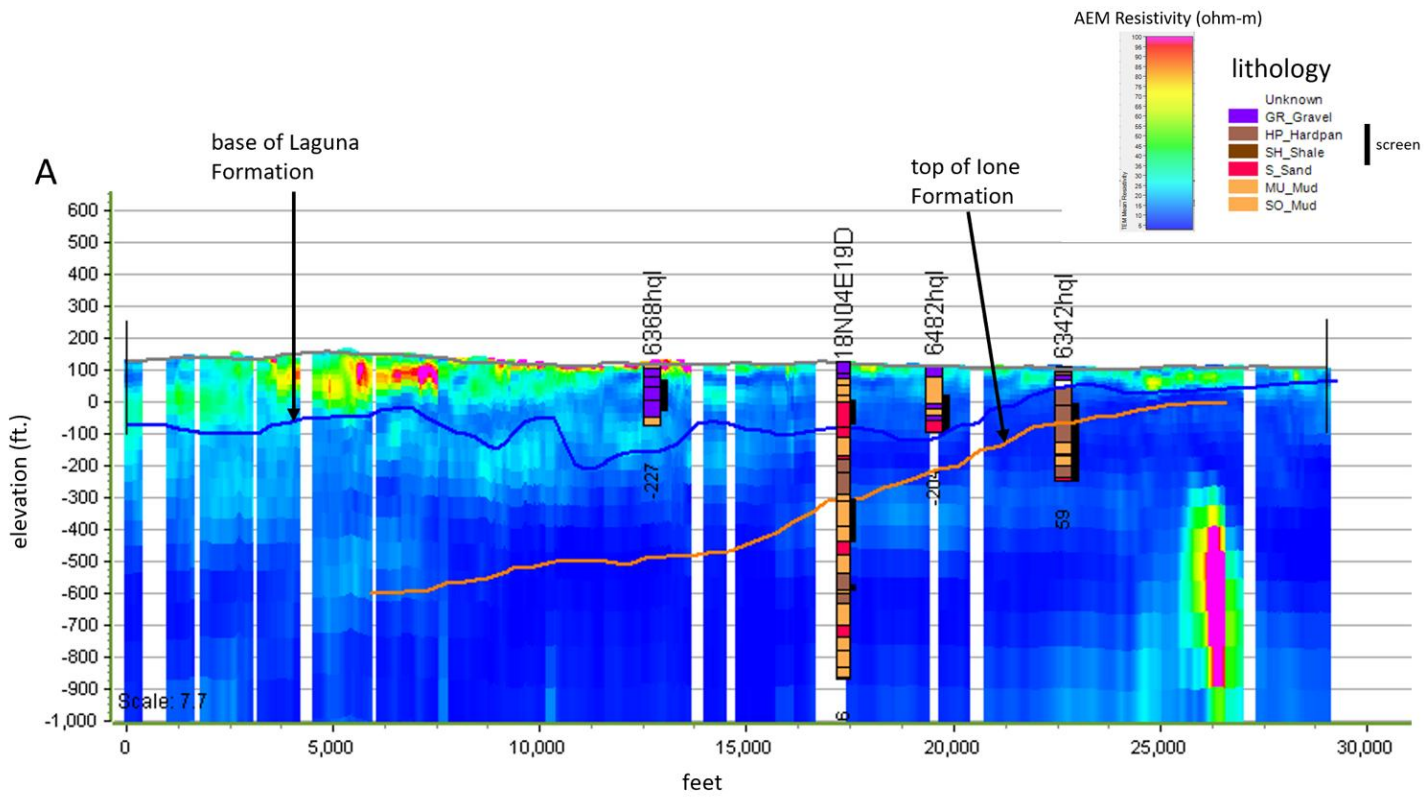
. Wyandotte Creek Subbasin AEM Flightlines



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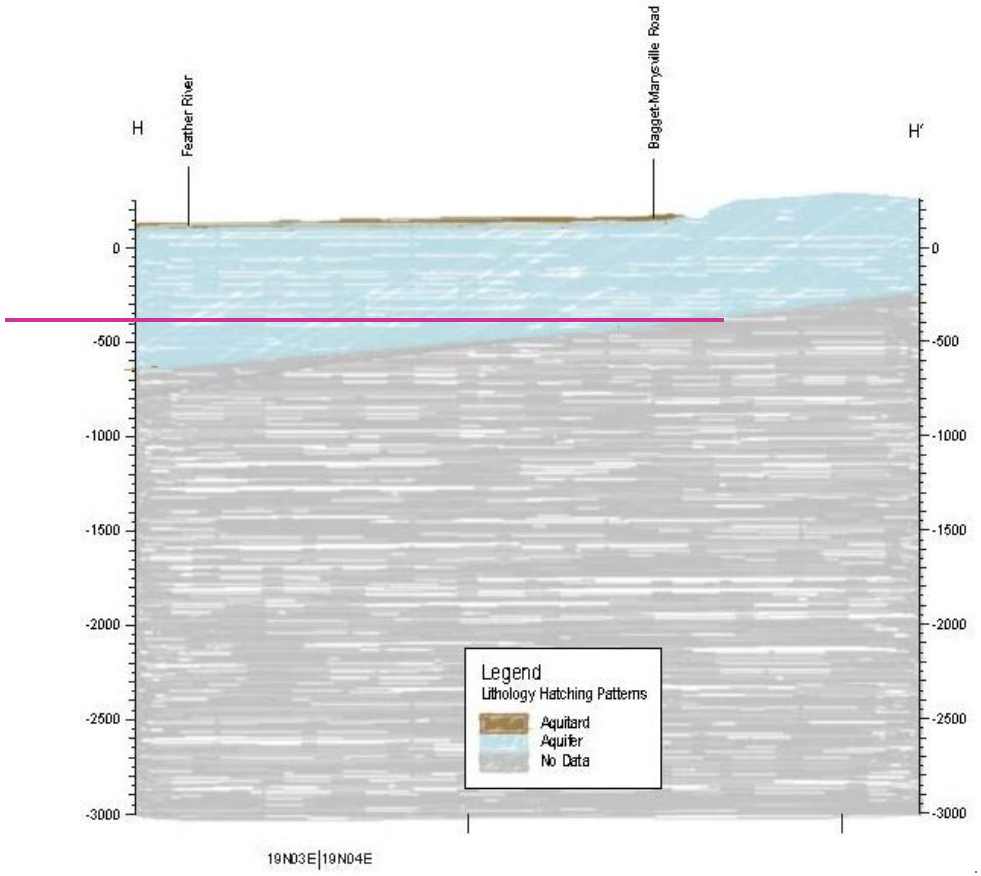

~~Figure 2-8C: East-West Geologic~~: Wyandotte Creek Subbasin Groundwater Aquifer Representative Cross-Section ~~H-H'~~ from DWR's AEM Survey.

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2.1.7 Principal Aquifers and Aquitards

DWR defines principal aquifers under SGMA as the "aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems" (California Code of Regulations [CCR], Title 23, § 351(aa)). A single principal aquifer in the subbasin consists predominantly of Ione, Mehrten, and Laguna Formations. There are no known structural properties that significantly restrict groundwater flow within the subbasin within the portion of the aquifer that stores, transmits, and yields significant quantities of water.

2.1.7.1 Primary Uses

Water produced from the principal aquifer is primarily used to meet irrigation, domestic and municipal water demand. Domestic supply is used to meet rural residential demands. Municipal supply is largely used to meet demand from the City of Oroville.

2.1.7.2 Specific Yield

Specific Yield or storativity quantifies the ability of the aquifer to hold or store water. Quantitative water-bearing data for the Laguna Formation is limited, especially in the area of the Wyandotte Creek Subbasin. Although the occurrence of thin sand and gravel zones is common, many of them have reduced permeability due to cementation. This, coupled with its fine-grained character, leads to an overall low permeability for the Laguna Formation. An unpublished study by Bookman-Edmonston Engineering, Inc. (1992) estimated groundwater storage based on an average specific yield of 6.9% and assumed thickness of 200 feet (DWR, 2006). The 2005 DWR report assumed a specific yield of 8.8%.

Values for specific yield and storativity used in the calibrated BBGM v.1.0 throughout the Wyandotte Creek Subbasin are 10% and 0.00001, respectively (BCDWRC, 2021). Specific Yield will be refined as additional information becomes available.

2.1.7.3 Transmissivity

Transmissivity (T) quantifies the ability of water to move through aquifer materials. The aquifer hydraulic conductivity (K) quantifies the rate of groundwater flow and is related to the transmissivity and aquifer thickness (b) by the following formula: T = K x b. Limited hydraulic conductivity data is available for the subbasin. The BBGM calibrated hydraulic conductivity ranges from 20-250 feet per day depending upon the location and depth within the subbasin (BCDWRC, 2021).

~~*2.1.7.4 Water Quality*~~

~~The primary water chemistry in the area indicates calcium magnesium bicarbonate or magnesium calcium bicarbonate groundwater. Some magnesium bicarbonate can be found in the northwest portion of the subbasin (DWR, 2006). The generally good water quality characteristics of the subbasin are apparent in the overall salinity of groundwater. In general, total dissolved solids (TDS) concentrations in the study area are below 500 milligrams per liter (mg/L) throughout the subbasin (Bookman-Edmonston Engineering, Inc. 1992). Data collected from DWR water quality wells indicate a TDS range of 149 to 655 mg/L and a median of 277 mg/L (DWR, 2006). Butte County's water quality trend monitoring program measures electrical conductivity in two wells in the subbasin. Data collected annually from 2002 through 2019 indicate a range of 132 to 374 microsiemens per centimeter (µS/cm), well below the secondary water quality threshold for drinking water of 900 µS/cm.~~

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~~In the northern part of the subbasin, groundwater occurrence is saline to brackish except locally on the margins of the valley where the formational water has been flushed with newer fresh water. Non-saline water was also observed in deeper portions of the Ione Formation in the vicinity of Oroville (Dames and Moore, 1994). Sediments that were continentally derived contain fresh to brackish water and are poorly to moderately permeable (Olmsted and Davis, 1961). In the southern part of the subbasin, numerous wells appear to be completed within the Ione Formation (boring logs identify "blue clays" believed to be indicative of the Ione Formation) that produce fresh water.~~

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2.1.8 Opportunities for Hydrogeologic Conceptual Model Improvements

2.1.8.1 Identify Areas Where Additional Monitoring Would Help Increase Understanding of the Aquifer

Determine the best approach for increasing monitoring in these areas, such as installation of new wells or increased monitoring at existing wells.

2.1.8.2 Expand Isotopic Analysis to Further Assess Groundwater Recharge

Future recharge and aquifer studies should include the collection and interpretation of stable isotope data. Methodology considerations include: 1) Seasonal sampling should be performed as part of future surface water and groundwater isotope studies for purposes of assessing groundwater recharge; 2) Monitoring wells with multiple screened intervals (multi-completion monitoring wells) are recommended to assess stable isotope data at different depths. Sampling locations with a single well-screen interval do not provide nearly as much insight as sampling locations with wells screened at multiple depths; and 3) Monitoring wells with relatively short screened zones (20 feet or less) are preferred to minimize mixing between aquifer zones or between aquifer zones and residual water retained within the aquitard zones between aquifers.

2.1.8.3 Characterize Recharge Source With General Water Quality

Conduct general mineral analysis on groundwater samples to evaluate whether elevated ~~electrical~~specific conductivity values observed during sampling are due to irrigation influences (e.g., elevated nitrate, calcium, sulfate) or due to proximity to the Ione Formation (e.g., elevated sodium, chloride, and boron).

2.1.8.4 Recharge rate

Most monitoring well locations and depths should be sampled and analyzed for presence of tritium to help distinguish whether recharge to individual aquifer zones is occurring over periods shorter than about 60 years, or whether recharge is occurring over longer timeframes.

2.1.8.5 Field Testing and Monitoring Equipment Installation to Understand the Recharge Rates and Stream Losses in the Recharge Zone

Expansion of stream gauging locations to document changes in stream-aquifer interactions should be conducted. In addition to the stream gauging, a series of shallow dedicated monitoring wells with temperature sensors installed along stream courses in the recharge corridor may help identify what sections of streams are losing or gaining.

~~*2.1.8.6 Additional Aerial Electromagnetic Data Collection*~~

~~Expanding the extent of aerial electromagnetic (AEM) surveys is recommended to support refinement of the 3D HCM of the subsurface. AEM data sets provide valuable insights on the lithology of the subbasin and therefore better understanding of connectivity between aquifer layers and recharge areas.~~

2.2 Groundwater Conditions

2.2.1 Description of Current and Historical Conditions

Groundwater conditions in the Wyandotte Creek Subbasin are continually monitored and are comprehensively described in the 2001 and 2016 Water Resource Inventory and Analysis Reports and Annual Groundwater Status reports produced by Butte County. These documents

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and other reports portray a subbasin that has adequate groundwater resources to meet demands under most hydrologic conditions. However, comparison of the reports illustrates how in the period between their issuance demand for groundwater has grown relative to the available supply. This trend, quantified below in the water budget section of this document, suggests that as forces ranging from population growth to climate change play out, the value of well-informed water management policies and practices is likely to increase. In short, as shown below, while groundwater conditions in the subbasin remain relatively stable, maintaining this posture in the future may become less the result of a state of nature and more the reward for thoughtful management. The water budget analysis presented in this section provides a quantitative assessment of how conditions have changed in the Wyandotte Creek Subbasin at the time of GSP development and an indication of how conditions may change in the future. The GSA will provide updated groundwater condition assessments in GSP Annual Reports and Five-Year Periodic Evaluations.

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2.2.2 Groundwater Trends

2.2.2.1 Elevation and Flow Directions

Figures 2-9 and 2-10 show groundwater elevation contours in the Wyandotte Creek Subbasin for the spring and fall of 2015 and Figures 2-11 and 2-12 show elevation contours for the spring and fall of 2019.

Contours plotted on these maps show first encountered groundwater as reported through the CASGEM Program. The data were processed as follows:

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- Data from CASGEM were used to identify wells in the Wyandotte Creek Subbasin plus supplemental sites used to extend the contours to the west.
- Water level readings for 2015 and 2019 were then filtered for measurements taken between September 20th and October 30th for the fall contours and between March 20th and April 30th for the spring contours.
- Wells showing depths to first encountered groundwater deeper than 500 feet were eliminated from the data set. The remaining readings were sorted by well depth.

The four contour maps display groundwater elevations that are higher in the north of the subbasin than in the south indicating a general gradient that causes water to flow from north and from foothill recharge areas in the east toward the subbasin's southeastern corner. Because of the influence of Thermalito Afterbay and the Feather River, groundwater elevations in the north are generally stable between the spring and fall observation periods, while elevations in the south tend to be lower in the fall than the spring, a pattern typical of valley floor locations distant from major sources of recharge.

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When comparing elevations reported in 2015 with those reported in 2019, the influence of stable water elevations in Thermalito Afterbay has resulted in a corresponding stability in neighboring groundwater elevations. However, elevations in the spring of 2015 observed in the south tend to be higher than those reported for the spring of 2019. Fall elevations in the north continue to show the stabilizing influence of Thermalito Afterbay. However, elevations to the south for 2015 are slightly lower than those observed in 2019. This may be an indication of an increase in the volume of water recharged from upland areas flowing into the subbasin's principal aquifer.

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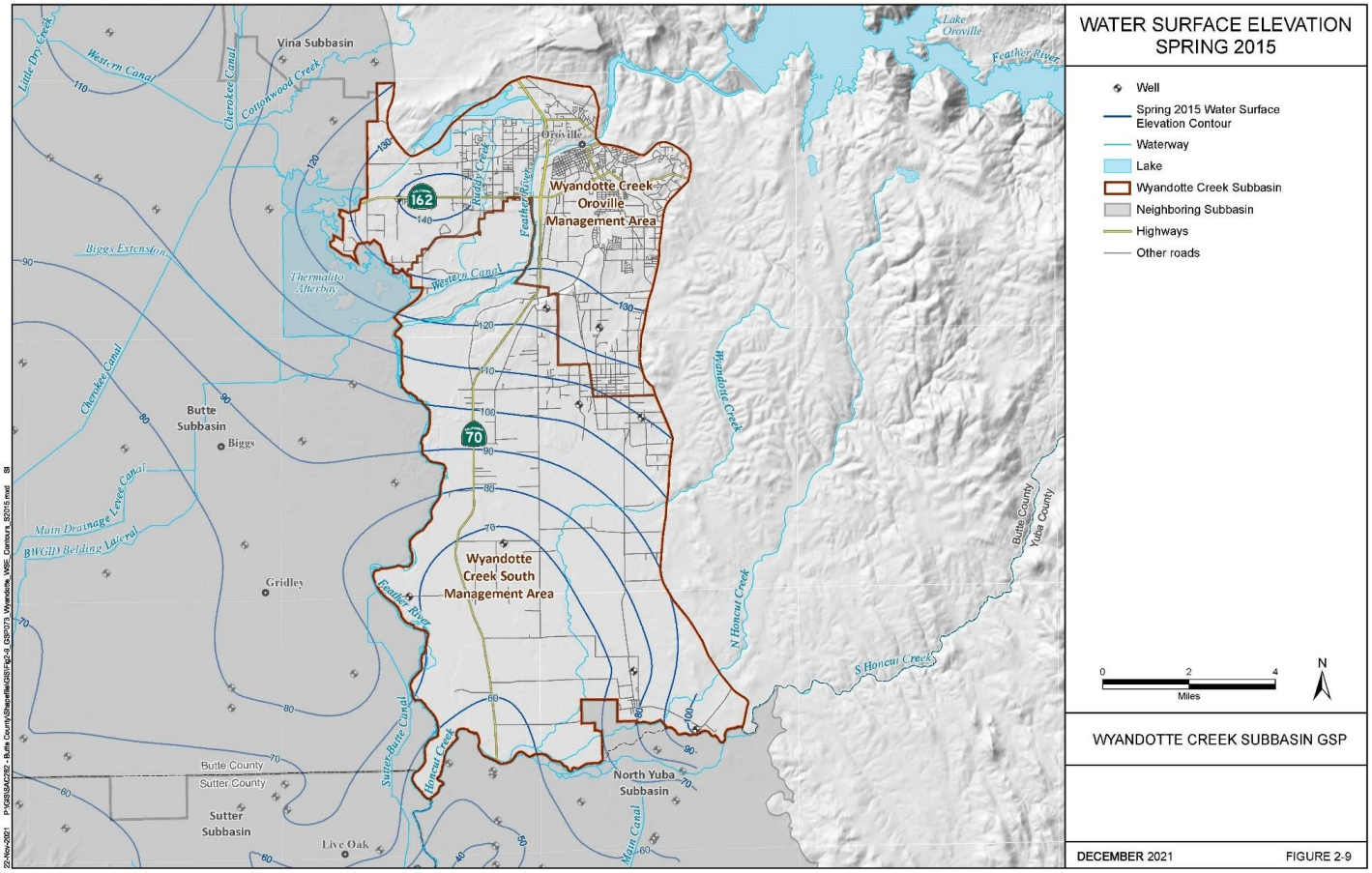

Figure 2-9 ~~placeholder page~~: Water Surface Elevation Contours (Spring 2015)

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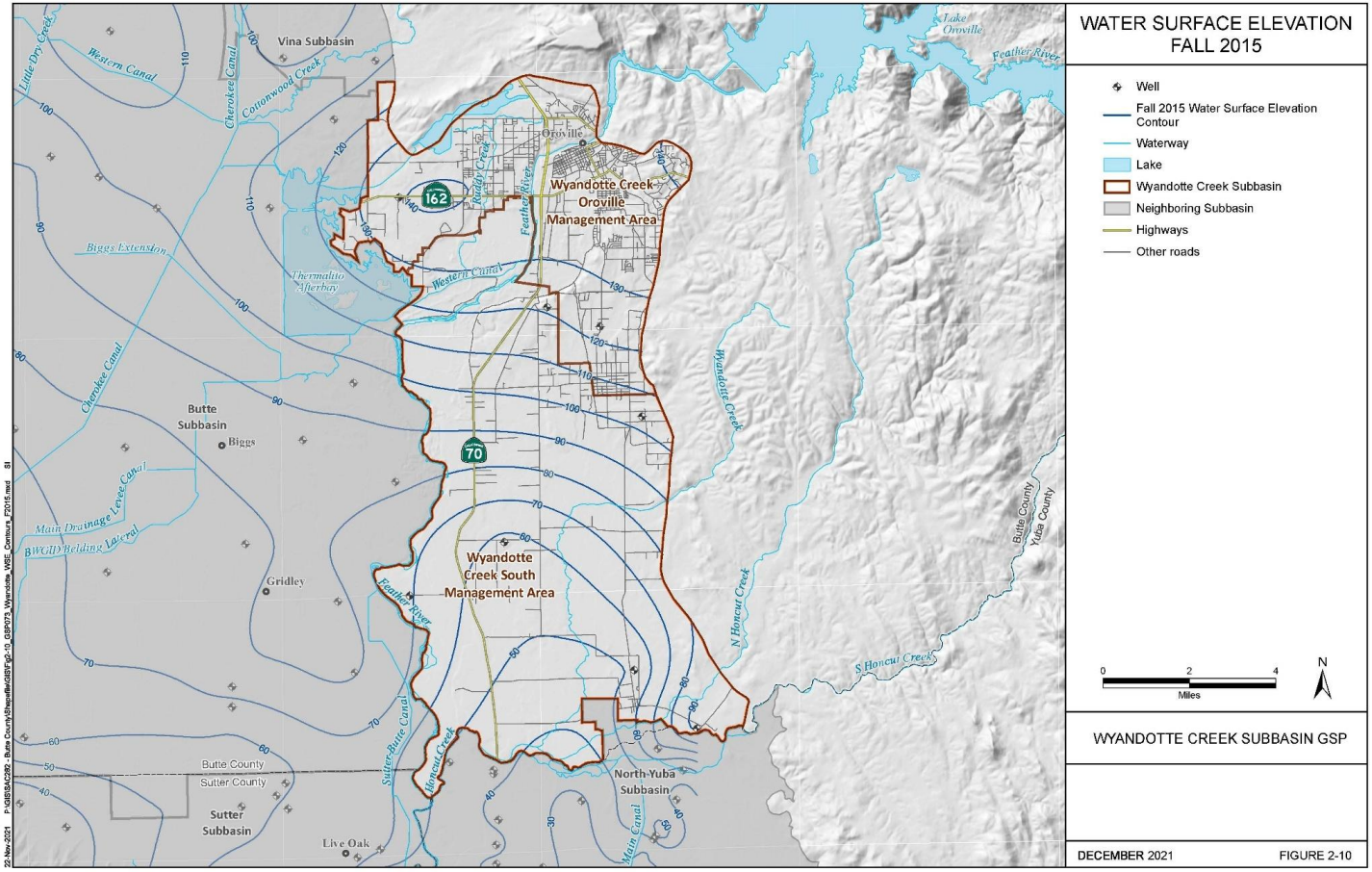
WATER SURFACE ELEVATION
FALL 2015
Well
Fall 2015 Water Surface Elevation Contour
Waterway
Lake
Wyandotte Creek Subbasin
Neighboring Subbasin
Highways
Other roads
Wyandotte Creek Oroville Management Area
Wyandotte Creek South Management Area
Vina Subbasin
Butte Subbasin
North Yuba Subbasin
Sutter Subbasin
Butte County
Sutter County
Yuba County
Oroville
Biggs
Gridley
Live Oak
Lake Oroville
Feather River
Western Canal
Cherokee Canal
Biggs Extension
Thermalito Afterbay
Main Drainage Levee Canal
BWGID Belding Lateral
Sutter-Butte Canal
Main Canal
Wyandotte Creek
N Honcut Creek
S Honcut Creek
Honcut Creek
Ruddy Creek
Little Dry Creek
Cottonwood Creek
0
2
4
Miles
N
WYANDOTTE CREEK SUBBASIN GSP
DECEMBER 2021
FIGURE 2-10

Figure 2-10 ~~placeholder page~~: Water Surface Elevation Contours (Fall 2015)

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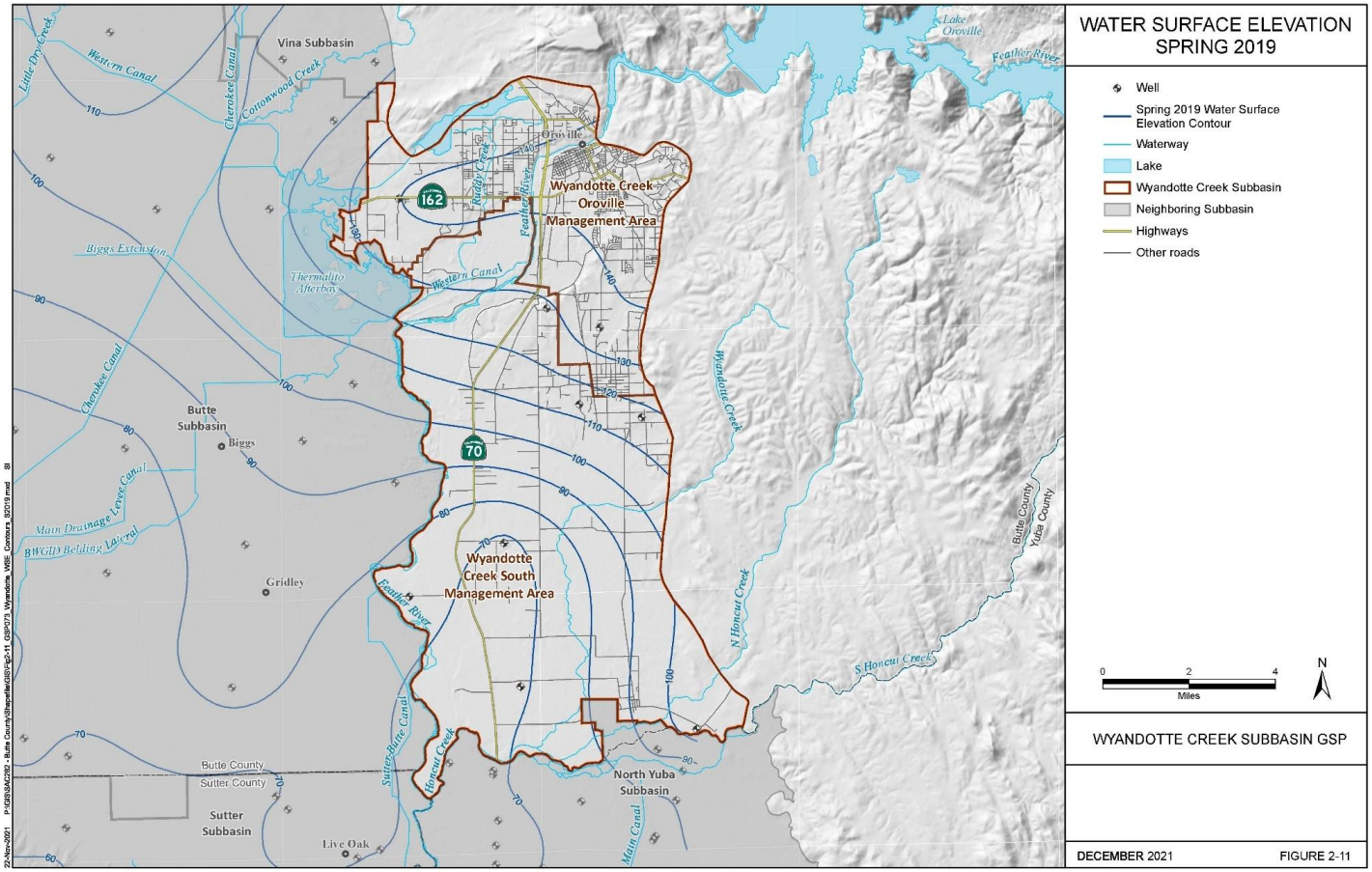

Figure 2-11 ~~placeholder page~~: Water Surface Elevation Contours (Spring 2019)

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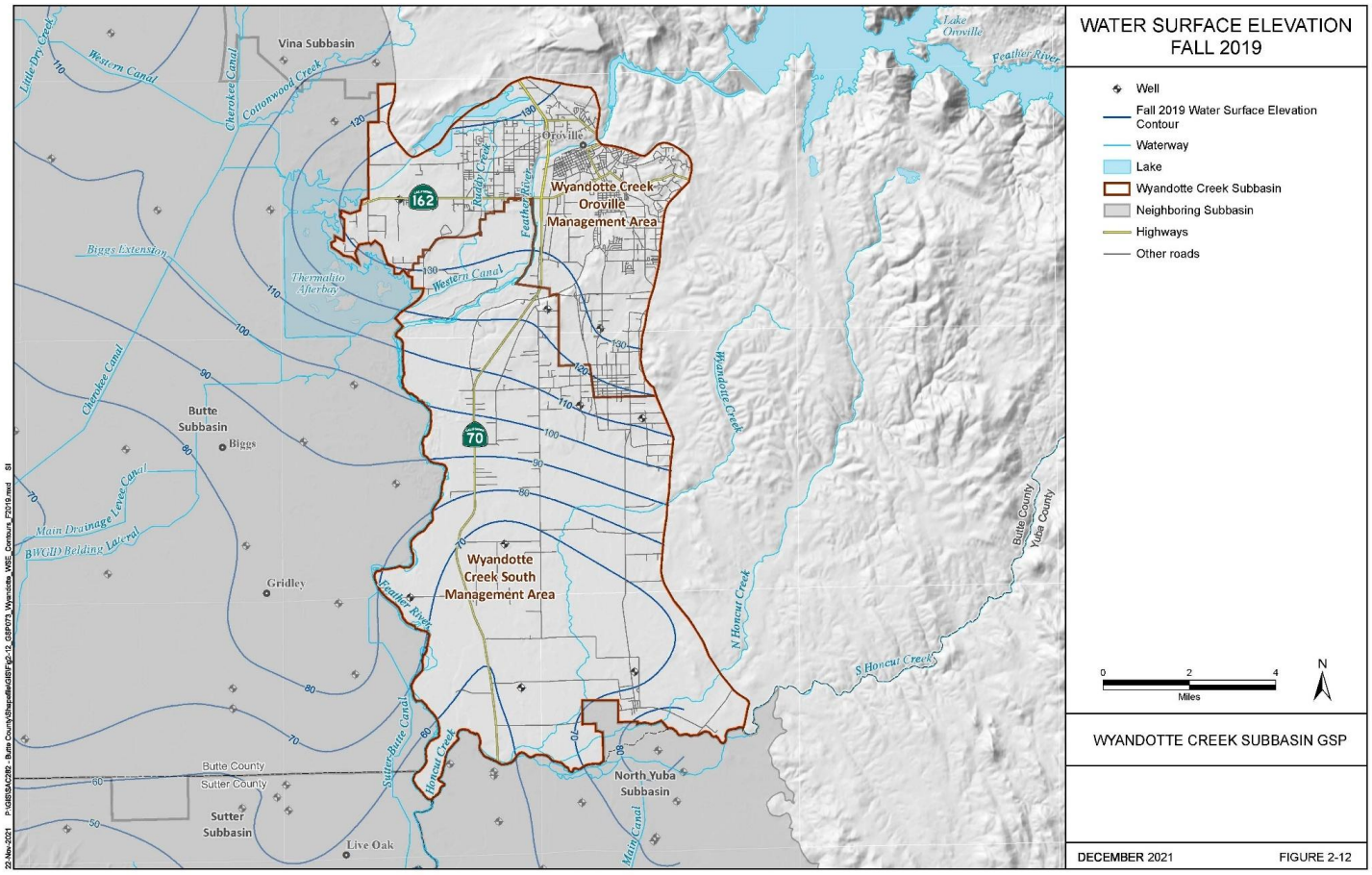

Figure 2-12 ~~placeholder page~~: Water Surface Elevation Contours (Fall 2019)

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2.2.2.2 Lateral/vertical Gradients

Lateral groundwater gradients generally reflect ground surface topography. In the foothills east of the Wyandotte Creek Subbasin the gradient is steep, as high as 60 feet per mile. However, in most of the subbasin itself, the gradient is gradual at approximately 3 feet per mile, with the gradient influenced both by the terrain and by the groundwater mound fed by seepage from Thermalito Afterbay.

Figure 2-13 is a map of the Wyandotte Creek Subbasin's Oroville MA that displays hydrographs of selected monitoring wells, and Figure 2-14 is a similar map of the subbasin's South MA. Just as comparison of the spring and fall contours indicated the shift in groundwater elevations that typically occurs between the seasons, the hydrographs display annual oscillations in elevations as well as trends over the monitoring period, snapshots of which are captured in comparison between the 2015 and 2019 contours. Each of the hydrographs displays water surface elevations in feet amsl and also gives the depth of the bottom of the well which indicates the location of the zone being measured.

All of the hydrographs are taken from single completion wells where only one aquifer zone is screened. As discussed in Chapter 4, as part of the Technical Support Services program (TSS), DWR completed installation of a nested monitoring well (Figure 4-6). However, no water levels ~~have been~~were collected from this well for inclusion into the 2022 GSP.

Hydrographs for the selected wells in the Wyandotte Creek Subbasin are similar to the seasonal fluctuations illustrated in the contour maps with depths to groundwater at all locations being shallower in the winter and spring than in the summer and fall. Wells in the vicinity of Oroville tend to have higher groundwater elevations than those to the south and west because of higher ground surface elevations at those locations and because of recharge from the foothills. While wells in the eastern portion of the subbasin show periods when high levels of pumping cause water levels to drop during the summer, groundwater elevations tend to rebound to consistent elevations over the winter.

As would be expected, wells located near major water bodies such as the Thermalito Afterbay and the Feather River display stable groundwater elevations due to their proximity to these features. These hydrographs also display the strong gradient that exists between spring groundwater elevations observed in the northeastern quadrant of the subbasin, where elevations between 140 and 160 feet amsl are typical, and those observed in the southwestern quadrant, where groundwater elevations are near or shallower than 90 feet amsl.

Vertical groundwater gradients are typically measured by comparing groundwater elevations using multi-completion or nested wells that are designed to measure elevations from different aquifer zones. If groundwater levels in the shallower zone are higher than in the deeper ones, the gradient allows downward movement of groundwater. In locations where groundwater levels in the shallower zone are lower than in the deeper zones, the gradient encourages upward movement of groundwater. In locations where groundwater levels are similar in elevation and track each other in fluctuations across two or more zones, there is no vertical gradient and no vertical movement of groundwater. One of the data gaps observed in the Wyandotte Creek Subbasin is the lack of nested monitoring wells needed to observe and interpret vertical groundwater gradients in the subbasin.

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~~Figure 2-13 placeholder page~~

~~Figure 2-14 placeholder page~~

Installation of shallow wells (with multiple completions) in 2026 funded by the SGM grant program help to address this data gap.

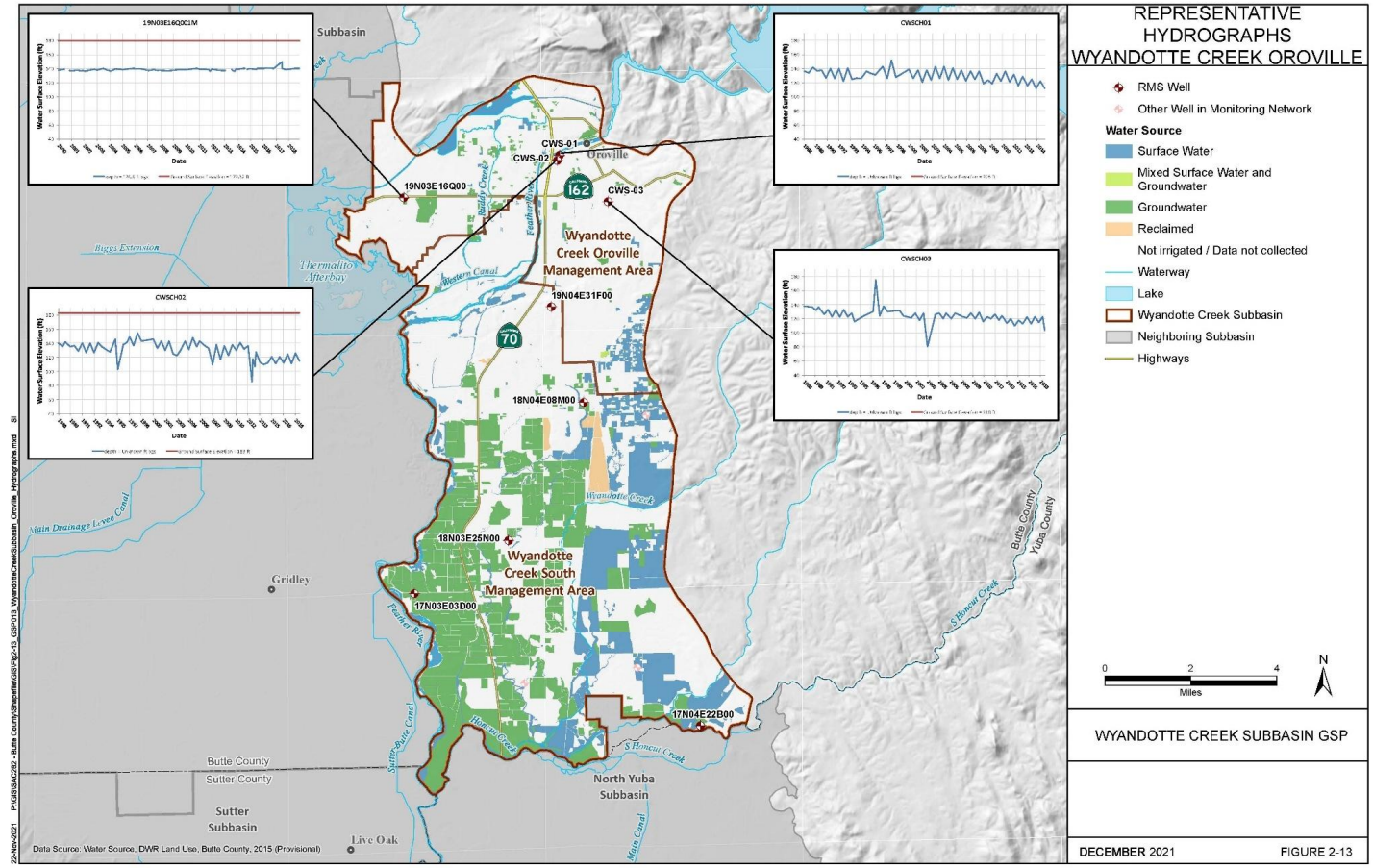

Figure 2-13: Representative Hydrographs (Wyandotte Creek Oroville Management Area)

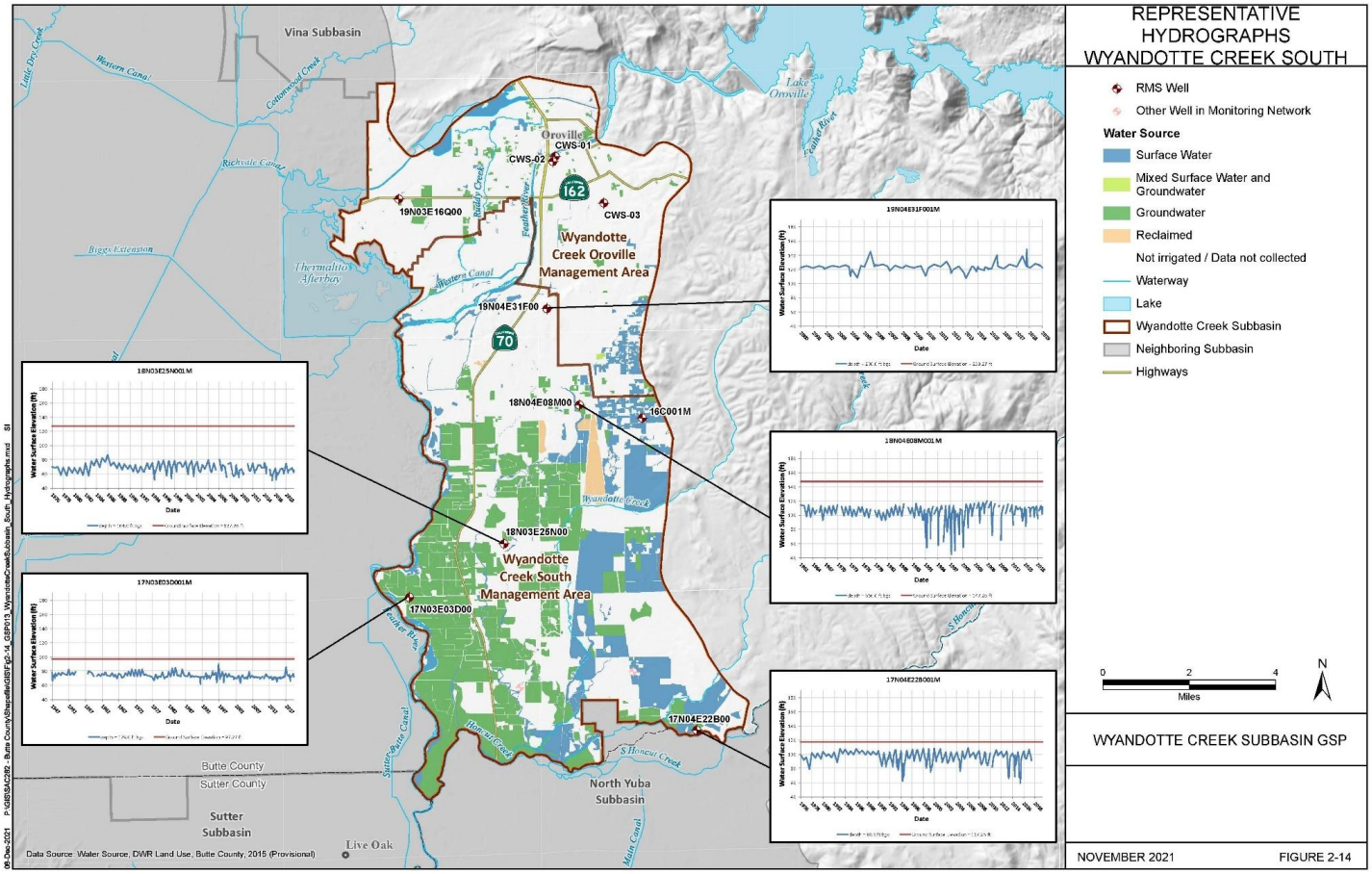

Figure 2-14: Representative Hydrographs (Wyandotte Creek South Management Area)

2.2.2.3 Regional Patterns

The series of contour maps and hydrographs presented above complement each other in showing how groundwater levels respond to seasonal variations in demand and recharge and are affected by long-term events such as the recent drought. The patterns in groundwater conditions observed in the Wyandotte Creek Subbasin resemble those found throughout the region and are driven by similar forces. However, groundwater conditions in the Wyandotte Creek Subbasin tend to be moderated by recharge from precipitation, canal seepage and the proximity of Thermalito Afterbay and the foothills. Although the Wyandotte Creek Subbasin receives little groundwater inflow from the north, the subbasin does contribute groundwater to areas to its south.

2.2.2.4 Change in Storage

Change in groundwater storage is the product of the volume of aquifer material lying between groundwater elevations at the beginning and end of the period over which the change takes place and 'storage' values representing the storage capacity of a unit of aquifer material. The heterogeneity of the lithology of the shallow, unconfined, and confined zones results in a wide range of values for storage: specific yield for unconfined zones and coefficient of storage for confined zones.

Groundwater storage in the Wyandotte Creek Subbasin follows a pattern typical of much of the Sacramento Valley where during normal to wet years, water stored in the aquifer system is withdrawn over the summer when demand is high, and the main pathways for recharge are deep percolation of precipitation and irrigation applications, canal seepage, and seepage from Thermalito Afterbay. As illustrated in the water budget, in many years, reductions in storage during the summer are replenished by precipitation over the winter allowing storage to rebound by the following spring.

Review of the hydrographs from monitoring wells in the Wyandotte Creek Subbasin demonstrates the influence of the Wyandotte Creek Subbasin's location with the foothills to the east, the Feather River to the west and Thermalito Afterbay to the northwest as factors that stabilize both groundwater elevations and groundwater storage. While the Afterbay, canal seepage and the foothills are important sources of recharge, the prevailing groundwater gradients allow groundwater to flow to the river and to subbasins to the south. Outflows to the river and to the south increase when inflows to the Wyandotte Creek Subbasin increase causing gradients to the south and to the river to steepen. The dynamics of the interaction between inflows, outflows, changes in groundwater elevations and changes in storage are captured in the water budget described later in the Basin Setting and by the BBGM.

A graph depicting estimates of the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type based on the Sacramento Valley Water Year Index[5] is provided in Figure 2-15. ~~Water year types are identified as wet (W, shaded blue), above normal (AN, shaded green), below normal (BN, shaded yellow), dry (D, shaded orange), or critical (C, shaded red). Annual change in storage was estimated using the BBGM based on March groundwater storage~~

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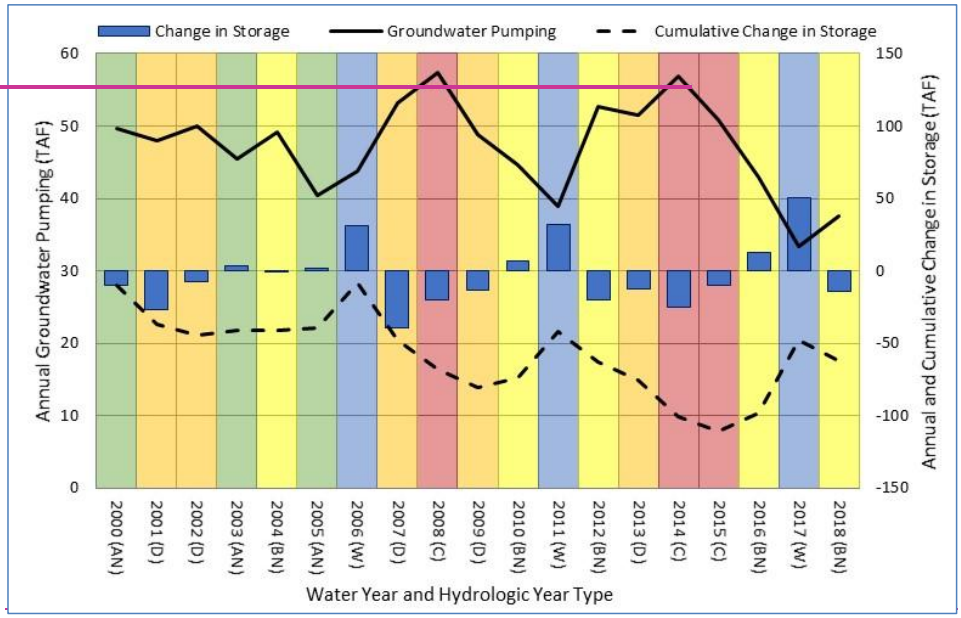
[5] Additional details describing the Sacramento Valley Water Year Index are available from the California Data Exchange Center (https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST).

~~amounts. Groundwater pumping was estimated using the BBGM and is shown on a water year basis.[6] Values are reported in TAF.~~

The change in groundwater storage is estimated based on the change in measured spring-to-spring groundwater levels at each GWL RMS well, multiplied by the area of a Thiessen polygon surrounding that RMS well (defining a representative area for each RMS well) and a representative storage coefficient of 0.1 for the subbasin. The groundwater pumping is estimated through measurements (agricultural, municipal/industrial), calculations (rural residential), and estimates (municipal/industrial). and is shown on a water year basis.[7]

As indicated in the figure, groundwater storage has generally decreased in dry and critical years and increased in wet years. In above normal and below normal years, changes in storage are smaller and less predictable, with increases in some years and decreases in others. For the recent historical period, which was marked by relatively dry conditions from 2007 to 2016~~,~~ (with the exception of the wet year of 2011) and 2020-2022, there has generally been a decline in groundwater storage within the subbasin. Historical and projected changes in storage are discussed in greater detail in Section 2.3, Water Budget.



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[6] ~~A water year is defined as the period from October 1 of the prior year to September 30 of the current year. For example, water year 2000 refers to the period from October 1, 1999, to September 30, 2000.~~

[7] A water year is defined as the period from October 1 of the prior year to September 30 of the current year. For example, water year 2000 refers to the period from October 1, 1999, to September 30, 2000.

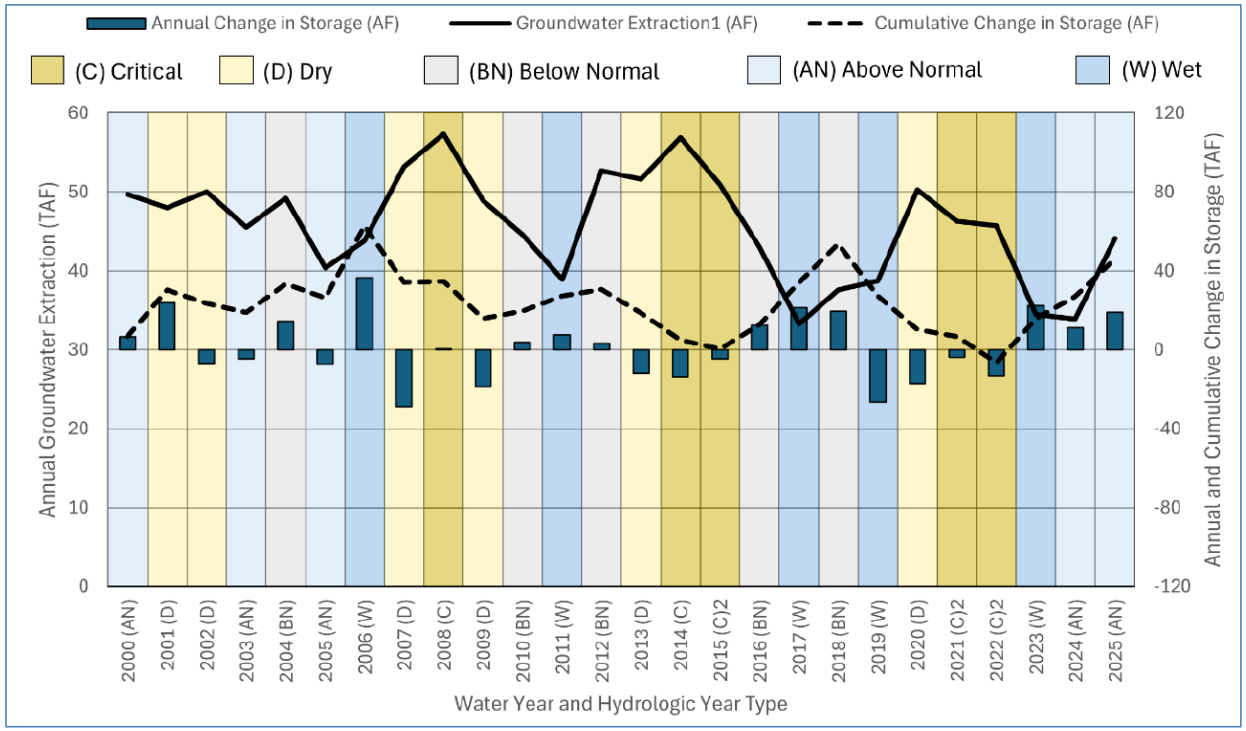

Figure 2-15: Change in Storage and Groundwater Pumping by Water Year Type~~.~~
~~**AN – above normal, D – dry, BN – below normal, W – wet, C – critical.**~~

Note: TAF = thousand acre-feet

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2.2.3 Seawater Intrusion

Intrusion of seawater is not a consideration in the Wyandotte Creek Subbasin because of the subbasin's location. For this reason, no monitoring of seawater intrusion is required nor is there a need for projects and management actions to mitigate seawater intrusion.

2.2.4 Groundwater Quality

2.2.4.1 Current Conditions

The primary water chemistry in the area indicates calcium magnesium bicarbonate or magnesium calcium bicarbonate groundwater. Some magnesium bicarbonate can be found in the northwest portion of the subbasin (DWR, 2006). The generally good water quality characteristics of the subbasin are apparent in the overall salinity of groundwater. In general, total dissolved solids (TDS) concentrations in the study area are below 500 milligrams per liter (mg/L) throughout the subbasin (Bookman-Edmonston Engineering, Inc. 1992). Data collected from DWR water quality wells indicate a TDS range of 149 to 655 mg/L and a median of 277 mg/L (DWR, 2006). Butte County's water quality trend monitoring program measures specific conductance in monitoring wells in the subbasin. Data collected annually from 2002 through 20252025 indicate a range of 132 to 374 microsiemens per centimeter (µS/cm) for most wells, well below the secondary water quality threshold for drinking water of 900 µS/cm. There are a few isolated instances where specific conductance exceeded drinking water standards in the deeper aquifer zone. The County is monitoring these locations and will report to the GSA if high saline water moves.

In the northern part of the subbasin, groundwater occurrence is saline to brackish except locally on the margins of the valley where the formational water has been flushed with newer fresh water. Non-saline water was also observed in deeper portions of the Ione Formation in the vicinity of Oroville (Dames and Moore, 1994). Sediments that were continentally derived contain fresh to brackish water and are poorly to moderately permeable (Olmsted and Davis, 1961). In the southern part of the subbasin, numerous wells appear to be completed within the Ione Formation (boring logs identify "blue clays" believed to be indicative of the Ione Formation) that produce fresh water.~~General~~

Flooding during heavy rain is causing many domestic wells in Palermo to be cross contaminated with septic effluent. This contamination has moved into the upper groundwater aquifer. Well samples taken in 2007 and in 2021 show that up to 25% of the sampled wells in Palermo have coliform contamination above safe levels to consume. The GSA, in partnership with Butte County, is actively addressing the flooding.

~~*2.2.4.1*~~*2.2.4.2 Additional* ***Water Quality*** ~~*of Principal Aquifers*~~*Programs*

The goal of groundwater quality management under SGMA is to supplement information available from other sources with data targeted to assist ~~GSAs~~the GSA in the Wyandotte Creek Subbasin comply with the requirements of SGMA. Development of groundwater quality-related SMC for the Wyandotte Creek Subbasin is not intended to duplicate or supplant the goals and objectives of ongoing programs including Butte County, the SVWQC (SVWQC, 2016), the CRC (2019), and the State Drinking Water Information System (SDWIS).

Because irrigated agriculture is the predominant land use in the subbasin, monitoring of the groundwater quality data developed through the GQTMWP being implemented by the SVWQC and by the CRC for compliance with the CVRWQCB's ILRP will be an important source of

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information to ~~GSAs~~the GSA in the Wyandotte Creek Subbasin. The SVWQC has identified one low priority High Vulnerability Area (HVA) in the South MA of Wyandotte Creek Subbasin (SVWQC, 2016). However, this area has been classified as an HVA because of conditions that make it susceptible to contamination and not due to contaminant levels observed in the area. Additional information on the ILRP is presented in the section describing the monitoring network.

Among the contaminants that may affect groundwater conditions in the future are Chemicals of Emerging Concern (CECs). These are contaminants having toxicities not previously recognized, which may have the potential to cause adverse effects to public health or the environment and are found to be building up in the environment or to be accumulating in humans or wildlife. ~~CECs such as perfluorooctanesulfonic acid (PFOS) and per- and polyfluoroalkyl substances (PFAS) will not be monitored under the groundwater quality monitoring program established for SGMA. However, GSAs will have access to data on CECs collected by other entities and will be attentive to the presence of CECs that may impact groundwater management in specific locations.~~

The Butte County Department of Water and Resource Conservation (WRC) manages the Groundwater Quality Trend Monitoring Program to provide information on groundwater quality for GSAs. Annual data collected by the program is reported in the GSP annual reports. Program goals include establishing a baseline of water quality data to document any water quality temporal trends, and ensure that groundwater resources are well managed by documenting groundwater water quality.

Water quality samples will be collected and evaluated (as needed) to determine concentrations of other potential constituents of concern including nitrate, perfluorooctanoic acid (PFOA), and perfluorooctanoic sulfonate (PFOS) per State Water Resources Control Board recommendations[8]. All constituents currently being monitored by other agencies have been kept at reasonable levels within the Subbasin and are not impacted by groundwater pumping. Additionally, the GSA plans to develop a handout that highlights key water quality issues in the subbasin to provide to project partners to ensure projects take water quality into consideration during feasibility and design.

GSA staff and members of the consulting team stay informed regarding groundwater quality issues and mitigation programs in the Subbasin. Staff have participated in CV-SALTS webinars and have responded to CV-SALTS requests for GSA input. Additionally, point-source contaminants are managed and regulated through a variety of other programs by the Regional Water Quality Control Board, DTSC, and the EPA. Through coordination with existing agencies, the Wyandotte Creek GSA will know if existing regulations are being met or groundwater pumping activities in the Wyandotte Creek Subbasin are contributing to significant and unreasonable undesirable effects related to degraded water quality. The GSA will continue to stay engaged with these other regulatory programs.

~~2.2.4.2~~2.2.4.3 *Description and Map of Known Sites and Plumes*

The SGMA regulations require that GSPs describe locations, identified by regulatory agencies, where groundwater quality has been degraded due to industrial and commercial activity.

[8] Groundwater Quality Considerations for High and Medium Priority Groundwater Basins. State Water Resources Control Board. November 22, 2022.

Locations of impacted groundwater were identified by reviewing information available on the SWRCB Geotracker/GAMA website, the California Department of Toxic Substances Control (DTSC) EnviroStor website, and the Environmental Protection Agency's (EPA) National Priorities List (NPL). Cases that have been closed by the supervisory agency are not considered.

To identify known plumes and contamination within the Basin, SWRCB GeoTracker[9] and DTSC program[10],was reviewed for active clean-up sites of all types within the subbasin. The GeoTracker database shows one open Leaking Underground Storage Tank (LUST) site and five open cleanup program sites with potential or actual groundwater contamination located within the subbasin. Underground storage tanks (UST) are containers and tanks, including piping, that are completely or significantly below ground and are used to store petroleum or other hazardous substances. Soil, groundwater and surface water near the site can all be affected by releases from USTs. The DTSC program listed two open cases, with one potential overlap with GeoTracker. A summary of each active site is listed below.

[9] Information on these and other sites is available at https://geotracker.waterboards.ca.gov/map/?CMD=runreport&myaddress=Sacramento

[10] Information on these and other sites is available at www.envirostor.dtsc.ca.gov.

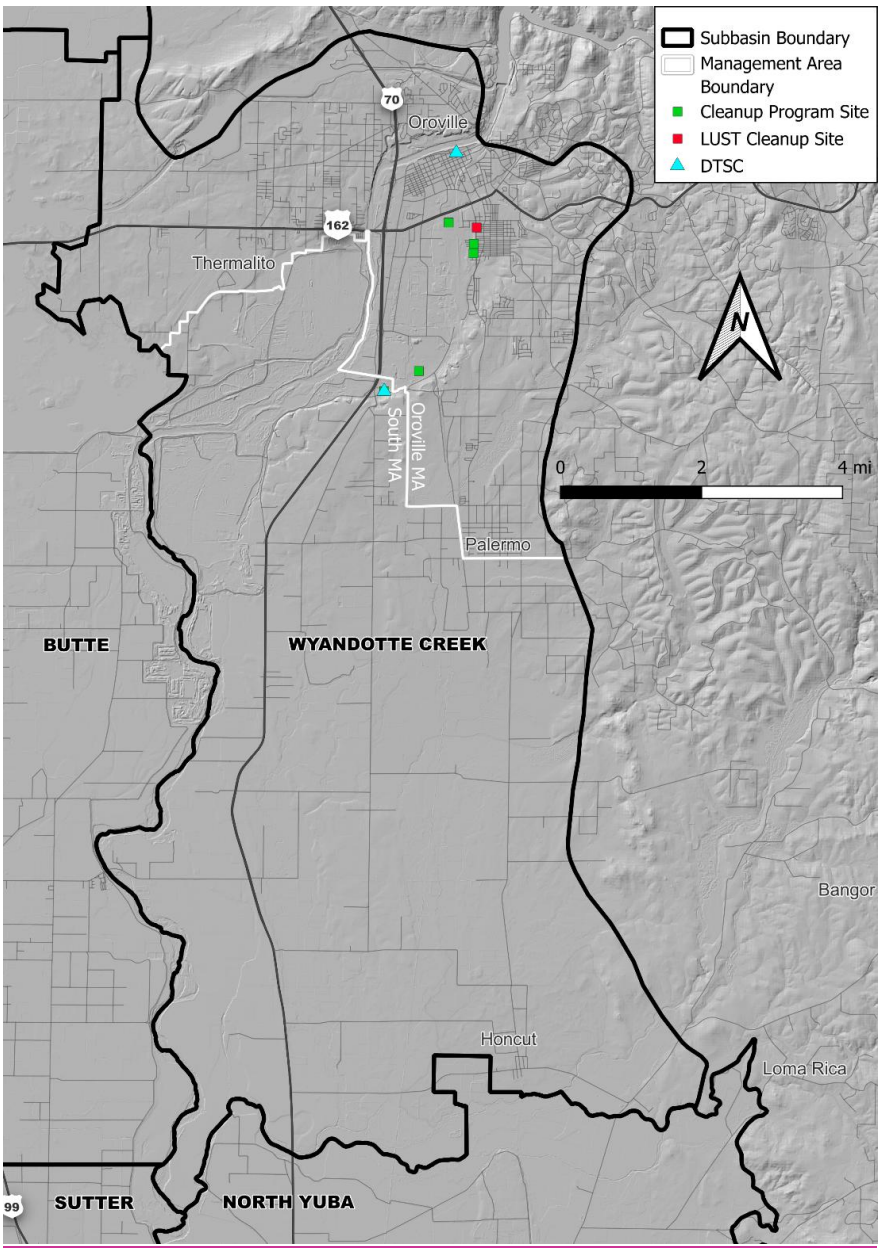
Subbasin Boundary
Management Area Boundary
Cleanup Program Site
LUST Cleanup Site
DTSC
70
Oroville
162
Thermalito
N
South MA
Oroville MA
0
2
4 mi
Palermo
BUTTE
WYANDOTTE CREEK
Bangor
Honcut
Loma Rica
99
SUTTER
NORTH YUBA

Figure ~~2-16,~~2-16, Active Contamination Remediation Sites~~, presents the locations of known impacted groundwater or potentially impacted groundwater in the Wyandotte Creek Subbasin. The sites were divided into the following categories based on regulatory designation:~~

- ~~Other Sites with Corrective Action (Current)~~

~~**Sites Needing Evaluation (**~~

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- Active ~~or Inactive)~~
- ~~Federal Superfund Listed Sites~~
- ~~Leaking Underground Storage Tank (LUST) Cleanup Sites~~

~~Figure 2-16 placeholder page~~

~~Active DTSC Cleanup Program Sites~~clean-up sites in the Wyandotte Creek Subbasin include the following:

LUST Cleanup Site

- No. T0600766902 – ATWALS:
  - Past use that caused contamination: gasoline service station
  - Potential contaminants of concern: gasoline
  - Potential Media affected: aquifer used for drinking water supply

GeoTracker Cleanup Program Sites

- No. T10000013302 – Former Mill Property:
  - Past use that caused contamination: former mill site
  - Potential contaminants of concern: Arsenic, Dioxin / Furans, Lead, Pentachlorophenol (PCP)
  - Potential Media affected: none specified
- No. SL0600770982 - Chlorinated Solvents, Unknown Rp (Oroville)
  - Past and current use that caused contamination: Potentially Responsible Party (PRP) Search Report by Partner Engineering Science, Inc.
  - Potential contaminants of concern: Chlorinated Solvents - PCE, Tetrachloroethylene (PCE)
  - Potential Media affected: Well Used For Drinking Water Supply
- No. T10000013678 - Delallo Italian Foods, Inc
  - Past and current use that caused contamination: Olive processing and packing companies
  - Potential contaminants of concern: Tetrachloroethylene (PCE)
  - Potential Media affected: Under Investigation
- No. T10000012642 - Koppers Co. Inc. (Oroville Plant) Superfund Site
  - Past and current use that caused contamination: wood treating facility
  - Potential contaminants of concern: Arsenic, Boron, Chromium, Copper, Dioxin / Furans, Pentachlorophenol (PCP), Polynuclear Aromatic Hydrocarbons (PAHS)
  - Potential Media affected: Soil, Well Used For Drinking Water Supply
- No. T10000000611 - Chico Scrap Metal - Ophir Road Facility
  - Past and current use that caused contamination: accumulation of materials related to salvage and metal recycling
  - Potential contaminants of concern: Arsenic, Chromium, Copper, Lead, Polychlorinated Biphenyls (PCBS), Silver
  - Potential Media affected: Soil

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DTSC Cleanup Program Sites

- No. 60000689 – Ophir Road Property:
  - Past use that caused contamination: junkyard, recycling, sand blasting
  - Potential contaminants of concern: metals, polychlorinated biphenyls (PCBs)
  - Potential Media affected: soil
- No. 60001282 – Pacific Gas and Electric Company (PG&E) Former Oroville Manufactured Gas Plant Site:
  - Past use that caused contamination: manufactured gas plant
  - Potential contaminants of concern: arsenic, cyanide, lead, polynuclear aromatic hydrocarbons (PAHs); total petroleum hydrocarbons (TPH)-diesel
  - Potential media affected: aquifer used for drinking water supply, soils, soil vapor
- ~~No. 60002933 – St. Francis Mine – site under evaluation:~~
  - ~~Past uses that caused contamination: none specified~~
  - ~~Contaminants of concern: none specified~~
  - ~~Potential media affected: none specified~~

~~Of the three open cases within the boundaries of the Wyandotte Creek Subbasin, only the former Oroville manufactured gas plant site has been confirmed as impacting groundwater. Information on these and other sites is available at www.envirostor.dtsc.ca.gov.~~

Active and Inactive Contamination Remediation Sites are shown in Figure 2-16, presenting the locations of known impacted groundwater or potentially impacted groundwater in the Wyandotte Creek Subbasin. The sites were divided into the following categories based on regulatory designation:

- Leaking Underground Storage Tank (LUST) Cleanup Sites (Active or Inactive)
- Cleanup Program Sites (Active or Inactive)
- Military Cleanup Sites (Active or Inactive)
- DTSC (Active or Inactive)

The GSA may periodically review all contamination plumes within the Subbasin to monitor the potential impact to groundwater. In coordination with state agencies, potential constituents of concern will also be monitored to track potential transport into new areas of the subbasin.

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2.2.5 Land Subsidence

2.2.5.1 Rates and Locations

The SGMA regulations define the MT for significant and unreasonable land subsidence to be the "rate and the extent of land subsidence." Unlike other sustainability indicators (SIs), the harmful effects of subsidence result from the damage it may cause to critical infrastructure and the costs of repairing or mitigating those damages. Critical infrastructure in the Wyandotte Creek Subbasin that could be affected by subsidence includes county, and state highways, power transmission lines and water conveyance and distribution facilities.

Land subsidence is a gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials often caused by groundwater or oil extraction. The potential effects of land subsidence include differential changes in elevation and gradients of stream channels, drain and water transport structures, failure of water well casings due to compressive stresses generated by compaction of aquifer system, and compressional strain in engineering structures and houses. Inelastic land subsidence is a major concern in areas of active groundwater extraction due to infrastructure damage, permanent reduction in the groundwater storage capacity of the aquifer, well casing collapse, and increased flood risk in low lying areas. To date, no inelastic land subsidence has been recorded in Wyandotte Creek Subbasin or surrounding subbasins.

Processes that can contribute to land subsidence include aquifer compaction by overdraft, hydrocompaction (shallow or near-surface subsidence) of moisture deficient deposits above the water table that are wetted for the first time since deposition, and subsidence caused by tectonic forces (Ireland et al., 1984). Land subsidence in the Wyandotte Creek Subbasin would most likely occur as a result of aquitard consolidation. An aquitard is a saturated geologic unit that is incapable of transmitting significant quantities of water. As the pressure created by the height of water (i.e., head) declines in response to groundwater withdrawals, aquitards between production zones are exposed to increased vertical loads. These loads can cause materials in aquitards to rearrange and consolidate, leading to land subsidence. Factors that influence the rate and magnitude of consolidation in aquitards include mineral composition, the amount of prior consolidation, cementation, the degree of aquifer confinement and aquitard thickness.

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Subsidence has elastic and inelastic deformation components. As the head lowers in the aquifer, the load that was supported by the hydrostatic pressure is transferred to the granular skeletal framework of the formation. As long as the increased load on the formation does not exceed the pre-consolidation pressure, the formation will remain elastic. Under elastic conditions, the formation will rebound to its original volume as hydrostatic pressure is restored. However, when the head of the formation is lowered to a point where the load exceeds pre-consolidation pressure, inelastic deformation may occur. Under inelastic consolidation, the formation will undergo a permanent volumetric reduction as water is expelled from ~~aquitards4.~~

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~~To determine whether subsidence is occurring, a subsidence monitoring network has been established throughout the Sacramento Valley, the Sacramento Valley GPS Subsidence Monitoring Network. This system consists of observation stations and extensometers managed jointly by Reclamation and DWR. The observation stations are a result of DWR's efforts to establish a subsidence monitoring network to capture changes in subsidence across the Sacramento Valley. The observation stations are established monuments with precisely surveyed land surface elevations, which are distributed throughout the County such that the entire county is well represented. In 2008, DWR along with numerous partners performed the initial GPS survey of the observation stations to establish a baseline measurement for future comparisons. The network was resurveyed again in 2017 (DWR, 2018b) using similar methods and equipment as those used in the 2008 survey and results were analyzed to depict the change in elevation at each station between those two years.~~

~~Extensometers are installed in wells or boreholes and are a more site-specific method of measuring land subsidence as they can detect changes in the thickness of the sediment surrounding the well due to compaction or expansion. These instruments are capable of detecting~~aquitards

~~very slight changes in land surface elevation on a continuous basis with an accuracy of +/- 0.01 feet or approximately 3 millimeters. The three extensometers in Butte County are all located outside of the Wyandotte Creek Subbasin.~~

~~Recent subsidence studies in the Central Valley have utilized satellite- and aircraft-based Interferometric Synthetic Aperture Radar (InSAR). Much of the InSAR work has been led by the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL). However, because JPL InSAR data is limited to a period from 2015 through 2017, TRE ALTIMIRA InSAR available through DWR was used for this analysis as data from this source is available for a period extending from June 2015 through September 2019.~~

2.2.5.2 Historical and Recent Cumulative Subsidence and Rates of Subsidence

Historical data from monuments in the Sacramento Valley Global Positioning System (GPS) Subsidence Monitoring Network were used to track cumulative subsidence from 2008 to 2017 and InSAR data is used from 2015 to present. The data shown in Table 2-2 includes the range of cumulative subsidence observed within the Wyandotte Creek Subbasin over the period between 2008 and 2017 as reported by Sacramento Valley GPS Subsidence Monitoring stations included in the Wyandotte Creek Subbasin Monitoring Network and a range of annual subsidence rates calculated from the cumulative totals. The range of recent cumulative subsidence and rates of subsidence over the period from June 2015 through September 2019 and 2020 to 2025 is also presented in the table and are based on InSAR data. As both the Sacramento Valley GPS monuments and InSAR monitor changes in land surface elevations, the data do not distinguish between elastic and inelastic subsidence, however the cumulative subsidence values observed by both sources indicate that inelastic subsidence is not significant in the Wyandotte Creek Subbasin.

Table 2-2: Cumulative Subsidence and Approximate Annual Rate of Subsidence

Subbasin Area (square miles)	Date Range	Cumulative Subsidence (feet)	Calculated Annual Rate of Subsidence (feet/year)	Source
93	2008-2017	0.038 to -0.015	0.004 to -0.002	Sac Valley
93	2015-2019	0.25 to -0.25	0.063 to -0.063	InSAR
93	2020-2025	-0.015 to -0.072	-0.003 to -0.0144	InSAR

Figures 2-17A and 2-17B show historical and recent levels of subsidence within the Wyandotte Creek Subbasin. Historical levels for the period comparing 2008 to 2017 are shown in Figure 2-17A – Historical Subsidence and are the locations of subsidence monitoring network monuments used to measure subsidence. Recent levels for the period from 2015 through 2019 are presented in Figure 2-17B – Recent Subsidence. The values presented in Table 2-2 and in Figures 2-17A and 2-17B support the observation that inelastic land subsidence due to groundwater withdrawal is unlikely to result in an Undesirable Result in the Wyandotte Creek Subbasin, and both figures show subsidence to be uniform over the subbasin.

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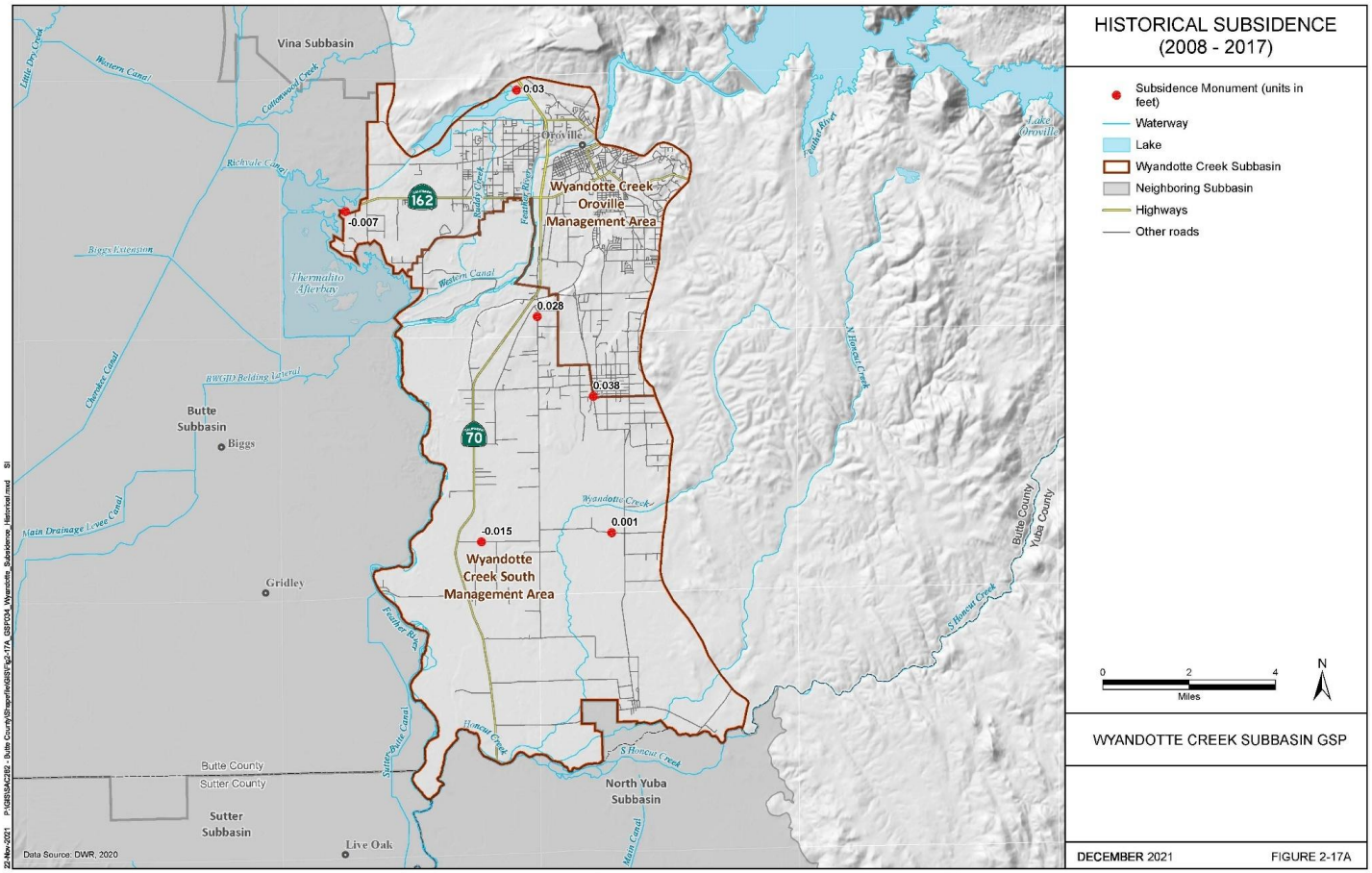

Figure 2-17A: Historical Subsidence in the Wyandotte Creek Subbasin (2008 and 2017)

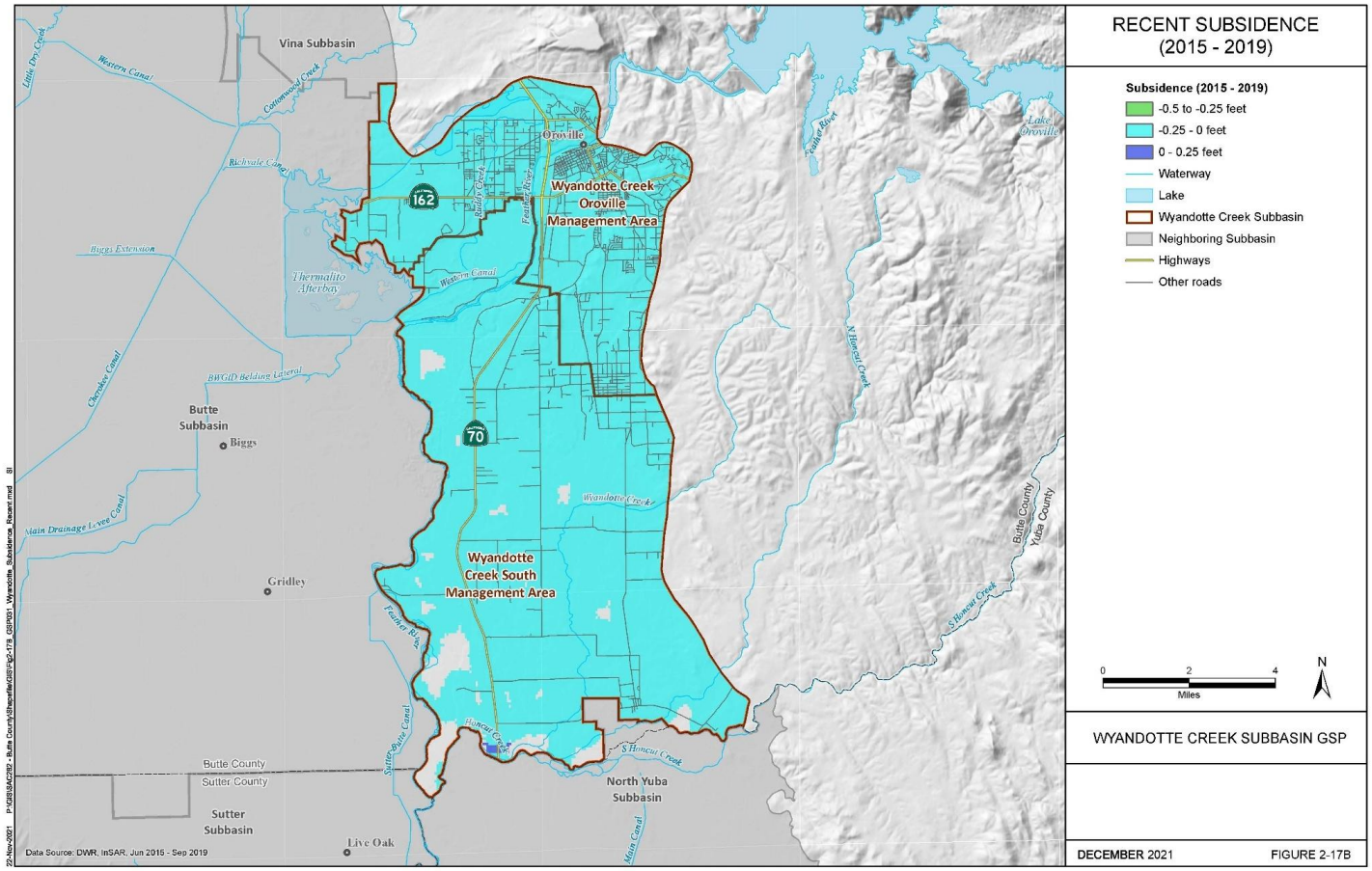

Figure 2-17B**: Recent Subsidence in the Wyandotte Creek Subbasin (2015 through 2019)**

2.2.6 Interconnected Surface Water Systems

This section describes ISW interactions and presents preliminary results identifying where ISW exist, using multiple lines of evidence (model results, groundwater elevations, water quality isotopes); the location, timing, and quantity of depletions; and remaining data gaps. ISW were identified using the BBGM, measured groundwater elevation data representative of the shallow aquifer, and an isotope study. Results from each method are presented in the following sections.

2.2.6.1 Streamflow Depletion and Accretion

The term interconnected surface water systems describes surface water features that are hydraulically connected by a continuous saturated zone to an underlying aquifer such that changes in elevations of either the aquifer or the surface water features propagate throughout the interconnected system. Within the Wyandotte Creek Subbasin, it is likely that surface water features, specifically the Feather River, are interconnected with shallow groundwater.

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Interconnected surface waters are classified as either gaining or losing with respect to the condition of the surface water feature with gaining reaches gaining thorough accretion of groundwater and losing reaches losing through depletion to groundwater. It is important to recognize that these interconnections are dynamic and are affected by factors including variations in local geology, hydrology and water use.

~~Figure 2-17A placeholder page~~

~~Figure 2-17B placeholder page~~

Thus, at a single point in time, a stream may have both gaining and losing reaches and reaches that are gaining under certain seasonal, or long-term hydrologic and water use conditions may become losing under others. Moreover, changes in water use or hydrology may cause interconnected surface water features to decouple from the groundwater system.

Direct measurement of interactions between groundwater systems and surface water features is difficult because of the need for a monitoring system that tracks both stream stage and groundwater elevations at nearby locations. Therefore, the interaction between groundwater systems and surface water features within the Wyandotte Creek Subbasin is analyzed through use of the BBGM which, absent the presence of a monitoring system dedicated to assessing interactions at selected locations, integrates information from groundwater monitoring wells and stream stages to model gradients that control flow between surface water and groundwater.

The difference between gaining and losing reaches is illustrated in Figure 2-18. For gaining reaches, the water table adjacent to the stream is above the elevation of water in the stream, resulting in flow of water from the groundwater system to the stream (gains or accretions). For losing reaches, the water table adjacent to the stream is below the elevation of water in the stream, resulting flow of water from the stream to the groundwater systems (losses or seepage). In both cases, flows in the stream are directly connected to the groundwater system, with no unsaturated zone present beneath the streambed.

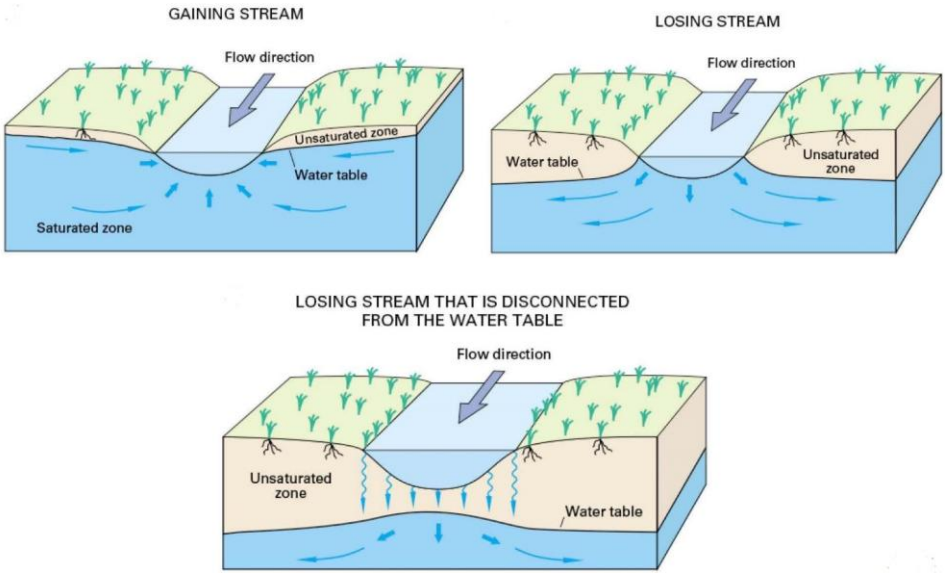

Figure 2-18: Illustration of Gaining and Losing Interconnected and Disconnected Stream Reaches (Source: USGS)

Butte Basin Groundwater Model~~Direct measurement of interactions between groundwater systems and surface water features is difficult because of the need for a monitoring system that~~

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~~tracks both stream stage and groundwater elevations at nearby locations (see Section 4.2). Therefore, the interactions between groundwater systems and surface water features within the Butte Subbasin are estimated through use of the BBGM which integrates information from groundwater monitoring wells and stream stages to model gradients that control flow between surface water and groundwater.~~

~~The BBGM~~

BBGM version 1.3 was utilized to evaluate stream segments ~~within the subbasin~~ of the Feather River and Honcut Creek along the border of the Subbasin and to classify ~~them~~segments as being primarily gaining or losing over the historical period from water year 2000 to ~~2018~~2024. A total of seven stream segments traversing or bounding the ~~subbasin~~Subbasin with a total length of approximately 42 miles were defined. Characteristics of the stream segments (cross section, parameters etc.) are described in Butte Basin Groundwater Model Documentation v 1.0 (Butte County, 2021). The segments range in length from 3.4 to 7.3 miles with an average length of 5.3 miles and are shown in Figure 2-19. The results of this analysis are shown in Figure 2-20. The figure shows the ~~percent~~percentage of months for the period from water year 2000 to ~~2018~~2024 with gaining conditions and classifies streams as primarily gaining (gaining conditions more than 80% of the time), primarily losing (losing conditions more than 80% of the time), or mixed. As indicated in Figure 2-20, stream segments representing the Feather River appear to be gaining more than 80% of the time. North Honcut Creek and South Honcut Creek both appear to experience gaining conditions less than 50% of the time transitioning from gaining to losing depending on time of year.

~~To further evaluate the interconnectedness of streams with the groundwater system in the basin, streambed elevations at individual stream nodes from the BBGM were compared to groundwater elevations from spring groundwater level measurements provided by DWR as part of the SGMA Data Viewer.[11] Spring groundwater levels were available for 2014 to 2018. As indicated in Figure 2-21, the vast majority of stream nodes within the subbasin had spring groundwater levels within 10 feet of the estimated streambed elevation.~~

Based on consideration of the frequency with which stream segments are gaining based on BBGM results and on consideration of the spring depth to groundwater below the estimated streambed depth along each primary stream, it is likely that all streams traversing or bounding the subbasin are connected to the groundwater system.

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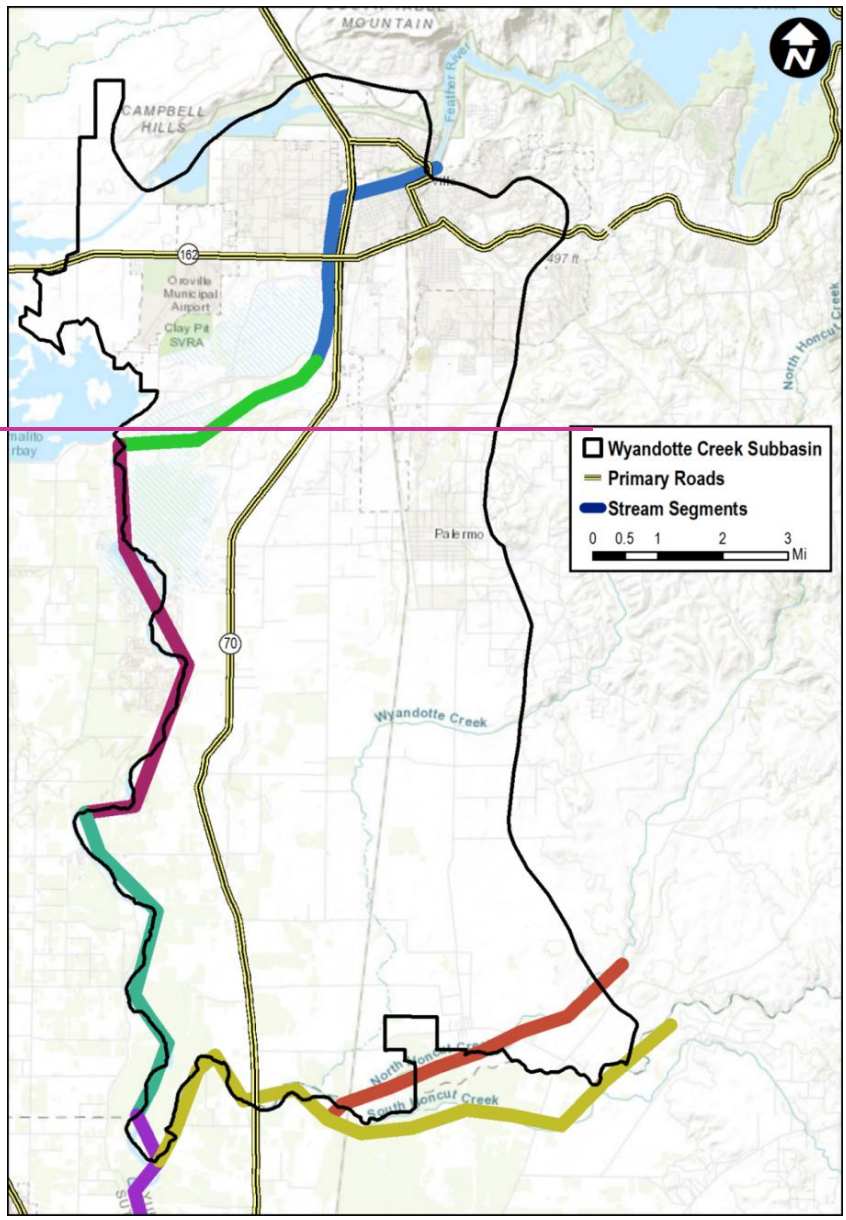
~~[11] Accessed at https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels.~~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Feather River
CAMPBELL HILLS
162
Oroville Municipal Airport
Clay Pit SVRA
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Wyandotte Creek Subbasin
Primary Roads
Stream Segments
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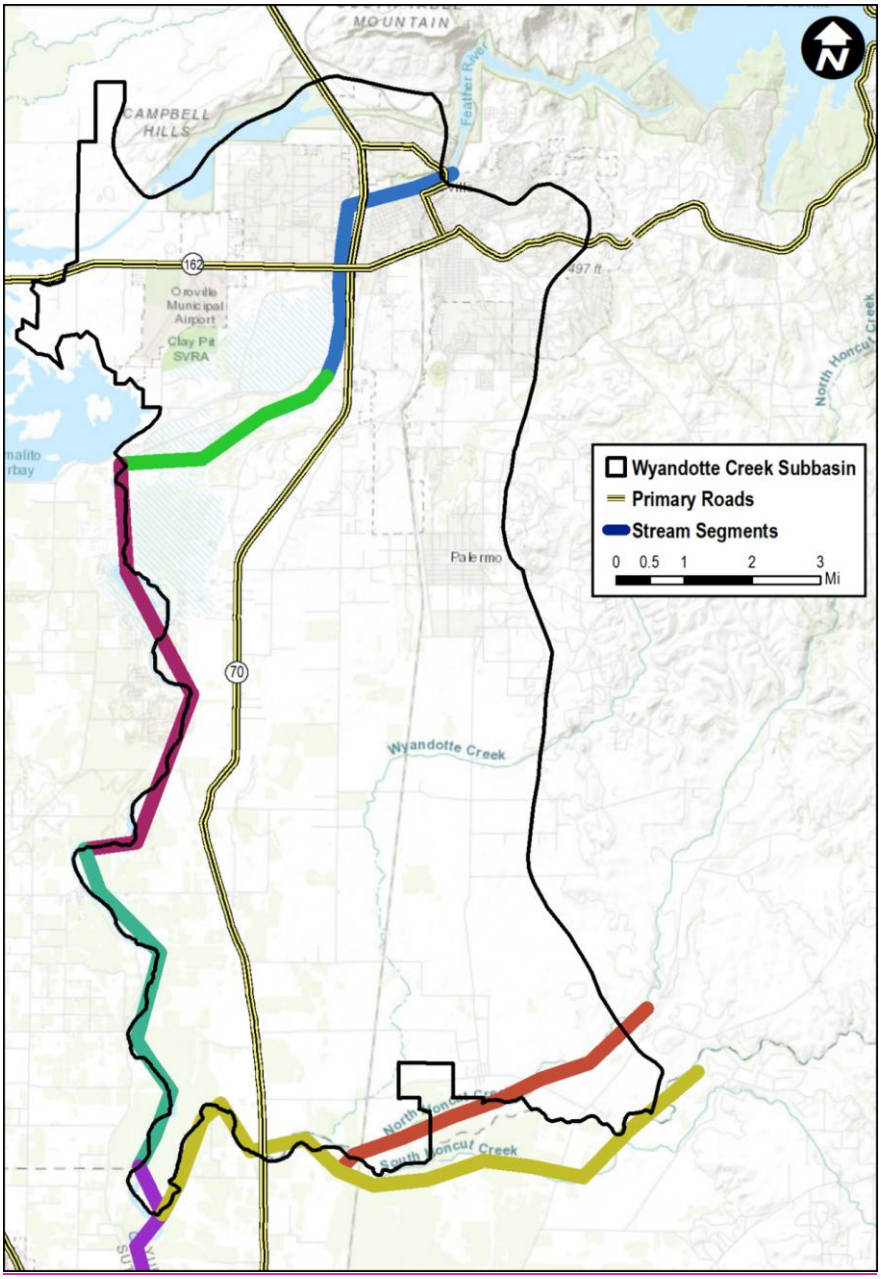
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North Honcut Creek
Wyandotte Creek Subbasin
Primary Roads
Stream Segments
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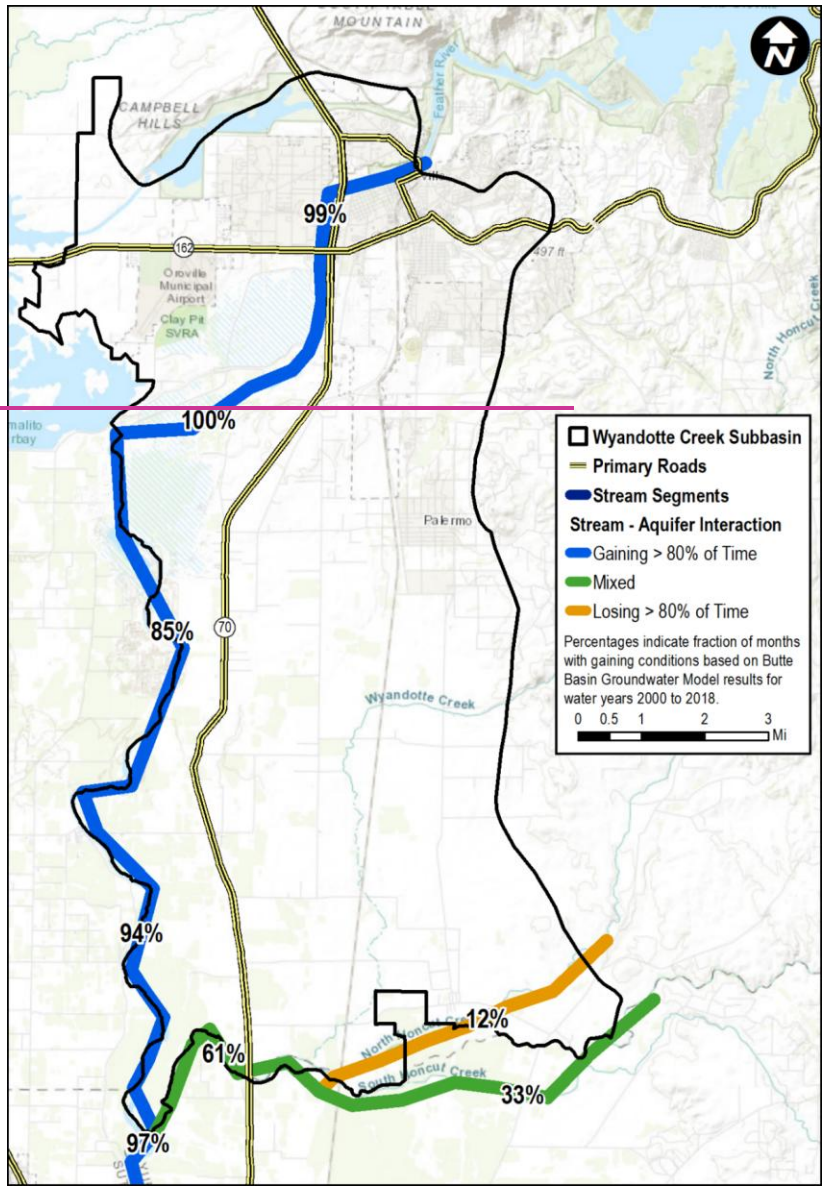
South Honcut Creek

Figure 2-19: Wyandotte Creek Subbasin Stream Segments



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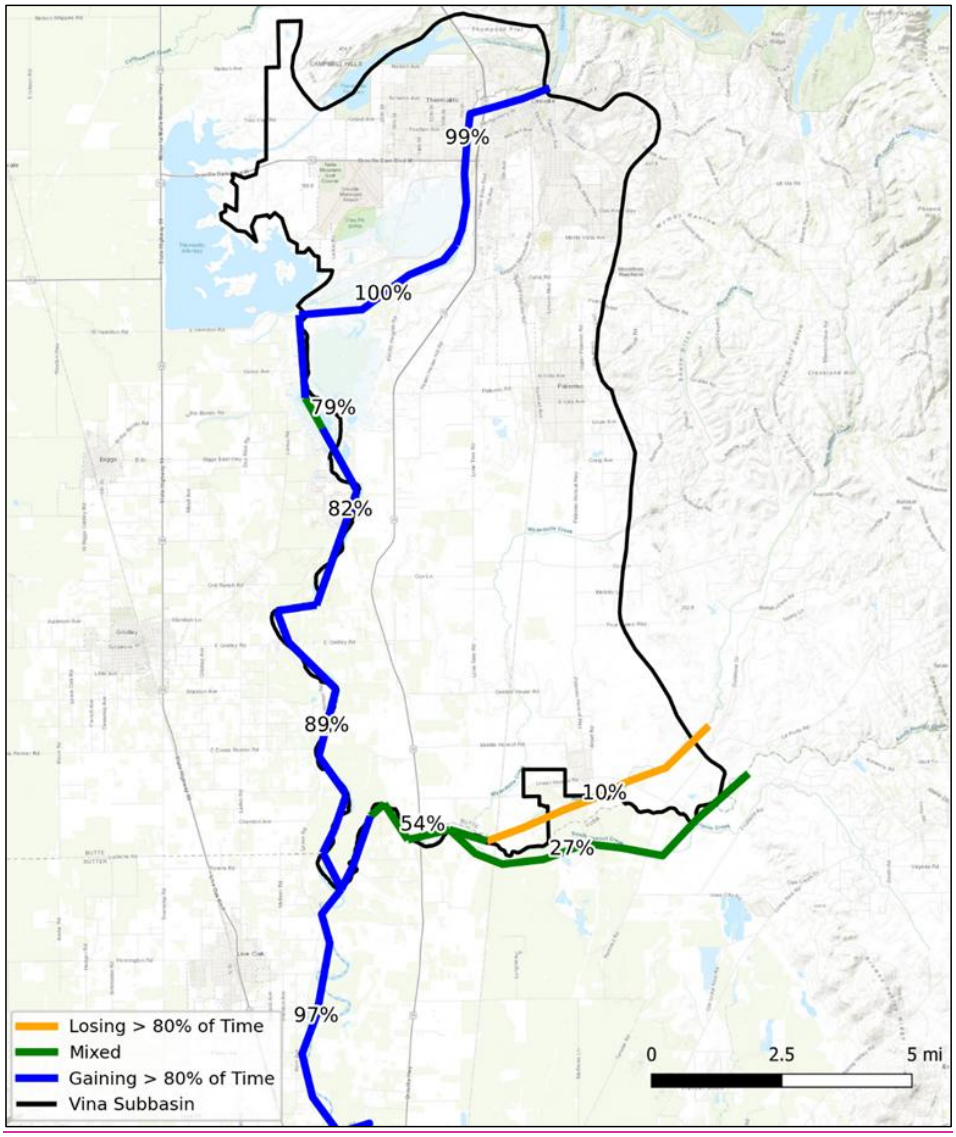

Figure 2-20: Wyandotte Creek Subbasin Gaining and Losing Stream Reaches Based on the BBGM v.1.3, Water Years 2000 to ~~2018~~2024.

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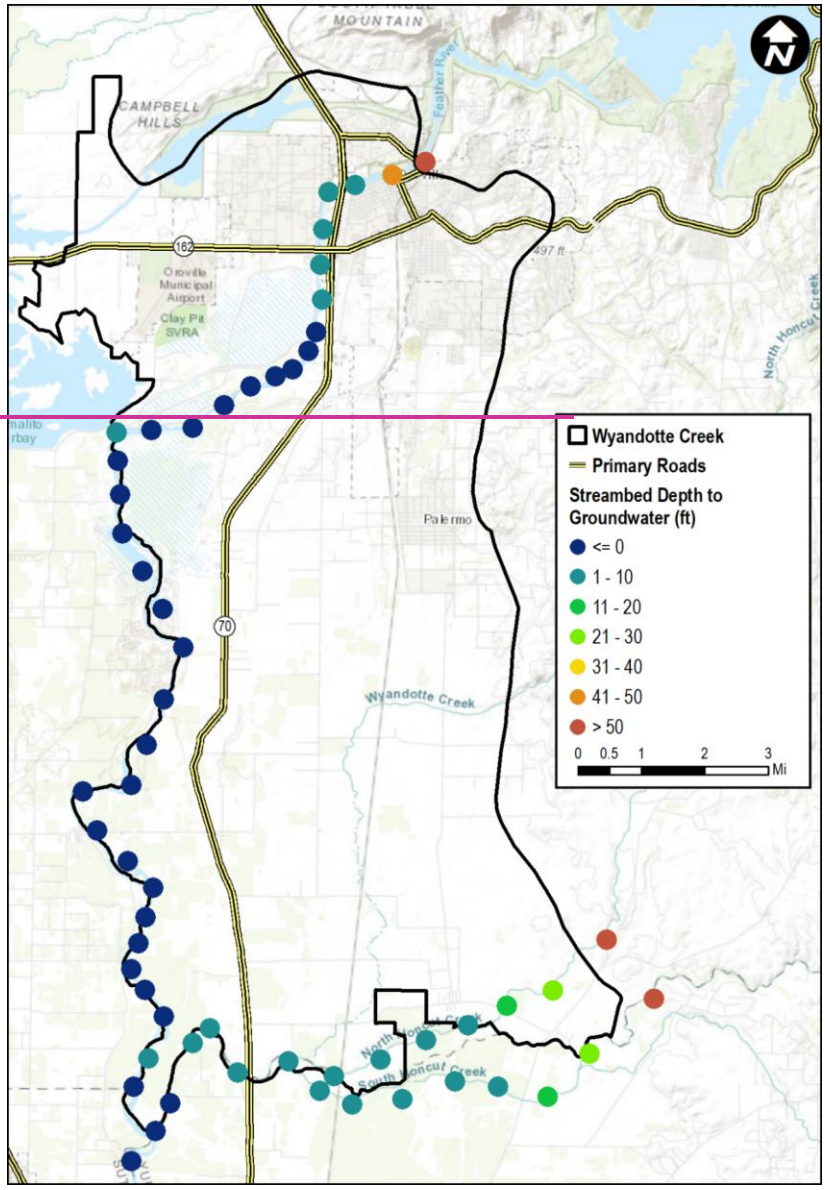

~~Figure 2-21: Wyandotte Creek Subbasin Average Spring Depth to Groundwater, 2014 to 2018~~

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~~2.2.6.2~~ *Timing and Amount of Surface Water – Groundwater Interaction*

The timing and amount of surface water–groundwater interaction was estimated using the BBGM v.1.3 for the primary streams in the ~~subbasin.~~Subbasin including the Feather River, North Honcut Creek, and South Honcut Creek. Wyandotte Creek and Wyman Ravine are not modeled in the BBGM. Monthly net gains to streamflow from groundwater were estimated ~~on a~~ monthly ~~basis~~ for the historical period from water year 2000 to ~~2018~~2024 and are summarized in ~~Table~~Tables 2-~~3~~3A and 2-3B. Average monthly gains to streamflow are expressed in cubic feet per second (cfs~~).~~) and acre-feet, respectively. Negative values denote average losses from streamflow to groundwater (i.e., seepage ~~or leakage~~).

Table 2-~~3~~3A: Average Monthly Gains to Streamflow from Groundwater, Water Years 2000 to ~~2018~~2024 (cfs)

Stream	Month												Average
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Feather River	~~34~~32	~~41~~37	~~54~~53	70	~~56~~53	~~68~~64	~~56~~53	~~49~~46	~~29~~28	~~21~~17	~~23~~20	~~26~~22	~~44~~41
North Honcut Creek	-1	-1	-2	-1	-1	0	~~1~~0	0	0	0	0	~~0~~-1	~~0~~-1
South Honcut Creek	0	0	0	2	2	3	3	2	0	0	~~0~~-1	0	1
Total	~~34~~31	~~40~~36	~~52~~51	71	~~58~~54	~~71~~66	~~60~~56	~~51~~48	~~29~~28	~~20~~17	~~23~~19	~~26~~21	~~45~~41

Table 2-3B: Average Monthly Gains to Streamflow from Groundwater, Water Years 2000 to 2024 (TAF)

Stream	Month												Annual Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Feather River	2.0	2.2	3.3	4.3	2.9	3.9	3.1	2.8	1.7	1.0	1.2	1.3	29.6
North Honcut Creek	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.7
South Honcut Creek	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.1	0.0	0.0	-0.1	0.0	0.7
Total	1.9	2.1	3.1	4.4	3.0	4.1	3.3	2.9	1.7	1.0	1.2	1.2	29.6

Average monthly gains from groundwater are greatest for the Feather River, at approximately ~~44~~41 cfs. Gains are least between June and ~~October~~November, potentially due to relatively low groundwater elevations resulting from summer pumping. Gains tend to be greatest between late winter and spring (approximately December to May), potentially due to higher groundwater elevations relative to river stage. On average, streams traversing or bounding the subbasin are currently estimated to gain approximately 41 cfs on average, or approximately 30 TAF annually.

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It is estimated that the Feather River is losing approximately 30 CFS (or 11 TAF per year) between June through November on average due to pumping within Wyandotte Creek and adjacent subbasins. This additional depletion is less than 1% of the total flow of approximately 4,800,000 AFY on the Feather River. Based on the relatively small volume of additional depletions, the relatively low level of depletions as a percentage of the total streamflow, and based on the managed nature of the Feather River, the risk of additional depletions from the Feather River are not considered to have the potential to have significant and unreasonable impacts on beneficial uses of the river.

ISW Identification using Groundwater Elevation Data

To identify the location of ISW reaches within the basin and ground truth BBGM modeled results we used seasonally interpolated shallow groundwater elevations, created from monitoring well data, in conjunction with LiDAR extracted surface water elevations. There are nine (9) existing shallow groundwater monitoring wells across the Subbasin. Well hydrographs are provided in Appendix 3-CB. Groundwater elevations were interpolated between monitoring wells to develop spatial datasets across the entire Subbasin. Groundwater elevation rasters were developed for the spring and fall from 2000 through 2025. LiDAR, or Light Detection and Ranging, is a technology that allows for precise measuring of ground surface elevations by using laser light pulses from aircraft. Longer pulse return times indicate distances farther from the aircraft, and thus lower elevations. Due to the wavelength of light used for LiDAR surveys in the Wyandotte Subbasin, water penetration was limited and it is assumed that the returned elevations of surface water bodies reflect their stage rather than their bottom elevations. To account for this uncertainty as well as uncertainty related to capillary effects below losing streams, a conservative threshold of 20 feet was used to determine connectivity (DWR, 2024). Whether inaccuracies in LiDAR measurements would change connectivity determinations is then done by comparing results generated by manual survey measurement at select locations on North Honcut Creek and Wyman Ravine. Ultimately, the above method yields the following two categories for determining surface water connectivity:

1. Likely Disconnected: Interpolated groundwater levels are greater than 20 feet below the extracted surface water elevation
2. Likely Connected: Interpolated groundwater levels are less than 20 feet below the extracted surface water elevation

Streams were gaining if the interpolated groundwater elevation is greater than the LiDAR extracted reach elevation. The exception to this is the Feather River, which in contrast to the seasonal streams in the rest of the Subbasin, has a consistent stage of many feet. To account for this, we conservatively only consider the reach gaining on the Feather River if the groundwater elevation is greater than 10 feet below the LiDAR returned elevation. This approach allows for uncertainty related to LiDAR returns off water surfaces on the Feather River, and removes the margin allocated to connected but losing streams elsewhere. We then use this classification in a similar way to the BBGM model results, and define three categories of Gaining, Mixed, and Losing.

1. Gaining: Reach is likely gaining greater than 80% of the time
2. Mixed: Reach is likely gaining between 80 and 20% of the time

3. Losing: Reach is likely losing greater than 80% of the time

Results indicate that most streams in the subbasin have groundwater elevations within 20 feet of extracted surface water elevations, with the exceptions to this being the upper reaches of Wyman Ravine and its tributary. For visualization of this result - years 2000, 2015, 2022, and 2025 were selected as being reflective of the start of the modeled period (2000), two drought years (2015 and 2022), and current conditions (2025) as shown on Figures 2-2121 through 2-2424, respectively. Of these, the modeled low points in groundwater storage (i.e., 2015 and 2022) correlate to the smallest extent of interconnected reaches. By 2025 the extent of interconnected reaches rebounds to that displayed at the beginning of the modeled period. It should be noted that there is only one well available in the southeast with sufficient data to be used in the interpolation. As a result, there may be inaccuracies in this region on North Honcut, Wilson, and South Honcut creeks. However, this method produces results that align with isotope tracers explained further in the next section.

Expanding the LiDAR analysis to all spring and fall measurements between 2000 and 2025 and applying the BBGM categories as detailed in the methods section, the Feather River and Honcut Creek are determined to be gaining, with the lower reaches of other smaller streams considered mixed (Figure 2-2525). The upper reaches of these mixed streams (Wyman Ravine, Wyandotte Creek, North Honcut Creek, South Honcut Creek, and Wilson Creek) are considered losing. Furthermore, surveyed results indicate that while LiDAR elevations can be up to 5 feet higher at channel bottom, indicating erosive action since LiDAR acquisition, classification into connected and disconnected categories would remain unchanged due to both our use of wide bin intervals and groundwater elevations that remain far below streambeds (Appendix 3-C).

Overall, the categorization of interconnected surface waters and their status as gaining or losing by use of both LiDAR extracted surface water elevations and interpolated groundwater elevations match the general spatial pattern of the BBGM v1.3 results. Due to this, despite Wyandotte Creek, Wyman Ravine, and Wilson Creek not being simulated in BBGM, estimates on these reaches are reasonable. In general, we conclude that aside from the Feather River, the likelihood of streams gaining within the subbasin increases as they traverse westward towards the Feather River, with reaches towards the outer margins often connected but losing.

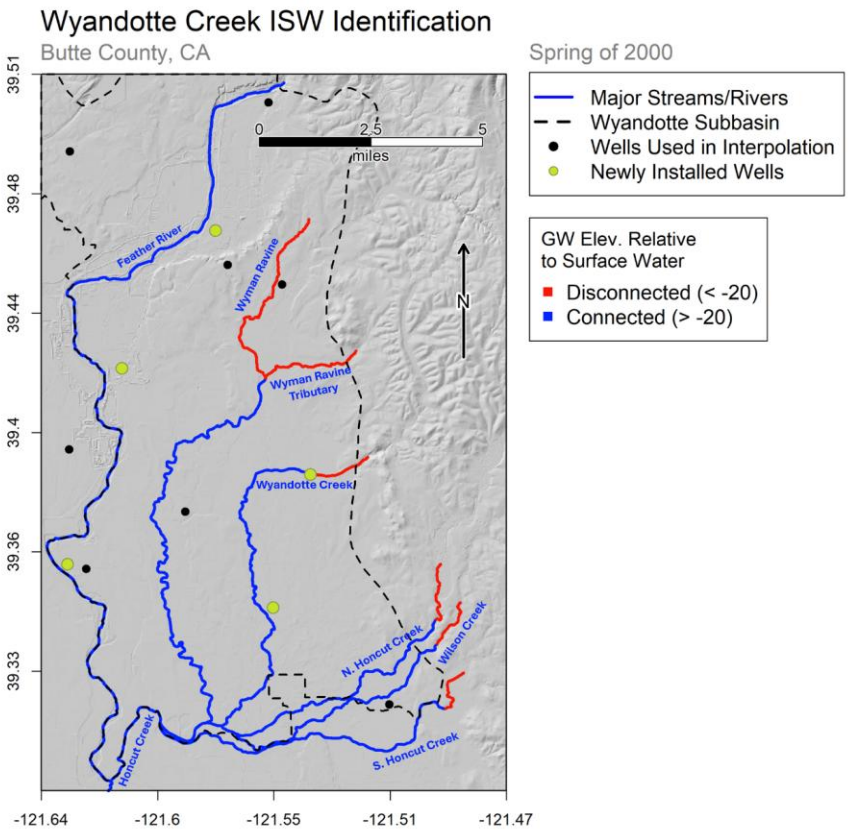

Figure 2-21: Comparison between shallow interpolated water surface elevations and LiDAR extracted streambed elevations in the spring of 2000.

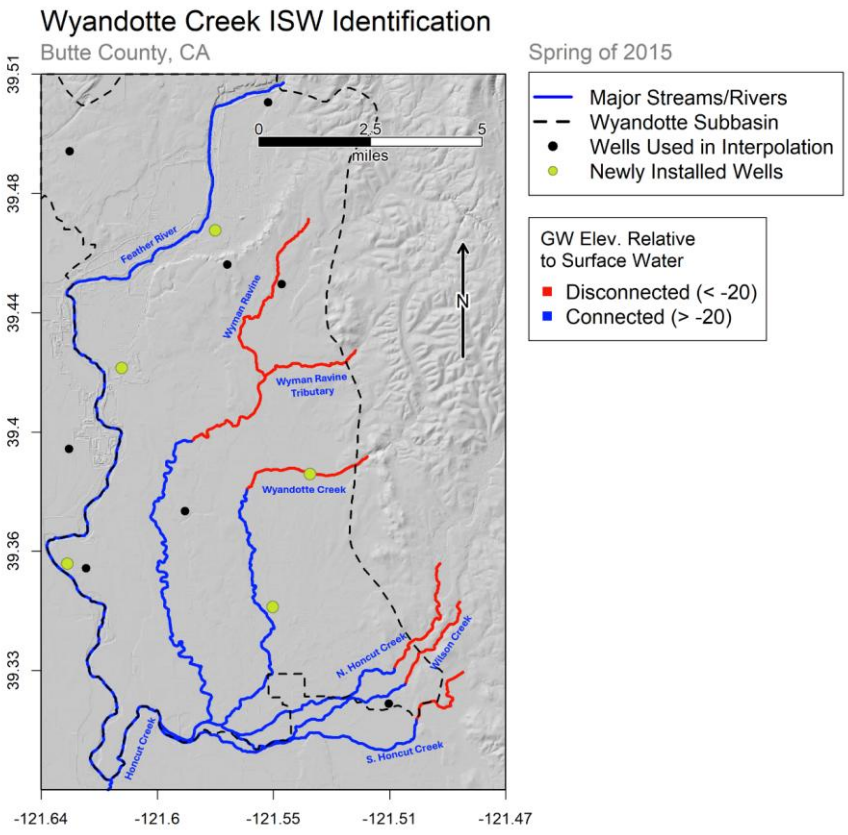

Figure 2-22: Comparison Between Shallow Interpolated Water Surface Elevations and LiDAR Extracted Streambed Elevations in the Spring of 2015.

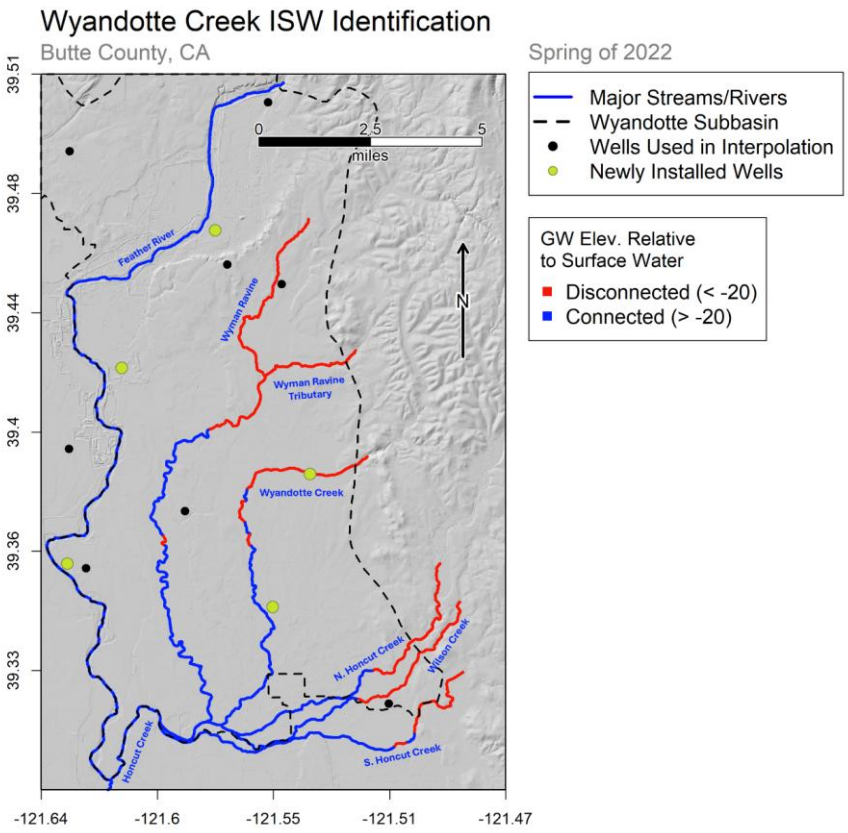

Figure 2-23: Comparison Between Shallow Interpolated Water Surface Elevations and LiDAR Extracted Streambed Elevations in the Spring of 2022.

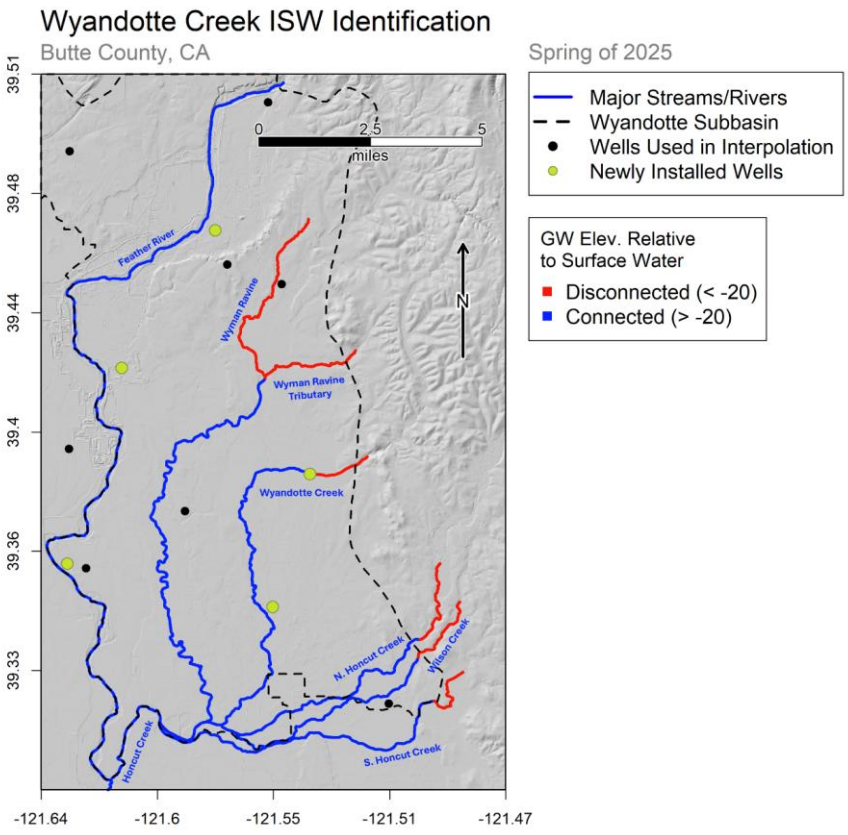

Figure 2-24: Comparison Between Shallow Interpolated Water Surface Elevations and LiDAR Extracted Streambed Elevations in the Spring of 2025.

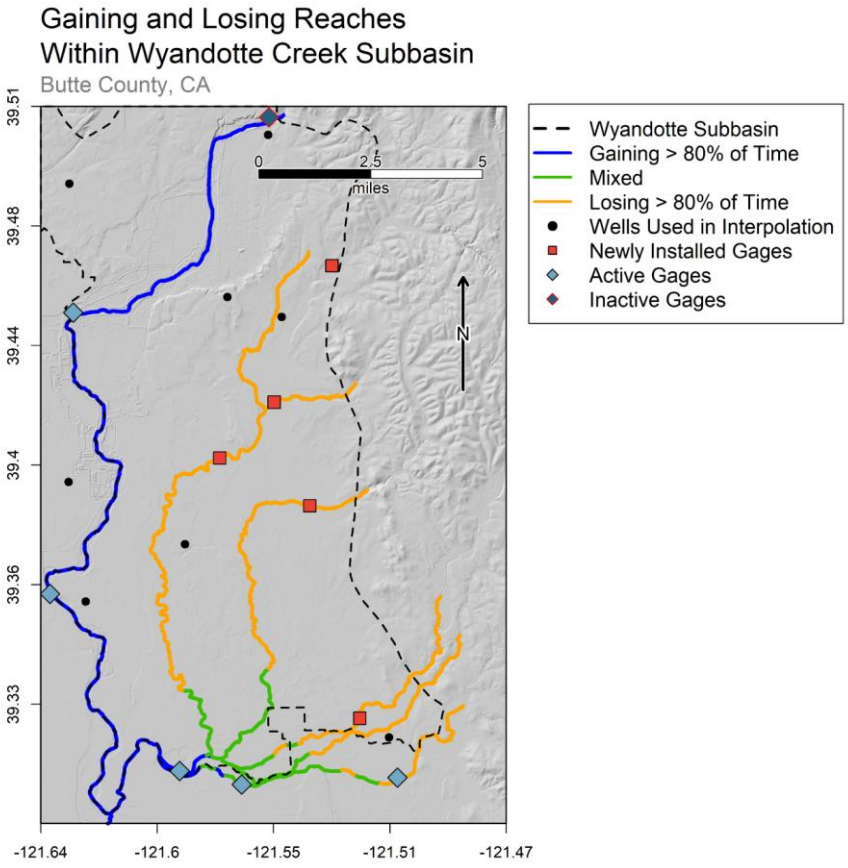

Figure 2-25: Use of Interpolated Water Surface Elevations and LiDAR Extracted Water Surface Elevations over the Period from 2000 through 2025 to Determine the Percentage of Time in Which a Given Reach is Gaining.

ISW Identification through Isotope Sampling

To understand ISW interactions on a finer timescale than seasonal groundwater interpolations can provide, radon-222 and stable isotopes of the water molecule along Wyman Ravine, Wilson Creek, and the tributaries to Honcut Creek were sampled monthly June through October of 2025. Firstly, radon-222 is a naturally occurring short-lived radioactive noble gas that is produced in geologic material and accumulates in groundwater. As groundwater discharges to the surface, radon-222 quickly degasses, and its presence therefore indicates a localized groundwater contribution to surface water flows. In a 2005 USGS study of the South Sacramento Valley,

groundwater radon-222 was measured at between 200-700 pCi/L (USGS, 2005). Therefore, it would be expected that surface water in the Wyandotte Subbasin receiving groundwater inputs (i.e. gaining) should contain elevated levels of radon-222. Secondly, as the ratio of stable isotopes of the water molecule (16O,18O,1H,2H) varies due to natural hydrologic processes such as evaporative fractionation and precipitation altitude, sampled water bodies with different source areas should be detected as having distinct isotopic fingerprints (Jameel et al., 2019; Visser et al., 2016). The combination of radon-222 and isotopes of the water molecule allow us to detect seasonal and local groundwater inputs, source area elevation, and evaporative signatures (Castaldo et al., 2021).

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~~45 cfs on average, or approximately 32 TAF annually.~~ In terms of radon-222, low activities (< 7 pCi/L) were observed compared to the 200-700 pCi/L expected from a groundwater signal in all but the upper reach of South Honcut Creek (Figures 2-26 through 2828). When combined with the results discussed in the previous section, it is confirmed that the upper reaches of Wyman Ravine, Wilson Creek, and North Honcut Creek are losing while South Honcut Creek may retain small local groundwater contributions in the summer. This again matches BBGM modeled results regarding the status of South and North Honcut Creeks (WGSA, 2021; Figure 3). In terms of stable water isotopes, samples on North and South Honcut Creek are depleted in heavy isotopes relative to Wyman Ravine and Wilson Creek, signaling a higher elevation source area (Figure 12, Castaldo et al., 2021). Samples along North and South Honcut Creek are furthermore generally close to the Global Meteoric Water Line (GMWL) implying limited impact of evaporative fractionation (Figure 29). These results agree with the potential local groundwater contributions described above as well as the 'mixed' status of much of South Honcut Creek. This is in contrast to samples along Wyman Ravine and Wilson Creek, which show consistent evidence of evaporative fractionation as measured by a deuterium excess consistently below that of the GMWL (Figure 30). This is consistent with radon activities describing a lack of groundwater contribution in the summer months. Given the general agreement between the results of groundwater elevations, radon, and stable water isotopes we can conclude three things:

1. South and North Honcut Creek source water originates on average from higher in elevation than that of Wyman Ravine and Wilson Creek. This may be due to Honcut Creek is used to convey agricultural drainage and irrigation water during the irrigation season with the water originating in the upper Feather River or Yuba River watersheds.
2. South Honcut Creek may receive seasonal and local groundwater contributions, which is corroborated by fluctuations in radon-222 activity, though these contributions appear to be limited.
3. Wyman Ravine and Wilson Creek are likely either disconnected or losing along much of their length, though disagreement between LiDAR and radon results on their lower reaches may indicate that sampling in a different year would have yielded higher radon activities.

The isotope study represents a snapshot in time and may not capture transitions from gaining to losing or vice versa that occur over time. The isotope study may be continued as funding allows to assess seasonal trends and impacts from groundwater level fluctuations.

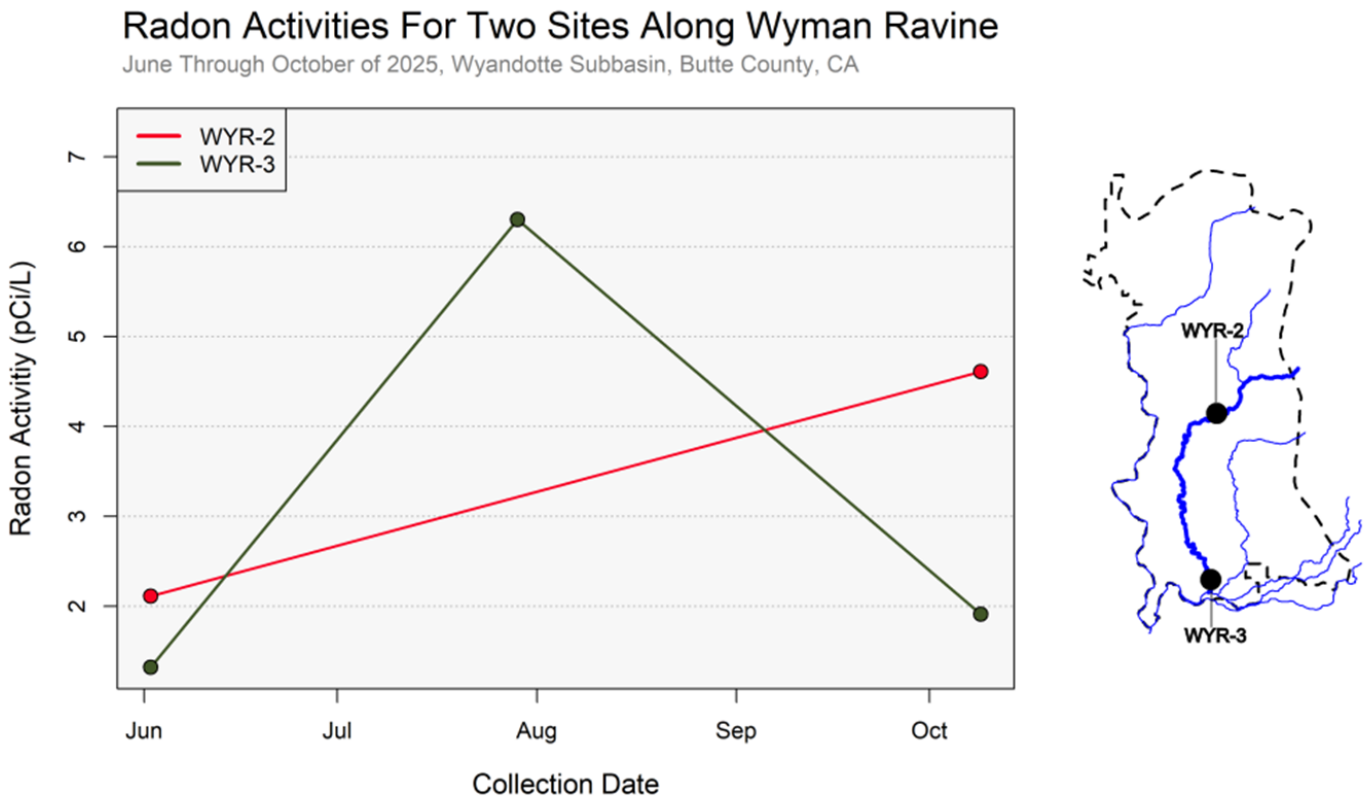

Figure 2-26: Radon Activity for Sampled Sites along Wyman Ravine in June through October of 2025

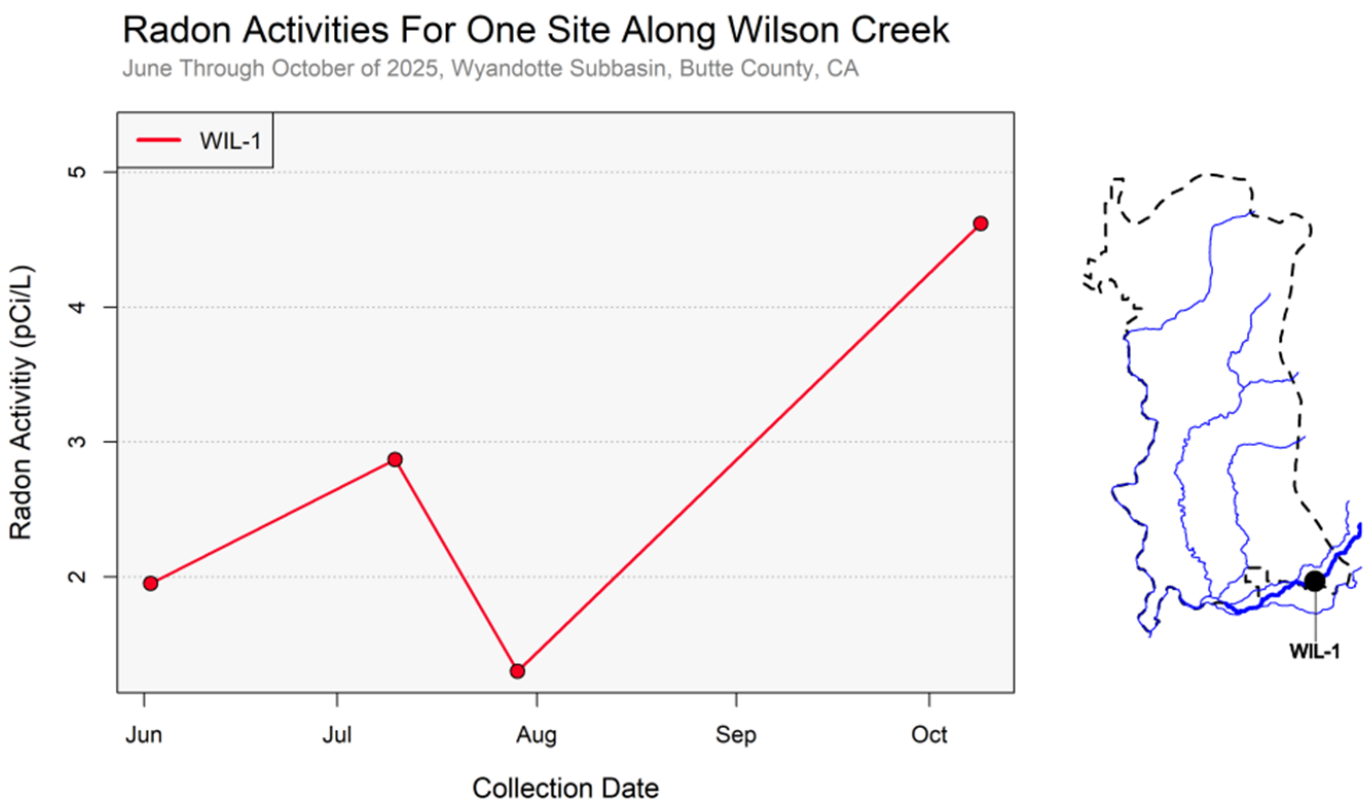

Figure 2-27: Radon activity for sampled sites along Wilson Creek in June through October of 2025

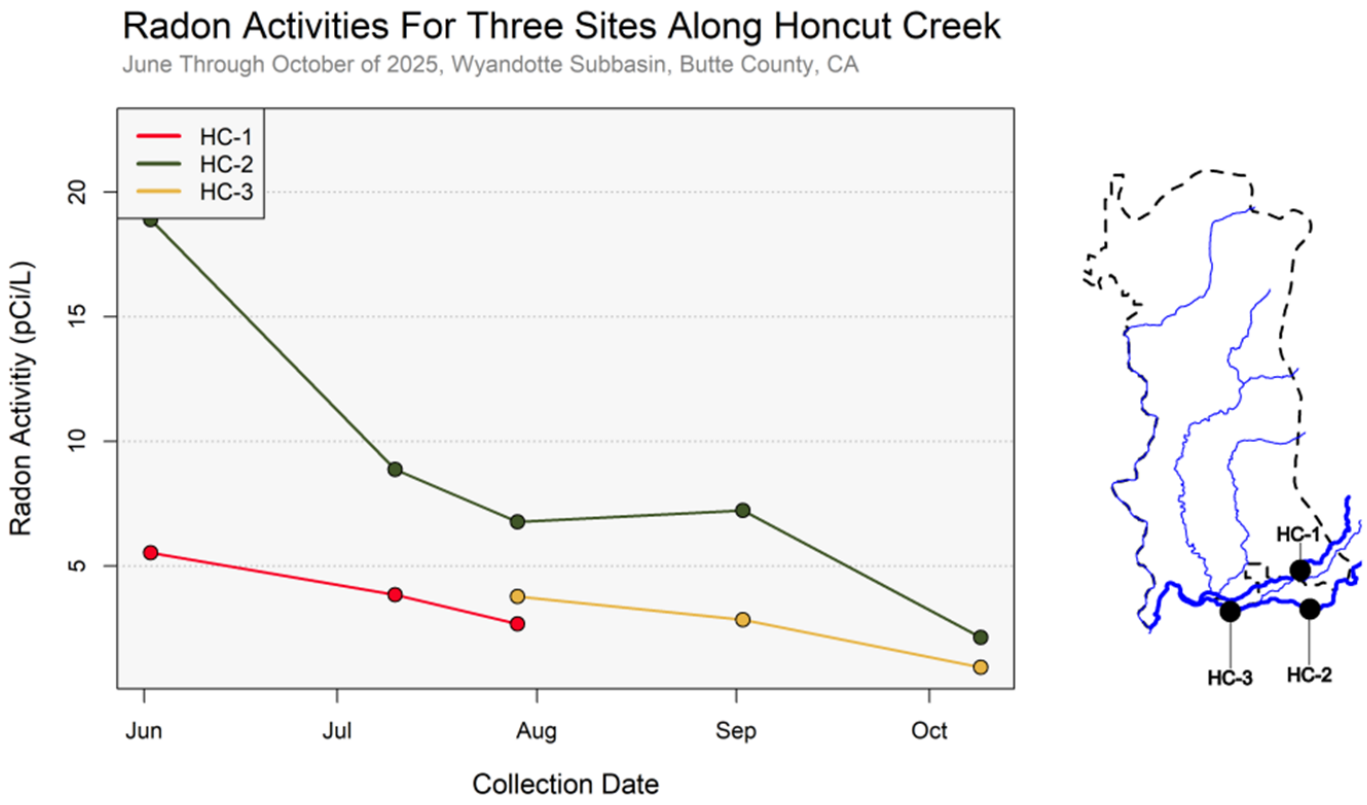

Figure 2-28: Radon Activity for Sampled Sites along Honcut Creek in June through October of 2025

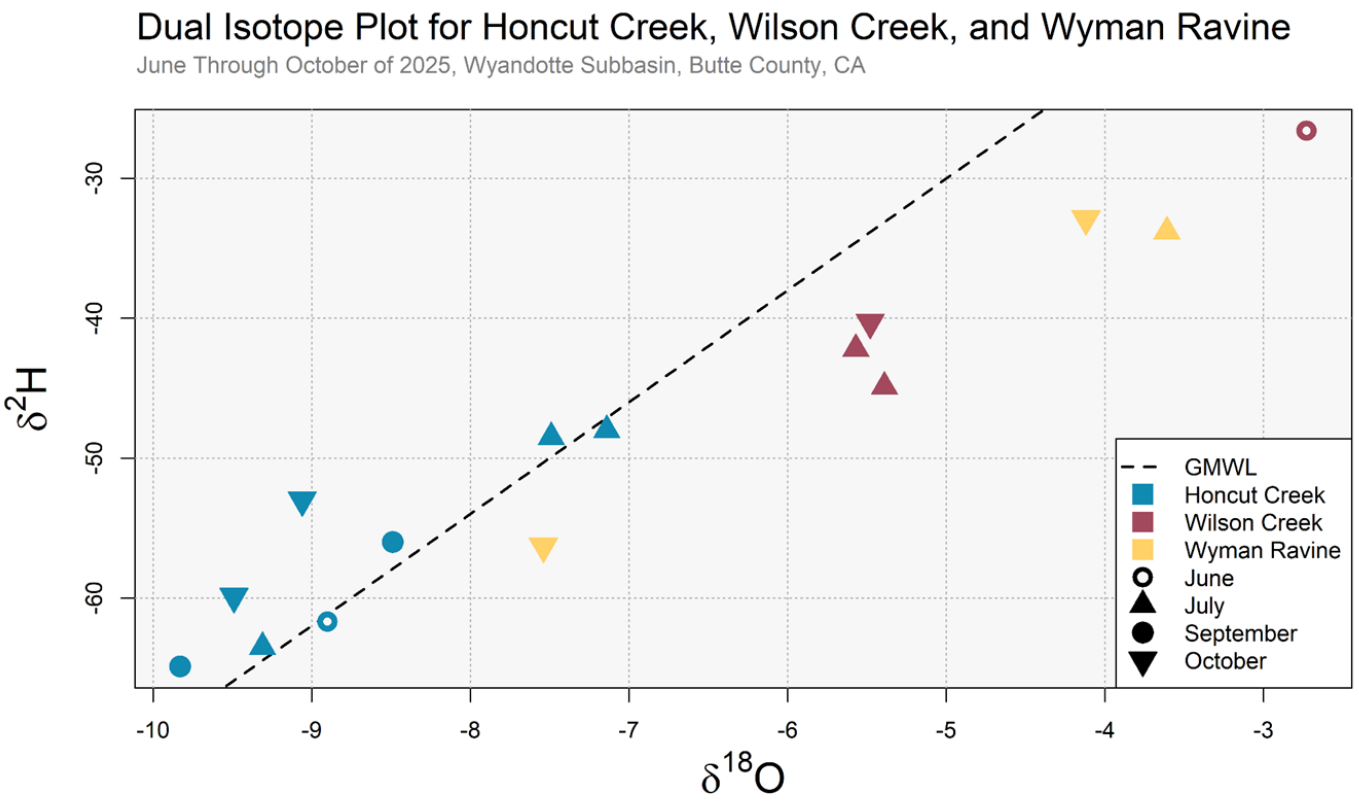

Figure 2-29: Dual isotope plot for isotopes of the Water Molecule at Sampled Sites along Honcut Creek, Wilson Creek, and Wyman Ravine in June through October of 2025

Note:. Delta notation is relative to Vienna Standard Mean Ocean Water (VSMOW). Global Meteoric Water Line (GMWL) is defined by the equation δD = (8 * δ18O) + 10 ‰.

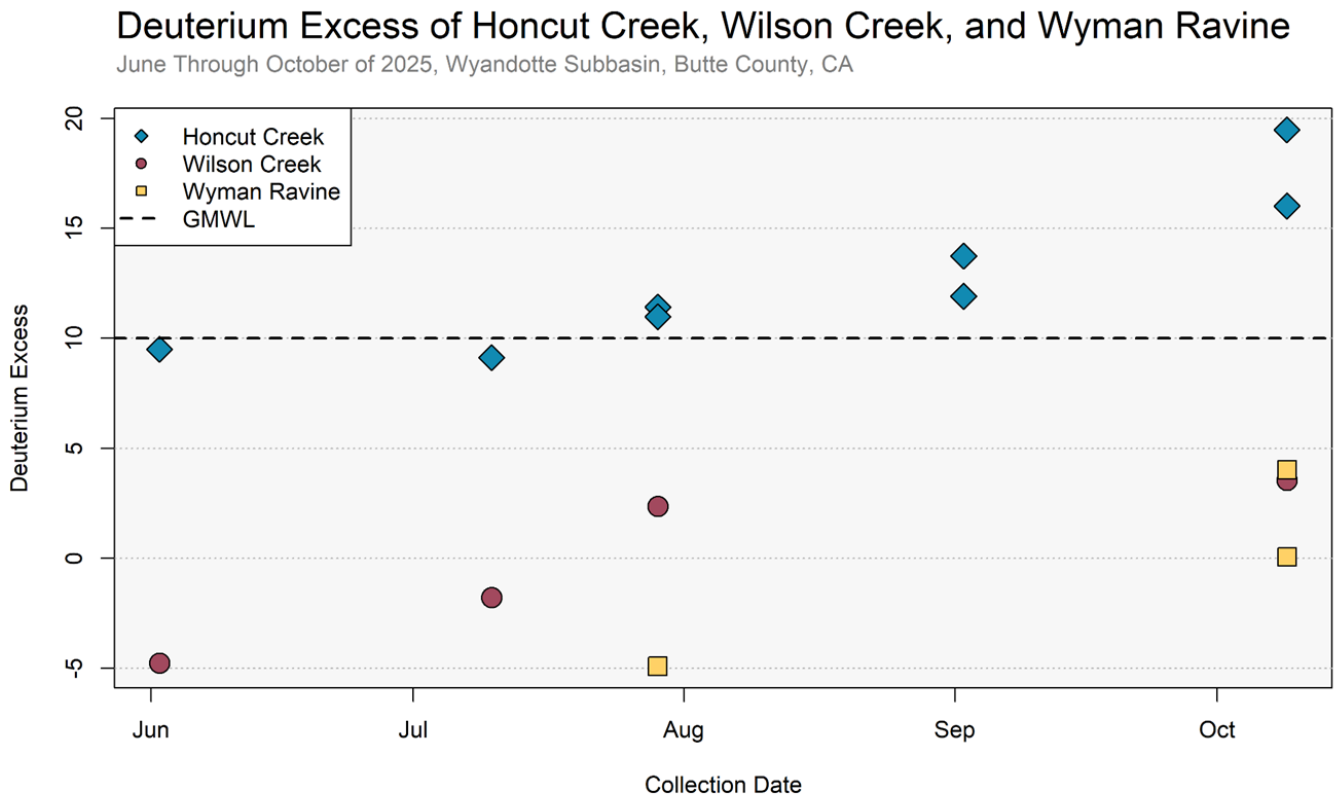

Figure 2-30: Deuterium Excess of Honcut Creek, Wilson Creek, and Wyman Ravine Samples

Note: Samples taken in June through October of 2025. Deuterium excess defined by the equation Excess = $\delta D - 8*\delta 18O$.

The sections above detail efforts in the Wyandotte Creek Subbasin to identify Interconnected Surface Water (ISW) locations using the updated BBGM (v.1.3), LiDAR extracted surface water elevations in conjunction with interpolated groundwater elevations, and stable and radioactive isotope tracers. Groundwater level monitoring wells and stream gages installed in 2026 will help address data gaps. Key findings include:

- The Feather River is primarily a gaining stream and is subject to depletions from groundwater pumping. Depletions from the Feather River are not considered to have the potential to have significant and unreasonable impacts on beneficial uses and users of the river.
- North Honcut Creek likely transitions from a gaining and losing stream depending on time of year and groundwater demands. The stream is ephemeral. Depletions from pumping are limited to when the stream is flowing, the stream is connected to the aquifer, and pumping is occurring. This limited timeframe typically ends by June and leads to a small amount of potential gains / losses in the spring as pumping starts for the irrigation season.
- Groundwater level data gaps exist along Wyman Ravine and Wyandotte Creek, ephemeral creeks. Additional monitoring wells and stream gages may be warranted before establishing SMCs in these areas.

2.2.7 Groundwater Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) are defined in the SGMA regulations as "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (CCR, Title 23, § 351(m)). GDEs exist within the Wyandotte Creek subbasin largely where vegetation accesses shallow groundwater for survival; and in areas with streams and creeks where a connection to groundwater exists. Without access to shallow groundwater, these plants and the ecosystems supported by the hydrology would die.

GDEs are incredibly diverse (e.g., riparian forests, rivers, and oak woodlands) and often host rare and endemic species, such as the giant garter snake or green sturgeon to name characteristic species known to occur in the Subbasin. Many of these species are protected under state and federal endangered species act. Moreover, a key goal of SGMA is to prevent depletion of interconnected surface water (ISW) that have significant and unreasonable reductions on beneficial uses and users of surface water (e.g., insufficient water for aquatic species, GDEs). For example, GDEs are closely tied to ISW because many ecosystems depend on groundwater-fed streams and rivers. If pumping reduces streamflows, it can harm fish, wildlife, and other species that make up GDEs.

Surface water depletion and GDEs were identified by the GSA in the 2022 GSP and by the DWR RCAs as having data gaps, including:

- Limited data to analyze how pumping and streamflows interact within the primary aquifer system and the impacts on GDEs,
- Limited groundwater level data for the shallow aquifer, and therefore higher uncertainty on the actual depth to groundwater throughout the subbasin,

- Uncertainty about the location and distribution of GDEs and shallow groundwater conditions in the Subbasin,
- Limited information on the baseline condition and ecological value of GDEs in the Subbasin, and,
- Uncertainty about how sensitive GDEs are to changes in groundwater levels.

To address the data gaps and DWR's RCA, a desktop analysis has been performed. This analysis brings together hydrologic, hydrogeologic, physical, and ecological datasets to better understand the baseline condition and ecological value of the subbasin's GDEs and how sensitive they may be to changes in the groundwater levels. The goals are to create more accurate maps of potential GDEs.. Ultimately, the GSA may select representative GDEs for future long term GDE monitoring. These monitoring sites would support the refinement of Sustainable Management Criteria (SMCs) and help ensure that management actions avoid significant and unreasonable impacts on GDEs.

2.2.7.1 NCCAG Database

The initial identification of GDEs ~~for this GSP~~ was performed by using the Natural Communities Commonly Associated with Groundwater (NCCAG) database to identify and map potential groundwater dependent ecosystems (iGDEs) in the Wyandotte Creek Subbasin. The NCCAG database was developed by a working group comprised of DWR, CDFW, and TNC by reviewing publicly available state and federal agency datasets that have mapped California vegetation, wetlands, springs and seeps and by conducting a screening process to retain types and locations of ~~these~~ecosystems commonly associated with groundwater. The results were compiled into the NCCAG database with two habitat classes defined. The first class includes wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions. The second class includes vegetation types commonly associated with the sub-surface presence of groundwater (phreatophytes). Figure 2-~~22~~31 shows the locations of iGDEs identified by the NCCAG database within the Wyandotte Creek Subbasin. The primary vegetation types within the Subbasin include Valley Oaks, Cottonwoods, Riparian Vegetation (including Bulrush, Cattail, and Reeds), and Willows accounting for 2,435 acres, 2,227 acres, 1,930 acres, and 1,663 acres; respectively.

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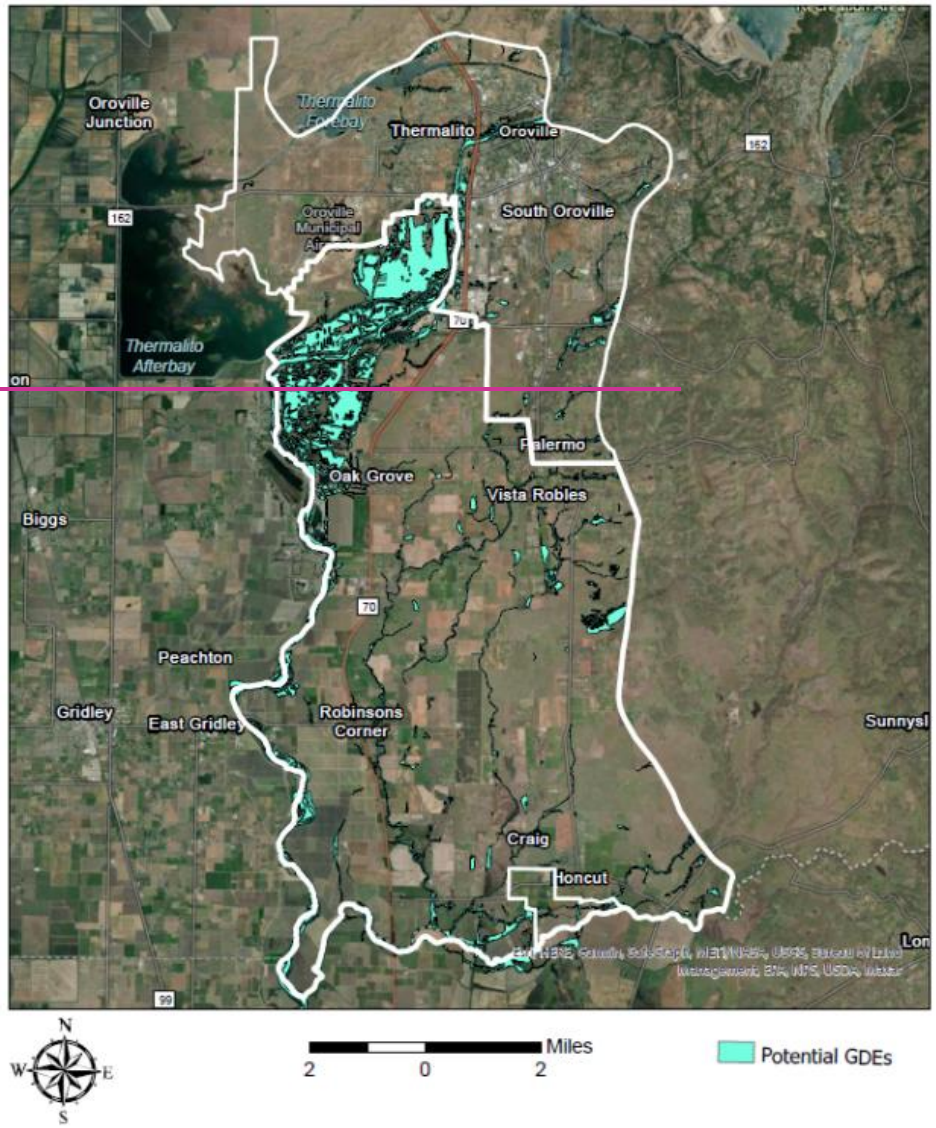

~~Figure 2-22: All Potential Groundwater Dependent Ecosystems in the Wyandotte Creek Subbasin as Identified in the Natural Communities Commonly Associated with Groundwater Database Hosted by The Nature Conservancy~~

The NCCAG dataset is based on 48 layers of publicly available data developed by state or federal agencies that map vegetation, wetlands, springs, and seeps in California (DWR, 2019a). A NCCAG technical working group with representatives from DWR, CDFW, and TNC

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reviewed the datasets compiled to assemble the NCCAG dataset. The NCCAG dataset attempts to extract mapped vegetation and wetland features that have indicators suggesting dependence on groundwater. The data presented in NCCAG dataset display vegetation polygons that have indicators of GDEs based on published and/or field observations of phreatophytic vegetation defined as a "deep-rooted plant that obtains water that it needs from the phreatic zone (zone of saturation) or the capillary fringe above the phreatic zone" (Rohde et al., 2018). The dominance of phreatophytic plant species in a mapped vegetation type is a primary indicator of GDEs. A list of plant species considered to be phreatophytes based on peer-reviewed scientific literature on rooting depths, published lists of phreatophytes, expert field observations, and vegetation alliance descriptions is publicly available (Klausmeyer et al., 2018; DWR, 2018a).

While developing the NCCAG dataset of areas with indicators of GDEs, the technical working group attempted to exclude vegetation and wetland types and polygons that are less likely to be associated with groundwater (Klausmeyer et al., 2018). The NCCAG working group attempted to remove any polygons that are not likely to be GDEs where they occurred in areas where they are likely to be supported by alternate artificial water sources (e.g. local seepage from agricultural irrigation canals), or where appropriate available data indicated the shallow groundwater depth is located well below the rooting zone (Klausmeyer et al., 2018).

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The vegetation data presented in the NCCAG dataset is a ~~latest available~~ starting point for the identification of GDEs as the dataset includes the best available public datasets and has been screened to include only areas that have indicators of groundwater dependent vegetation. DWR has stated that use of the NCCAG dataset is not mandatory and does not represent DWR's determination of a GDE (DWR, 2018a). Rather, the NCCAG dataset can provide a starting point for the identification of GDEs within a groundwater basin.

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~~Additional information, such as near surface groundwater depth obtained from piezometers, information about subsurface stratigraphy and geology on confining layers, and information on local land use and hydrology can be used to confirm whether vegetation in areas identified by the NCCAG as iGDEs is, in fact, reliant on groundwater.~~

~~***2.2.7.2 Initial iGDE Analysis***~~

~~GSA Managers from the subbasin used this database as a starting point to analyze a portion of the total iGDEs in the NCCAG database to evaluate local groundwater dependence. Specific criteria to each polygon to answer a series of questions led to an eventual characterization for each iGDE. These iGDEs were designated as either "Likely a GDE," "Not likely a GDE," or "Uncertain" based on evaluations. The criteria aimed at understanding each iGDE's dependence on groundwater including questions about land use changes, proximity to perennial surface water supplies, irrigated agriculture and agricultural dependent surface water, condition of vegetation during drought years and water applications to the iGDEs.~~

~~The first phase of the analysis was conducted by thorough review of aerial photographs from Google Earth across multiple years specifically focusing on the 2007, 2009, 2013, and 2015 drought years as well as use Managers' local knowledge of these areas.~~

~~***2.2.7.3 iGDE Designations***~~

~~While there were some areas identified as "Not likely a GDE" during this effort, Managers were also able to add any iGDEs into the map that were not captured in the original NCCAG database. NCCAG areas identified as "Not likely a GDE" from the initial analysis by Managers can be categorized as follows.~~

Not Likely a GDE Due to Significant Land Use Change

Some areas in the NCCAG database may have changed in land use since the database was published. Developed areas where there have been significant land use changes to the iGDE, i.e., land transitioned to cultivated irrigated agricultural lands, industrial or residential development occurred or lands had undergone man-made changes such as golf courses or other obvious anthropogenic changes were labeled as "Not likely a GDE."

Not Likely a GDE Due to Perennial Surface Water Supplies

Areas with perennial water supplies such as those subject to historical hydraulic gold mining runoff and dredging activities or those near reservoirs were labeled as "Not likely a GDE." In some areas historic mining activities have left tailings of cobbles and coarse gravel which rapidly transmit water. To some extent, it is assumed that pooled water in this area is tied to river stage through direct connections with the river with surface water bodies. Likewise, the reservoirs provide water year-round for adjacent ecosystems. If any iGDEs were located within 150 feet of reservoirs or mine tailings, they were assumed to be able to access the nearby surface water bodies and were labeled as "Not likely a GDE."

Not Likely a GDE Due to Supplemental Water Supplies

Irrigated agriculture, irrigated refuge / managed wetlands or irrigated urban areas with supplemental water deliveries were identified by Managers during the initial GDEs analysis effort. These areas are assumed to be accessing supplemental water supplies and not reliant on groundwater and were labeled as "Not likely a GDE."

Not Likely a GDE Due to Adjacency to Irrigated Agricultural Fields

Agricultural lands are dependent on reliable water supplies to ensure a successful harvest. Surface water and / or groundwater pumped from the aquifer is used to irrigate crops in the Wyandotte Creek subbasin. Such irrigation benefits not only the crops, but also surrounding vegetation. Potential GDEs further than 150 feet from irrigated rice fields and areas further than 50 feet from all other irrigated agriculture were assumed to be unable to access irrigation water. These distances are based on professional judgment, including past experience in the region and consideration of the physical characteristics of the Wyandotte Creek subbasin, such as hydraulic conductivity. Rice fields, along with other irrigated agriculture, are known to have percolation and lateral seepage, supplying water to the aquifer and into adjacent areas. Lateral seepage in Sacramento Valley rice areas has been estimated at between 1.0% and 1.9% of the total irrigation volume (LaHue and Lindquist, 2019). A larger distance was used for rice due to the long-term ponding of water and due to restrictive layers in the subsurface that result in the horizontal spreading of irrigation water. Potential GDEs near these irrigated areas are assumed to be accessing irrigation water through lateral movement through the soils, thus, they were labeled as "Not likely a GDE."

Not Likely a GDE Due to Dependence on Agricultural-dependent Surface Water

Similar to areas adjacent to reservoirs, iGDEs adjacent to surface water bodies that are perennial due to agricultural practices and those near drainage canals, are able to access surface water throughout the year. Agricultural water conveyance features, i.e., the Cherokee Canal is included in this definition; however, this does not include the Sacramento River, Butte Creek, or Honcut Creek because these natural waterways also convey non-agricultural water. Potential GDEs within 150 feet of these agricultural-dependent surface water bodies were assumed to be accessing water from them thus, they were labeled as "Not likely a GDE."

Not Likely a GDE Due to Non-Survival during Drought Conditions

To assess if the iGDE was groundwater dependent, Managers reviewed the condition of the iGDE over multiple dry drought years using aerial photographs from Google Earth. Specifically, the group focused on the drought years of 2007, 2009, 2013, and 2015 in addition to the Managers' local knowledge of these areas. Green vegetation over multiple drought years during summer months indicated survival of the iGDE as well as an assumed connection to groundwater. Potential GDEs which did not indicate any surviving conditions over multiple drought years were assumed to not be connected to groundwater and were labeled as "Not likely a GDE."

Uncertain – All Other Areas

The iGDEs analyzed by the Managers in this initial effort, which did not receive a designation as either "Not likely a GDE" or "Likely a GDE" based on the conclusions from the analysis above, were labeled as "Uncertain" and were analyzed as described below.

2.2.7.4 Additional GIS Analysis

Irrigated Agricultural Land Use

After the initial analysis was completed for a selection of the total iGDEs in the NCCAG database as described above, a geographical information systems (GIS) analysis was performed for all remaining iGDEs in this subbasin by Butte County staff to determine each iGDE's proximity to rice and other irrigated agriculture as described below. The DWR / Land IQ land use and crop mapping data for 2016 (DWR, 2019b) was used to determine the dominant crop type throughout the subbasin.

Land classified as "Rice" for the "Crop Type 2016" in the dataset was identified. Then all polygons in the TNC iGDEs dataset within 150 feet of land classified as rice were identified and designated as "Not likely a GDE near irrigated rice" for the same reasons as described above in the "Not Likely a GDE Due to Adjacency to Irrigated Agricultural Fields" section of this document above.

Land with "Crop Type 2016" classifications other than "Managed Wetland," "Urban," "Rice," and "Mixed Pasture" in the dataset were identified and for this purpose referenced as "Other Irrigated Agriculture" for this GIS analysis, as all other remaining irrigated crop types. All polygons in the NCCAG dataset within 50 feet of land classified as "Other Irrigated Agriculture" were designated as "Not likely a GDE near irrigated agriculture (Non-Rice)" for the same reasons as described above in the "Not Likely a GDE Due to Adjacency to Irrigated Agricultural Fields" section of this document.

Valley Oak Dominated Areas

The dataset provided by TNC indicates the dominant species of vegetation for each polygon, including Valley oak (*Quercus lobata*) in the Wyandotte Creek subbasin. Those polygons were classified as "Likely a GDE" due to feedback from TNC staff that this species can access groundwater over a wide range of depths (M. Rohde personal communication March 2, 2021).

2.2.7.5 Mapping

The map in Figure 2-23 show iGDEs classified as "Likely a GDE" or "Not Likely a GDE" for one of the reasons described above. The iGDEs classified as "Not Likely a GDE" in the Wyandotte Creek subbasin were designated this way due to either their proximity to irrigated agriculture as rice, proximity to irrigated agriculture other than rice, or for another reason as determined during the initial analyses performed by the GSA Managers.

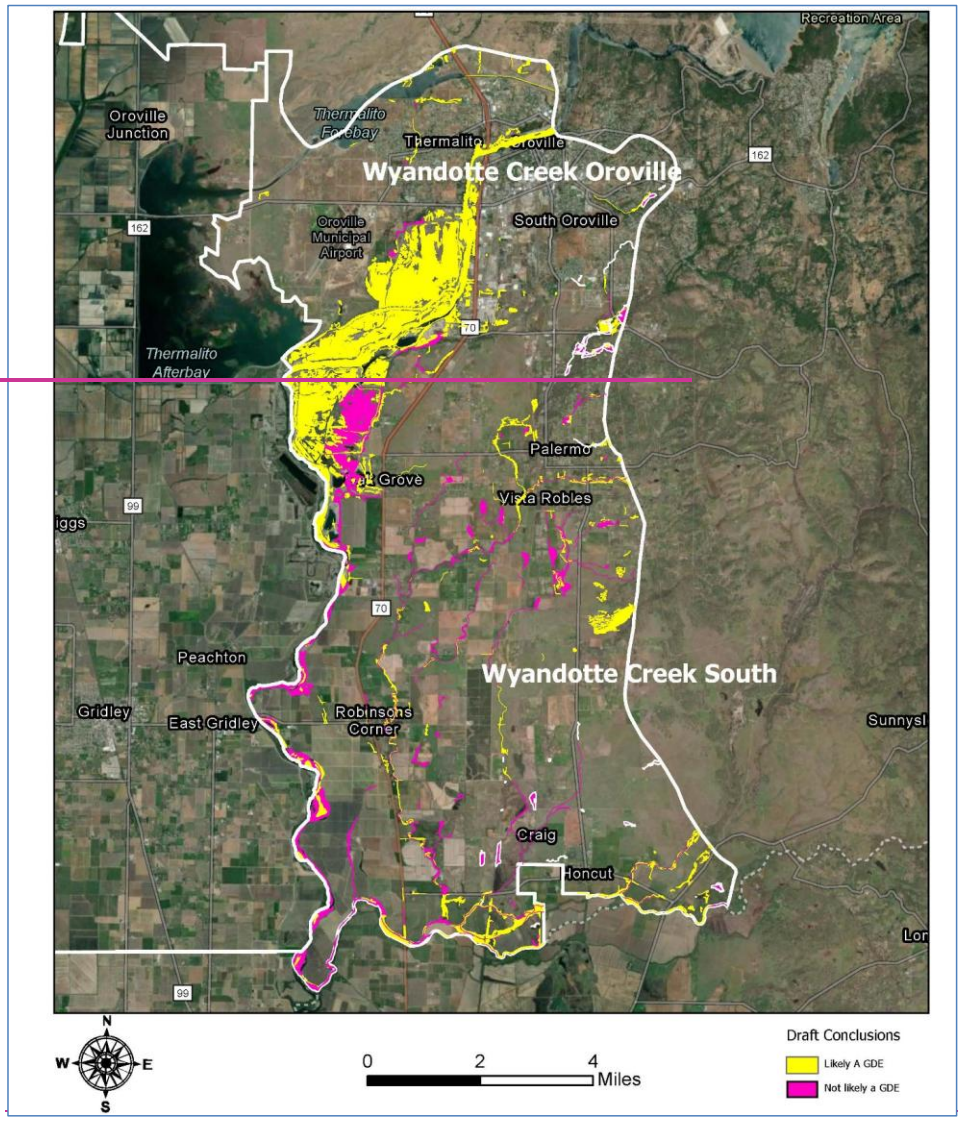

Figure 2-23: Potential Groundwater Dependent Ecosystems (iGDEs) Designations

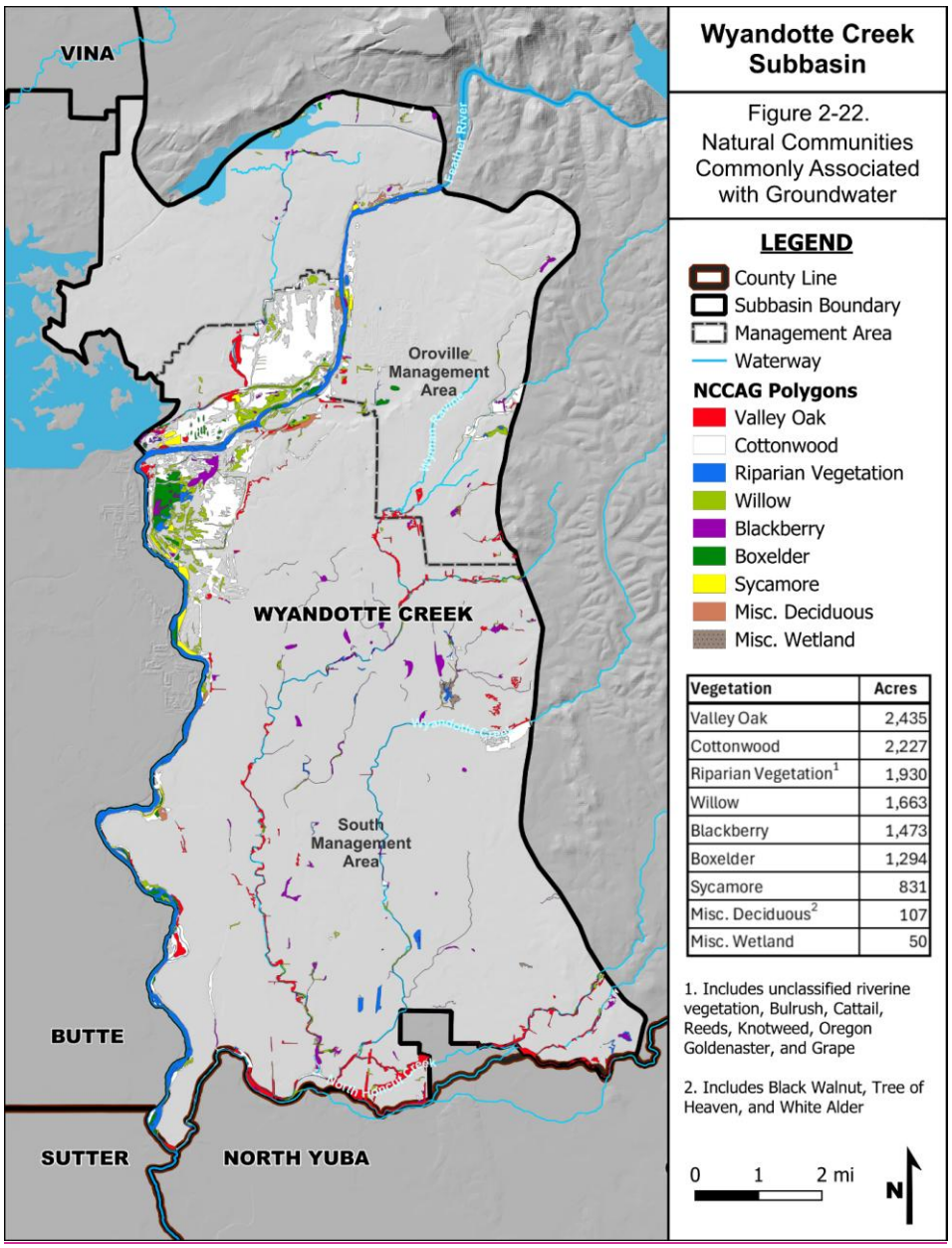

Figure 2-31: All Potential Groundwater Dependent Ecosystems in the Wyandotte Creek Subbasin as Identified in the Natural Communities Commonly Associated with Groundwater Database Hosted by The Nature Conservancy

2.2.7.2 Updated GDE Classification

Characterize Groundwater Conditions in the Shallow Aquifer Zone

Detailed maps were created showing groundwater levels across the region using data from monitoring wells collected between 2000 and 2025. The seasonal maps show depth to the groundwater table during spring and fall of each year, creating a comprehensive picture of how these levels change over time. By combining this groundwater information with precise land surface elevation data from 2018 LiDAR surveys, the depth to groundwater (DTG) was calculated – essentially how deep water is below the ground surface – for each season across 25 years. This resulted in a detailed map showing DTG patterns throughout the subbasin, which were then used to analyze how close groundwater comes to the surface in areas where GDEs might exist.

Refine GDE Mapping

Central locations of potential GDE areas were identified within the Wyandotte Subbasin using an existing database of natural plant communities that typically rely on groundwater. The GDEs were overlaid onto the DTG maps to track how groundwater depths varied over time at each potential GDE site.

Together, these two steps link groundwater data with ecological information. By first developing a detailed picture of groundwater conditions in the shallow aquifer and then overlaying that information with the mapped locations of potential GDEs, the analysis shows where ecosystems are likely to rely on groundwater, where they are not, and where uncertainty remains based on estimated rooting depths for each vegetation type. This connection is critical for deciding which areas should be prioritized for further study and monitoring.

To test this connection, the analysis evaluated rooting depths of groundwater-dependent vegetation from the Nature Conservancy's "Plant Rooting Depth Database." Groundwater levels were compared against rooting depths to determine whether vegetation could reliably access groundwater. GDEs with evidence supporting that groundwater levels are always outside the range accessible to vegetation were preliminarily identified as "Not likely a GDE" (no access to groundwater and would not require consideration under SGMA as part of groundwater management; i.e. not a beneficial user of groundwater), while polygons with evidence supporting that groundwater levels are within the range accessible to vegetation were preliminarily identified as "Potential GDE."[12]

Separately, a second analysis was conducted using a proposed depth to groundwater threshold of 13 feet derived from Rhode et al. (2024)[13], who developed a relationship between DTG and vegetation health to establish a protective threshold. This analysis compared groundwater levels to the 13-foot threshold to distinguish between GDEs with persistent groundwater levels that

[12] Thresholds of certainty will be defined in coordination with the GSA but is envisioned to include situations where 1:1 vegetations mapping to rooting depth relationships are not available or otherwise unclear, where groundwater depths are close to maximum rooting depths (e.g., within 10 percent), and where uncertainty in interpolated groundwater depths with within or close to maximum rooting depths.

[13] Rhode, M.M. et al. (2024). Establishing ecological thresholds and targets for groundwater management. Nature Water. https://doi.org/10.1038/s44221-024-00221-w

theoretically maintain healthy conditions versus those where groundwater levels may lead to more stressful conditions.

Together, these two methods provide complementary perspectives.

The rooting depth analysis focuses on whether groundwater levels fall within the range that specific plant species can access, while the 13-foot threshold offers a broader, protective benchmark across vegetation types. Comparing results from both approaches helps identify areas that are clearly groundwater dependent, areas that are clearly not, and areas where uncertainty remains.

As a basis of comparison DTG was evaluated for the 90th percentile groundwater elevation (the elevation met or exceeded 90 percent of the time at each GDE during the period of record), the fall season for 2015 (the year SGMA came into effect), and 2021 (recent historical low groundwater levels).[14] These groundwater elevations were selected as basis for comparison because they represent typical, dry, and extremely dry conditions, respectively. GDEs where DTG was greater than or equal to rooting depths are likely potential GDEs whereas those where DTG is greater than rooting depth are not likely GDEs.

Updated GDE Map

As shown on Figure 2-3123, potential GDEs were identified along the Feather River, Honcut Creek, lower Wyman Ravine, and lower Wyandotte Creek. The red areas in the middle of the Subbasin and further east correspond to areas that are not likely a GDE as vegetation rooting depths are above historical water table elevations used in the analysis described above. These areas may rely on stored precipitation in the rootzone, perennial or supplemental surface water supplies, or access to water from adjacent irrigated agricultural fields.

Existing and proposed groundwater monitoring wells tracking water table conditions are shown using yellow and blue triangles on Figure 2-3223, respectively. There are seven existing wells and fourteen proposed wells across the Subbasin. The proposed wells will improve understanding of geological and water table conditions near streams and potential GDEs. The updated GDE map is preliminary and subject to change as new data becomes available.

Additional information on the updated GDE classifications and field surveys are available in report titled "Wyandotte Creek Groundwater Subbasin Groundwater Dependent Ecosystem Analysis (February 2026)."

[14] The 90th percentile represents an estimate for the frequency of a given groundwater levels being observed.

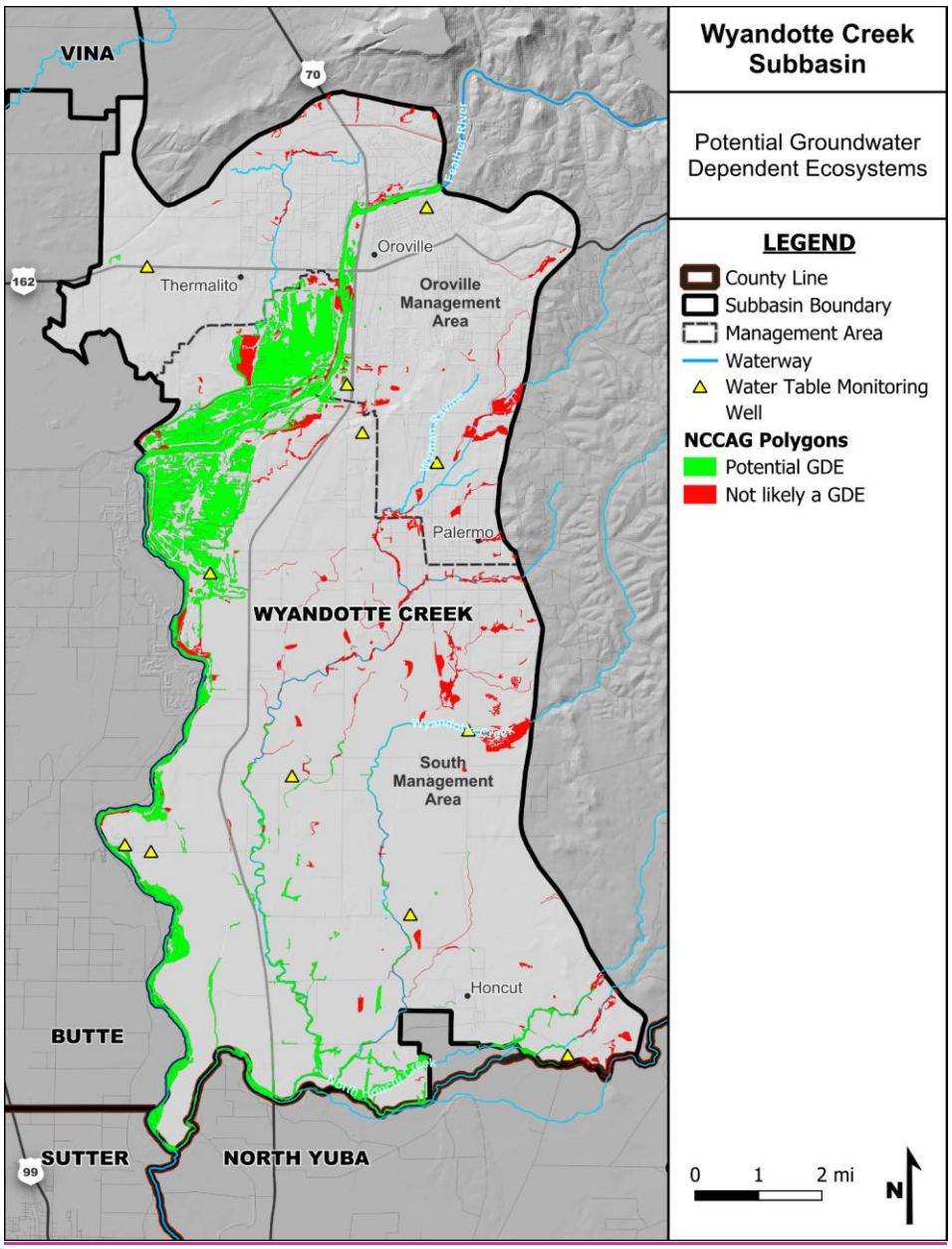

Figure 2-32: Potential Groundwater Dependent Ecosystems in the Wyandotte Creek Subbasin

2.3 Water Budget

This section describes historical, current, and projected water budgets in accordance with §354.18 of the GSP Emergency Regulations, including quantitative estimates of inflows to and outflows from the basin over time and annual changes in water storage within the basin. Components of the water budgets are depicted in Figure 2-~~24~~33.

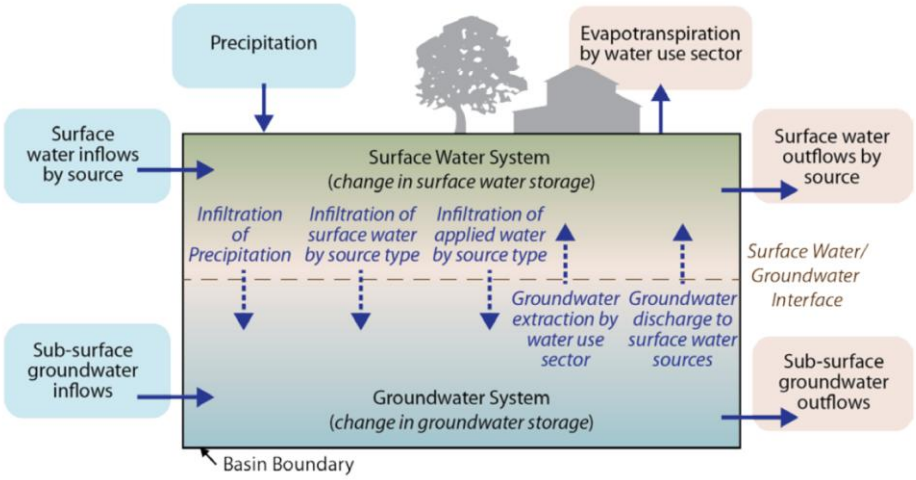

Figure 2-~~24~~33: Water Budget Components (DWR, 2016)

Water budgets were developed considering hydrology, water demand, water supply, land use, population, climate change, surface water – groundwater interaction, and subsurface groundwater inflows and outflows to and from neighboring basins. Water budget results are reported on a water year basis spanning from October 1 of the prior year to September 30 of the current year. The water budget presented in this section is based on the Butte Basin Groundwater Model (version BBGM v.1.00) used during the 2022 GSP development. Current conditions are based on data through 2018.

2.3.1 Selection of Hydrologic Periods

The GSP Emergency Regulations require evaluation of water budgets over a minimum of 10 years for the historical water budget, using the most recent hydrology for the current water budget, and 50 years of hydrology for the projected water budget. Hydrologic periods were selected, as described below, for each water budget category based on consideration of the best available information and science to support water budget development and based on consideration of the ability of the selected periods to provide a representative range of wet and dry conditions.

- Historical – The 19-year period from water years[15] 2000 to 2018 was selected based on the level of confidence in historical information to support water budget

[15] A water year is defined as the period from October 1 of the prior year to September 30 of the current year. For example, water year 2000 refers to the period from October 1, 1999, to September 30, 2000.

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development considering land use, surface water availability, hydrology, and other factors.

- Current Conditions – Historical water budget information for 2018 represents the most recent hydrology. To provide a broader basis for understanding current water budget conditions, a water budget scenario combining current land use and urban demands with 50 years of hydrology was selected. The period selected was 1971 to 2018 (48 years) with 2004–2005 (two relatively normal years) repeated at the end of the scenario. An advantage of evaluating the current conditions water budget over a representative 50-year period is that the results provide a baseline for evaluation of the projected water budgets. Results for 2018, the most recent available information, are provided in Appendix 2-A.
- Future Conditions – Consistent with the current conditions water budget, the period selected for the projected water budgets was 1971 to 2018 (48 years) with 2004–2005 repeated at the end of the scenarios to provide a full 50-year period as required by the GSP Emergency Regulations.
- Selection of the 50-year hydrologic period for the current and projected water budget scenarios was based primarily on three considerations:
  - The BBGM, the primary tool used to develop the water budgets, has a simulation period from water years 1971 to 2018.
  - The Sacramento Valley Water Year Index[16] over the period from 1971 to 2018 has an average of 8.0, as compared to 8.1 for the 103-year period from 1906 to 2018 (1906 is the first year for which the index is available) (Figure 2-~~25~~34).
  - The selected period includes a combination of wet and dry cycles, including relatively wet periods in the early 1970s, mid 1980s, and late 1990s and dry periods in the late 1970s, early 1990s, and from approximately 2007 to 2015.
- Additionally, annual precipitation for the 1971 to 2018 period averaged approximately 26.3 inches per year, as compared to 24.8 inches for the 1906 to 2018 period indicating slightly drier conditions than the full period of record for the Sacramento Valley Index.

[16] The Sacramento Valley Water Year Index classifies water years as wet, above normal, below normal, dry, or critical based on Sacramento River unimpaired flows. Additional details describing the Sacramento Valley Water Year Index are available from the California Data Exchange Center (https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST).

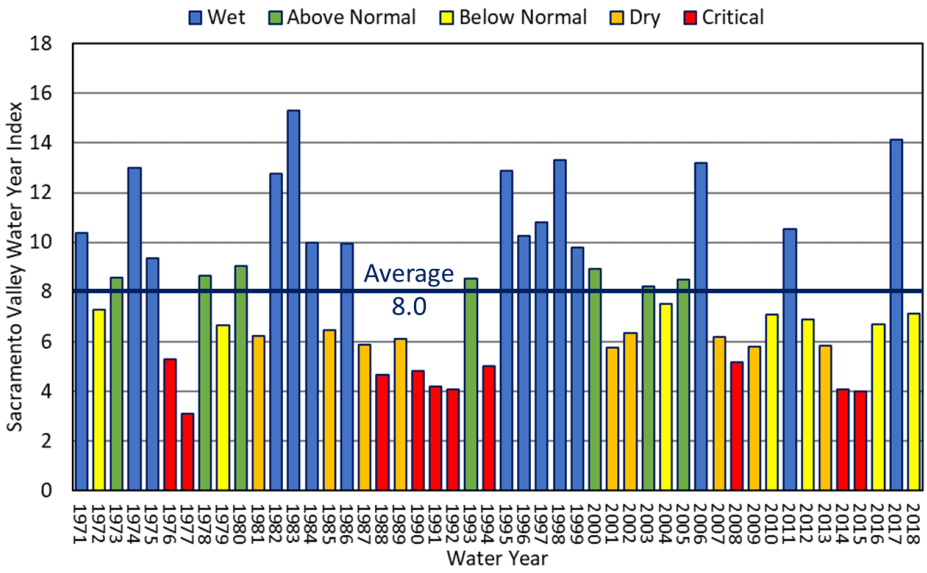

Figure 2-~~25~~34: 1971 – 2018 Sacramento Valley Water Year Index and Water Year Types

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2.3.2 Usage of the Butte Basin Groundwater Model

Development of the original BBGM began in 1992 under the direction and funding of the Butte Basin Water Users Association. The model has been updated over time to simulate historical conditions through water year 2018. The model performs calculations on a daily time step with some daily input (i.e., precipitation, stream inflow), some monthly input data (i.e., surface water diversions) and some annual input data (i.e., land use). Refinements to the model over time include additional crop types to better represent ponded crops (i.e., rice and wetlands), recalibrated soil parameters, and elemental land use. The development of the BBGM ~~are~~is described in more detail in BCDWRC, 2021. The BBGM was updated to version 1.3 and extended through water year 2024. Further information on model updates is available in Woodard & Curran, January 2026. This section did not use the updated BBGM v1.3 as additional model calibration is recommended before its application in the Wyandotte Creek subbasin.

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To prepare water budgets ~~for this GSP~~, historical BBGM results for water years 2000 to 2018 have been relied upon, and four additional baseline scenarios have been developed to represent current and projected conditions utilizing 50 years of hydrology (described previously). Specific assumptions associated with these scenarios are described in the following section.

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2.3.3 Water Budget Assumptions

Assumptions utilized to develop the historical, current, and projected water budgets are described below and summarized in Table 2-4.

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Table 2-4: Summary of Water Budget Assumptions (version BBGM v.1.00)

Water Budget	Analysis Period	Hydrology	Land Use	Water Supplies
Historical Simulation	2000 – 2018	Historical	Historical	Historical
Current Conditions Baseline	1971 – 2018	Historical	Current (2015 and 2016)	Current (2015 and 2016 surface water diversions, 2016-2018 average urban demands)
Future Conditions, No Climate Change Baseline	1971 – 2018	Historical	Current, adjusted based on Butte County 2030 General Plan	Current (2015 and 2016 Surface water diversions and 2050 projected urban demands)
Future Conditions, 2030 Climate Change Baseline	1971 – 2018	Historical, adjusted based on 2030 climate change	Current, adjusted based on General Plan	Current, adjusted based on climate change
Future Conditions, 2070 Climate Change Baseline	1971 – 2018	Historical, adjusted based on 2070 climate change	Current, adjusted based on General Plan	Current, adjusted based on climate change

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2.3.3.1 Historical Conditions

A historical water budget was developed to support understanding of past aquifer conditions, considering surface water and groundwater supplies utilized to meet demands. The historical water budget was developed using the BBGM and incorporates the best available science and information. Historical water supplies and aquifer response have been characterized by water year type based on DWR's Sacramento Valley Water Year Index, which classifies water years as wet, above normal, below normal, dry, or critical based on Sacramento River unimpaired flows.

As described previously, water years 2000 to 2018 were selected to provide a minimum of 10 years across a range of hydrologic conditions. This period includes relatively wet years in 2006, 2011, and 2017 as well as dry conditions between 2007 and 2009 and between 2013 and 2015.

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Information utilized to develop the historical water budget include:

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- Analysis Period – Water years 2000 to 2018.
- Stream Inflows – Inflows of surface water into the basin were estimated based on stream gage data from USGS and DWR where available (e.g., Feather River and South Honcut Creek). For un-gaged streams, inflows were estimated using the Natural Resources Conservation Service (NRCS) rainfall runoff method applied at the watershed scale, considering precipitation timing and amount, soil characteristics, and other factors. Additional detail describing stream inflows is described in the BBGM model report (BCDWRC, 2021).

- Land Use – Land use characteristics for agricultural, native, and urban (including rural residential) lands were estimated annually based on a combination of DWR land use surveys and county agricultural commissioner cropping reports. DWR land use data were available for 1994, 1999, 2004, 2011, 2014, 2015, and 2016. Additional detail describing the development of land use estimates can be found in the BBGM model report (BCDWRC, 2021).
- Agricultural Water Demand – Agricultural irrigation demands were estimated using the BBGM, which simulates crop growth and water use on a daily basis, considering crop type, evapotranspiration, root depth, soil characteristics, and irrigation practices. For ponded land uses (rice and managed wetlands), pond depths and pond drainage are also considered to simulate demands.
- Urban and Industrial Water Demand[17] – Urban and industrial demands were estimated based on a combination of pumping data provided directly by water suppliers (e.g., Cal Water) and estimates of population and per capita water use over time. Additional detail describing the development of urban demand estimates can be found in the BBGM model report (BCDWRC, 2021).
- Surface Water Diversions – Surface water diversions were estimated based on a combination of reported diversions by water suppliers (e.g., SFWPA) and, in some cases, agricultural water demand estimates for areas known to receive surface water but for which reported diversion data were not available.
- Groundwater Pumping – For urban water suppliers, historical pumping was estimated from reported pumping volumes over time. Pumping to meet agricultural and managed wetlands demands was estimated within the BBGM by first estimating the total demand and then subtracting surface water deliveries to calculate estimated groundwater pumping required to meet the remaining demand.

2.3.3.2 Current Conditions

The current conditions water budget was developed as a baseline to evaluate projected water budgets considering future conditions and is based on 50 years of hydrology along with the most recent information describing land use, urban demands, and surface water supplies. The 50-year hydrologic period was selected rather than the most recent year for which historical water budget information is available to allow for direct comparison of potential future conditions to current conditions. The use of a representative hydrologic period containing wet and dry cycles supports the understanding of uncertainty in groundwater conditions over time, establishment of SMC, and development of projects and management actions to avoid undesirable results.

The current water budget estimates current inflows, outflows, and change in storage for the basin using 50 years of representative hydrology and the most recent water supply, water demand, and land use information.

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[17] Current estimates of industrial water use not supplied by urban water suppliers have not been explicitly included at this time and are identified as a data gap that could be filled as part of future GSP updates. These water uses are small relative to other water uses (i.e., agricultural and urban) and tend to be non-consumptive in nature. Additionally, future refinements of the BBGM to incorporate rural residential demands may also be made; these demands were estimated as part of the 2016 Water Inventory and Analysis and are also small relative to other uses.

Information utilized to develop the current conditions baseline water budget include:

- Analysis Period – 50-years of hydrology were utilized representing the period from 1971 to 2018, with 2004 and 2005 repeated following 2018.
- Stream Inflows – Inflows of surface water into the basin were estimated utilizing the same information as for the historical water budget.
- Land Use – Land use for agricultural, native, and urban (including rural residential) lands was estimated annually using the most recent land use information. Specifically, 2015 and 2016 land use were mapped to the 50-year analysis period, with 2015 land use applied to extreme dry years and 2016 land use applied to all other years. Extreme dry years were identified based on April to July inflows of the Feather River to Lake Oroville. April to July runoff to the Feather River is believed to be a reasonable indicator of surface water supplies within the basin, which are primarily associated with the Feather River.
- Agricultural Water Demand – Agricultural irrigation demands were estimated using the BBGM, in the same manner as the historical water budget.
- Urban and Industrial Water Demand – Urban and industrial demands were estimated based on recent demands. Specifically, average demands for the period 2016 to 2018 were assumed.
- Surface Water Diversions – Similar to land use, surface water diversions were estimated based on 2015 and 2016 conditions, with 2015 diversion assumed for extreme dry years as discussed above.
- Groundwater Pumping – Pumping to meet urban demands was estimated based on average 2016 to 2018 demands, as described above. Pumping to meet agricultural and managed wetlands demands was estimated using the BBGM as described previously for the historical water budget.

2.3.3.3 Future Conditions

Three projected baseline water budget scenarios were developed considering a range of future conditions that may occur. The scenarios consider future planned land use changes (i.e., development) based on the Butte County 2030 General Plan, along with changes in climate, including precipitation, surface water inflows, and evapotranspiration. These baselines provide information regarding changes in basin conditions (e.g., groundwater storage) that may occur in the future over a series of wet and dry cycles.

The projected water budget estimates potential future inflows, outflows, and change in storage for the basin using 50-years of representative hydrology (including modifications based on climate change projections), the most recent water supply and water demand, and planned future land use information.

Information utilized to develop the future conditions baseline water budgets includes:

- Analysis Period – 50-years of hydrology were utilized representing the period from 1971 to 2018, with 2004 and 2005 repeated following 2018.
- Stream Inflows:

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- Future Conditions, No Climate Change – Inflows of surface water into the basin were estimated utilizing the same information as for the historical water budget.
- Future Conditions, 2030 Climate Change – Precipitation, evapotranspiration, and surface water supplies were adjusted to reflect climate change based on the 2030 Central Tendency climate change datasets provided by DWR to support GSP development.
    - For precipitation and evapotranspiration, monthly change factors were applied to historical values to estimate potential future conditions.
- For streamflows, DWR estimates of stream inflows were utilized where available; for streams without direct estimates of inflows, inflows were estimated using streamflow change factors applied at the watershed scale.
- Future Conditions, 2070 Climate Change – Precipitation, evapotranspiration, and surface water supplies were adjusted to reflect climate change based on the 2070 Central Tendency climate change datasets provided by DWR to support GSP development:
    - For precipitation and evapotranspiration, monthly change factors were applied to historical values to estimate potential future conditions.
    - For streamflows, DWR estimates of stream inflows were utilized where available; for streams without direct estimates of inflows, inflows were estimated using streamflow change factors applied at the watershed scale.
- Land Use – Land use for agricultural, native, and urban (including rural residential) lands was estimated annually using the most recent land use information and modified based on planned development according to the Butte County 2030 General Plan. Specifically, 2015 and 2016 land use were mapped to the 50-year analysis period, with 2015 land use applied to extreme dry years and 2016 land use applied to all other years. 2015 and 2016 land use data were modified to reflect planned development, generally resulting in an increase in urban land through development of previously undeveloped (i.e., native) lands:
- Future Conditions, No Climate Change – Land use was assumed to be similar to the current conditions water budget scenario.
- Future Conditions, 2030 Climate Change – 2015 and 2016 land use data were mapped to the 50-year analysis period considering 2030 central tendency climate change projections, with 2015 land use used for extreme dry years and 2016 land use used for all other years.
- Future Conditions, 2070 Climate Change – 2015 and 2016 land use data were mapped to the 50-year analysis period considering 2070 central tendency climate change projections, with 2015 land use used for extreme dry years and 2016 land use used for all other years.
- Agricultural Water Demand – Agricultural irrigation demands were estimated using the BBGM, in the same manner as the historical water budget.
- Urban and Industrial Water Demand – Urban and industrial demands were estimated based projected urban demands. Specifically, future urban demands were estimated

based on preliminary draft demand estimates provided by Cal Water, a primary urban supplier in the basin, as part of 2020 UWMP development.

- Surface Water Diversions – Similar to land use, surface water diversions were estimated based on 2015 and 2016 conditions, with 2015 diversions assumed for extreme dry years and 2016 diversions assumed for other years. Extreme dry years are identified based on April to July unimpaired Feather River inflows into Lake Oroville.
- Groundwater Pumping – Pumping to meet urban demands was estimated based on draft projections from UWMPs currently under development, as described above. Pumping to meet agricultural and managed wetlands demands was estimated using the BBGM as described previously for the historical water budget.

2.3.4 Water Budget Estimates

As described previously, water budget estimates were developed using the BBGM. Primary components of the land and surface water system water budget include the following:

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- Inflows:
  - Surface Water Inflows – Inflows at the land surface through streams, canals, or other waterways. These inflows may also include overland flow from upslope areas outside of the basin. Although interactions with streams along the boundary of the basin (i.e., diversions and stream-aquifer interaction) are accounted for, the flow in the stream is not considered an inflow to the basin. Inflows from the Feather River, which traverses the basin, are accounted for explicitly.
  - Precipitation – Rainfall intercepting the ground surface within the basin boundary.
  - Groundwater pumping – Extraction of groundwater to meet agricultural, urban, managed wetlands, or other beneficial uses.
  - Stream Accretions – Gains in streamflow from shallow groundwater occurring when the water level in the aquifer adjacent to the stream is greater than the water level in the stream.
- Outflows:
  - Surface Water Outflows – Outflows at the land surface through streams, canals, or other waterways. These outflows may also include overland flow to downslope areas outside of the basin.
  - Evapotranspiration – Consumptive use of water including both evaporation and transpiration components from all land uses.
  - Deep Percolation – Recharge of the groundwater system through the vertical movement of precipitation and applied irrigation water below the root zone.
  - Seepage (Also referred to as Losses or Leakage) – Recharge of the groundwater system from streams, canals, or other water bodies.
- Change in Storage – Changes in soil moisture storage within the upper several feet of soil in the root zone, as well as changes in storage in surface water bodies within the

basin. These changes are generally negligible on an annual basis but vary over the course of a year based on precipitation patterns and other factors.

Primary components of the groundwater system water budget include the following:

- Inflows:
  - Deep Percolation – Described above.
  - Subsurface Inflows – Groundwater inflows from adjacent basins or from the foothill area north of the Wyandotte Creek Subbasin.
  - Seepage – Described above.
- Outflows:
  - Groundwater Pumping – Described above.
  - Subsurface Outflows – Groundwater outflows to adjacent basins.
  - Stream Accretions – Described above.
- Change in Storage – Changes in water storage in the aquifer system. These changes tend to be large compared to changes in root zone soil moisture storage and can vary substantially from year to year.

Many components of the water budget can be estimated based on measured data (e.g., precipitation, diversions, evapotranspiration, etc.) and are used to develop inputs to the BBGM to support water budget development. Other components are more difficult to measure or do not have measured values readily available (e.g., deep percolation, subsurface flows, groundwater pumping, surface water-groundwater interaction, etc.) and are estimated using the BBGM. Additional detail describing the BBGM is available in (BCDWRC, 2021).

Average annual water budget estimates for the historical water budgets and for the current and projected water budget scenarios are summarized in Table 2-5 for the land and surface water system and in Table 2-6 for the groundwater system. Additional information and discussion regarding the water budgets is provided in the following subsections. It is anticipated that the water budgets will be refined and updated over time as part of GSP implementation in the basin.

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Table 2-5: Water Budget Summary: Land and Surface Water System (version BBGM v.1.00)

Component	Historical (AFY)	Current (AFY)	Future, No Climate Change (AFY)	Future, 2030 Climate Change (AFY)	Future, 2070 Climate Change (AFY)
Inflows					
Surface Water Inflows	**1,067,300**	**923,900**	**924,000**	**986,500**	**1,036,300**
Outside Diversions	5,700	5,600	5,700	5,700	5,700
Feather River	*1,019,200*	*874,500*	*874,500*	*933,800*	*981,400*
North Honcut Creek	*41,800*	*43,100*	*43,100*	*46,200*	*48,400*
Precipitation Runoff from Upslope Lands	*500*	*600*	*600*	*700*	*700*
Applied Water Return Flows from Upslope Lands	*100*	*100*	*100*	*100*	*100*
Precipitation	**130,800**	**136,100**	**136,100**	**141,500**	**144,900**
Groundwater Pumping	**47,100**	**43,100**	**45,000**	**46,600**	**48,700**
Agricultural	*39,300*	*36,200*	*35,800*	*37,400*	*39,300*
Urban and Industrial	700	500	2,800	2,700	2,700
Managed Wetlands	*7,100*	*6,400*	*6,400*	*6,500*	*6,700*
Stream Gains from Groundwater	**36,300**	**32,000**	**29,500**	**28,500**	**26,600**
Total Inflow	***1,281,500***	***1,135,100***	***1,134,600***	***1,203,100***	***1,256,500***
Outflows					
Evapotranspiration	**87,100**	**82,500**	**81,500**	**84,100**	**86,500**
Agricultural	*43,800*	*41,300*	*40,800*	*42,200*	*44,000*
Urban and Industrial	*8,600*	*8,700*	*11,800*	*12,000*	*12,200*
Managed Wetlands	*5,400*	*4,500*	*4,500*	*4,700*	*4,800*
Native Vegetation	*29,300*	*28,000*	*24,400*	*25,200*	*25,500*
Canal Evaporation	*0*	*0*	*0*	*0*	*0*
Deep Percolation	**70,700**	**69,600**	**67,300**	**69,900**	**70,700**
Precipitation	*47,000*	*48,800*	*45,300*	*49,100*	*47,000*
Applied Surface Water	*6,200*	*4,800*	*4,500*	*4,800*	*4,800*
Applied Groundwater	*17,500*	*16,000*	*17,500*	*16,000*	*18,900*
Seepage	**10,000**	**9,700**	**9,900**	**10,700**	**11,900**
Streams	*4,100*	*4,900*	*5,100*	*5,900*	*7,100*
Lakes	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*
Canals and Drains	*2,300*	*1,200*	*1,200*	*1,200*	*1,200*
Surface Water Outflows	**1,113,500**	**973,200**	**975,600**	**1,038,600**	**1,087,400**
Precipitation Runoff	*17,800*	*19,200*	*21,600*	*23,200*	*24,800*
Applied Surface Water Return Flows	*1,700*	*1,200*	*1,300*	*1,300*	*2,600*

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Component	Historical (AFY)	Current (AFY)	Future, No Climate Change (AFY)	Future, 2030 Climate Change (AFY)	Future, 2070 Climate Change (AFY)
Applied Groundwater Return Flows	*3,300*	*2,700*	*3,100*	*3,100*	*4,100*
Streams	*1,090,700*	*950,100*	*949,600*	*1,011,000*	*1,055,900*
Total Outflow	***1,281,300***	***1,135,000***	***1,134,300***	***1,203,300***	***1,256,500***
Change in Storage (Inflow - Outflow)	***200***	***100***	***300***	***-200***	***0***

Note: AFY = acre-feet per year
Totals are the sum of numbers in bold.

Table 2-6: Water Budget Summary: Groundwater System (version BBGM v.1.00)

Component	Historical (AFY)	Current (AFY)	Future, No Climate Change (AFY)	Future, 2030 Climate Change (AFY)	Future, 2070 Climate Change (AFY)
Inflows					
Subsurface Inflows	**24,900**	**22,500**	**22,500**	**22,100**	**22,200**
Butte Subbasin	*15,200*	*13,300*	*13,300*	*12,900*	*13,000*
North Yuba Subbasin	*2,700*	*2,500*	*2,500*	*2,300*	*2,100*
Sutter Subbasin	*700*	*500*	*500*	*600*	*800*
Vina Subbasin	*0*	*0*	*0*	*0*	*0*
Foothill Area	*6,300*	*6,200*	*6,100*	*6,300*	*6,300*
Deep Percolation	**70,800**	**69,600**	**67,300**	**69,900**	**70,700**
Precipitation	*47,000*	*48,800*	*45,300*	*46,900*	*47,000*
Applied Surface Water	*6,200*	*4,800*	*4,500*	*4,700*	*4,800*
Applied Groundwater	*17,500*	*16,000*	*17,500*	*18,300*	*18,900*
Seepage	**10,000**	**9,700**	**9,900**	**10,700**	**11,900**
~~*Streams*~~[1] *Streams*[1]	*4,100*	*4,900*	*5,100*	*5,900*	*7,100*
~~*Lakes*~~[2] *Lakes*[2]	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*
Canals and ~~*Drains*~~[3] *Drains*[3]	*2,300*	*1,200*	*1,200*	*1,200*	*1,200*
Total Inflow	***105,700***	***101,800***	***99,700***	***102,700***	***104,800***
Outflows					
Subsurface Outflows	**26,000**	**26,700**	**25,600**	**27,600**	**29,900**
Butte Subbasin	*14,000*	*14,800*	*13,700*	*14,400*	*14,900*
North Yuba Subbasin	*10,500*	*10,500*	*10,700*	*11,800*	*13,600*
Sutter Subbasin	*400*	*300*	*300*	*300*	*200*

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Component	Historical (AFY)	Current (AFY)	Future, No Climate Change (AFY)	Future, 2030 Climate Change (AFY)	Future, 2070 Climate Change (AFY)
Vina Subbasin	*200*	*300*	*200*	*300*	*300*
Foothill Area	*900*	*800*	*700*	*800*	*900*
Groundwater Pumping	**47,100**	**43,000**	**44,900**	**46,600**	**48,700**
Agricultural	*39,300*	*36,200*	*35,800*	*37,400*	*39,300*
Urban and Industrial	*700*	*500*	*2,800*	*2,700*	*2,700*
Managed Wetlands	*7,100*	*6,400*	*6,400*	*6,500*	*6,700*
Stream Gains from Groundwater	**36,300**	**32,000**	**29,500**	**28,500**	**26,600**
Total Outflow	***109,400***	***101,700***	***100,000***	***102,700***	***105,200***
Change in Storage (Inflow - Outflow)	***-3,700***	***100***	***-300***	***0***	***-400***

~~Note:~~

Notes:

[1] Feather River and North Honcut Creek

[2] Thermalito Afterbay

[3] SFWPA

Totals are the sum of numbers in bold.

2.3.4.1 Historical Conditions

The historical water budget provides a foundation for how the basin has behaved historically, including insight into historical groundwater conditions (e.g., observed water levels). Also, in accordance with the GSP Regulations, the historical water budget covers a period of at least 10 years (19-year period from 2000 to 2018), is used to evaluate the availability and reliability of historical surface water supplies, and provides insight into the ability to operate the basin within the sustainable yield. The historical analysis period experienced somewhat less precipitation than the long-term average and included historic drought conditions from approximately 2007 to 2015.[18]

Average annual inflows to and outflows from the basin for the historical land and surface water system water budget were estimated to be 1.28 million acre-feet (MAF) per year. Average annual values were presented previously in Table 2-5 and are shown graphically in Figure 2-~~26~~35.

Primary inflows to the land and surface water system include surface water inflows (1,067 thousand acre-feet per year [TAF/year]), precipitation (131 TAF/year), stream gains from groundwater (i.e., accretions) (36 TAF/year), and groundwater pumping (47 TAF/year). Surface water inflows consist primarily of the Feather River, which traverses the basin, as well as inflows from Honcut Creek and overland runoff of precipitation and applied water from upslope lands.

[18] For the 2000 to 2018 period, mean annual precipitation was 26.7 inches, compared to 23.1 inches for the 2007 to 2015 period.

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Primary outflows from the land and surface water system include surface water outflows (1,113 TAF/year), evapotranspiration (87 TAF/year), deep percolation (71 TAF/year), and stream losses (also referred to as seepage) (10 TAF/year). Surface water outflows include outflows through the Feather River and Honcut Creek, as well as overland runoff of precipitation and applied water to downslope lands. Evapotranspiration is primarily from agricultural lands but also from native vegetation, urban and industrial lands, and managed wetlands. Deep percolation is primarily from precipitation, but also from applied water. Stream losses include a combination of seepage from canals and drains, stream seepage, and seepage from Thermalito Afterbay.

The average annual change in storage in the land and surface water system is negligible due to similar soil moisture content in the root zone, on average, across water years, and limited storage capacity exists in surface water bodies within the basin.

Additional details describing the historical land and surface water system water budget are provided in Appendix 2-A.

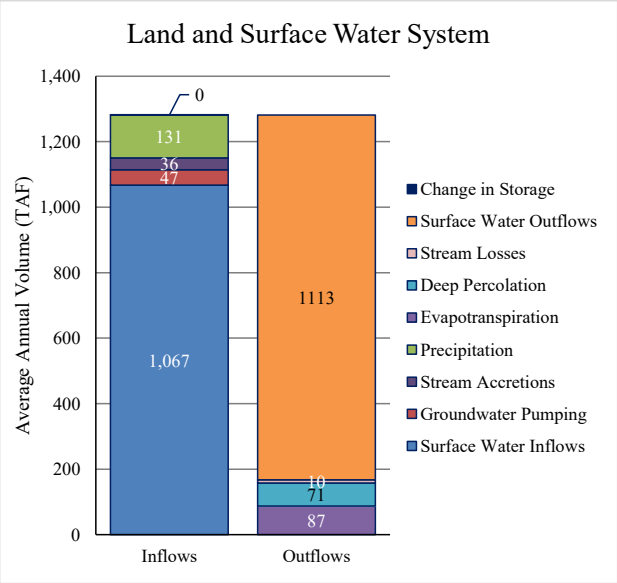

Figure 2-~~26~~35: Average Annual Historical Land and Surface Water System Water Budget (version BBGM v.1.00)

Average annual inflows to and outflows from the groundwater system were estimated to be 106 TAF and 109 TAF, respectively, with an average decrease in groundwater storage of 4 TAF per year during the historical simulation period. Average annual values were presented previously in Table 2-6 and are shown graphically in Figure 2-~~27~~36.

Inflows to the groundwater system include deep percolation (71 TAF/year); subsurface inflows from the Butte, North Yuba, Sutter, and Vina subbasins and from the foothill area (25 TAF/year); and stream losses (10 TAF/year). Outflows from the groundwater system include groundwater pumping (47 TAF/year); subsurface outflows to the Butte, North Yuba, Sutter, and

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Vina subbasins and to the foothill area (26 TAF/year); and stream gains from groundwater (36 TAF/year).

Additional details describing the historical groundwater system water budget are provided in Appendix 2-A.

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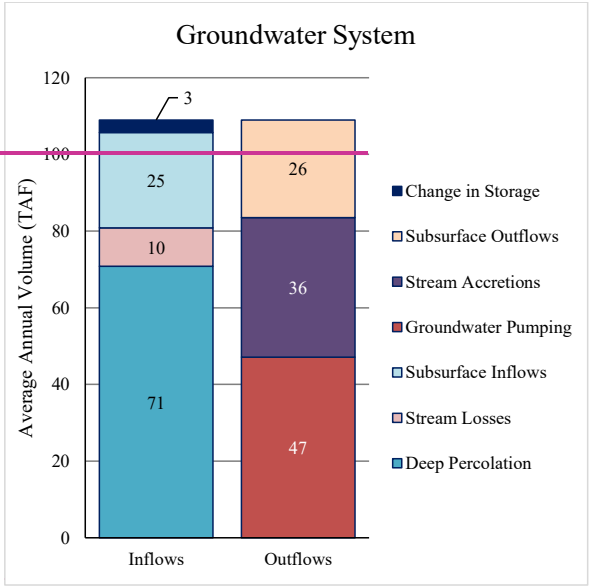

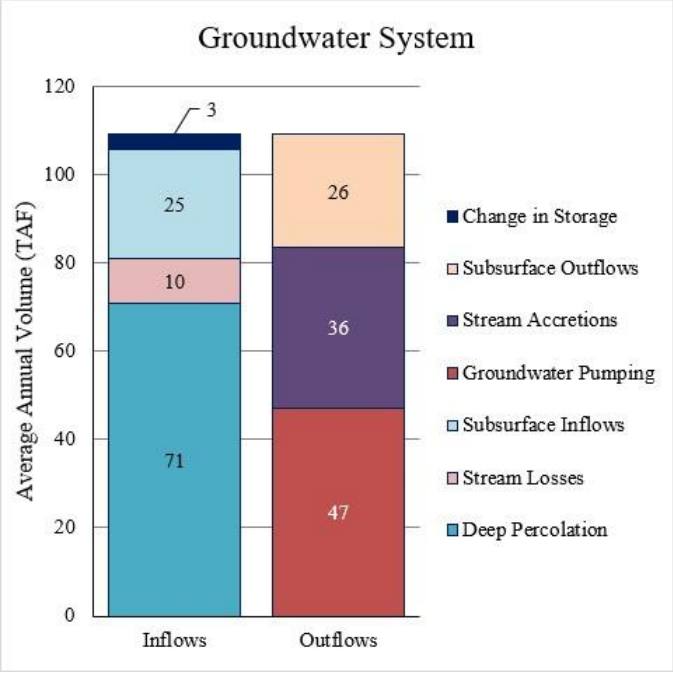

Figure 2-~~27~~36: Average Annual Historical Groundwater System Water Budget (version BBGM v.1.00)

Historical water supplies and change in groundwater storage are summarized by water year type in Table 2-7 based on the Sacramento Valley Water Year Index. Between 2000 and 2018, there were three wet years, three above normal years, five below normal years, five dry years, and three critical years. Historical surface water deliveries were similar across year types, while groundwater pumping was greatest in critical years and least in wet years. Historically, groundwater storage in the basin has tended to increase in wet years and to decrease in above normal, below normal, dry, and critical years, with reductions in storage in above normal and below normal years less than reductions in dry and critical years. Surface water supplies are relatively reliable in the basin but currently represent only about 20% of total water supplies.

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Table 2-7: Historical Water Supplies and Change in Groundwater Storage by Hydrologic Water Year Type (version BBGM v.1.00)

Water Year Type	Surface Water Deliveries (AFY)	Groundwater Pumping (AFY)	Total Supply (AFY)	Change in Groundwater Storage (AFY)
Wet	10,500	38,700	49,200	37,300
Above Normal	12,500	45,200	57,700	-2,000
Below Normal	11,100	45,400	56,500	-3,500
Dry	13,300	50,300	63,600	-20,300
Critical	9,900	55,000	64,900	-18,900

Availability or Reliability of Historical Surface Water Supplies

As indicated in Table 2-7, historical surface water supplies vary somewhat based on water year type with the primary water supply in the basin being groundwater. The primary source of surface water in the basin is the Feather River. Surface water supplies are relatively reliable in the basin and represent approximately 20% of total water supplies. Potential effects of climate change on surface water reliability are further evaluated as part of the projected water budgets in the following sections.

Suitability of Tools and Methods for Planning

The water budgets presented herein have been developed using the best available information and best available science and structured in a manner consistent with the HCM of the basin. The BBGM, which is used to organize information for the water budgets, develop water budget scenarios, and perform water budget calculations, is currently the best available tool and is suitable for GSP development for the Wyandotte Creek Subbasin. The BBGM has been developed over the past several decades and updated over time to use updated model code, updated datasets, and updated input parameters through a series of efforts. Refinements to the BBGM have been made through extensive engagement with local stakeholders as part of several past efforts. It is anticipated that the BBGM will may be updated and refined in the future as part of GSP implementation.

~~The water budgets developed using the BBGM support the development of SMC, evaluation of the monitoring network, and development of projects and management actions as part of GSP development. It is anticipated that the BBGM will be updated and refined in the future as part of GSP implementation. Additional information describing the BBGM is available in (BCDWRC, 2021).~~

~~***Ability to Operate the Basin within the Sustainable Yield***~~

~~Sustainable yield refers to the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin, and including any temporary surplus that can be withdrawn annually from a groundwater supply without causing an undesirable result. As a result, determination of sustainable yield requires consideration of SGMA's six SIs. Historical water budget estimates indicate an average annual decrease in storage of 3,700 TAF/year for the period from water year 2000 to 2018. Operation of the basin within the sustainable yield may require incorporation of projects and management actions into the GSP and implementation over the 50-year SGMA planning and implementation horizon. The estimated sustainable yield of the basin is described in greater detail in Section 2.3.5.~~

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2.3.4.2 Current Conditions

The current conditions baseline water budget provides a foundation to understand the behavior of the basin considering current land use and urban demands over a broad range of hydrologic conditions as well as a basis for evaluating how groundwater conditions may change in the future based on comparison of water budget results to projected water budgets presented in the following section. A 50-year hydrologic period was selected, rather than a single, recent year to improve the basis for estimation of sustainable yield under current conditions.

Average annual inflows to and outflows from the basin for the current conditions land and surface water system baseline water budget were estimated to be 1.14 MAF per year. Average annual values were presented previously in Table 2-5 and are shown graphically in Figure 2-~~28~~37.

Primary inflows to the land and surface water system include surface water inflows (924 TAF/year), precipitation (136 TAF/year), stream gains from groundwater (i.e., accretions) (32 TAF/year), and groundwater pumping (43 TAF/year). Surface water inflows consist primarily of the Feather River, which traverses the basin, as well as inflows from Honcut Creek and overland runoff of precipitation and applied water from upslope lands.

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Primary outflows from the land and surface water system include surface water outflows (973 TAF/year), evapotranspiration (83 TAF/year), deep percolation (70 TAF/year), and stream losses (also referred to as seepage) (10 TAF/year). Surface water outflows include outflows through the Feather River and Honcut Creek, as well as overland runoff of precipitation and applied water to downslope lands. Evapotranspiration is primarily from agricultural lands but also from native vegetation, urban and industrial lands, and managed wetlands. Deep percolation is primarily from precipitation, but also from applied water. Stream losses include a combination of seepage from canals and drains, stream seepage, and seepage from Thermalito Afterbay.

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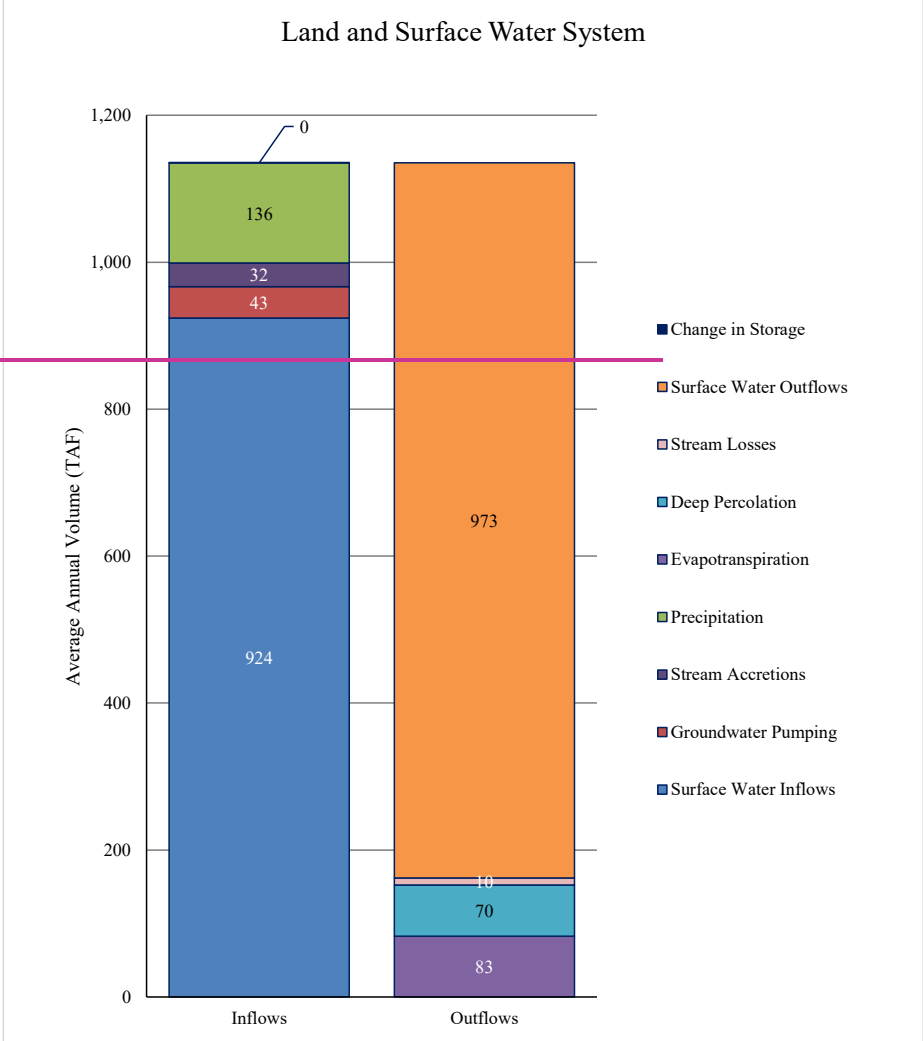
The average annual change in storage in the land and surface water system is negligible due to similar soil moisture content in the root zone, on average, across water years, and limited storage capacity exists in surface water bodies within the basin.


Land and Surface Water System
Average Annual Volume (TAF)
1,200
1,000
800
600
400
200
0
Inflows
Outflows
0
136
32
43
924
973
10
70
83
Change in Storage
Surface Water Outflows
Stream Losses
Deep Percolation
Evapotranspiration
Precipitation
Stream Accretions
Groundwater Pumping
Surface Water Inflows

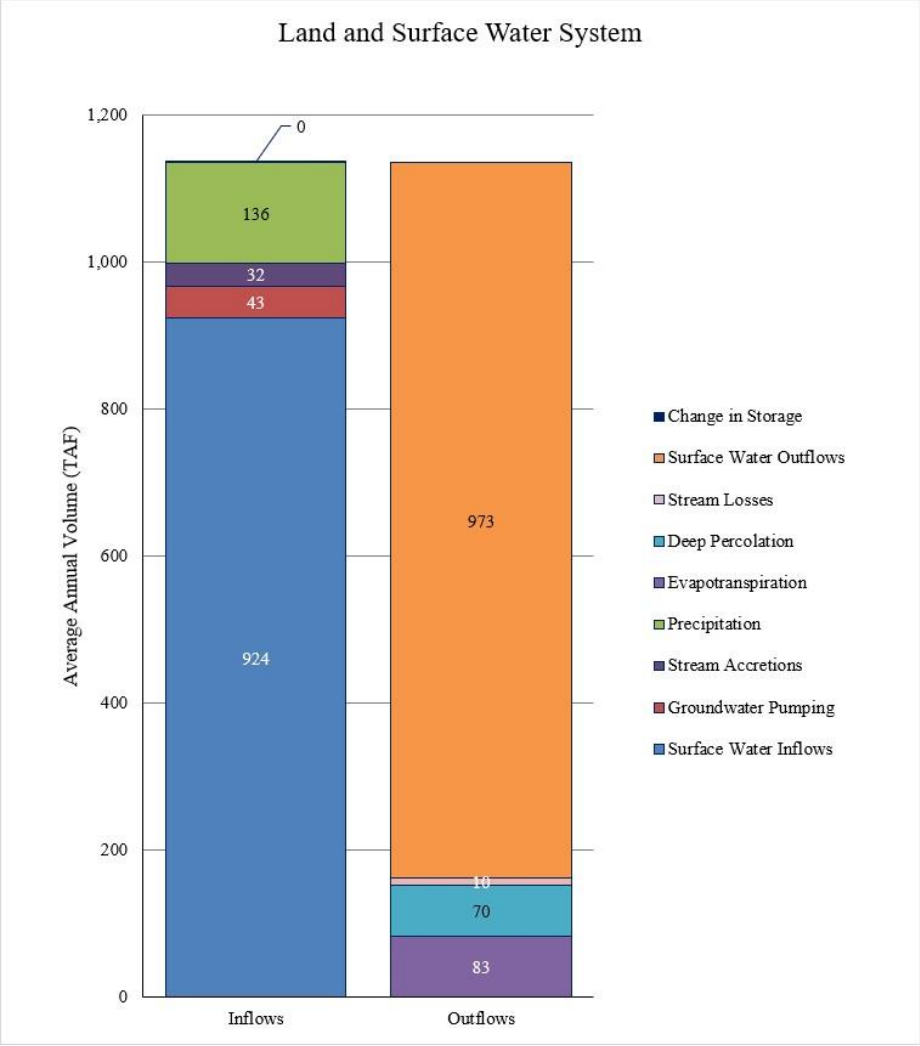


Figure 2-~~28~~37: Average Annual Current Conditions Land and Surface Water System Water Budget (version BBGM v.1.00)

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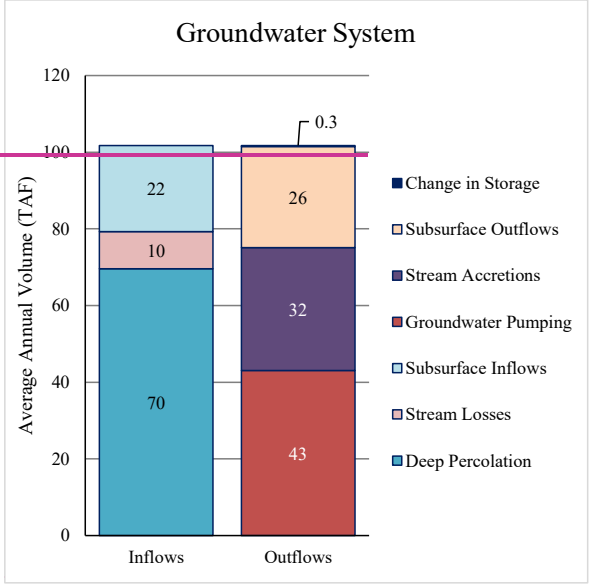
Average annual inflows to and outflows from the groundwater system were estimated to be 102 TAF, with limited average change in groundwater storage during the current conditions baseline simulation period. Average annual values were presented previously in Table 2-6 and are shown graphically in Figure 2-~~29~~38.

Inflows to the groundwater system include deep percolation (70 TAF/year); subsurface inflows from the Butte, North Yuba, Sutter, and Vina subbasins and from the foothill area (22

TAF/year); and stream losses (10 TAF/year). Outflows from the groundwater system include groundwater pumping (43 TAF/year); subsurface outflows to the Butte, North Yuba, Sutter, and Vina subbasins and to the foothill area (26 TAF/year); and stream gains from groundwater (32 TAF/year).



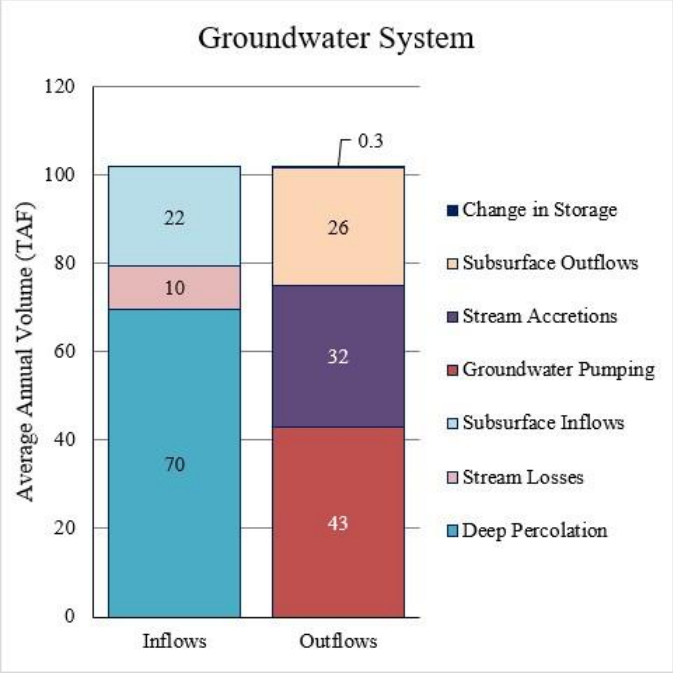


Figure 2-~~29~~38: Average Annual Current Conditions Groundwater System Water Budget (version BBGM v.1.00)

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2.3.4.3 Future Conditions

Three projected water budgets were developed for the basin to provide baseline scenarios representing potential future conditions considering planned development under the Butte County 2030 General Plan and climate change centered around 2030 and 2070 based on central tendency climate change datasets provided by DWR. The projected water budget scenarios provide a foundation to understand the behavior of the basin considering potential land use and urban demands over a broad range of hydrologic conditions, modified based on climate change projections). Use of a 50-year hydrologic period provides a basis for estimation of sustainable yield under potential future conditions.

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Future Conditions, no Climate Change

Average annual inflows to and outflows from the basin for the future conditions without climate change projected land and surface water system baseline water budget were estimated to be 1.13 MAF per year. Average annual values were presented previously in Table 2-5 and are shown graphically in Figure 2-~~30~~39.

Primary inflows to the land and surface water system include surface water inflows (924 TAF/year), precipitation (136 TAF/year), stream gains from groundwater (i.e., accretions) (29 TAF/year), and groundwater pumping (45 TAF/year). Surface water inflows consist primarily of

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the Feather River, which traverses the basin, as well as inflows from Honcut Creek and overland runoff of precipitation and applied water from upslope lands.

Primary outflows from the land and surface water system include surface water outflows (976 TAF/year), evapotranspiration (82 TAF/year), deep percolation (67 TAF/year), and stream losses (also referred to as seepage) (10 TAF/year). Surface water outflows include outflows through the Feather River and Honcut Creek, as well as overland runoff of precipitation and applied water to downslope lands. Evapotranspiration is primarily from agricultural lands but also from native vegetation, urban and industrial lands, and managed wetlands. Deep percolation is primarily from precipitation, but also from applied water. Stream losses include a combination of seepage from canals and drains, stream seepage, and seepage from Thermalito Afterbay.

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The average annual change in storage in the land and surface water system is negligible due to similar soil moisture content in the root zone, on average, across water years, and limited storage capacity exists in surface water bodies within the basin.

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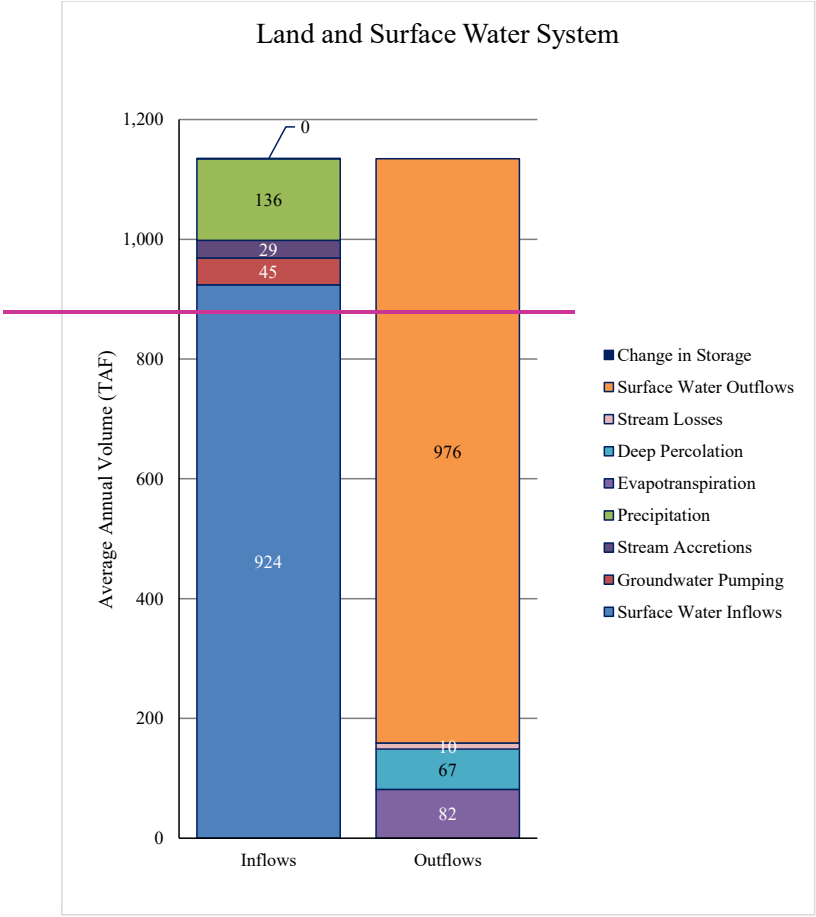
Land and Surface Water System
Average Annual Volume (TAF)
1,200
1,000
800
600
400
200
0
Inflows
Outflows
0
136
29
45
924
976
10
67
82
Change in Storage
Surface Water Outflows
Stream Losses
Deep Percolation
Evapotranspiration
Precipitation
Stream Accretions
Groundwater Pumping
Surface Water Inflows

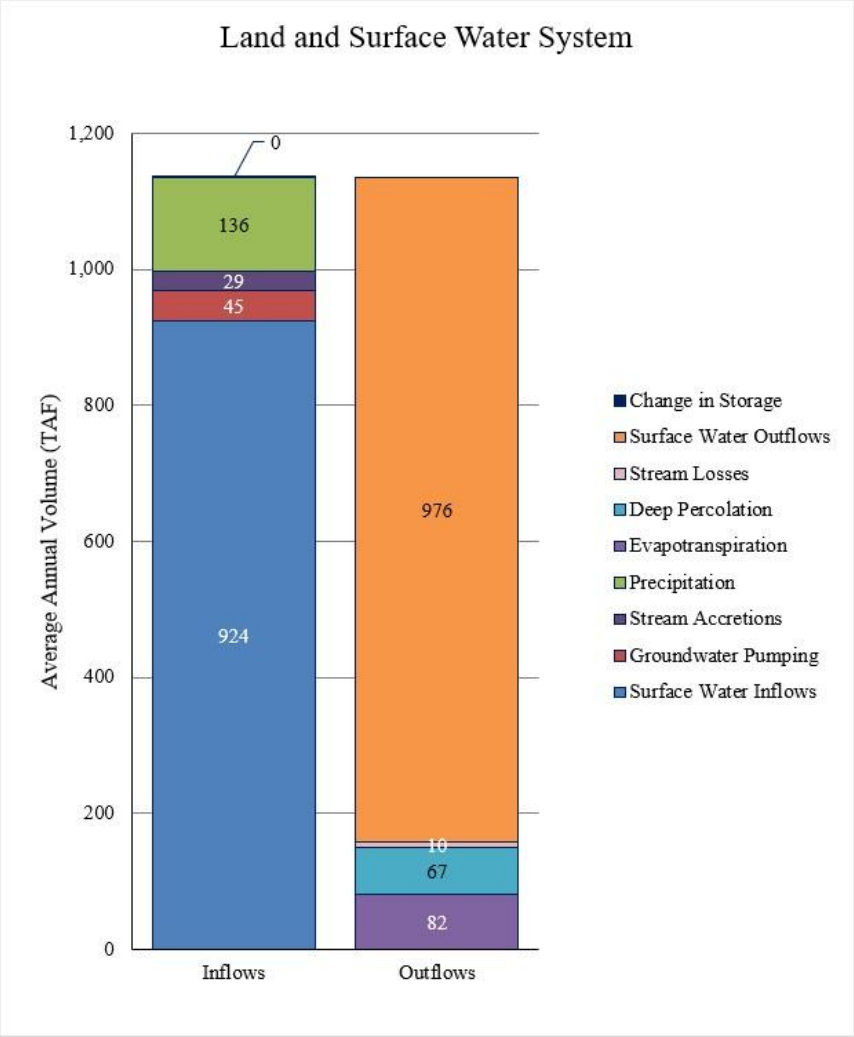

Figure 2-~~30~~39: Average Annual Future Conditions without Climate Change Land and Surface Water System Water Budget (version BBGM v.1.00)

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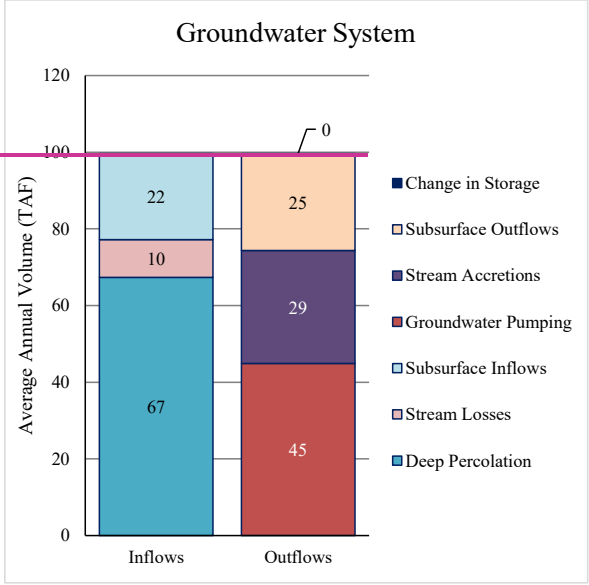
Average annual inflows to and outflows from the groundwater system were estimated to be 100 TAF, with limited average change in groundwater storage during the future conditions without climate change baseline simulation period. Average annual values were presented previously in Table 2-6 and are shown graphically in Figure 2-~~31~~40.

Inflows to the groundwater system include deep percolation (67 TAF/year); subsurface inflows from the Butte, North Yuba, Sutter, and Vina subbasins and from the foothill area (22

TAF/year); and stream losses (10 TAF/year). Outflows from the groundwater system include groundwater pumping (45 TAF/year); subsurface outflows to the Butte, North Yuba, Sutter, and Vina subbasins and to the foothill area (25 TAF/year); and stream gains from groundwater (29 TAF/year).



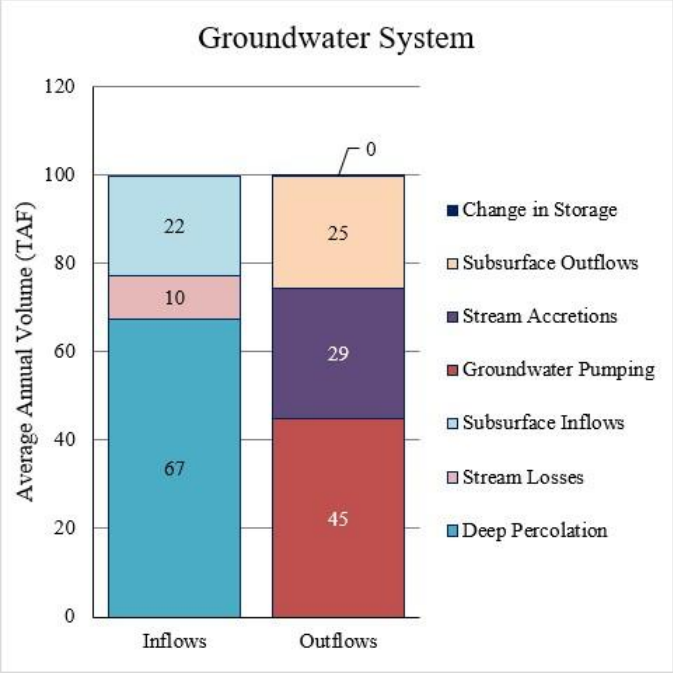


Figure 2-~~31~~40: Average Annual Future Conditions without Climate Change Groundwater System Water Budget (version BBGM v.1.00)

Future Conditions, 2030 Climate Change

Average annual inflows to and outflows from the basin for the future conditions with 2030 climate change projected land and surface water system baseline water budget were estimated to be 1.20 MAF per year. Average annual values were presented previously in Table 2-5 and are shown graphically in Figure 2-~~32~~41.

Primary inflows to the land and surface water system include surface water inflows (986 TAF/year), precipitation (142 TAF/year), stream gains from groundwater (i.e. accretions) (29 TAF/year), and groundwater pumping (47 TAF/year). Surface water inflows consist primarily of the Feather River, which traverses the basin, as well as inflows from Honcut Creek and overland runoff of precipitation and applied water from upslope lands.

Primary outflows from the land and surface water system include surface water outflows (1,039 TAF/year), evapotranspiration (84 TAF/year), deep percolation (70 TAF/year), and stream losses (also referred to as seepage) (11 TAF/year). Surface water outflows include outflows through the Feather River and Honcut Creek, as well as overland runoff of precipitation and applied water to downslope lands. Evapotranspiration is primarily from agricultural lands but also from native vegetation, urban and industrial lands, and managed wetlands. Deep percolation is primarily from precipitation, but also from applied water. Stream losses include a combination of seepage from canals and drains, stream seepage, and seepage from Thermalito Afterbay.

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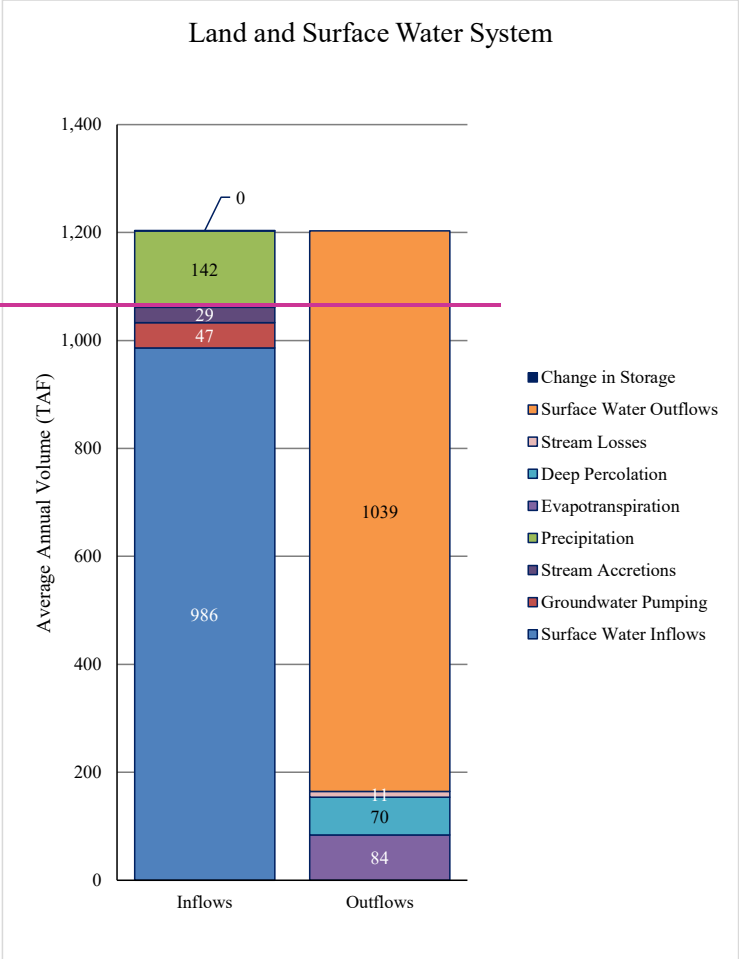
The average annual change in storage in the land and surface water system is negligible due to similar soil moisture content in the root zone, on average, across water years, and limited storage capacity exists in surface water bodies within the basin.



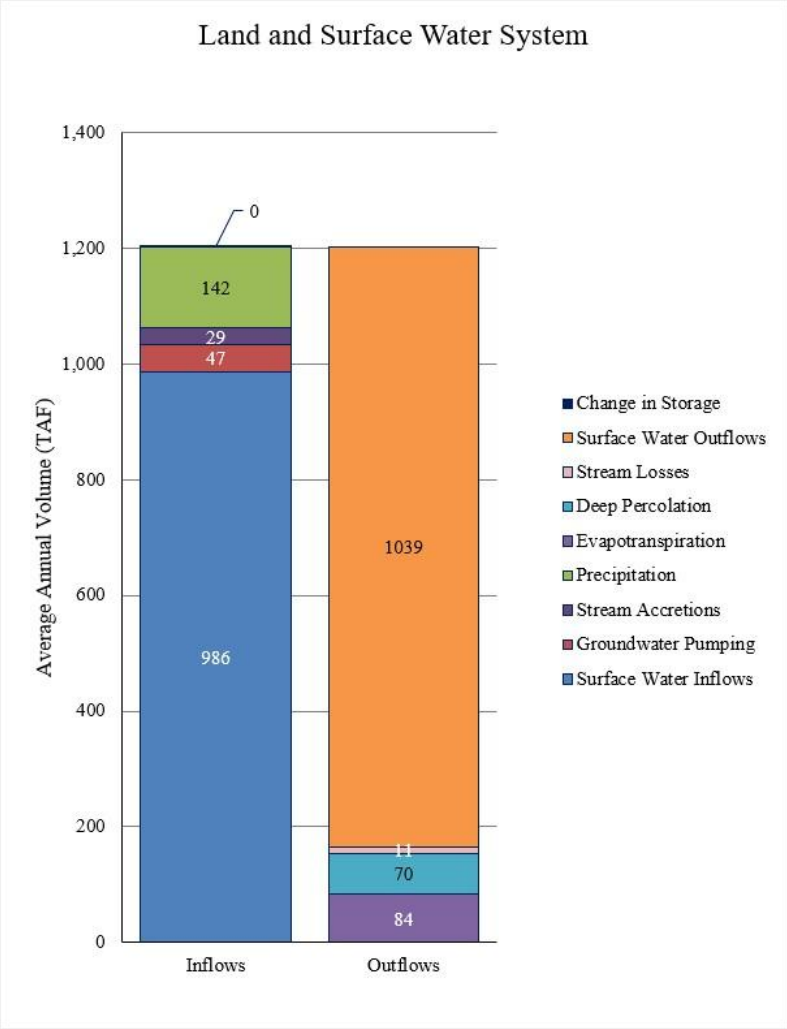


Figure 2-~~32~~41: Average Annual Future Conditions with 2030 Climate Change Land and Surface Water System Water Budget (version BBGM v.1.00)

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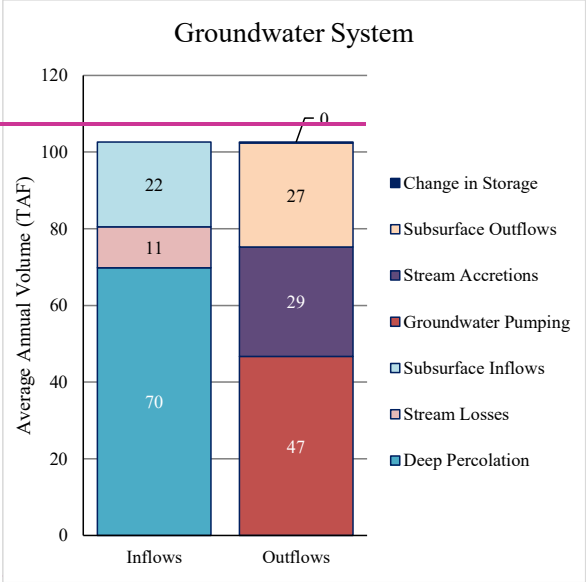
Average annual inflows to and outflows from the groundwater system were estimated to be 103 TAF, with limited average change in groundwater storage during the future conditions with 2030 central tendency climate change baseline simulation period. Average annual values were presented previously in Table 2-6 and are shown graphically in Figure 2-42.

~~Average annual inflows to and outflows from the groundwater system were estimated to be 103 TAF, with limited average change in groundwater storage during the future conditions with 2030~~

~~central tendency climate change baseline simulation period. Average annual values were presented previously in Table 2-6 and are shown graphically in Figure 2-~~ 33.

Inflows to the groundwater system include deep percolation (70 TAF/year); subsurface inflows from the Butte, North Yuba, Sutter, and Vina subbasins and from the foothill area (22 TAF/year); and stream losses (11 TAF/year). Outflows from the groundwater system include groundwater pumping (47 TAF/year); subsurface outflows to the Butte, North Yuba, Sutter, and Vina subbasins and to the foothill area (27 TAF/year); and stream gains from groundwater (29 TAF/year).



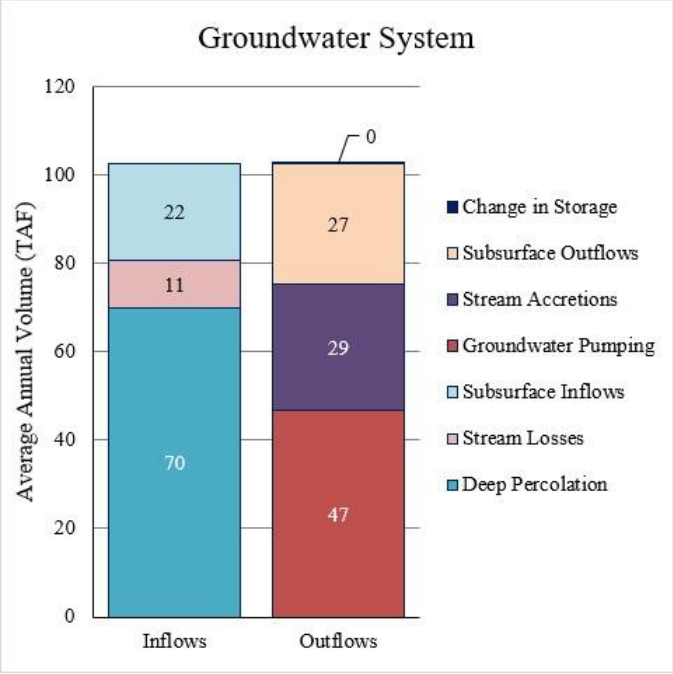


Figure 2-~~33~~42: Average Annual Future Conditions with 2030 Climate Change Groundwater System Water Budget (version BBGM v.1.00)

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Future Conditions, 2070 Climate Change

Average annual inflows to and outflows from the basin for the future conditions with 2070 climate change projected land and surface water system baseline water budget were estimated to be 1.26 MAF per year. Average annual values were presented previously in Table 2-5 and are shown graphically in Figure 2-~~34~~43.

Primary inflows to the land and surface water system include surface water inflows (1,036 TAF/year), precipitation (145 TAF/year), stream gains from groundwater (i.e. accretions) (27 TAF/year), and groundwater pumping (49 TAF/year). Surface water inflows consist primarily of the Feather River, which traverses the basin, as well as inflows from Honcut Creek and overland runoff of precipitation and applied water from upslope lands.

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Primary outflows from the land and surface water system include surface water outflows (1,087 TAF/year), evapotranspiration (87 TAF/year), deep percolation (71 TAF/year), and stream losses (also referred to as seepage) (12 TAF/year). Surface water outflows include outflows through the Feather River and Honcut Creek, as well as overland runoff of precipitation and applied water to downslope lands. Evapotranspiration is primarily from agricultural lands but also from native vegetation, urban and industrial lands, and managed wetlands. Deep percolation is primarily from precipitation, but also from applied water. Stream losses include a combination of seepage from canals and drains, stream seepage, and seepage from Thermalito Afterbay.

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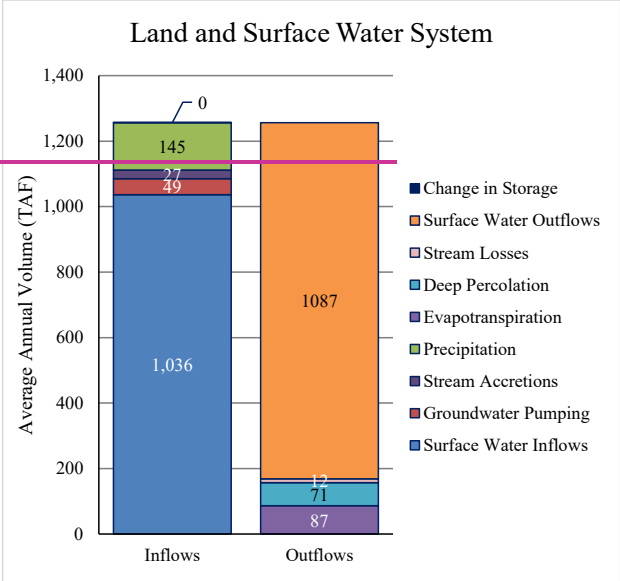
The average annual change in storage in the land and surface water system is negligible due to similar soil moisture content in the root zone, on average, across water years, and limited storage capacity exists in surface water bodies within the basin.



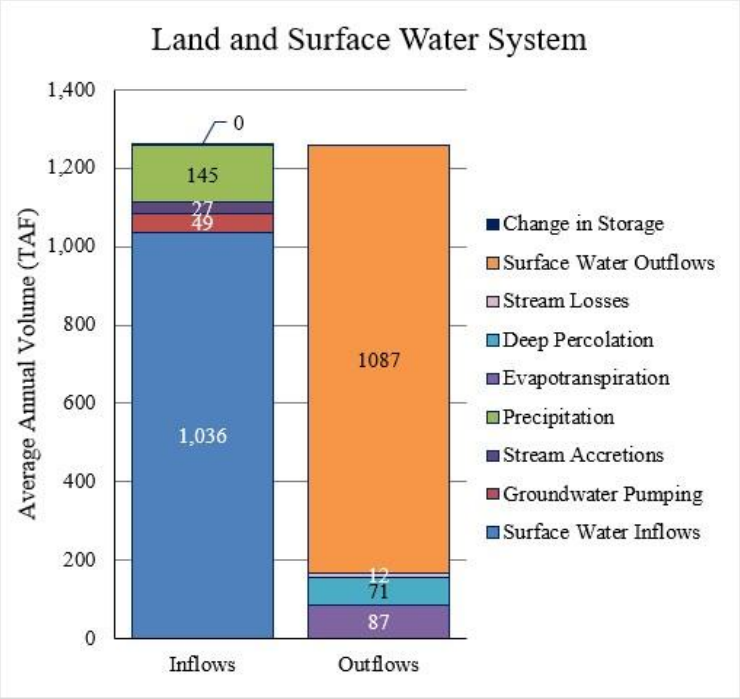


Figure 2-~~34~~43: Average Annual Future Conditions with 2070 Climate Change Land and Surface Water System Water Budget (version BBGM v.1.00)

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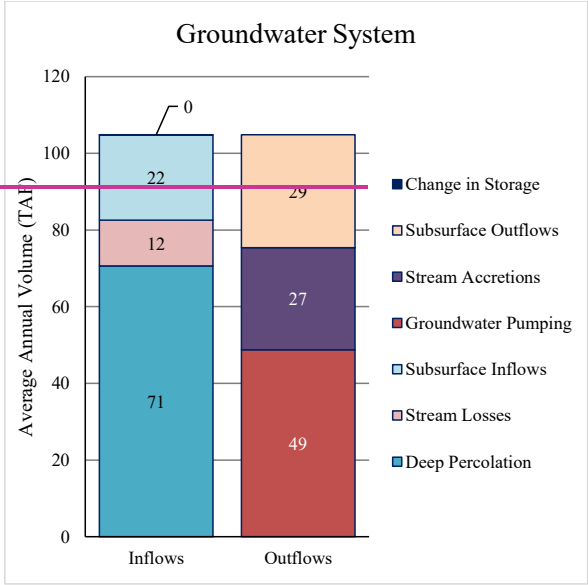
Average annual inflows to and outflows from the groundwater system were estimated to be 103 TAF, with limited average change in groundwater storage during the future conditions with 2030 central tendency climate change baseline simulation period. Average annual values were presented previously in Table 2-6 and are shown graphically in Figure 2-44.

~~Average annual inflows to and outflows from the groundwater system were estimated to be 103 TAF, with limited average change in groundwater storage during the future conditions with 2030 central tendency climate change baseline simulation period. Average annual values were presented previously in Table 2-6 and are shown graphically in Figure 2-35.~~

Inflows to the groundwater system include deep percolation (71 TAF/year); subsurface inflows from the Butte, North Yuba, Sutter, and Vina subbasins and from the foothill area (22 TAF/year); and stream losses (12 TAF/year). Outflows from the groundwater system include groundwater pumping (49 TAF/year); subsurface outflows to the Butte, North Yuba, Sutter, and Vina subbasins and to the foothill area (29 TAF/year); and stream gains from groundwater (27 TAF/year).


Groundwater System
Average Annual Volume (TAF)
120
100
80
60
40
20
0
0
22
12
71
29
27
49
Inflows
Outflows
Change in Storage
Subsurface Outflows
Stream Accretions
Groundwater Pumping
Subsurface Inflows
Stream Losses
Deep Percolation

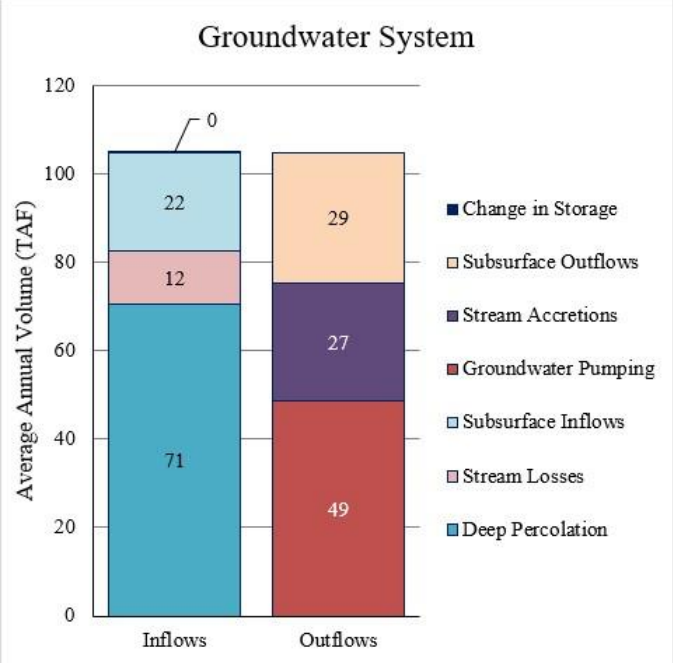

Groundwater System
Average Annual Volume (TAF)
120
100
80
60
40
20
0
0
22
12
71
29
27
49
Inflows
Outflows
Change in Storage
Subsurface Outflows
Stream Accretions
Groundwater Pumping
Subsurface Inflows
Stream Losses
Deep Percolation

Figure 2-~~35~~44: Average Annual Future Conditions with 2070 Climate Change Groundwater System Water Budget (version BBGM v.1.00)

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Comparison of Water Budget Scenarios

A figure depicting cumulative change in storage for the current conditions and three future conditions baseline scenarios is provided on the following page (Figure 2-~~36~~45). In the figure, the cumulative change in groundwater storage is shown for the 50-year hydrologic period. The x-axis (horizontal axis) is labeled with the historical reference year along with the corresponding water year type based on the Sacramento Valley Water Year Index. Years are identified as wet (W), above normal (AN), below normal (BN), dry (D), or critical (C).

There is a projected decrease in groundwater in storage for the future conditions scenarios relative to the current conditions scenarios likely resulting from a combination of increased urban and rural residential demands that may be met by groundwater and reduced recharge due to increased runoff on developed lands. Climate change may lead to additional reductions in storage due to increased temperatures and potential reductions in surface water availability.

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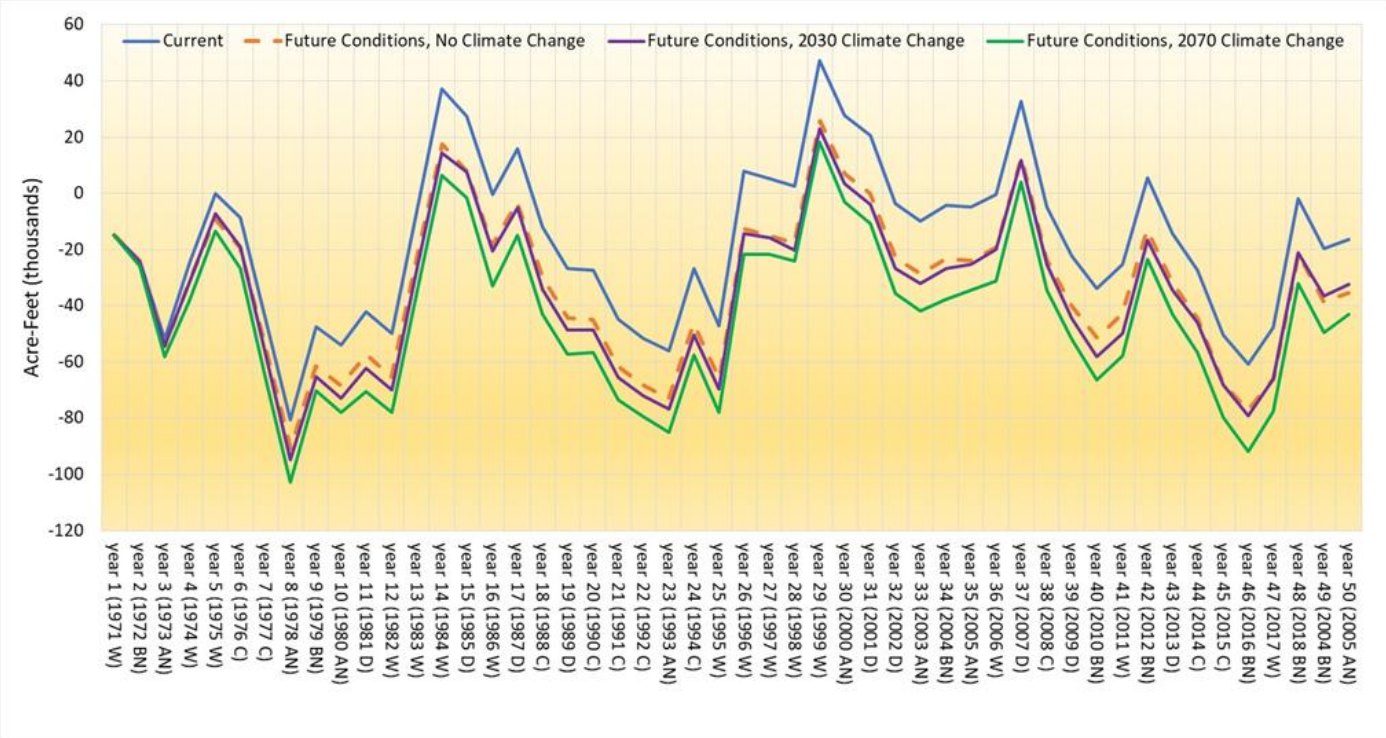

Figure 2-45: Cumulative Change in Groundwater Storage for Current and Future Conditions Baseline Scenarios (version BBGM v.1.00)

2.3.5 Water Budget Uncertainty

Uncertainty refers to a lack of understanding of the basin setting that significantly affects an Agency's ability to develop SMC and appropriate projects and management actions in a GSP, or to evaluate the efficacy of plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed. Uncertainty exists in all components of each water budget and in the assumptions used to project potential future conditions related to planned development and associated urban demands as well as projections of climate change. These uncertainties are not expected to substantially limit the ability to develop and implement a GSP for the basin including the ability to develop SMC and appropriate projects and management actions, nor the ability to assess whether the basin is being sustainably managed over time. It is anticipated that these uncertainties will be reduced over time through monitoring and additional data collection, refinements to the BBGM and other tools, and coordination with neighboring basins.

2.3.6 Sustainable Yield Estimate

~~Sustainable~~SGMA defines sustainable yield ~~refers to~~ as "the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin~~.~~ and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result~~. As a result, determination~~ (CWC 10721(w))."

2.3.6.1 Current Conditions

The current sustainable yield is estimated based on 10-year rolling average using measured and estimated groundwater extraction and annual change in storage calculated from observed groundwater level measurements. The change in groundwater storage is estimated based on the change in measured spring-to-spring groundwater levels at each RMS well, multiplied by the area of ~~sustainable yield requires consideration~~a Thiessen polygon surrounding that RMS well (defining a representative area for each RMS well) and a representative storage coefficient of ~~SGMA's six SIs.~~0.1 for the subbasin. The GSP annual reports estimate the groundwater pumping through measurements (agricultural, municipal/industrial), calculations (rural residential), and estimates (municipal/industrial). In WY 2025, the 10-year average sustainable yield and overdraft are 45,300 AFY and +4,600 AFY, respectively. Currently, the Subbasin is operating within its sustainable yield. The sustainable yield and overdraft estimate may be updated periodically to account for climate change.

2.3.6.2 Future Conditions

The BBGM v.1.0 was used to estimate sustainable yield under different climate scenarios.. Historical water budget estimates indicate an average annual decrease in storage of ~~about~~up to 3,700 AFY ~~for the period from 2000 to 2018~~. In general, decreased precipitation and increased groundwater pumping in dry years leads to decreases in groundwater levels and storage and may pose challenges to operating within the sustainable yield over multiple dry years. Operation of the basin within the sustainable yield ~~will likely~~may require ~~incorporation~~ implementation of projects and management actions ~~into the GSP and implementation over the 50-year SGMA planning and implementation horizon. The estimated sustainable yield of the basin is described in greater detail in Section 2.3.6.~~.

Draft estimates have been developed for the basin for each scenario as the long-term annual groundwater pumping, minus the average annual decrease in groundwater storage, as

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summarized in Table 2-8. ~~Ultimately, it is anticipated that other factors will be considered in refining these estimates as part of development of SMC for the basin.~~

Table 2-8: Estimated Groundwater Pumping, Decrease in Storage, and Change in Sustainable Yield (version BBGM v.1.00)

Baseline Scenario	Groundwater Pumping (AFY)	Decrease in Groundwater Storage (AFY)	Difference (AFY)
Current	43,000	-100	43,100
Future, No Climate Change	44,900	300	44,600
Future, 2030 Climate Change	46,700	200	46,500
Future, 2070 Climate Change	48,700	400	48,300

However, as discussed in Section 2.3.4, the decrease in groundwater storage is sensitive to the ~~time~~ period used to calculate this value. All of the scenarios presented in Table 2-8 are based on 50 years of data. As discussed in Section 2.3.~~6~~11, a fifth scenario was used called historical that covers the period from 2000 to 2018 or 18 years. The groundwater pumping and decrease in storage for this scenario are 47,100 AFY and 3,700 AFY, respectively. Using these values, a sustainable yield of 43,400 AFY would be calculated similar to the ~~current~~Current scenario.

~~For development of SMC as discussed in Chapter 3, the MO was developed to address the long-term trend of the "peaks and valleys" of the short-term cycles and stop the long-term decline in groundwater levels during dry years. Using this method, the average depth below the MO at compliance points (see Chapter 3 for discussion of representative monitoring sites [RMS]) if no actions are taken before the end of the implementation period in 2042 is about 5 feet. Using this value, a sustainable yield can be estimated based on the reduction in pumping needed to stop the observed decline in water levels across the subbasin. This value is sensitive to the specific storage. Specific storage is the parameter that translates the change in groundwater elevation to an associated change in volume (i.e. change in storage).~~

~~As discussed in Section 2.1.8.3, the average specific storage value used in the BBGM is 0.03967. Specific storage values estimated from pumping tests conducted in the Wyandotte Creek Subbasin ranged from 0.0002 to 0.00044 (Brown and Caldwell, 2013). Table 2-9 provides estimates of sustainable yield to maintain the MO in 2042 using this range of storativity values and the average decline in water levels across the subbasin in 2042. The groundwater pumping rate for the historical scenario is used for the calculation of sustainable yield.~~

~~**Table 2-9: Estimated Sustainable Yield Using Average Depth Below Measurable Objective in 2042 and Range of Storativity Values**~~

~~Feet Below MO in 2042~~	~~Specific Storage~~	~~Area of Subbasin (square miles)~~	~~Volume Storage Below MO in 2042 (acre-feet)~~	~~Average Change in Storage Between 2030 and 2042 (AFY)~~	~~Groundwater Pumping[1] (AFY)~~	~~Estimated Sustainable Yield (AFY)~~
~~5~~	~~0.03967~~	~~75~~	~~9,521~~	~~793~~	~~47,100~~	~~46,307~~
~~5~~	~~0.002~~	~~75~~	~~480~~	~~40~~	~~47,100~~	~~47,060~~
~~5~~	~~0.0002~~	~~75~~	~~48~~	~~4~~	~~47,100~~	~~47,096~~
~~5~~	~~0.0005~~	~~75~~	~~120~~	~~10~~	~~47,100~~	~~47,090~~

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~~Using the information presented above, this GSP defines the estimate of the sustainable yield as 46,100 AFY based on groundwater pumping of 47,100 AFY and a decrease in storage of 1,000 AFY.~~These projected sustainable yield estimates using the BBGM v.1.0 are preliminary and subject to change. The GSA may periodically update sustainable yield to reflect current conditions using the methodology described in Section 2.3.6.1 until further model calibration is complete.

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2.3.7 Opportunities for Improvement to the Water Budget

2.3.7.1 Refine Surface Water Diversion Estimates

While many of the large diversions are continuously monitored and recorded, limited information is available for others. It is recommended that the GSA in the basin work with local stakeholders to better document surface water diversions. Diversion estimates developed as part of the water budgets provide a good basis to support discussion with diverters.

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2.3.7.2 Refine Groundwater Pumping Estimates

Groundwater pumping for irrigation has generally been estimated based on estimates of crop irrigation requirements in areas known to rely on groundwater. It is recommended that the GSA look for opportunities to verify and refine groundwater pumping estimates to support water budget validation and refinements by obtaining pumping data from cooperative landowners.

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2.3.7.3 Refine Deep Percolation Estimates

Deep percolation in some areas may return to the surface layer through accretion in drains and natural waterways or may be consumed by phreatophytic vegetation. It is recommended that the GSA look for opportunities to further understand and investigate the ultimate fate of deep percolation from agricultural lands. Through modeling of specific waterways and shallow groundwater, the BBGM can help support these investigations.

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2.3.7.4 Refine Urban Lands Water Budgets

The relative proportion of non-consumed water returning as deep percolation or surface runoff does not explicitly account for percolation from stormwater retention ponds or releases from wastewater treatment plants to local waterways. There is an opportunity to refine water budgets for developed lands to verify and refine estimates of non-consumed water. Additionally, there is an opportunity to evaluate and develop refined water use estimates for industrial uses.

2.3.7.5 Refine Characterization of Interbasin Flows

Interbasin flows are dependent on conditions in adjacent basins. It is recommended that the GSA refine estimates of subsurface groundwater flows from and to neighboring basins through coordination with GSAs in neighboring basins during ~~or following~~ GSP ~~development~~implementation and through review of modeling tools that cover the Sacramento Valley region, including the C2VSim and SVSim integrated hydrologic model applications developed by DWR.

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2.3.7.6 Land Use Changes Due to the Camp Fire

In 2018, the Camp Fire destroyed 18,000 structures in Butte County displacing over 27,000 residents. While the Town of Paradise, Concow and other areas destroyed by the Camp Fire

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rebuild, many residents have relocated to the City of Oroville and other portions of the Wyandotte Creek Subbasin. The existing General Plans may not fully account for the relocation of Camp Fire survivors. A focused accounting of changes to residential land use as a result of the Camp Fire should be conducted.

3. SUSTAINABLE MANAGEMENT CRITERIA

SMC offer guideposts and guardrails for groundwater managers seeking to achieve sustainable groundwater management~~.~~ (Figure 3-1). SGMA defines sustainable groundwater management as "the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results," where the planning and implementation horizon is 50 years with the first 20 years spent working toward achieving sustainable groundwater management and the following 30 years (and beyond) spent maintaining it (California Water Code §10721). For the Wyandotte Creek Subbasin, SMC were formulated by working with the Wyandotte Creek Subbasin GSA and WAC, and members of the public. ~~This~~During development of the 2022 GSP, this stakeholder outreach process was facilitated by the Consensus Building Institute (CBI) with sessions documented on the Wyandotte Creek GSA website. Outreach included a robust discussion and broad agreement on the Wyandotte Creek Subbasin sustainability goal as well as what constitutes locally defined undesirable results. The sustainability goal is meant to reflect the GSA's desired condition, maintained over time, for the groundwater basin. Similarly, public engagement supported the development of amendments to the GSP.

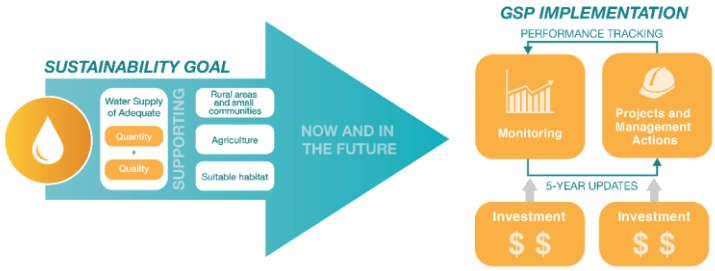

Figure 3-1: Flow Chart for Sustainability

Undesirable results are associated with up to six SIs that include chronic lowering of groundwater levels, reduction in groundwater storage, land subsidence, degraded groundwater quality, depletion of interconnected surface waters, and sea water intrusion. SGMA defines undesirable results as those having significant and unreasonable negative impacts to these six SIs. Failure to avoid undesirable results on the part of the GSA may lead to intervention by the State. Once the sustainability goal and undesirable results have been locally identified, projects and management actions are formulated to achieve the sustainability goal and avoid undesirable results.

The Wyandotte Creek Subbasin is divided into two MAs: Oroville and South (Figure 1-1). The associated undesirable results for each SI have been defined similarly across the two MAs ~~within the Wyandotte Creek Subbasin.~~ In turn, the rationale and approach for determining MT and MO for each SI are the same across the two MAs.

The terminology for describing SMC ~~are~~is defined as follows:

- Undesirable Results – Significant and unreasonable negative impacts associated with each SI.

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- MT – Quantitative threshold for each SI used to define the point at which undesirable results may begin to occur.
- MO – Quantitative target that establishes a point above the MT that allows for a range of active management to prevent undesirable results.
- Margin of Operational Flexibility – The range of active management between the MT and the MO.
- Interim Milestones (IM) – Targets set in increments of 5 years over the implementation period of the GSP offering a path to sustainability.

Figure 3-2 illustrates these terms for the groundwater level SI.

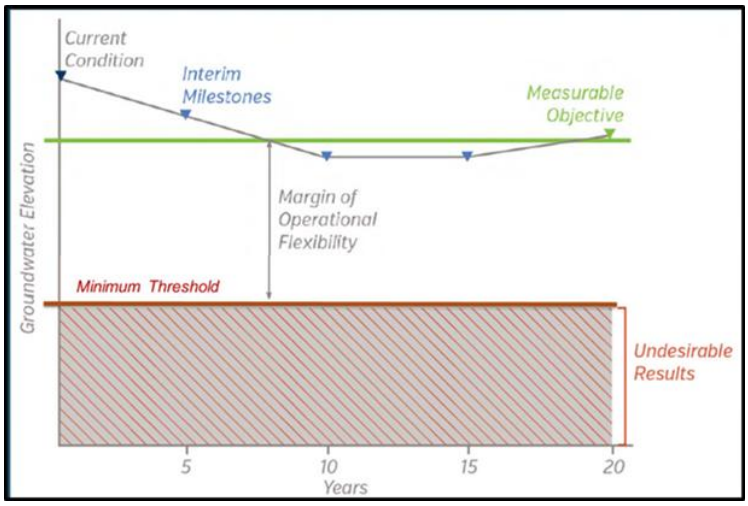

Figure 3-2: Illustration of Terms Used for Describing Sustainable Management Criteria Using the Groundwater Level ~~SI~~Sustainability Indicators

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SIs are intended to be measured and compared against quantifiable SMC throughout a monitoring framework of RMS (Section 4). Ongoing monitoring of SIs can:

- Determine compliance with the adopted GSP
- Offer a means to evaluate the effectiveness of projects and management actions over time
- Allow for course correction and adaptation in 5-year ~~updates~~periodic evaluations
- Facilitate understanding among diverse stakeholders
- Support decision-making on the part of the GSA into the future

To quantify SMC for the Wyandotte Creek Subbasin, information from the HCM, descriptions of current and historical groundwater conditions, and input from stakeholders have been considered.

3.1 Sustainability Goal

The sustainability goal for the Wyandotte Creek Subbasin is:

> *to ensure that groundwater is managed to provide a water supply of adequate quantity and quality to support beneficial users of groundwater including but not limited to rural areas and other communities, the agricultural economic base of the region, and environmental resource uses in the Subbasin now and in the future.*

Implementation of the Wyandotte Creek GSP may achieve sustainability before 2042, however, groundwater levels in the Wyandotte Creek subbasin may continue to decline during the implementation period. As projects are implemented and basin operations are modified, sustainable groundwater management will be achieved within its sustainable yield. The Wyandotte Creek Subbasin will be managed to prevent undesirable results throughout the implementation period, despite the possible decline of groundwater elevations. This sustainability goal is supported by locally defined MTs that will avoid undesirable results. Demonstration of stable groundwater levels on a long-term average basis combined with the absence of undesirable results will ensure the Wyandotte Creek Subbasin is operating within its sustainable yield and the sustainability goal will be achieved.

SMC within the Wyandotte Creek Subbasin emphasize management objectives related to domestic, municipal, and agricultural wells as well as suitable habitat. Groundwater management has already been occurring throughout Butte County. The Wyandotte Creek Subbasin will be managed within its sustainable yield by adapting existing management objectives and strategies to address current and future conditions, or by developing new ones. Sustainable yield means the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result. The Wyandotte Creek Subbasin intends to achieve its sustainability goal by implementing GSP projects and management actions that both augment water supply and increase efficiency of water application (see Section 5 for proposed projects and management actions and Section 6 for the implementation plan to achieve sustainability).

The BCDWRC has been participating in groundwater management activities for many years, including within the Wyandotte Creek Subbasin. In the last several years, the BCDWRC has increased groundwater level and water quality monitoring and has worked with other entities to collect and disseminate water data. In addition, the BCDWRC assists with other locally driven groundwater management activities. The Wyandotte Creek Subbasin intends to build on this ongoing county-wide process and broadly shares the objective of long-term maintenance of high-quality groundwater resources within the region for domestic, agricultural, and environmental uses.

3.2 Sustainability Indicators, Minimum Thresholds, and Measurable Objectives

3.2.1 Sustainability Indicators

Six SIs are defined by SGMA and are used to characterize groundwater conditions throughout a basin or subbasin. SGMA requires development of locally defined SMC for each SI and allows for identification of SIs that are not applicable. For example, sea water intrusion is not applicable in the Wyandotte Creek Subbasin due to its distal location from the Pacific Ocean.

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Sustainability Indicators and associated undesirable results, if significant and unreasonable

3.2.2 Minimum Thresholds

As noted earlier, MT are those quantitative thresholds for each SI used to define the point at which undesirable results may begin to occur. Undesirable results are those having significant and unreasonable negative impacts, avoidance of which is required by SGMA. Potential impacts and the extent to which they are considered "significant and unreasonable" were determined by the GSA Board of Directors with input from the WAC and members of the public. The GSA established MTs intended to prevent such significant and unreasonable negative impacts from occurring. If observed data trend toward the locally defined MTs, this will trigger action on part of the GSA to reverse this trend before reaching the MT. Actions to reverse a trend toward reaching a MT could be taken at any time during implementation. For this reason, MTs are like guardrails.

3.2.3 Measurable Objectives / Interim Milestones

MO are those quantitative targets that establish a point above the MT that allows for a range of active management to achieve the sustainability goal and prevent undesirable results. This range of active management between the MT and the MO is referred to as the margin of operational flexibility.

MO were determined by the GSA Board of Directors with input from the WAC and members of the public. The GSA established MO intended to preserve the desired condition throughout the Wyandotte Creek Subbasin while offering flexibility in GSP implementation. IM are targets set in increments of 5 years over the implementation period of the GSP offering a path to sustainability. For this reason, the MO and IM are like guideposts.

3.3 Groundwater Levels Sustainable Management Criteria

Groundwater Level SMC are those meant to address the chronic lowering of groundwater levels and avoid the depletion of supply at a given location that may lead to undesirable results caused by groundwater pumping. The locally defined undesirable result, MT, and MO are discussed in the next sections.

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3.3.1 Undesirable Result

An undesirable result caused by the chronic lowering of groundwater levels is experienced if:

> *sustained groundwater levels are too low to provide a water supply of adequate quantity and quality to achieve the Sustainability Goal. Two (or 25%, whichever is greater) RMS wells within a management area reach their MT for two consecutive years.*

3.3.2 Minimum Thresholds

The Groundwater Level MT represent quantitative thresholds used to define the point at which undesirable results may begin to occur, avoidance of which is required under SGMA. To establish locally defined MT, the Wyandotte Creek GSA, WAC, and members of the public explored and analyzed potential impacts of declining groundwater levels.

Potential impacts identified by stakeholders from declining groundwater levels included:

- Wells going dry, particularly nearby shallow domestic wells,
- Reduced pumping capacity of existing wells
- Need for deeper well installations and/or lowering of pumps
- Increased pumping costs due to greater lift
- ~~Reduced flows in rivers and streams supporting aquatic ecosystems~~

~~Issues related to reduced flows in rivers and streams and/or water tables that support aquatic ecosystems are addressed in the Interconnected Surface Water SMC (Section 3.8). As stated in this section, data are not available to assess these issues and are a data gap for the GSP. Section 3.8 also provides the framework to provide the data to develop SMC for these components.~~

- ~~In recent years,~~Groundwater dependent ecosystem vegetative habitat loss

Data collection will continue to help further characterize groundwater dependent ecosystems (GDE), with the potential to reconsider the groundwater level SMCs in relation to GDEs during the next Periodic Evaluation Period ending in 2032.

In the most recent drought years (2020-2022), Butte County has documented a number of domestic wells that have "gone dry," meaning groundwater levels have fallen below the depth of the well installation and/or pump throughout the County. This occurred during summer months of recent drought years and heightened concern among some stakeholders. As a result, domestic well reliability and protection are the focus of the Groundwater Level MT. From a policy perspective, sustainably constructed domestic wells going dry ~~during non-dry year conditions~~ would be a "significant and unreasonable" result of groundwater management. The quantitative Wyandotte Creek Subbasin Undesirable Result for the Chronic Lowering of Groundwater Levels occurs when:

> *Two RMS wells (or 25%, whichever is greater) within a management area reach their MT for two consecutive ~~non-dry year types~~years.*

~~Non-dry year types include those with wet, above normal, and below normal classifications as defined by the Sacramento Valley Water Year Index. Dry year types include those with dry and critical classifications. See Section 2.3.1 for more information on the Sacramento Water Year Index.~~

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As shown in the figures presented in Appendix 3-A showing the average depth of domestic, irrigation, and public supply wells, domestic wells are generally shallower than other wells throughout the ~~Vina~~Wyandotte Creek Subbasin. These figures were constructed using data from DWR OSWRC and the completed Wyandotte Creek domestic well inventory. Protection of domestic wells was therefore deemed to be additionally protective of other well types, such as agricultural wells. The Wyandotte Creek ~~subbasin~~Subbasin SMC for Chronic Lowering of Groundwater Levels is based on groundwater levels throughout the subbasin that would support sustainably constructed domestic wells. Exceeding the MT may lead to significant and unreasonable effects ~~during drought years.~~ Impacts to domestic wells and other groundwater uses may occur and would not constitute an Undesirable Result. Local and state drought ~~response~~responses play a role in addressing dry year impacts. However, once a drought period ends, it is anticipated that groundwater conditions should return to the MO levels. Year-type is defined according to the Sacramento Valley Water Year Hydrologic Classification and groundwater level is defined based on groundwater elevation.

The MT is set to the deeper value of two criteria:

- Criterion 1: Set to protect 95% of the nearby shallow domestic wells; AND
- Criterion 2: Set to a specified distance below the historic low: the distance is either the range of historically measured groundwater levels or 20 feet, whichever is shallower.

Criterion 1 is based on an updated domestic well risk assessment. In order to establish appropriate MT levels protective of sustainably constructed domestic wells, a representative zone ~~is established for each RMS well. The DWR domestic well~~(RMS zone) is established for each RMS well. 10 RMS zones, three in the Oroville MA and seven in the South MA, were created using the RMS wells as points as inputs into a Voronoi Diagram (see Appendix 3-C). The Criterion 1 depth is then calculated by finding the 5th percentile of well depths of all domestic wells in the RMS Zone. DWR's OSWCR database provides information on all submitted well completion reports when a well is drilled. This database contains information on characteristics of the wells, including well location, ~~groundwater surface elevation of the~~ well use, and total well depth. These well characteristics, however, are not always accurate or precise, and, unfortunately, it is not known which of the wells in the database are in use or have been abandoned or replaced. OSWCR indicates that there are 785 domestic wells in the Subbasin. The final domestic well dataset used for Criterion 1 was refined from 785 wells down to 345 wells using the following steps:

- ~~To refine the dataset,~~Removed 237 wells installed before 1980 ~~were removed~~. This removes the oldest wells and wells likely to have been replaced as a result of historically low groundwater conditions that occurred during the 1976-1977 drought. Wells that remain are more likely to be consistent with current well standards and currently serving domestic water needs. Still, there is much information that remains to be gathered to further refine the dataset given the unknowns previously identified, as well as relationships to changes in surface elevation.

~~The MT was developed using the refined dataset by removing the 15% most shallow wells based on the elevation of the bottom of the wells within a 3-mile radius of the RMS well (see figures in Appendix 3-B). The percentile analysis is based on the statistical calculation of domestic well depths (translated to elevation amsl) in the DWR domestic well database for wells completed after 1980. Box and whisker plots were used to calculate the MT using this method. Box plots~~

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~~are a method for graphically depicting groups of numerical data through their quartiles. Box plots may also have lines extending vertically from the boxes (whiskers) indicating variability outside the upper and lower quartiles, hence the terms box-and-whisker plot. Box plots are non-parametric: they display variation in samples of a statistical population without making any assumptions of the underlying statistical distribution. The spacings between the different parts of the box indicate the degree of dispersion (spread) and skewness in the data. An illustration of the box and whisker plot is provided in Appendix 3-B.~~

- Removed 35 domestic wells with estimated bottom elevations above observed historical low groundwater levels based on monitoring data.
- Excluded all domestic wells within public water supplier service areas. Eight domestic wells from California Water Company – Oroville, 25 wells from TWSD, and 135 wells from SGWPA were excluded.

A narrative description of ~~this method~~Criterion 1 is as follows: a MT of 50 feet amsl at an RMS having 100 domestic wells within ~~a 3-mile radius~~its RMS zone means that ~~15~~5 wells within that ~~radius~~zone have a reported total well depth such that the bottom of the well is at or above 50 feet amsl (and are therefore potentially vulnerable to going dry) and ~~85~~95 wells have been completed at an elevation below 50 feet amsl (and are therefore not vulnerable to going dry). The ~~fifteenth~~fifth-percentile MT assigned to ~~each~~the RMS ~~3-mile radius~~well is protective of ~~at least 85~~895% of all domestic wells within ~~its 3-mile radius. Some wells that fall above the MT may not "go dry" even if the MT is reached at the RMS well due to differences in groundwater elevation conditions within~~ the RMS zone ~~3-mile radius~~. Though an attempt was made to remove wells that are no longer in use due to age, as discussed above, there still may be several wells in the dataset used that are not in operation or may go dry due to poor maintenance issues of the well not related to groundwater levels. Typically, domestic wells are shallower than other wells throughout the Wyandotte Creek Subbasin~~,~~ and therefore analyses of this well type yields MT that are largely protective of other well types such as agricultural wells. In addition, the lowering of groundwater levels during ~~two or more consecutive dry and/or critically dry~~a single year ~~types~~ is not considered significant and unreasonable and therefore not considered an undesirable result, as long as the groundwater levels rebound to values greater than the MT in the following ~~those consecutive dry and/or critically dry~~ years ~~and should return to MO levels~~.

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~~Appendix 3-B contains the box and whisker plots for each RMS.~~

Criterion 2 was included as an alternative option for calculating MTs to allow for operational flexibility for agricultural and municipal supply wells in cases where the historical minimum groundwater level measured at a given RMS well, minus a buffer, was lower than the depth calculated using Criterion 1. The buffer distance is either the range of historically measured groundwater levels or 20 feet, whichever is shallower.

Water levels calculated following Criterion 1 and Criterion 2 are summarized in Table 3-1.

Table 3-1: Water surface elevations calculated following Criterion 1 and Criterion 2

RMS Well ID	Criterion 1 WSE (ft AMSL)	Minimum WSE Measurement (ft AMSL) (Measurement Date)	WSE Range (ft)	Criterion 2 WSE (ft AMSL)[1]	Criterion Used for MT
Wyandotte Creek Subbasin – Oroville Management Area					
16Q001M	108	131.3 (07/2022)	9.1	122.2	1

32P001M	103	108.8 (09/2016)	44.0	88.8	2
PWS-03	-83	114.0 (10/2014)	25.0	94.0	2
Wyandotte Creek Subbasin – South Management Area					
13B002M	11	42.2 (07/2021)	26.9	22.2	1
22B001M	48	49.8 (07/2021)	59.0	29.8	2
25N001M	25	46.3 (07/2024)	34.0	26.3	1
19D003M	44	53.2 (08/2022)	35.0	33.2	2
08M001M	69	76.1 (07/2024)	38.8	56.1	2
16C001M	70	94.4 (08/2021)	35.7	74.4	1
31F001M	98	108.1 (03/2005)	42.0	88.1	2

[1] The[1]The buffer was set to 20 feet except for RMS well 16Q001M which used the historical WSE range.

3.3.3 Measurable Objectives / Interim Milestones

The Groundwater Levels MO represent quantitative targets that establish a point above the MT allowing for a range of active management to prevent undesirable results and reflect the desired state for groundwater levels ~~at the year 2042. To establish the MO, the water-level hydrograph of observed groundwater levels at each RMS was evaluated. The historical record at these locations shows cyclical fluctuations of groundwater level over a four- to seven-year cycle consistent with variations in water year type according to the Sacramento Valley Water Year Hydrologic Classification. Groundwater levels are typically lower during dry years and higher during wet years. Superimposed on this four- to seven-year short-term cycle is a long-term decline in groundwater levels. In other words, groundwater levels during more recent dry-year cycles are lower than groundwater levels in earlier dry-year cycles~~in the year 2042. To establish the MO, the historic record of observed groundwater levels at each RMS was evaluated.

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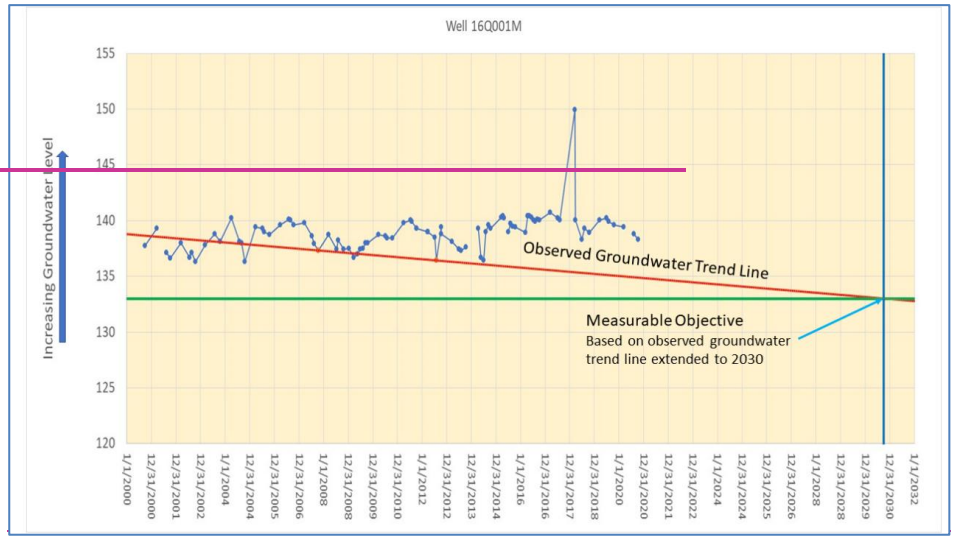
~~The wet-dry cycles are climatically induced, and the GSA has no ability to change this cyclical behavior; there will always be short-term cyclical fluctuations in groundwater levels. The MO are therefore intended to address the long-term trend of the "peaks and valleys" of the short-term cycles and stop the long-term decline in groundwater levels during dry years. Because the GSA cannot immediately augment water supply and/or reduce water demand, some continuation of the long-term decline in groundwater levels is expected in the near future. Currently (in 2021), the Wyandotte Creek subbasin appears to be coming out of a wet period (2017 and 2019 being wet years) of a short-term cycle and beginning the next dry period of the short-term cycle starting in 2020. The MO was therefore based on the trend line of observed historical data extended to the year 2030. The year 2030 was chosen as a reasonable time frame in which the GSA could implement projects and management actions to address long-term groundwater level decline while recognizing that groundwater levels may experience another dry period of the short-term cycle in the intervening years. The MO for the Groundwater Levels SMC is (Figure 3-3):~~

> ~~*the groundwater level based on the groundwater trend line for the dry periods (over the period of record) of observed short-term climatic cycles extended to 2030.*~~



~~Figure 3-3: Illustration of Long-Term Trend Using Historical Water Levels Extended to 2030 for Development of Measurable Objectives~~

~~The projection of groundwater levels for each RMS was based on a simple non-statistical linear projection of the observed data. Generally, the lowest groundwater levels of a given cycle were used for the projection, unless they appeared to be outliers relative to the general long-term trend of the dry years in the cycle.~~

~~IM for groundwater levels between 2022 and 2042 were interpolated based on the linear projection of groundwater level at each RMS. Using a projection based on the dry years of the short-term cycle, it will be important to assess IM relative to dry years as they occur, rather than at fixed 5-year intervals. By projecting based on the dry years in the cycle, the observed groundwater levels may be higher than the IM. This will be addressed in the annual reports and interim GSP updates based on what occurs with respect to the short-term cycles in the future. Appendix 3-C contains the hydrographs with projected data used to develop MO and IMs for each RMS.~~

The MO was set equal to the average groundwater level recorded from October 1st, 2015, through September 30th, 2025.

IM for groundwater levels are set at regular intervals between 2022 and 2042. Since the MO for groundwater levels reflect current conditions and is set as a target for future conditions, all IMs for groundwater levels are set to the MO.

3.3.4 Minimum Threshold Effects on Beneficial Uses and Users

Groundwater level MT would primarily impact beneficial uses and users reliant on groundwater and environmental users.. To better understand the effect on beneficial uses and users, specifically domestic well users, a domestic well risk assessment was performed, which is

presented in Appendix 3-B. The analysis provides an estimate of the undesirable result that would occur if water levels declined to the MT.

The following provides greater detail regarding the potential impact of lowering groundwater levels on several major classes of beneficial users:

1. **Rural and/or Agricultural Residential Drinking Water Users** - Falling groundwater levels can cause shallow domestic and stock wells to go dry, which may require well owners to drill deeper wells. The well outage analysis shows, at the minimum threshold, 11% of domestic/shallow wells in the subbasin would be susceptible to well outages. Additionally, the lowering of the water table may lead to decreased groundwater quality in drinking water wells.
2. **Municipal Drinking Water Users** - Declining groundwater levels can adversely affect current and projected municipal users, causing increased costs for potable water supplies.
3. **Agricultural Users** - Continued lowering of groundwater levels increases costs to agricultural operations; this; this could necessitate changes in irrigation practices and crops grown and could cause adverse effects to property values and the regional economy.
4. **Environmental Uses** - Reduced groundwater levels may result in significant and unreasonable reduction of groundwater flow toward ISWs and availability of shallow groundwater to vegetative GDEs, which may adversely impact ecological habitat and resident species, resulting in reduced spatial coverage and/or health. Currently, in the Subbasin the location of ISWs and GDEs is a data gap the GSA is addressing through installation of new monitoring wells (installed March 2026).

To avoid undesirable results to the first three beneficial user groups, should they occur at water levels above the MT, the GSA includes aa well mitigation program as a management action (Chapter 5). To avoid undesirable results to the fourth group of beneficial uses, the GSA may expand upon historic monitoring and assessment efforts to fill data gaps, then develop mitigation programs to avoid significant and unreasonable impacts. In addition, adjustment of the MTs at relevant RMS locations and/or mitigation triggers could be incorporated in future periodic evaluations or amendments to the GSP as needed. The MO is already protective of GDEs, where they exist, as it preserves baseline water levels.

~~3.3.4~~3.3.5 Summary

To achieve the sustainability goal and therefore preserve the desired condition for the groundwater basin over time, the GSA, in setting Groundwater Levels SMC, will implement appropriate projects and/or management actions as necessary to maintain groundwater levels within operational flexibility to limit the decline in groundwater levels to certain values and manage groundwater levels within ~~certain~~established ranges at each RMS shown in Table 3-~~1~~22. (See Section 4, Figure 4-5, and Table 4-6 for relevant information on the RMS for groundwater levels.)

Table 3-~~1~~2: Groundwater Levels Sustainable Management Criteria by Representative Monitoring Site in Feet Above Mean Sea Level

RMS Well ID	Domestic Well Count	Well Type	MT	MO	IM		
					2027	2032	2037
Wyandotte Creek Subbasin – Oroville Management Area							
~~[~~16Q001M[3]	~~85~~41	~~133~~Shallow	~~134~~108	~~133~~139	~~133~~139	139	139
32P001M[2]	~~78~~64	~~107~~Shallow	~~108~~88.8	~~106~~128	~~106~~128	128	128
~~CWS~~PWS-03[1,2]	~~10~~21	~~133~~Shallow	~~135~~94	~~132~~131	~~132~~131	131	131
Wyandotte Creek Subbasin – South Management Area							
13B002M[3]	~~35~~14	~~47~~Deep	~~48~~11	~~46~~58	~~46~~58	58	58
22B001M[2]~~09N02M~~	~~35~~32	~~49~~Shallow	~~51~~29.8	~~47~~89	~~47~~89	89	89
25N001M[3]	~~37~~23	~~52~~Shallow	~~53~~25	~~52~~61	~~52~~72	72	72
19D003M[2]	59	Shallow	33.2	72	105	105	105
08M001M[2]	~~59~~74	~~86~~Deep	~~87~~56.1	~~85~~105	~~85~~106	106	106
16C001M[3]	~~71~~74	~~95~~Both	~~96~~70	~~95~~106	~~95~~124	124	124
31F001M[2]	~~76~~48	~~99~~Shallow	~~101~~88.1	~~98~~124	~~98~~58	58	58

Notes:
[1] The MT for RMS PWSPWS-03 will be set using criterion 2 due to only having 1 domestic well in the RMS zone.
[2] RMS well uses criterion 2 for setting the MT.
[3] RMS well uses criterion 1 for setting the MT.

3.4 Groundwater Storage Sustainable Management Criteria

Groundwater Storage SMC are those meant to address the reduction of groundwater storage caused by groundwater pumping. The locally defined undesirable result, MT, and MO are discussed in the next sections.

3.4.1 Undesirable Result

An undesirable result coming from the reduction of groundwater storage is experienced if:

> *sustained groundwater storage volumes are insufficient to achieve the Sustainability Goal.*

This undesirable result is closely related to that associated with groundwater levels. Because groundwater levels and groundwater storage are closely related, measured changes in groundwater levels can serve as a proxy for changes in groundwater storage. For this reason, the

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SMC developed for groundwater levels are used for groundwater storage to ensure avoidance of the undesirable result.

3.4.2 Minimum Thresholds

As Groundwater Levels SMC are used by proxy, the Undesirable Result for groundwater storage is the same as for groundwater levels:

> *Two RMS wells (or 25%, whichever is greater) within a management area reach their MT for two consecutive ~~non-dry year types.~~ years.*

In the historical record and recent years, there are ~~isolated~~ incidences of shallow wells going dry in Butte County during summer months of ~~recent~~ critically dry years. This was noted in the earlier section addressing the development of Groundwater Levels SMC. MT intended to prevent significant and unreasonable negative impacts related to the chronic lowering of groundwater levels are assumed adequate to protect against significant and unreasonable reductions of groundwater storage. Section 3.3.4 Minimum Threshold Effects on Beneficial Uses and Users also applies to the groundwater storage SI.

3.4.3 Measurable Objectives

As Groundwater Levels SMC are used by proxy, the MO for groundwater storage is the same as for groundwater levels:

> *~~the~~The groundwater level based on the groundwater trend line for the dry periods of observed short-term climatic cycles extended to 2030.*

The aquifer system in the Wyandotte Creek Subbasin generally has sufficient groundwater storage capacity to take additional groundwater recharge during wet periods and remain saturated during dry periods, allowing for a range of active management reflecting the desired state for groundwater storage at the year 2042.

3.5 Water Quality Sustainable Management Criteria

Water Quality SMC are those meant to address degraded water quality caused by groundwater pumping. The locally defined undesirable result, MT, and MO are discussed in the next sections.

3.5.1 Undesirable Result

An undesirable result coming from degraded water quality is experienced if:

> *~~groundwater pumping compromises the Subbasin's ability to achieve its Sustainability Goal. This occurs in the Wyandotte Creek subbasin when two~~Two or 25% (whichever is higher) of measured RMS wells ~~over~~across the entire Wyandotte Creek Subbasin exceed their Maximum Threshold (MT) for two consecutive ~~non-dry~~ years.*

Salinity is the only water quality constituent for which MTs are established in the Wyandotte Creek Subbasin based on the potential for movement of underlying brackish water from greater depths into the freshwater pool where groundwater pumping for beneficial uses occurs. Other constituents, as discussed in Section 2.2.4, are managed through existing management and regulatory programs within the Wyandotte Creek Subbasin, such as the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) and the ILRP, which focus on improving water quality by managing septic and agricultural sources of salinity and nutrients.

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Additionally, point-source contaminants are managed and regulated through a variety of programs by the Regional Water Quality Control Board, DTSC, and the EPA. Through coordination with existing agencies, the Wyandotte Creek GSA will know if existing regulations are being met or groundwater pumping activities in the Wyandotte Creek Subbasin are contributing to significant and unreasonable undesirable effects related to degraded water quality from these constituents.

3.5.2 ~~Minimum~~Maximum Threshold

The Water Quality Maximum Threshold (MT) for water quality represents a quantitative threshold used to define the point at which undesirable results may begin to occur, avoidance of which is required under SGMA. The MT is established based on the potential for movement of underlying brackish water from greater depths into the freshwater pool where groundwater pumping for beneficial uses occurs.

To establish a locally defined MT, the Wyandotte Creek GSA Boards, WAC, and members of the public explored and analyzed potential impacts of degraded water quality.

Potential impacts identified by stakeholders were:

- Aesthetic concerns for drinking water
- Reduced crop yield and quality
- Increased reliance on surface water for "blending"

To address the potential impacts of concern related to degraded water quality, the GSA, in setting a MT, commits to avoiding a decline in water quality as it relates to specific conductance, a measure of the water's saltiness, which can impact the suitability of the water as a source for agricultural irrigation or domestic drinking water. Title 22 of CCR recommended secondary drinking water maximum contaminant level (MCL) for specific conductance is 900 µS/cm with an upper secondary MCL of 1,600 µS/cm and short-term secondary MCL of 2,200 µS/cm. Constituent concentrations lower than the recommended secondary contaminant level (900 µS/cm) are desirable for a higher degree of consumer acceptance. Constituent concentrations ranging to the Upper secondary contaminant level are acceptable if it is neither reasonable nor feasible to provide more suitable waters. Constituent concentrations ranging to the short-term secondary contaminant level are acceptable only for existing community water systems on a temporary basis pending construction of treatment facilities or development of acceptable new water sources. Water quality standards for irrigated agriculture aim to manage water salinity, which affects plant water availability and crop yield.

~~For the Wyandotte Creek Subbasin undesirable result is considered "significant and unreasonable" if groundwater quality degrades such that the specific conductance exceeds the upper Secondary MCL of 1,600 µS/cm. There are no public health goal or primary MCL goal associated with specific conductance. The MT for the Water Quality Secondary MCL is:~~

> ~~*the upper Secondary MCL for specific conductance based on the State Secondary Drinking Water Standards.*~~

The maximum threshold for specific conductance in water quality representative monitoring wells is set to 900 µs/cm or the measured historical high, whichever is greater, to ensure safe drinking water (Title 22 CCR §64449-B). This maximum threshold was set based on best

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available data, limits that are protective of both irrigated agriculture and drinking water. Salinity thresholds for irrigation are more restrictive than the State Drinking Water Standards. Therefore, the MTs are protective of both irrigation and drinking water.

In Wyandotte Creek ~~Oroville~~, undesirable results have not been reported historically, are not currently occurring, and are not expected to occur in the future. ~~Observations of specific conductance at RMS from 2001 through 2019 ranged between 346 and 390 µS/cm and demonstrated no trend. In Wyandotte Creek South undesirable results related to water quality as a result possibly due to groundwater pumping have been reported in one well, 18N04E28L001M (Figure 4-6), with data collected in the 1970s and 1980s. The last reported value of specific conductance was greater than 2,000 µS/cm for a sample collected in 1986. No samples have been collected in this area since that time. These results may also be naturally occurring within this well (total depth 190 feet bgs) and not due to groundwater pumping. If access cannot be obtained for the proposed RMS well in this area, then a new RMS well will be installed. Although there have been no reported undesirable results due to groundwater pumping in this area, other RMS wells in Wyandotte Creek South have not been sampled for specific conductance. The proposed~~The current sampling schedule for these wells ~~will provide~~has provided the data by the first 5-year ~~update~~Periodic Evaluation to assess if undesirable results occur in this area~~.~~, as well as developing SMCs for new RMS wells.

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3.5.3 Measurable Objective / Interim Milestones

The Water Quality MO represents a quantitative target that establishes a point ~~above~~below the ~~MT~~maximum threshold allowing for a range of active management to prevent undesirable results and reflect the desired state for groundwater quality at the year 2042. To address the potential impacts of concern related to degraded water quality, the MO was established for specific conductance at ~~the recommended Secondary MCL~~700 µs/cm. This is protective of sensitive crops per California Department of ~~900 µS/cm based on~~Health Services established agricultural water quality limits.[19] Additionally, it is below State ~~Secondary~~below State Drinking Water Standards ~~as discussed above for the MT. The MO for the Water Quality SMC is:~~.. This is consistent with the Butte County Basin Management Objectives (BMO) defined in the Butte County Code of Ordinances. The Butte County BMO Program expired upon the adoption of the 2022 GSP.

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~~*the recommended Secondary MCL for specific conductance based on the State Secondary Drinking Water Standards.*~~

Water quality monitoring implemented for compliance with SGMA will build upon Butte County's existing groundwater quality monitoring program. Additional monitoring by DWR and other agencies will continue to track constituents not managed by the GSA, including minerals, metals, pesticides, and herbicides.

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Since groundwater quality is already at or near MOs, it is reasonable to set the interim milestones equal to the MOs to provide numerical metrics for the GSAGSA to track conditions so the basin remains sustainable.

[19] Artiola, Janick F., Ian L. Pepper, Mark Brusseau. Environmental Monitoring and Characterization. Table 9.4, pg 148

3.5.4 Summary

To achieve the sustainability goal and therefore preserve the desired condition for the groundwater basin over time, the GSA, in setting the Water Quality SMC, commits to managing groundwater quality in line with the State Secondary Drinking Water Standards and California Department of Health Services' recommended limits for irrigation water at each RMS shown in Table 3-~~2~~3. (See Section 4, Figure 4-6)

Table 3-~~2:~~ 3: Water Quality Sustainable Management Criteria by Representative Monitoring Site in µS/cm

GSP Well ID	Depth	MT	MO	IM		
				2027	2032	2037
Wyandotte Creek Subbasin – Oroville Management Area						
~~16Q001M~~06E002M	~~1,600~~Shallow	900	~~900~~700	~~900~~700	~~900~~700	700
~~CWS-02~~						
Wyandotte Creek Subbasin – South Management Area						
08M001M	~~1,600~~Deep	900	~~900~~700	~~900~~700	~~900~~700	700
09N002M~~18C001M[1]~~ ~~18C002M~~ ~~18C003M~~	Deep	900	700	700	700	700
~~28L001M[2]~~						
~~13B002M~~						
~~Note:~~ ~~1. New nested well (wells completed in same borehole) installed by DWR under TSS Grant.~~ ~~2. If access cannot be obtained for this well, new well will be obtained.~~19D003M[1]	Shallow	900	700	700	700	700

Notes:

[1] New nested well (wells completed in same borehole) installed by DWR under TSS Grant.

3.6 Seawater Intrusion Sustainable Management Criteria

Seawater intrusion is not applicable to the Wyandotte Creek Subbasin due to its distal location from the Pacific Ocean.

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3.7 Land Subsidence Sustainable Management Criteria

Land Subsidence SMC are those meant to address land subsidence that substantially interferes with surface land uses caused by groundwater pumping. The locally defined undesirable result, MT, and MO are discussed in the next sections.

3.7.1 Undesirable Result and Minimum Thresholds

An undesirable result coming from land subsidence is experienced if:

> *groundwater pumping leads to changes in the ground surface elevation severe enough to ~~disrupt~~cause disruptions to critical infrastructure ~~or~~ , development and operations of projects ~~in a manner~~ that ~~is inconsistent with~~enhance the ~~Sustainability Goal~~viability of rural areas, communities, and the agricultural economic base of the region. Undesirable results will occur when the ground surface elevation of at least 12% of monitoring sites (or at least 3 of 21 sites) declines a distance that exceeds the subsidence MT.*

~~Land subsidence typically occurs concurrently or shortly after significant declines in groundwater levels, therefore measured changes in groundwater levels can serve as a proxy for potential land subsidence. For this reason, the SMC developed for groundwater levels are used for land subsidence to ensure avoidance of the undesirable result.~~

~~As Groundwater Levels SMC are used by proxy, the quantitative Undesirable Result for land subsidence is the same as for groundwater levels:~~

~~*Two RMS wells within a management area reach their MT for two consecutive non-dry year types.*~~The locations of the monitoring sites are shown in Figure 4-3 and 4-7.

The undesirable results from subsidence due to groundwater pumping are disruptions to critical infrastructure, development of projects that enhance the viability of rural areas, communities, and the agricultural economic base of the region. According to the DWR Subsidence BMP this may include disruptions and damage such as reduced capacity to convey water to beneficial users and damage to pipelines and other utilities.

While elastic subsidence is recoverable deformation, inelastic subsidence is permanent irreversible sinking of the ground surface. The minimum threshold is meant to represent inelastic, or irreversible, subsidence solely due to lowering groundwater levels and may lead to undesirable results. According to the DWR Land Subsidence Best Management Practices[20] (DWR Subsidence BMP) in groundwater basins where land subsidence has occurred, the MT should be the amount of subsidence that does not substantially interfere with surface land uses and infrastructure. Since the Subbasin has not experienced substantial disruption to infrastructure, the MT is based on historically observed vertical displacement.

Undesirable results related to land subsidence in the Wyandotte Creek Subbasin have not occurred historically, are not currently occurring, and are not likely to occur in the future. Elastic subsidence on the east side of the Sacramento Valley, including the Wyandotte Creek Subbasin, has historically not been a concern, with cumulative subsidence rarely greater than 0.1 feet. To

[20] https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Land_Subsidence_BMP.pdf

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assess land subsidence in the Sacramento Valley, a subsidence monitoring network was established consisting of observation stations and extensometers managed jointly by the USBR and DWR. This network of observation stations is no longer monitored within the Subbasin as of 2017. This subsidence monitoring network ~~includes~~included six ~~GSP~~GPS monuments located within the Wyandotte Creek Subbasin. The subsidence monitoring network also ~~includes~~included three extensometers in Butte County with a period of record beginning in 2005 ~~(There~~, which are still active (there are no extensometers in the Wyandotte Creek Subbasin). By 2019, a review of the data showed that changes in ground surface elevations were slight and remained at or above baseline levels, indicating that inelastic land subsidence has not been an observed in the Wyandotte Creek Subbasin. From 2020 to 2025, InSAR data does not detect any substantial subsidence (all displacement is within the -0.11 to 0.11 ft range of measurement uncertainty). This is likely due to relatively stable groundwater levels historically and subsurface materials that are not especially conducive to compaction. For this reason, inelastic land subsidence due to groundwater pumping is unlikely to produce an undesirable result in the Wyandotte Creek Subbasin.

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3.7.2 Measurable Objectives / Interim Milestones

~~As Groundwater Levels SMC are used by proxy, the MO for land subsidence is the same as for groundwater levels:~~

~~the groundwater level based on the groundwater trend line for the dry periods of observed short-term climatic cycles extended to 2030.~~Undesirable results from subsidence are not currently observed in the Subbasin and the historical trends were used to set the subsidence MO, which is equal to the observed maximum subsidence from InSAR data (Table 2-2). The MO is one foot over 20 years (e.g., 0.25 feet over a 5-year period) for each InSAR pixel (Table 3-43). The interim milestone is 0.25 feet over a 5-year period. This MO and IM are consistent with those of the neighboring groundwater basins.

Table 3-43: Subsidence Sustainable Management Criteria

SMC	Subsidence Extent from 2022 (feet)	Subsidence Rate (feet per 5 years)
IM 2027	0.25	0.25
IM 2032	0.50	0.25
IM 2037	0.75	0.25
MO	1.00	0.25
MT	2.00	0.50

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3.8 Interconnected Surface Water Sustainable Management Criteria

Interconnected Surface Water SMC are those meant to address depletions of interconnected surface water caused by groundwater pumping. Relevant context, the Interconnected Surface Water SMC framework, and the locally defined undesirable result, MT and MO are presented in the next sections.

3.8.1 Relevant Context

The objective of the Interconnected Surface Water SMC is to avoid significant and unreasonable adverse impacts on beneficial uses of surface water resources (rivers, creeks and streams). To address this SMC, DWR has provided various forms of guidance, including mapping of potential GDEs. GDEs are a sub-class of aquatic and riparian habitat that depend on groundwater for optimum ecological function. The distinction between an ecosystem's dependence on groundwater versus its dependence on surface water and the associated riparian zone or floodplain is important. In addition, the distinction between the shallow aquifer zone and the deep aquifer zone, or principal aquifer, is ~~also~~ important. The principal aquifer only influences surface water to the extent that it affects water levels in the shallow aquifer zone which then influences the shallow aquifer zone's connection to the stream. The Feather River and its floodplain are affected by large and cumulative hydrologic processes, including operation of multiple reservoirs.

Potential impacts of the depletion of interconnected surface water were discussed by stakeholders during technical discussions covering the fundamentals of groundwater-surface water interactions ~~and mapping analysis of GDEs prepared by BCDWRC. The GDEs mapping analysis is presented in Section 2.2.7.~~. Potential impacts identified by stakeholders were:

- ~~Disruption to GDEs~~
  - Reduced flows in rivers and streams supporting aquatic ecosystems (in-stream GDEs) and water right holders
  - Streamflow changes in upper watershed areas outside of the Wyandotte Creek GSA boundary
- ~~Water table depth dropping below the maximum rooting depth of Valley Oak (*Quercus lobata*) or other deep-rooted tree species~~
  - Cumulative groundwater flow moving toward the Feather River from both the Wyandotte Creek Subbasin and surrounding GSAs on both the east and west side of the river

The Wyandotte Creek Subbasin acknowledges that overall function of the riparian zone and floodplain is dependent on multiple components of the hydrologic cycle that may or may not have relationships to groundwater levels in the principal aquifer. For example, hydrologic impacts outside of the Wyandotte Creek Subbasin, such as upper watershed development or fire-related changes in run-off, could result in impacts to streamflow, riparian areas, or GDEs that are completely independent of any connection to groundwater use or conditions within the Wyandotte Creek Subbasin.

Data needed to develop this SMC as required by Section 354.28 (c)(6)(B) of the GSP regulations includes: definition of stream reaches and associated priority habitat, streamflow measurements to develop profiles at multiple time periods, and measurements of groundwater levels directly adjacent to stream channels, first water bearing aquifer zone, and deeper aquifer zones. ~~These~~The GSA has expanded its network of stream gages and groundwater wells near tributaries but needs additional time collecting data ~~are not available and are a~~ to further fill this data gap ~~for the GSP~~. The GSA intends to further evaluate this SMC for the next periodic evaluation to avoid undesirable results to aquatic ~~ecosystems and GDEs.~~GDEs. Preliminary SMCs are presented

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below with the goal of collecting additional data for five more years to address remaining data gaps. Finalized SMCs are expected to be developed for the 2032 periodic evaluation to manage stream depletions as needed. To that end, an Interconnected Surface Water SMC framework has been developed for the GSP as described below. This framework will guide future data collection efforts to fill data gaps~~, either~~ as part of GSP ~~projects and management actions or~~ plan implementation. As additional data are collected and evaluated, the GSA will evaluate the development of additional SMC, as appropriate, for specific stream reaches and associated habitat where there is a clear connection to groundwater pumping in the principal aquifer.

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3.8.2 Interconnected Surface Water SMC Framework

To evaluate the potential for depletion of interconnected streams, an integrated assessment of both surface water and groundwater is required that includes:

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- Collect additional data from 2027 to 2032, with the aim of filling data gaps and developing finalized ISW SMCs for the 2032 periodic evaluation. This includes collecting data from newly installed wells and stream gages, and calibrating stream depletion estimates.
- Definition of stream reaches and associated priority habitat. This is typically developed using a combination of geomorphic classification of the stream channel and ecological classification of the associated habitat.
- Multiple streamflow measurements in each stream reach to develop a profile of streamflow at multiple time periods over at least one year. Comparison of flow rates in each reach defines whether the reach is gaining (water moving from the groundwater system to the stream/river) or losing (water moving from the stream/river to the groundwater system). A reach can be both gaining and losing, depending on the time of year (i.e., losing during high flow periods and gaining during low flow periods). Five new stream gages have been installed, growing the ISW network and filling data gaps.
- Measurement of groundwater levels directly adjacent to the stream channel in the adjacent riparian zone or floodplain. Groundwater measurement of this type is typically done with piezometers, or "mini-piezos," which may be very shallow (less than 15 feet deep) and hand-driven (i.e., not requiring a drill rig). Groundwater levels are collected simultaneous to streamflow profiles. New wells near stream channels have been installed in 2026, growing the ISW network and filling data gaps.
- Measurement of groundwater levels in the first water bearing aquifer zone. This is the first regional or sub-regional aquifer zone that interacts with the stream by either discharging water to the stream or gaining water from the stream. These wells are typically between 20 and 100 feet deep and require a drill rig for installation. It is important to complete these wells across the water table. Groundwater levels are collected simultaneous to streamflow profiles. Water level differences between the shallow aquifer and the water surface elevation of the nearest stream reach are evaluated. New wells for the shallow aquifer have been installed in 2026, growing the ISW network and filling data gaps.
- Measurement of groundwater levels in deeper aquifer zones. These are typically regional or sub-regional aquifers that are used for regional supply. Water levels in

these aquifers can be higher or lower than water levels in the overlying aquifer. The degree of connectivity to the nearest stream reach depends on how stratigraphically isolated the deeper zone is from the shallow zone. These wells are typically greater than 100 feet deep and require a drill rig for installation. It is important to conduct a pumping test of the deeper aquifer and measure water levels in the overlying aquifer to determine how hydraulically connected it is to the overlying aquifer. It is important to complete wells in the shallow aquifer across the water table. Groundwater levels are collected simultaneous to streamflow profiles. Additional Airborne Electromagnetic (geophysical) data would be valuable in further understanding the structure and potential interconnection of the aquifers in different zones.

This information is then integrated to define which surface water reaches are connected to the shallow aquifer zones and where those shallow aquifer zones are influenced by pumping of the deeper aquifer zones. Butte County is leading an effort, in coordination with the NCWA to work with DWR to better characterize ISW across the Sacramento Valley. It is anticipated that a regional model such C2VSimFG will be needed to effectively characterize stream depletions. The framework outlined above will need to be modified as needed to align with regional coordination efforts.

3.8.3 Undesirable Result

The undesirable result for this SMC is focused on connectivity where there is a measurable connection between groundwater levels in the principal aquifer and streamflow or associated aquatic habitat viability. The Wyandotte Creek Subbasin specifically recognizes deep-rooted tree species, such as Valley Oak~~.~~, that are common along riparian corridors in the Feather River. This connectivity is not well measured or understood in the Wyandotte Creek Subbasin at this time~~.~~ ~~For now, an~~ and data gaps remain, although the GSA has installed new shallow wells to help address this data gap. For now, undesirable result coming from the depletion of interconnected surface water is simply defined as:

> *depletion of surface water flows caused by groundwater pumping significantly and unreasonably impacts beneficial uses of surface water. Two shallow RMS wells (or 25%, whichever is greater) across the entire Subbasin reach their MT for two consecutive years.*

~~For this reason, the~~The SMC ~~developed~~ISW for ISW are set for ISW RMS wells using groundwater levels ~~are used~~ as a proxy for interconnected surface water ~~in an interim manner until data gaps are addressed. As outlined in Chapter 6, an aggressive schedule has been provided to fill these data gaps and the GSA is committed to addressing these issues and develop appropriate SMC for Wyandotte Creek Subbasin.~~

3.8.4 Minimum Thresholds

The potential impact of groundwater levels on aquatic habitat or GDEs is typically specific to a certain stream reach or geographic area. Groundwater modeling conducted in association with the HCM (Section 2) incorporates the interaction of surface water and groundwater at a regional scale, including all the GSAs in Butte County. While the model is a useful tool for evaluating regional behavior of the groundwater system overall, there are significant data gaps that limit calibration of the groundwater response in the uppermost layer of the model, where the dynamics and "interconnectedness" between surface water and groundwater actually occur. ~~Therefore, at~~

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~~this time, Groundwater Levels SMC are used by proxy and the MT for interconnected surface water is the same as for groundwater levels:~~During the next evaluation period (2027 – 2032), the GSA will continue to collect data on ISWs with the goal of revisiting ISW SMCs in the next periodic evaluation.

> ~~*Two RMS wells within a management area reach their*~~ MT for ~~*two consecutive non-dry year types.*~~

~~This interim MT may be refined as more data are collected~~interconnected surface water is set to ~~support~~ the ~~SMC framework described above. In~~ following:

> *The MT is set within 20 feet of the ~~meantime, this~~historical low, as follows: The MT is set to the historical low minus the range of observed groundwater surface elevations. If the calculated range is greater than 20 feet, then the MT is set to the historical low minus 20.*

Table 3-54 summarizes the historical low groundwater elevation, range from high to low groundwater elevation, and the proposed minimum thresholds. All MTs are set 20 feet below the historical low. Additional RMS wells may be added as data becomes available.

Table 3-5: Interconnected Surface Water Sustainable Management Criteria by Representative Monitoring Site in Feet Above Mean Sea Level

RMS Well ID	Historical low (ft AMSL) (Measurement Date)	WSE Range (ft)	MT[1]
PWS-03	114 (10/2014)	26	94
03D001M	64 (8/1998)	26	44
22B001M	50 (7/2021)	59	30

[1] All[1]All MTs are based 20 feet below the historical minimum elevation.

This MT is protective of interconnected surface water ~~in so far as it is protective of shallow domestic wells, which are more likely to be completed in shallow aquifer zones that have a greater connection to surface water.~~to minimize impacts to stream depletions (Table 3-5). 4).

3.8.5 Measurable Objectives / Interim Milestones

~~As Groundwater Levels SMC are used by proxy, the MO for interconnected surface water is the same as for groundwater levels:~~

~~the~~ The ISW MO represents quantitative targets that establish a point above the MT allowing for a range of active management to prevent undesirable results and reflect the desired state for stream depletions in the year 2042. To establish the MO, the historic record of observed groundwater levels at each RMS was evaluated.

The MO was set equal to the average groundwater level ~~based on the groundwater trend line~~recorded from October 1st, 2015, through September 30th, 2025.

IM for ~~the dry periods of observed short-term climatic cycles extended to 2030.~~stream depletions are set at five-year intervals between 2022 and 2042. Since the MO reflect current conditions and is set as a target for future conditions, all IM will be set to the MO.6 Table 3-5 summarizes ISW SMCs.

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~~As described previously, the historical record of groundwater levels shows fluctuations over a four- to seven-year cycle consistent with variations in water year type according to the Sacramento Valley Water Year Hydrologic Classification. It is not known whether streamflow and associated aquatic habitat and GDEs that are connected to groundwater have also experienced a long-term decline. Long-term declines in Feather River streamflow may have been avoided by reservoir releases aimed at maintaining streamflow levels and meeting water supply demands. As described previously, the wet-dry cycles are climatically induced, and the GSA has no ability to change this cyclical behavior; there will always be short-term cyclical fluctuations in surface water availability. The MO are therefore intended to address the long-term trend of the "peaks and valleys" of the short-term cycles. A focus on long-term trends will be maintained as more data are collected to inform future MOs for the shallowest zone of the aquifer system.~~

~~3.9 Sustainable Management Criteria Summary Tables~~

~~Groundwater Levels SMC and Water Quality SMC for each RMS are shown in Table 3-1 and Table 3-2, respectively. The locations of these wells are shown in Figures 4-5 and 4-6, respectively.~~**Table 3-6: Interconnected Surface Water Sustainable Management Criteria by Representative Monitoring Site in Feet Above Mean Sea Level**

RMS Well ID	Well Type	MT	MO	IM		
				2027	2032	2037
PWS-03	Shallow	94	131	131	131	131
03D001M	Deep	44	72	72	72	72
22B001M	Shallow	30	89	89	89	89

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4. MONITORING NETWORKS

4.1 Monitoring Network Objectives

The objective of the existing monitoring networks is to observe and record data on groundwater levels, quality, and related conditions, such as the interconnection of surface water and groundwater and land subsidence. Wells included in the existing monitoring networks were selected based on spatial density, quality and frequency of historically collected data to detect short-term, seasonal, and long-term trends and evaluate conditions related to the effectiveness of the GSP. Parameters that have been monitored provide historic baseline information for establishing the current status of relevant SI that will be useful in tracking these SI as the GSP is being implemented. The complete list of SI is presented below:

1. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued
2. Significant and unreasonable reduction of groundwater storage
3. Significant and unreasonable seawater intrusion
4. Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies
5. Significant and unreasonable land subsidence that substantially interferes with surface land uses
6. Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

The existing monitoring networks form a pool of monitoring locations that will serve as the backbone of the representative monitoring network used to assess SGMA compliance as discussed in Section 3. The existing network will support improved understanding of conditions in the Wyandotte Creek Subbasin, inform ongoing management of the subbasin, and contribute to future ~~updates to~~Periodic Evaluations of the GSP. These objectives will be implemented in a manner that will:

- Demonstrate progress toward achieving MO, MT, and IM
- Monitor impacts to the beneficial uses or users of groundwater
- Monitor changes in groundwater conditions
- Quantify annual changes in water budget components, such as change in storage

Data collected from the monitoring ~~network~~networks will be used to track changes in groundwater elevations, water quality constituent concentrations, groundwater and surface water interactions and rates of subsidence at monitoring locations throughout the Wyandotte Creek Subbasin~~. At locations where MO differ substantially from current conditions, the monitoring data from the RMS (Section 4.9) will be used to determine whether local projects and management actions are meeting IM presented in the GSP as indicators of progress toward attainment of MO. MOs will be monitored directly through measurement of groundwater levels and water quality constituents~~ and will be compared to established SMC for each SI in annual reports and Periodic Evaluations.

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~~Groundwater elevations will be used as a proxy for evaluating reduction in groundwater storage, depletions of interconnected surface waters, and for land subsidence where either of these potential undesirable results is associated with declining groundwater elevations. In each of these instances, "significant and unreasonable" reductions are the guideposts used to warn of unsustainable groundwater conditions. For interconnected surface waters, the GSA in the Wyandotte Creek Subbasin intends to further evaluate this SMC to avoid undesirable results to aquatic ecosystems and GDEs. To that end, an Interconnected Surface Water SMC framework has been developed for the GSP, as described in Section 3.8. This framework will guide future data collection efforts to fill data gaps, either as part of GSP projects and management actions or as plan implementation. As additional data are collected and evaluated, the Wyandotte Creek Subbasin commits to developing additional SMC, as appropriate, for specific stream reaches and associated habitat where there is a clear connection to groundwater pumping in the principal aquifer.~~

In addition to being central to SGMA compliance by enabling tracking of SI, data collected through the monitoring network will be used to update inputs to the water budget and to guide interpretation of water budget results. Monitoring data will also be used to assess impacts of groundwater management on various categories of beneficial uses and users and to monitor overall groundwater conditions from local and subbasin-wide perspectives.

The monitoring networks for each of the following sustainability indicators are described below: groundwater levels, groundwater storage, water quality, land subsidence, and depletions of interconnected surface water ~~are described below. The BBGM and / or groundwater level data will be used to estimate changes in groundwater storage based on observed changes in groundwater levels.~~

. Seawater intrusion is not considered to be an SI relevant to the Wyandotte Creek Subbasin as seawater intrusion is not present and is not likely to occur in the Wyandotte Creek Subbasin due to the distance from the Pacific Ocean, bays, deltas, or inlets. However, there is some evidence that connate groundwater of a quality characteristic of its ancient marine origins is present in the Wyandotte Creek Subbasin and that this water has the potential to affect beneficial uses due to brackish characteristics. Ancient marine layers pose a water quality (saline) risk by contaminating groundwater from groundwater pumping. This GSP ~~will address~~addresses this risk through the water quality SI.

The location of existing sites and the frequency of monitoring at each site are presented below as is the spatial density of locations in each of the monitoring networks. Data gaps and plans to fill these gaps are also discussed as part of the program for defining the representative monitoring network to be used in monitoring SI to ensure SGMA compliance. Explanations of how gaps identified in the monitoring network will be filled are provided in Section 4.10.

The goal of defining the existing monitoring ~~network~~networks, identifying gaps in the ~~network~~networks, and developing and implementing a program to fill those gaps is to develop a representative monitoring network capable of collecting information needed to address:

- Short-term trends in groundwater and related surface water conditions
- Seasonal trends in groundwater and related surface water conditions
- Long-term trends in groundwater and related surface water conditions

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- Provide adequate coverage by establishing sufficient density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends listed above

4.2 Groundwater Level Monitoring

Groundwater level monitoring in the Wyandotte Creek Subbasin is conducted through a network of monitoring wells used for observation of groundwater levels and computation of hydraulic gradients and flow directions in the principal aquifer. The network also allows for characterization of the groundwater table or potentiometric surface of the principal aquifer.

The ~~13~~twenty-one (21) wells included in the network were selected based on the degree to which data from these wells represents conditions in the area, use in existing monitoring programs, permission of the well owner to access the well, and the length and continuity of the monitoring record. Of the ~~13~~21 wells, ~~5~~6 are located in the ~~Wyandotte Creek~~ Oroville MA~~,~~ and ~~8~~15 are in the ~~Wyandotte Creek~~ South MA. Table 4-1 lists wells now used for monitoring in each MA and Figure 4-1 shows the locations of these wells ~~(except for municipal wells)~~ in their respective MAs. Multi-completion wells are sites where more than one monitoring well has been installed at a single location. The wells are drilled and screened at different depths with each well designed to measure groundwater elevations at a selected zone in the underlying aquifer. ~~A multi-completion well was recently installed as shown in Figure 4-6 by DWR under the TSS program and will be used for both groundwater level and water quality assessments (Section 4.9.2). No other multi-completion wells are located within the Wyandotte Creek Subbasin~~Section 2.1.6 and Figures 4-1 and 2-8C discuss and show AEM flightlines and representative aquifer cross-section.

Groundwater level monitoring sites were analyzed and then classified to provide stratigraphic context for the well screened intervals to identify which aquifer zone each monitoring well is representative of. A previous investigation (Blair et al., 1991) provided the initial framework for placing screens of the monitoring wells into three different stratigraphic units, from oldest to youngest: Ione Formation, Mehrten Formation (including the Nomlaki Tuff), and the Laguna Formation.[21] Additionally, 72 boreholes and 8 Airborne Electromagnetic (AEM) data profiles from the Department of Water Resources (DWR) W07 region were used to guide interpretations as discussed in Section 2.1.6. In general, monitoring wells screened in the Laguna Formation are representative of the shallow (or upper) aquifer zone and wells screened in the Ione Formation are representative of the deeper aquifer zone. Table 4-1 identifies which aquifer zone each monitoring well is screened within (e.g., Shallow, Deep, or Both). RMS wells were selected based on proximity to domestic wells, aquifer zone representative of domestic wells, and having at least five years of high-quality measurements (further discussed in Section 4.9.1). Typically, domestic wells are screened in the shallow zone and upper portion of the deep aquifer zones.

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[21] Blair, T.C., Baker, F., and Turner, J., 1991, Cenozoic fluvial facies architecture and aquifer heterogeneity, Oroville, California, Superfund site and vicinity, in Tyler, N., and Miall, A.D., editors, Three-dimensional facies architecture of terrigenous clastic sediments and its implications for hydrocarbon discovery and recovery: SEPM Concepts in Sedimentology and Paleontology, No. 3, p. 147-159.

Both shallow and deep wells were used as RMS wells as these wells are intended to monitor conditions for domestic wells.

Table 4-1: Wyandotte Creek Subbasin Groundwater Level Broad Monitoring Network ~~Well Locations~~Wells

Well ID	State Well Number[1]	Monitoring Frequency	Multi-Completion ~~(number of wells at site)~~	Well Type	Aquifer Category	Drill Depth	First Meas. Date	RMS
Wyandotte Creek – Oroville Management Area								
16Q001M~~19N03E1600Q~~	19N03E**16Q001M**	Quarterly	No	Residential	Shallow	120	10/3/2000	Yes
~~19N04E3200P~~32P001M	19N04E**32P001M**	Quarterly	No	Residential	Shallow	150	8/29/1959	Yes
~~CWS~~PWS-01		Quarterly	No	Municipal	Shallow	186	2/1/1978	No
~~CWS~~PWS-02		Quarterly	No	Municipal	Both	340	2/1/1978	No
~~CWS~~PWS-03		Quarterly	No	Municipal	Shallow	150	2/1/1978	Yes
S1[2]		Continuous	Yes	Observation	Shallow	70	3/31/2026	No
Wyandotte Creek – South Management Area								
~~17N03E0300D~~03D001M	17N03E**03D001M**	Quarterly	No	Irrigation	Shallow	179	4/10/1947	No
13B002M~~17N03E1300B~~	17N03E**13B002M**	Quarterly	No	Irrigation	Deep	320	3/20/2001	Yes
09N002M~~17N04E0900N~~	17N04E**09N002M**	Quarterly	No	Irrigation	Deep	325	3/20/2001	No
~~17N04E2200B~~22B001M	17N04E**22B001M**	Quarterly	No	Residential	Shallow	80	3/8/1976	Yes
~~18N03E2500N~~25N001M	18N03E**25N001M**	Quarterly	No	Irrigation	Shallow	164	3/9/1976	Yes
~~18N04E0800M~~08M001M	18N04E**08M001M**	Quarterly	No	Irrigation	Deep	656	5/2/1961	Yes
~~18N04E1600C~~16C001M	18N04E**16C001M**	Quarterly	No	Irrigation	Both	165	10/20/1947	Yes
19D001M	18N04E**19D001M**	Quarterly	Yes	Observation	Deep	720	6/14/2021	No
19D002M	18N04E**19D002M**	Quarterly	Yes	Observation	Deep	570	6/14/2021	No
19D003M	18N04E**19D003M**	Quarterly	Yes	Observation	Shallow	200	6/14/2021	Yes
~~19N04E31F~~31F001M	19N04E**31F001M**	Quarterly	No	Residential	Shallow	200	10/3/2000	Yes
M1[2]		Continuous	Yes	Observation	Shallow / Deep / Deep	105 / 290 / 585	3/31/2026	No
S2[2]		Continuous	Yes	Observation	Shallow	50	3/31/2026	No
S7[2]		Continuous	Yes	Observation	Shallow	50	3/31/2026	No

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Well ID	State Well Number[1]	Monitoring Frequency	Multi-Completion ~~(number of wells at site)~~	Well Type	Aquifer Category	Drill Depth	First Meas. Date	RMS
S10[2]		Continuous	Yes	Observation	Shallow	50	3/31/2026	No

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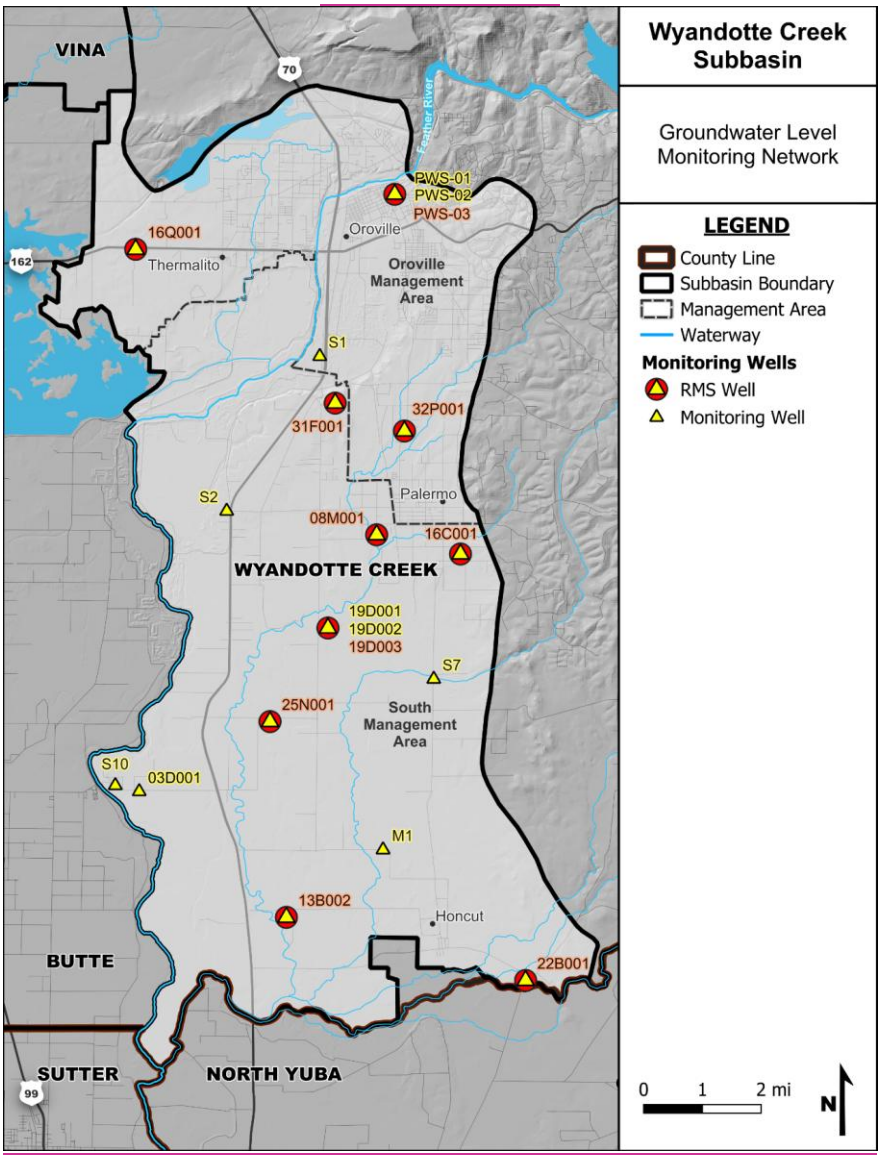

Figure 4-1 ~~placeholder page~~**: Groundwater Level Representative Monitoring Network**

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4.2.1 Density of Monitoring Sites and Frequency of Measurement

Each of the wells in the existing network is monitored either by Cal Water, Butte County, DWR, or the associated CASGEM collaborators in the subbasin. Each of the wells are reported quarterly.

For the purpose of SGMA compliance, water levels in the RMS network (Section 4.9) in the Wyandotte Creek Subbasin will be monitored at least biannually by the GSA, County or DWR within 14 days of one another.

Groundwater pumping typically peaks during the summer growing season and slows in the fall and winter. Therefore, spring levels represent an annual high prior to summer irrigation demands while fall levels represent an annual low for static (non-pumping) conditions. For wells that cannot be observed on the regular monitoring schedule or for which readings are questionable, it will be noted in the standard data sheet that the well was unable to be measured.

Groundwater elevation data will be used to observe seasonal and annual changes and for analysis of short-term and long-term trends. Analysis of trends in groundwater levels together with data on surface water deliveries and groundwater extraction will be important tools for tracking the Wyandotte Creek Subbasin's progress in meeting its MO and in determining the need for additional projects and management actions or modifications to projects and management actions to meet the MO.

A total of ~~13~~21 wells are included in the network for monitoring groundwater levels. These wells are distributed over the 93 square- mile area of the Wyandotte Creek Subbasin with a distribution equivalent to a spatial density of ~~14~~23 wells per 100 square miles, a network density that significantly exceeds those presented in the BMP Monitoring Networks and Identification of Data Gaps. Table 4-2 is taken from the BMP and shows a range of recommended monitoring network densities.

Table 4-2: Monitoring Well Density Considerations

Reference	Well Density (wells per 100 miles)
Heath (1976)	0.2 – 10
Sophocleous (1983)	6.3
Basins pumping more than 10,000 acre-feet/year per 100 miles	4.0
Basins pumping between 1,000 and 10,000 acre-feet/year per 100 miles	2.0
Basins pumping between 250 and 1,000 acre-feet/year per 100 miles	1.0
Basins pumping between 100 and 250 acre-feet/year per 100 miles	0.7

Annual groundwater pumping presented in the water balance section of the GSP shows a historical rate of pumping in the Wyandotte Creek Subbasin of 47,100 AFY (50,645 AFY per 100 square miles) and a current condition pumping rate of 43,000 AFY (46,237AFY per 100 square miles).

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Each monitoring site is located in one of the Wyandotte Creek Subbasin's two MAs:

- Wyandotte Creek – Oroville: ~~5~~6 wells in an area of 29 square miles, spatial density of ~~17~~20.69 wells per 100 square miles.
- Wyandotte Creek – South: ~~8~~15 wells in an area of 64 square miles, spatial density of ~~12.5 wells~~23.44 per 100 square miles.

4.3 Groundwater Storage Monitoring

4.3.1 Background

The BMP for Groundwater Monitoring (DWR, 2016) notes:

> *While change in groundwater storage is not directly measurable, change in storage can be estimated based on measured changes in groundwater levels… and a clear understanding of the Hydrogeologic Conceptual Model…. The HCM describes discrete aquifer units and the specific yield values associated with these units. These data, together with information on aquifer thickness and connectivity, can be used to calculate changes in the volume of groundwater storage associated with observed changes in groundwater elevation.*

As suggested in the preceding passage from DWR's BMP on Groundwater Monitoring, measured changes in groundwater levels can serve as a proxy for changes in storage. For this reason, the network for monitoring changes in groundwater storage is the same as that used for monitoring changes in groundwater levels. The groundwater level RMS network is a proxy for the groundwater storage RMS network. Monitoring sites and wells included in this network are presented above in Table 4-1 with well locations shown in Figure 4-~~1.~~3.3 It is anticipated that the methodology described in Section 2.3.66 will be utilized to calculate annual change in groundwater storage for the Annual Reports.

4.3.2 Frequency of Measurement

The data from the bi-annual frequency of monitoring groundwater levels described above will enable observed changes in levels to serve as a proxy to indicate changes in groundwater storage. Data presented in the HCM on parameters such as aquifer layer composition and thickness and the specific yield and hydraulic conductivity of these layers are integrated in the BBGM, and allow the model to be used to estimate changes in groundwater storage that result from observed changes in groundwater elevations. As data on aquifer characteristics and modeling capabilities improve, the methodologies used to relate changes in groundwater elevations with corresponding changes in storage will be updated.

4.4 Groundwater Quality

4.4.1 Background

Assessment of groundwater quality in the Wyandotte Creek Subbasin focuses on annual observation of salinity (through monitoring of specific conductance~~),~~) and temperature~~, and pH~~, in the principal aquifer. Each of these parameters is influenced by ambient conditions and the parent material of the principal aquifer. Specific conductance and pH are also influenced by human activity. While only salinity will be used to monitor attainment of MO and avoidance of breaches in MT, changes in pH and temperature may indicate shifting groundwater conditions that trigger additional investigation.

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The groundwater quality monitoring network implemented for representative monitoring under SGMA will build upon the County's existing program. Additional monitoring will continue to be conducted by other agencies to track constituents not managed under this GSP including a variety of minerals, metals, pesticides, and herbicides. Data from the ongoing monitoring by various state and federal agencies will be available to the GSA to augment local understanding of water quality in the Wyandotte Creek Subbasin and can be found on the State Board's GAMA program at https://www.waterboards.ca.gov/gama/. Water quality programs conducted by other agencies are summarized in section 1.5. ~~The locations of all water quality monitoring wells are in Figure 4-2.~~

~~A total of two sites are part of the County's ongoing water quality monitoring programs. These wells have been selected based on the existing period of record, depth of well screens, and the quality of data reported and subject to permission of the well owner to monitor the well. Water quality monitoring has historically been conducted by Butte County during the summer. Both of the wells are located in the Oroville MA.~~

Table 4-3 presents information on each of the wells monitored by Butte County in the Wyandotte Creek Subbasin groundwater quality monitoring network. Figure 4-2 shows the locations of the wells.

Table 4-3: Butte County Groundwater Quality Monitoring Program Sites

State Well ID Number	Local Name	Well Type
Wyandotte Creek – Oroville Management Area		
19N04E06E002M	Thermalito	Municipal and Industrial
Wyandotte Creek – South Management Area		
~~N/A~~18N04E08M001M	~~Thermalito domestic~~N/A	Irrigation~~Domestic~~
17N04E09N002M	N/A	Irrigation
18N04E19D001M 18N04E19D002M 18N04E19D003M**	N/A	Observation

**completion used as RMS well.

4.4.2 Density of Monitoring Sites and Frequency of Measurement

~~Following the~~The County's ongoing water quality monitoring program~~,~~ collects data ~~will be collected~~ annually ~~for monitoring the groundwater quality sustainability~~ in July which is near the peak season for groundwater demand. The groundwater quality monitoring sites are distributed over the 93 square-mile area of the Wyandotte Creek Subbasin resulting in a monitoring network with a spatial density of 2.1 sites per 100 square miles.

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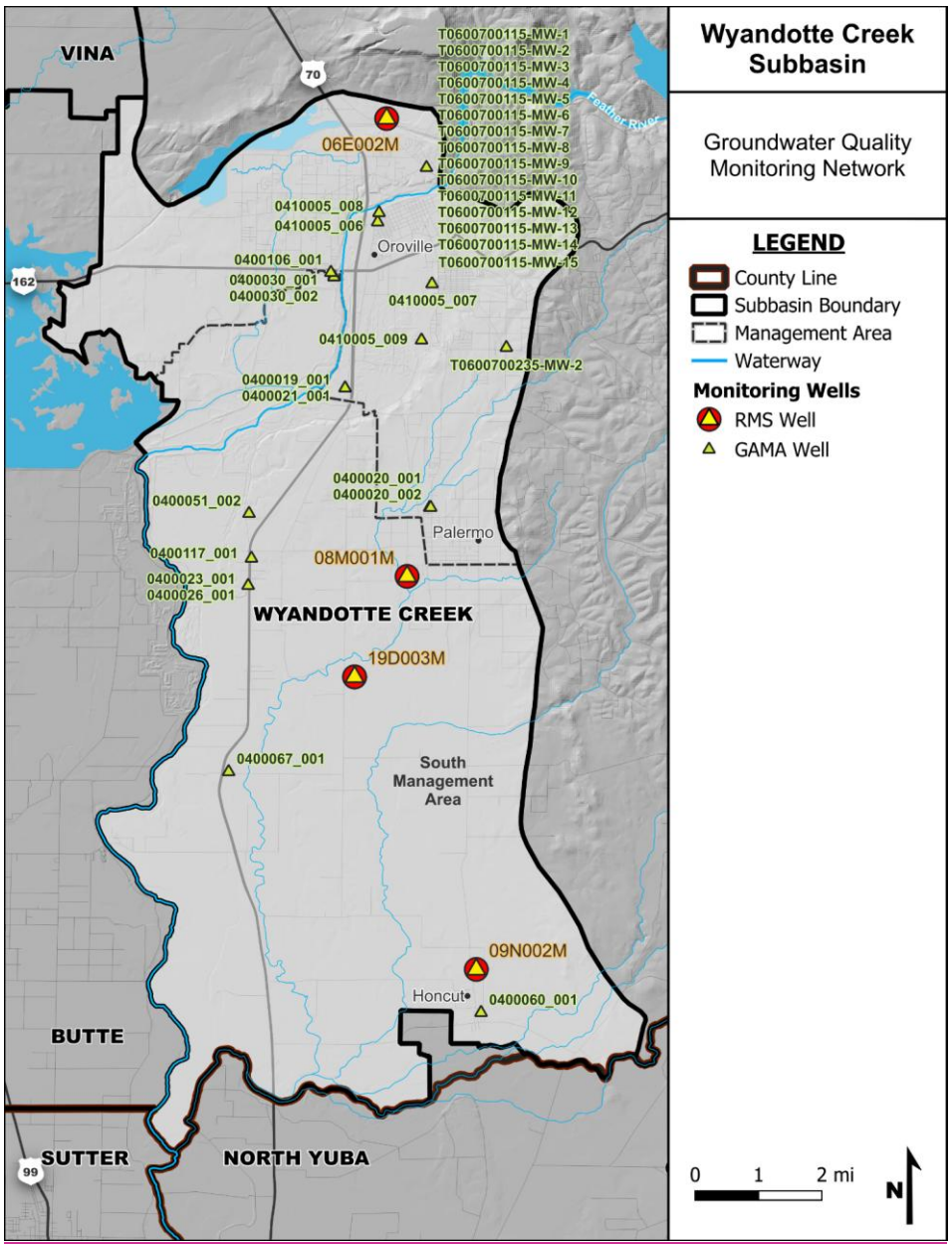

Figure 4-2: Groundwater Quality Monitoring Network

4.5 Land Subsidence

4.5.1 Background

Inelastic land subsidence has the potential to be of major concern in areas of active groundwater extraction due to infrastructure damage, permanent reduction in the storage capacity of an aquifer, well casing collapse, and increased flood risk in low lying areas. Inelastic subsidence typically occurs in the clay layers within aquifers and aquitards due to the withdrawal of water from storage within these layers. ~~This water~~Water supports the structure of the clay layers, and dewatering permanently rearranges or collapses this structure, a process that cannot be reversed as groundwater cannot re-enter the clay structure after collapse.

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To determine whether subsidence is occurring, a subsidence monitoring network has been established throughout the Sacramento Valley, the Sacramento Valley GPS Subsidence Monitoring Network. This system consists of observation stations and extensometers managed jointly by Reclamation and DWR. The observation stations are a result of DWR's efforts to establish a subsidence monitoring network to capture changes in subsidence across the Sacramento Valley. The observation stations are established monuments with precisely surveyed land surface elevations, which are distributed throughout the County such that the entire county is well represented. In 2008, DWR along with numerous partners performed the initial GPS survey of the observation stations to establish a baseline measurement for future comparisons. The network was resurveyed again in 2017 (DWR, 2018b) using similar methods and equipment as those used in the 2008 survey and results were analyzed to depict the change in elevation at each station between those two years.

Extensometers are installed in wells or boreholes and are a more site-specific method of measuring land subsidence as they can detect changes in the thickness of the sediment surrounding the well due to compaction or expansion. These instruments can detect very slight changes in land surface elevation on a continuous basis with an accuracy of +/- 0.01 feet or approximately 3 millimeters. The three extensometers in Butte County are all located outside of the Wyandotte Creek Subbasin.

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Recent subsidence studies in the Central Valley have utilized satellite- and aircraft-based Interferometric Synthetic Aperture Radar (InSAR). Much of the InSAR work has been led by the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL). However, because JPL InSAR data is limited to a period from 2015 through 2017, TRE ALTIMIRA InSAR available through DWR was used for this analysis as data from this source is available for a period starting June 2015 through present.

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The Wyandotte Creek Subbasin monitoring network is shown on Figure 4-3. Available data indicate that inelastic land subsidence due to groundwater withdrawal has not occurred in the Wyandotte Creek Subbasin. This is likely due to relatively stable groundwater levels and subsurface materials that are not conducive to compaction.

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~~The primary mechanism for subsidence monitoring in the Wyandotte Creek Subbasin is a group of GPS monuments established to create the Sacramento Valley GPS Subsidence Monitoring Network. This program has been developed jointly by DWR and Reclamation with cooperation and assistance from local entities, including Butte County. The locations of these monuments are shown in Figure 4-3. Monuments used to monitor subsidence in the Wyandotte Creek Subbasin network include six monuments located either in the interior of the Wyandotte Creek Subbasin or on the boundary between the Wyandotte Creek and the Butte and Vina subbasins. Data from this monitoring network is collected, analyzed and reported by DWR as the data becomes available.~~

~~Data from monuments in the Wyandotte Creek Subbasin portion of the Sacramento Valley GPS Subsidence Monitoring Network have been used to monitor cumulative subsidence in the Wyandotte Creek Subbasin in 2008 and 2017, a period used to satisfy the SGMA requirement to evaluate historical subsidence.~~

~~Observations from the GPS Subsidence Monitoring Network will be supplemented by InSAR data released by DWR. This information reports vertical ground surface displacement using data collected by the European Space Agency Sentinel-1A satellite and processed by NASA's JPL. Data released to date from DWR's InSAR program provides cumulative vertical ground surface~~

~~displacements from June 2015 through September 2019 and is used in the GSP to fulfill the requirement to estimate the rate and extent of recent subsidence.~~

~~InSAR data collection and mapping is regional and is not based on a defined network of monitoring locations. Therefore, no InSAR sites are shown in Figure 4-3.~~

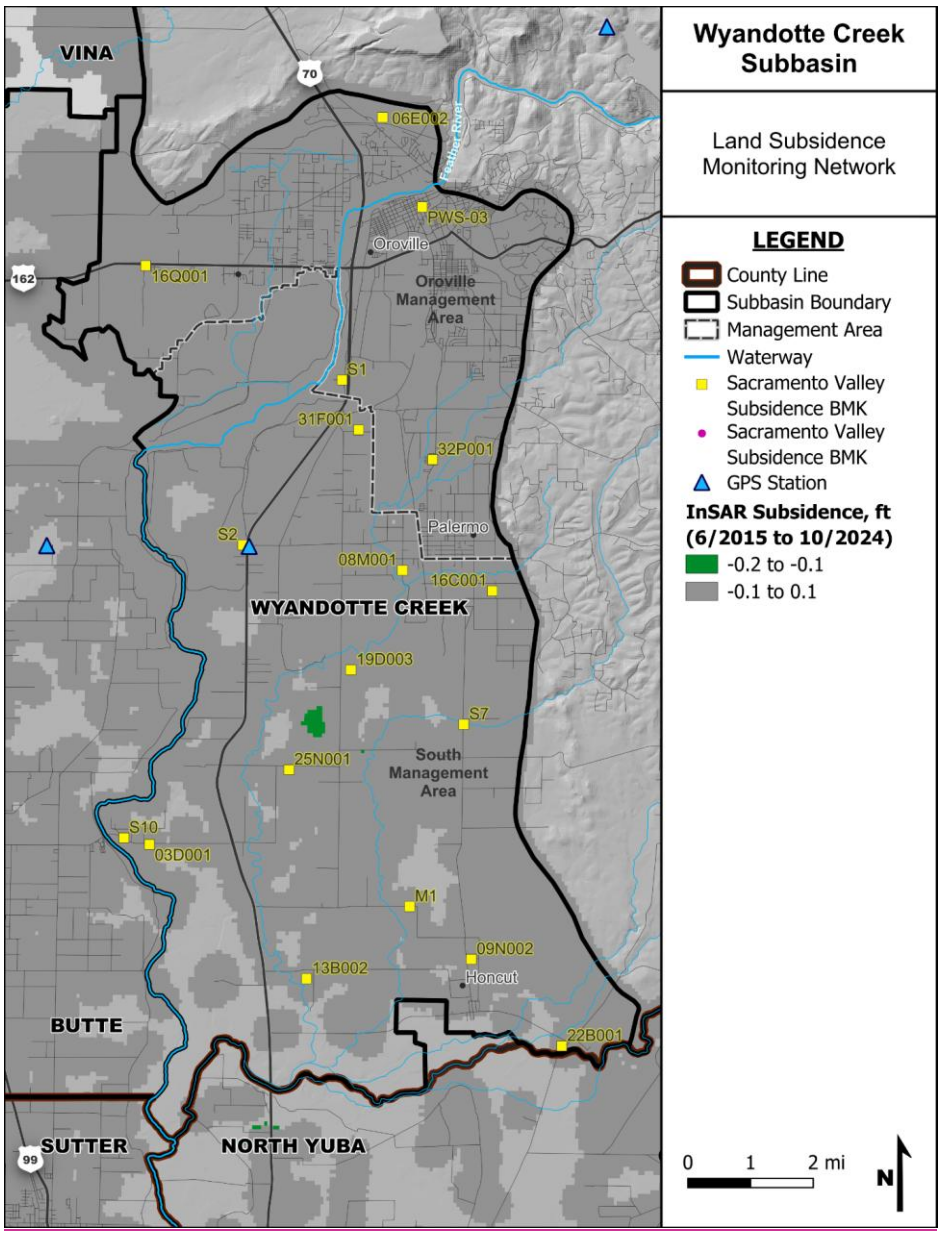

Figure 4-3: Subsidence Monitoring Network Showing Total Subsidence from June 2015 through October 2024

4.5.2 Location and Density of Monitoring Sites and Frequency of Measurement

The Sacramento Valley GPS Monitoring Network includes monuments that were measured in 2008 and 2017, while the InSAR program monitors subsidence on a continual basis. The GPS Monitoring Network is no longer active within the Subbasin, though one GPS Station in the subbasin continues to report vertical displacement. Data collected from both sources requires post processing and analysis, therefore the frequency of reporting is dependent on the work performed by DWR and ~~by NASA's JPL.~~TRE ALTAMIRA Inc. (TRE), under contract with the California Department of Water Resources (DWR). No extensometers exist in the Wyandotte Creek Subbasin.

4.6 Interconnected Surface Waters

4.6.1 Background

Monitoring depletions of interconnected surface water is conducted by monitoring water levels (stage) in streams and groundwater levels to characterize spatial and temporal exchanges between surface water and groundwater and to calibrate and apply the tools and methods necessary to estimate depletions. The existing monitoring network incorporates data from active stream gages reported to the California Data Exchange Center (CDEC), the California WDL, Yuba Water Agency, and the USGS National Water Information System and groundwater level monitoring, utilizing a subset of the locations described under the Wyandotte Creek Subbasin's groundwater level monitoring network.

~~Figure 4-3 placeholder page~~

The monitoring ~~sites~~network for the Wyandotte Creek Subbasin ~~include the~~includes stream gages ~~found~~listed in Table ~~4~~ 4-4A and shown in Figure 4 ~~4 and the~~ 4, as well as shallow groundwater quality monitoring sites ~~shown above~~ in Table 4 ~~3~~ 4B and Figure 4 ~~2. The groundwater~~ 4. Groundwater level monitoring sites selected ~~for observing~~to observe groundwater ~~and~~ surface water interactions ~~include~~consist of the entire ~~array~~set of ~~existing~~shallow wells in the ~~groundwater level~~ monitoring network ~~as~~ described in Section 4.2, ~~above, that form~~which serves as the pool of potential RMS ~~used to assess surface water and groundwater~~sites for assessing these interactions. The original nine shallow wells have been supplemented with 5 new shallow wells installed in 2026.

The stream gage network has also been expanded to a total of 12 stations. One USGS station stopped reporting daily streamflow in 2024. Two. Two CDEC/WDL stations were added—one (ORF) located directly across the Feather River from the inactive USGS station 11406930, and another (NHC) on Honcut Creek. Two stations operated by Yuba Water Agency on Honcut Creek have been incorporated. Five new stream gages were installed in 2026 to further strengthen the network.

As discussed in Section 4.1, the GSA in the Wyandotte Creek Subbasin intends to further evaluate the SMC for interconnected surface waters to avoid undesirable results to aquatic ecosystems and GDEs. As additional data are collected and evaluated, the Wyandotte Creek Subbasin commits to developing additional SMC and installation of monitoring points, as appropriate, for specific stream reaches and associated habitat where there is a clear connection to groundwater pumping in the principal aquifer.

As with locations used for monitoring ~~of~~ other SIs, the network of stream gages and wells used to monitor interactions between groundwater and streamflow includes sites selected for their period of record, the quality of data reported and subject to permission of the landowner to monitor the well. The locations of the newly installed wells and gages were selected to:

~~In addition to being used to identify relations between groundwater levels and streamflow, data from the network of stream gages and monitoring wells may be used to update and refine the calibration of the BBGM. This model will be used to combine data on groundwater levels and stream flows with data on aquifer parameters and water use to estimate the relation between groundwater conditions and stream flow and to identify instances where groundwater use depletes surface water.~~

- Better monitor surface bodies with known connections to the water table, such as the Feather River and Honcut Creek, Wyman Ravine, and Wyandotte Creek.
- Observe interactions between the water table and groundwater dependent ecosystems (in-stream GDEs),
- Support project planning and implementation, and assess benefits of SGMA project implementation in specific watersheds, such as Wyman Ravine.

A total of 14 monitoring wells and 12 stream gages are included in the Wyandotte Creek Subbasin's network for monitoring groundwater and streamflow interactions.

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Table 4-~~44~~A: Wyandotte Creek Subbasin Surface Water Stream ~~Gauges~~Gages

Stream Monitored	Gage ID	Well Network	Measurement Frequency	Status	Start Date	End Date
Oroville Management Area						
Feather River	11406930	USGS	Daily	Inactive	10/1/1973	9/30/202
Feather River	ORF	CDEC	Daily	Active	12/26/2019	Present
South Management Area						
Feather River	11406920	USGS	Daily	Active	11/16/1967	9/30/202
Feather River	GRL/ A05165	CDEC/WDL	Hourly/Continuous	Active	01/01/1984	Present
Honcut Creek	NHC/ A05189	CDEC/WDL	Continuous	Active	01/25/2018	Present
Honcut Creek	Honcut Creek Inflow	Yuba Water Agency	Continuous	Active	6/1/2021	Present
Honcut Creek	Honcut Creek Outflow	Yuba Water Agency	Continuous	Active	6/1/2021	Present
Wyman Ravine	SG5	GSA	Continuous	Active	3/31/2026	Present
Wyman Ravine	SG6	GSA	Continuous	Active	3/31/2026	Present
Wyandotte Creek	SG7	GSA	Continuous	Active	3/31/2026	Present
North Honcut Creek	SG8	GSA	Continuous	Active	3/31/2026	Present
Wyman Ravine	SG9	GSA	Continuous	Active	3/31/2026	Present

~~A total of 13 monitoring wells and 3 stream gages are included in the~~

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Table 4-4B: Wyandotte Creek ~~Subbasin's network~~Subbasin ISW Monitoring Network Wells

Well ID	State Well Number[1]	Monitoring Frequency	Multi-Completion (number of wells at site)	Well Type	Aquifer Category	Drill Depth	Date of First Meas.	RMS?
Wyandotte Creek – Oroville Management Area								
16Q001M	19N03E**16Q001M**	Quarterly	No	Residential	Shallow	120	10/3/2000	No
32P001M	19N04E**32P001M**	Quarterly	No	Residential	Shallow	150	8/29/1959	No
PWS-01		Quarterly	No	Municipal	Shallow	186	2/1/1978	No
PWS-03		Quarterly	No	Municipal	Shallow	150	2/1/1978	Yes
S1[2]		Continuous	Yes	Observation	Shallow	70	3/31/2026	No
Wyandotte Creek – South Management Area								
03D001M	17N03E**03D001M**	Quarterly	No	Irrigation	Shallow	179	4/10/1947	Yes
22B001M	17N04E**22B001M**	Quarterly	No	Residential	Shallow	80	3/8/1976	Yes
25N001M	18N03E**25N001M**	Quarterly	No	Irrigation	Shallow	164	3/9/1976	No
19D003M	18N04E**19D003M**	Quarterly	Yes	Observation	Shallow	200	6/14/2021	No
31F001M	19N04E**31F001M**	Quarterly	No	Residential	Shallow	200	10/3/2000	No
M1[2]		Continuous	Yes	Observation	Shallow	105	3/31/2026	No
S2[2]		Continuous	Yes	Observation	Shallow	50	3/31/2026	No
S7[2]		Continuous	Yes	Observation	Shallow	50	3/31/2026	No
S10[2]		Continuous	Yes	Observation	Shallow	50	3/31/2026	No

[1] The portion of the State Well Number shown in bold text is the RMS ID.

[2] Installed February / March 2026. Wells equipped with pressure transducers for ~~monitoring~~continuous groundwater ~~and streamflow interactions.~~ level and temperature monitoring.

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4.7 Monitoring Protocols for Data Collection

4.7.1 Monitoring Protocols and Frequency for Groundwater Levels

Each of the wells in the monitoring network is monitored either by the GSA, Cal Water, Butte County, DWR, or the associated CASGEM entity. Access agreements, including written description of each site location, access instructions, and point of contact, will be arranged prior to initiation of field data collection.

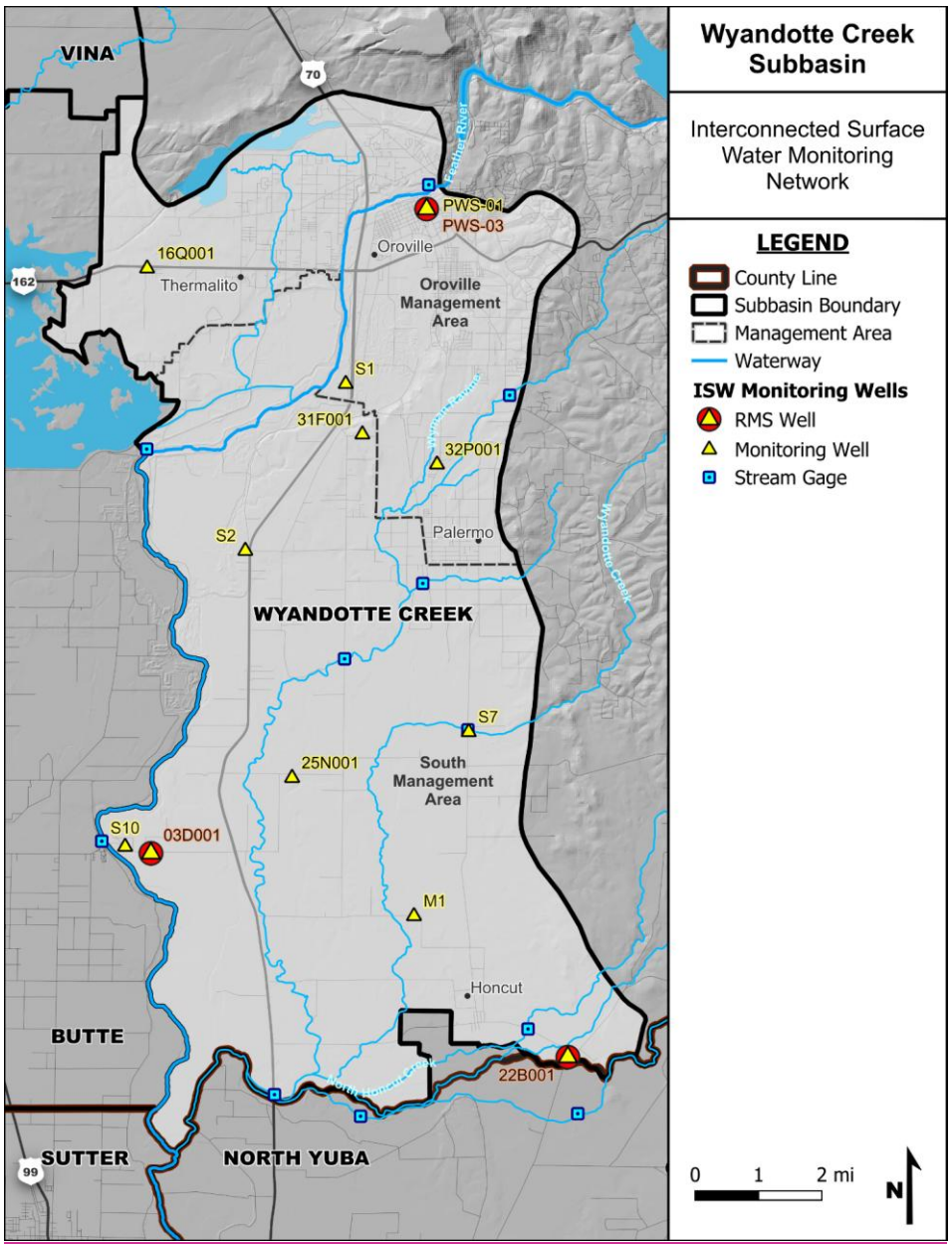

Figure 4-4 ~~placeholder page~~**. Interconnected Surface Water Monitoring Network**

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Monitoring for purposes of the GSP will be conducted in accordance with DWR guidelines (DWR, 2016) to ensure groundwater level data are:

- Taken from the correct location, well ID, and screen interval depth
- Accurate and reproducible
- Representative of conditions that inform appropriate basin management data quality objectives
- Recorded with all salient information to correct, if necessary, and compare data
- Handled in a way that ensures data integrity
- Taken using a CASGEM-approved water-level measurement method to ensure consistency across measurements

Methods include:

- Establishing a reference point
- Using one of four approved methods (steel tape, electric sounding tape, sonic water-level meter, or pressure transducer) to measure groundwater levels

Groundwater level data will include at a minimum the well identification number, measurement date, depth to water (to the nearest 0.01 or .1 foot depending on equipment) from the established reference point, measurement method, measurement quality descriptors (for no measurement or questionable measurement), and observations of well and/or site conditions (including modifications to the well). The equipment used to collect groundwater level data will be recorded to include the equipment manufacturer, model, and serial number, as applicable. Equipment used for data collection will be operated and maintained according the manufacturer's recommendations.

Each well in the network has an established reference point in North American Vertical Datum 1988.

The general procedure for groundwater level monitoring is as follows:

- The well port (cap, plug, or lid) for access will be removed. Pressure inside the well casing will be allowed to equalize to ambient conditions prior to data collection.
- Non-dedicated equipment will be decontaminated by washing with a non-phosphate soap solution and triple rinse of distilled water.
- Groundwater level data (described above) will be recorded.
- Groundwater elevation will be recorded (groundwater elevation = reference point elevation – depth to water).
- The well port (and lock, if applicable) will be replaced.

Groundwater level data will be entered into the data management system (DMS) as soon as possible following collection.

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Monitoring frequency for each well will occur at a minimum of bi-annually. Monitoring will be conducted in the Spring (March) and Fall (October). Select wells are monitored more frequently via dataloggers, at an hourly basis, but will only be reported bi-annually. Each RMS will be monitored within the same calendar month to ensure consistency for comparability over time. This monitoring frequency will achieve the goal of obtaining sufficient data to evaluate the seasonal, short-, and long-term trends in groundwater.

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4.7.2 Monitoring Protocols and Frequency for Water Quality

Each of the wells in the existing network is monitored for water quality by DWR and other agencies, both private and public, including Butte County.

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Monitoring for purposes of the GSP will be conducted in accordance with DWR guidelines (BMP 1) to ensure water quality data:

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- Are taken from the correct location
- Are accurate and reproducible
- Represent conditions that inform appropriate basin management and are consistent with the data quality objectives
- Are handled in a way that ensures data integrity
- Include pertinent information that is recorded to normalize, if necessary, and compare data

Water quality will be measured for compliance through monitoring of specific conductance. However, pH and temperature may also be recorded for informational purposes. Water quality samples will be assessed in the field and will not require laboratory analysis.

Groundwater quality data will include at a minimum the well identification number, sample time and date, groundwater elevation data if available (as described in Section 4.2), water quality values for pH, specific conductance, and temperature, sample quality descriptors (for no measurement or questionable measurement), and observations of well and/or site conditions (including modifications to the well). The equipment used to collect groundwater quality data will be recorded to include the equipment manufacturer, model and serial number, as applicable. Equipment used for data collection will be calibrated, operated and maintained according to the manufacturer's recommendations.

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The general procedures for groundwater quality sampling include:

- For wells with dedicated pumps, the sample will be collected near the wellhead.
- The sampling port and/or sampling equipment will be decontaminated by washing with a non-phosphate soap solution and triple rinse of distilled water prior to sample collection.
- With the exception of observation wells, the well will be purged of three well casing volumes prior to sampling (if not equipped with dedicated low-flow or passive equipment).
- Samples will be collected under laminar flow conditions.
- Equipment will be field calibrated to assess drift.

Monitoring for water quality for each well will occur annually in July or August. Select wells may be monitored more frequently but will only be reported annually. Each RMS will be monitored within one calendar month to ensure consistency for comparability over time. This monitoring frequency will achieve the goal of obtaining sufficient data to evaluate the seasonal, short-, and long-term trends in groundwater.

4.8 Representative Monitoring Sites

Representative monitoring sites (RMS ~~wells~~) are ~~intended to be representative~~a subset of ~~general~~monitoring sites chosen by the GSA to characterize conditions ~~within the area. This approach allows for a focused~~in the Subbasin. RMS sites have defined minimum thresholds, measurable objectives, and ~~specific monitoring location~~interim milestones, to ~~effectively represent a larger geographical area.~~monitor sustainability indicators. The data gathered from the RMS will be used to quantify the ~~MAs~~ groundwater conditions for the five SIs and evaluate GSP implementation.

RMS wells were selected using the following criteria:

1. Adequate Spatial Distribution – RMS were selected from the monitoring network to maximize the geographical coverage across each of the ~~three~~two MAs and avoid overlapping or redundant coverage.
2. Existing Data – RMS with a longer period of record and a greater number of historical measurements were selected to provide insight into long-term trends that can provide information about groundwater conditions through varying climatic periods such a droughts and wet periods. Historical data may also show changes in groundwater conditions through anthropogenic effects as well. While some sites chosen may not have extensive historical data, they may still be selected because there are no wells nearby with longer records.
3. Increased Density in Heavily Pumped Areas – Selection of additional wells in heavily pumped areas such as within urban residential areas in the city of Oroville will provide additional data where ~~high~~higher groundwater use occurs.
4. Multi-Completion Wells – The utilization of wells with different screen intervals is important to collect data on the groundwater conditions at different elevations within the aquifer. This can be achieved by using wells with different screen depths that are close to one another, or by using multi-completion wells.
5. Consistency with BMPs – The BMPs provided by DWR encourage consistency across subbasins and compliance with established regulations.
6. Well Construction Data – Well data such as perforation depths, construction date, and well depth was considered for selection.
7. Accessibility – Consideration for accessibility to the physical well location and to the existing data was incorporated into the selection of RMS wells. RMS in the network include residential, municipal, agricultural, and governmental wells that are owned and operated by various private and public entities.
8. Beneficial Uses/Users – RMS wells were selected if its location and/or screening interval represented local beneficial users such as domestic wells and interconnected surface water.

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~~8.~~9. Professional Judgement – Professional judgement was used to make the final decision about each well, particularly when more than one suitable well exists in an area of interest.

4.9 Representative Monitoring Sites for Sustainability Indicators

Each of the associated SMC for each SI described in Section 3 have RMS wells identified for monitoring and evaluation with the exception of seawater intrusion as it is not applicable to the Wyandotte Creek Subbasin. The selected RMS wells for each SI are discussed in the following sections.

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4.9.1 Groundwater Levels and Groundwater Storage

The RMS wells will be used as compliance points to record groundwater elevations for the evaluation of chronic lowering of groundwater levels~~.~~ and groundwater storage. SGMA allows groundwater elevations to be used as proxy for monitoring other SI if a significant correlation exists between groundwater elevations and the other SI and if the MO for groundwater elevation include a reasonable margin of operational flexibility to avoid undesirable results.

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Groundwater storage is directly connected to groundwater elevation, and therefore the ~~MO for groundwater levels will adequately serve as proxy for groundwater storage. Land subsidence occurs when compressible subsurface soils are dewatered. Soil units in the Wyandotte Creek Subbasin have not historically been susceptible to compression during periods of declining groundwater elevations. Therefore, the MO for groundwater levels will adequately serve as proxy for land subsidence.~~same RMS network is used for both SIs.

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~~Surface waters may manifest a depletion in volume if groundwater levels fall below the established MO. Such depletion is not evident in the historical records available, however more information may be required to adequately characterize interactions. See Section 3.8 for a discussion of interconnected surface water assessment. As indicated in this section, an Interconnected Surface Water SMC framework has been developed for the GSP. This framework will guide future data collection efforts to fill data gaps, either as part of GSP projects and management actions or plan implementation. As additional data are collected and evaluated, the Wyandotte Creek Subbasin commits to developing additional SMC and installation of RMS as appropriate, for specific stream reaches and associated habitat where there is a clear connection to groundwater pumping in the principal aquifer.~~

~~For the purposes of this GSP, groundwater elevations will be used as a proxy for monitoring of SMC of groundwater storage, land subsidence, and interconnected surface water.~~

A total of ~~nine~~ten RMS wells were selected as compliance points for monitoring of groundwater levels and groundwater storage (Figure 4-5). They will be monitored for the SMC listed in Section 3.9. ~~Each well (except CWS-03) was selected independently of the wells discussed in Section 4.2 and are not listed in Table 4-1 (CWS-03 is listed in Table 4-1).~~RMS wells were selected to be representative of domestic wells and upper and lower aquifer conditions (similar to irrigation wells) and includes shallow wells relevant to vegetative GDEs. Table 4-5 summarizes the RMS well construction details and Table 4-6 summarizes the RMS well location details. .

Table 4-5: Groundwater Levels Representative Monitoring Site Well Construction Details

RMS Well ID	State Well Number (Site Name)	Total Depth (feet bgs)	Screened Interval (feet bgs)	Reference Point ~~Elevation~~[1]Elevation[1] (feet)	Reference Point Description	Ground Surface ~~Elevation~~[1]Elevation[1] (feet)
Wyandotte Creek Subbasin – Oroville Management Area						
16Q001M	19N03E**16Q001M**	120	100-120	180.32	Top of casing	179.32
32P001M	19N04E**32P001M**	~~N/A~~150	N/A	188	Between plate and casing on west side	187
~~CWS~~PWS-03	~~CWS~~PWS-03	~~<~~200150	---	~~195~~161	---	---
Wyandotte Creek Subbasin – South Management Area						
13B002M	17N03E**13B002M**	320	~~N/A~~120-320	89.57	Top of casing	89.27
~~09N002M~~22B001M	17N04E**22B001M**~~17N04E09N002M~~	~~325~~80	~~N/A~~55-80	~~103~~118.26	Top of casing ~~N/A~~	~~102~~117.26
25N001M	18N03E**25N001M**	164	~~N/A~~81-164	128.26	Top of casing	127.26
08M001M	18N04E**08M001M**	~~656~~350	168-244	147.56	Between metal plate and top of casing	147.26
16C001M	18N04E**16C001M**	165	~~N/A~~65-165	204.46	Top of casing	203.26
19D003M	18N04E**19D003M**	944	120-200	124	N/A	124
31F001M	19N04E**31F001M**	200	160-200	260.97	Top of casing	259.27

~~Note:~~

RMS Well ID	State Well Number (Site Name)	Total Depth (feet bgs)	Screened Interval (feet bgs)	Reference Point ~~Elevation~~[1] Elevation[1] (feet)	Reference Point Description	Ground Surface ~~Elevation~~[1] Elevation[1] (feet)

~~1 North American Vertical Datum 1988.~~
~~N/A Not available~~
~~Details of public supply wells not disclosed~~

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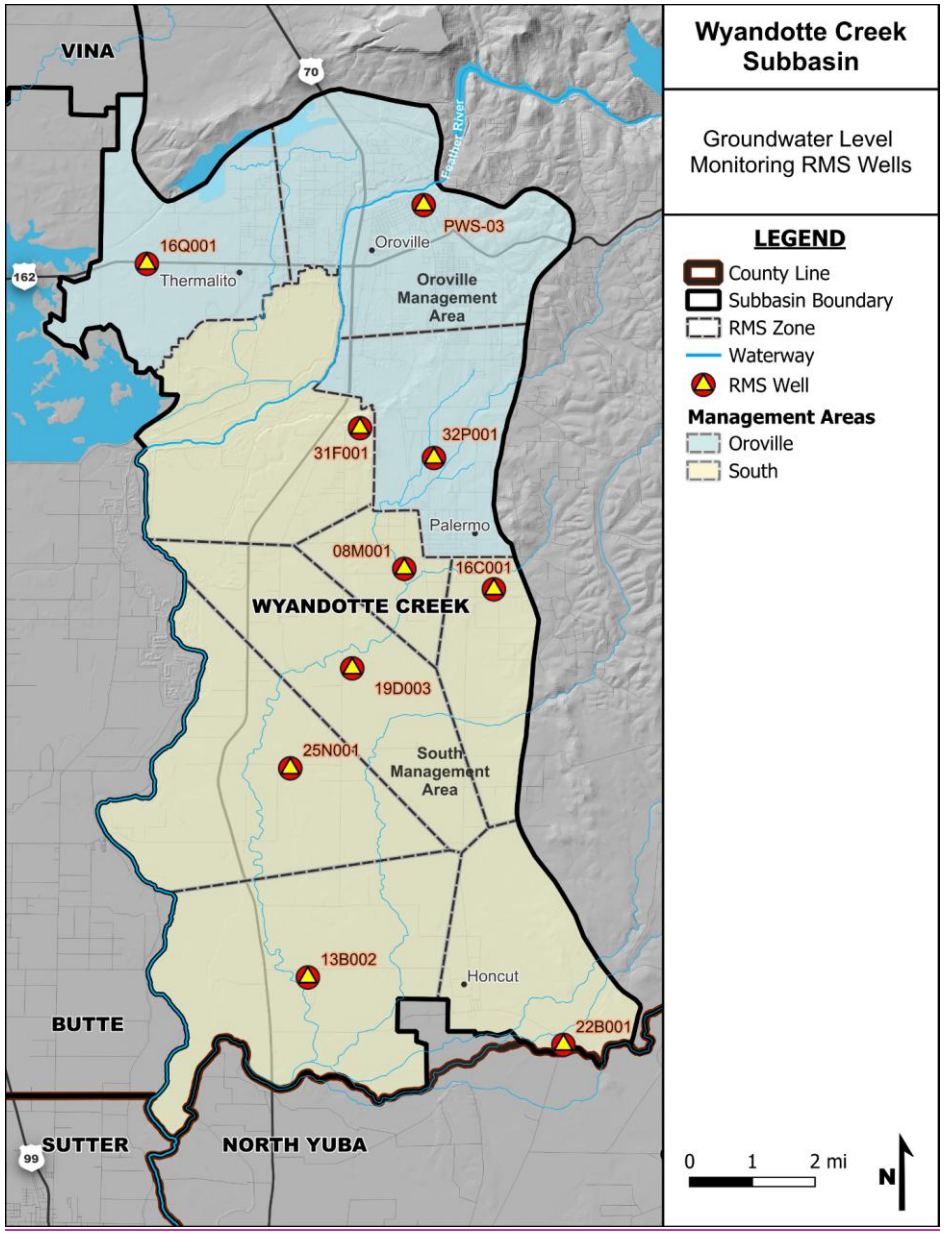
[1] North American Vertical Datum 1988.

N/A – Not available



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. Groundwater Level Representative Monitoring Site (RMS) Wells

Table 4-6: Groundwater Levels Representative Monitoring Site Well Location Details

RMS Well ID	State Well Number (Site Name)	~~Latitude~~[1] Latitude[1]	~~Longitude~~[1] Longitude[1]
Wyandotte Creek Subbasin – Oroville Management Area			
16Q001M	19N03E**16Q001M**	39.4977	-121.6369
32P001M	19N04E**32P001M**	39.4540	-121.5503
~~CWS~~PWS-03	~~CWS~~PWS-03	---	---
Wyandotte Creek Subbasin – South Management Area			
13B002M	17N03E**13B002M**	39.3336	-121.5853
~~09N002M~~22B001M	~~17N04E09N002M~~17N04E**22B001M**	39.~~3387~~319	-121.~~5363~~5089
25N001M	18N03E**25N001M**	39.3818	-121.59156
16C001M	18N04E**16C001M**	39.4239	-121.5318
08M001M	18N04E**08M001M**	39.4283	-121.5586
19D003M	18N04E**19D003M**	39.40512	-121.57362
31F001M	19N04E**31F001M**	39.4606	-121.5725

~~Note:~~
~~1 – North American Datum 1983 (NAD83).~~
~~--- Location of public supply wells not disclosed~~

Notes:
[1] North American Datum 1983 (NAD83).

4.9.2 Water Quality

~~A total of~~ The revised monitoring network includes four of the eight original RMS sites identified in the 2022 GSP. Four original RMS wells identified in the GSP were removed from the monitoring network for the following reasons:

- Two RMS wells were removed from the network per the request of the landowners, 28L001M in 2022 and 16Q001M in 2023.
- RMS well 13B002M was removed from the monitoring network in 2022 due to an inoperable pump.
- Well PWS-02 was removed in 2023 due to water quality issues at the well.

Well 06E002M was added in 2022. This well was historically measured for groundwater quality as part of the former Butte County Basin Management Objective (BMO) program. One more additional well, 09N002M was added into the monitoring network in 2023. This well also serves as an existing RMS well for groundwater level monitoring in the Subbasin. As of 2026, there are six (6) completions over four (4) locations being monitored within Wyandotte Creek GSA.

The revised RMS network currently has six completions over four locations, which were selected as compliance points for monitoring of water quality (Figure 4-~~5~~6). They will be monitored for the SMC listed in Section 3.9. Each well was selected independently of the wells discussed in

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Section 4.4 and thus not all wells are listed in Table 4-~~36~~. Table 4-~~78~~ summarizes the well construction details and Table 4-~~89~~ summarizes the well location details. As discussed in Section 4.2, one of these wells, designated as ~~19D001~~ 19D001M, 19D002M, and 19D003M~~,~~ was currently installed, as shown in Figure 4-6 by DWR under the TSS program.

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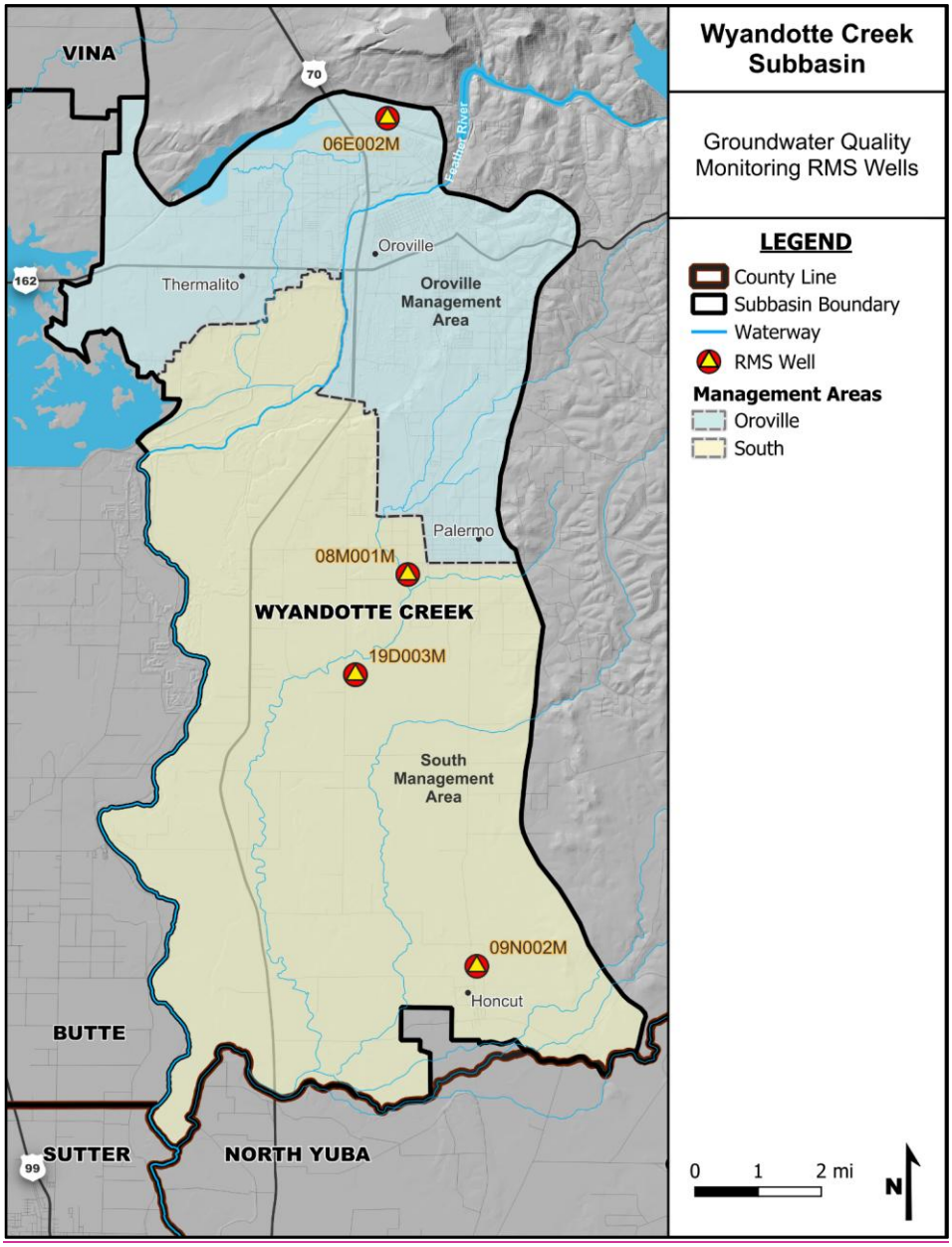

Figure 4-6. Groundwater Quality Representative Monitoring Site (RMS) Wells

Table 4-7: Water Quality Representative Monitoring Site Well Construction Details

RMS Well ID	State Well Number (Site Name)	Total Depth (feet bgs)	Screen Interval (feet bgs)	Reference Point ~~Elevation[1]~~Elevation[1] (feet)	Reference Point Description	Ground Surface ~~Elevation[1]~~Elevation[1] (feet)
Wyandotte Creek Subbasin – Oroville Management Area						
~~16Q001M~~06E002M	19N04E**06E002M**~~1 9N03E16Q001 M~~	~~120~~196	~~100-120~~110 – 130, 164 – 174	~~180.32~~N/A	N/A~~Top of casing~~	~~179.32~~N/A
~~CWS-02~~	~~CWS-02~~	~~< 600~~	~~---~~	~~---~~	~~---~~	~~---~~
Wyandotte Creek Subbasin – South Management Area						
09N002M~~1 3B002M~~	17N04E**09N002M**[3] ~~17N03E13B002 M~~	~~320~~325	~~N/A~~100 – 112	~~89.57~~103.26	~~Top of casing~~N/A	~~89.27~~102.26
08M001M	18N04E**08M001M**	656	168-244	147.56	Between metal plate and top of casing	147.26
~~19D001M 19D002M~~ 19D003M	~~18N04E19D001M[2] 18N04E19D002 M~~ 18N04E**19D003M**[2]	~~100022 0~~	~~700-720 430-450, 550-570~~ 120-130, 190-200	~~NR~~124	NR	~~NR~~124
~~28L001M~~	~~18N04E28L001M[3]~~	~~190~~	~~N/A~~	~~137.75~~	~~N/A~~	~~137.25~~

~~**Notes:**~~
~~1. North American Datum 1983 (NAD83).~~
~~2. New nested well installed by DWR under TSS Program.~~
~~3. If access cannot be obtained for this well, a new well will be obtained.~~
~~--- Details of public supply wells not disclosed~~
~~N/A – Not available~~
~~NR – Not yet reported by DWR~~

Notes:
[1] North American Datum 1983 (NAD83).
[2] Nested well installed by DWR under TSS Program.
[3] If access cannot be obtained for this well, a new well will be obtained.
--- Details of public supply wells not disclosed
N/A – Not available
NR – Not yet reported by DWR

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Table 4-8: Water Quality Representative Monitoring Site Well Location Details

RMS Well ID	State Well Number (Site Name)	~~Latitude~~[1]Latitude[1]	~~Longitude~~[1]Longitude[1]
Wyandotte Creek Subbasin – Oroville Management Area			
06E002M~~16Q001M~~	~~19N03E16Q001M~~19N04E**06E002M**	39.~~497~~753288	-121.~~6369~~566864
~~CWS-02~~	~~CWS-02~~	~~---~~	~~---~~
Wyandotte Creek Subbasin – South Management Area			
~~13B002M~~	~~17N03E13B002M~~	~~39.3336~~	~~-121.5853~~
08M001M	18N04E**08M001M**[2]	39.4283	-121.5586
09N002M	17N04E**09N002M**	39.3387	-121.5363
~~19D001M~~ ~~19D002M~~ 19D003M	~~18N04E19D001M~~[2] ~~18N04E19D002M~~ 18N04E**19D003M**	39.40512	-121.57363
~~28L001M~~	~~18N04E28L001M~~[3]	~~39.3844~~	~~-121.5333~~

~~**Note:**~~
~~1. North American Datum 1983 (NAD83).~~
~~2. New well installed by DWR under TSS Program.~~
~~3. If access cannot be obtained for this well, a new well will be obtained.~~
~~--- Location of public supply wells not disclosed~~
~~N/A – Not available~~

Note:
[1]. North American Datum 1983 (NAD83).
[2]. If access cannot be obtained for this well, a new well will be obtained.
N/A – Not available

4.9.3 Land Subsidence

The subsidence RMS network consists of 32 monitoring well and InSAR pixel pairs, ground-truthed with available GPS subsidence station(s). InSAR pixels are chosen near selected groundwater level monitoring site in the RMS network. If subsidence should occur, the GSA will check the groundwater levels of the paired groundwater well to determine if the subsidence is natural or from declining groundwater levels. InSAR pixels and GPSGPS subsidence stations are shown in Table 4-10 and Figure 4-7.

The quantitative metric for assessment of subsidence SMCs will use the average value of InSAR pixels around each RMS well. InSAR data will be downloaded, plotted, and analyzed annually as part of the GSP Annual Report. Both rates and cumulative extents of subsidence at each RMS site will be assessed to determine compliance with the MT described above.

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Table 4-9: Land Subsidence RMS Monitoring Network

Site ID	Site Type	Paired RMS Well – Well ID	Years of Record	Measurement Type	Basis of Selection
Wyandotte Creek – Oroville Management Area					
16Q001M	InSAR pixel	16Q001M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
32P001M	InSAR pixel	32P001M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
PWS-01	InSAR pixel	PWS-01	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
PWS-02	InSAR pixel	PWS-02	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
PWS-03	InSAR pixel	PWS-03	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
S1[1]	InSAR pixel	S1[2]	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
Wyandotte Creek – South Management Area					
03D001M	InSAR pixel	03D001M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
13B002M	InSAR pixel	13B002M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
09N002M	InSAR pixel	09N002M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
22B001M	InSAR pixel	22B001M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
25N001M	InSAR pixel	25N001M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
08M001M	InSAR pixel	08M001M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
16C001M	InSAR pixel	16C001M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
19D001M	InSAR pixel	19D001M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well

Site ID	Site Type	Paired RMS Well – Well ID	Years of Record	Measurement Type	Basis of Selection
19D002M	InSAR pixel	19D002M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
19D003M	InSAR pixel	19D003M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
31F001M	InSAR pixel	31F001M	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
M1[1]	InSAR pixel	M1[1]	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
S2[1]	InSAR pixel	S2[1]	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
S7[1]	InSAR pixel	S7[1]	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
S10[1]	InSAR pixel	S10[1]	2015-Present	Vertical Ground Surface Displacement	Proximity to GWL well
PMO	GPS Station	PMO	2021-Present	Vertical Ground Surface Displacement	

[1] Installed February / March 2026.

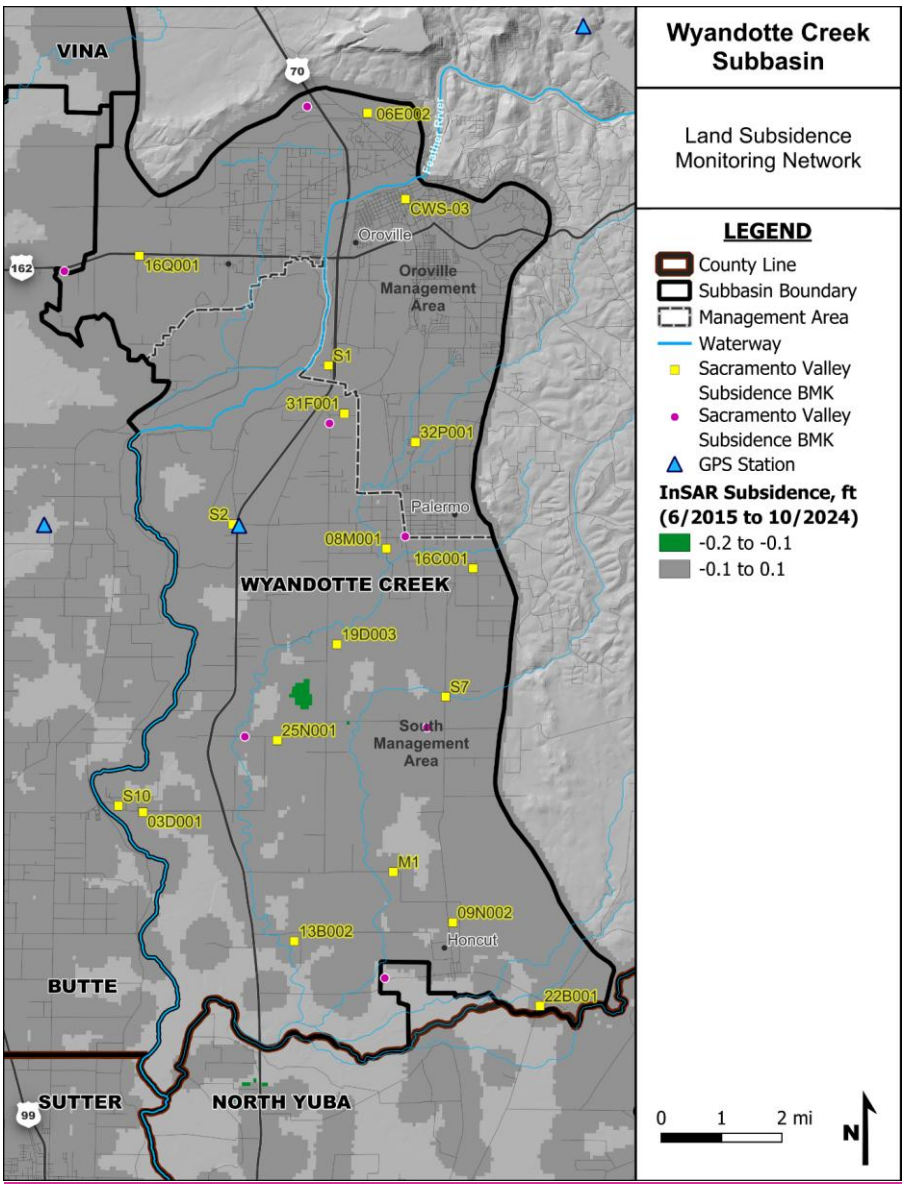

Figure 4-7. Land Subsidence Monitoring Network

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4.9.4 Interconnected Surface Waters

The preliminary ISWISW RMS network consists of three (3) monitoring wells, selected due to their proximity to existing stream gages and ISWs. RMS wells are shown in Table 4-10 and Figure 4-8. The finalized ISW SMCs are still in development and may be reconsidered in the 2032 periodic evaluation.

The RMS selection process includes the following:

1. Compile a comprehensive list of possible monitoring wells representative of groundwater table conditions in relation to surface water features.
2. Classify monitoring wells based on well lithology and screening intervals.
3. Review data quality and condition of all possible monitoring wells (e.g., presence of oil).
4. Consistent, high-quality spring and fall measurements for at least the past 5 years.
5. Map beneficial users (ISWs).
6. Select RMS based on proximity to sensitive beneficial uses/users of groundwater:
    a. ISW: within 0.5 miles of an identified ISW

Table 4-10: Interconnected Surface Waters Representative Monitoring Site Well Construction Details

RMS Well ID	State Well Number (Site Name)	Total Depth (feet bgs)	Screened Interval (feet bgs)	Reference Point Elevation[1] (feet)	Reference Point Description	Ground Surface Elevation[1] (feet)
Wyandotte Creek Subbasin – Oroville Management Area						
PWS-03	PWS-03	150	---	161	---	---
Wyandotte Creek Subbasin – South Management Area						
03D001M	17N03E**03D001M**	179	35-105	99.27	One inch pipe east side of pump base.	97.27
22B001M	17N04E**22B001M**	80	55-80	118.26	Top of casing	117.26

Notes:
[1] North American Vertical Datum 1988.
N/A – Not available
--- Details of public supply wells not disclosed

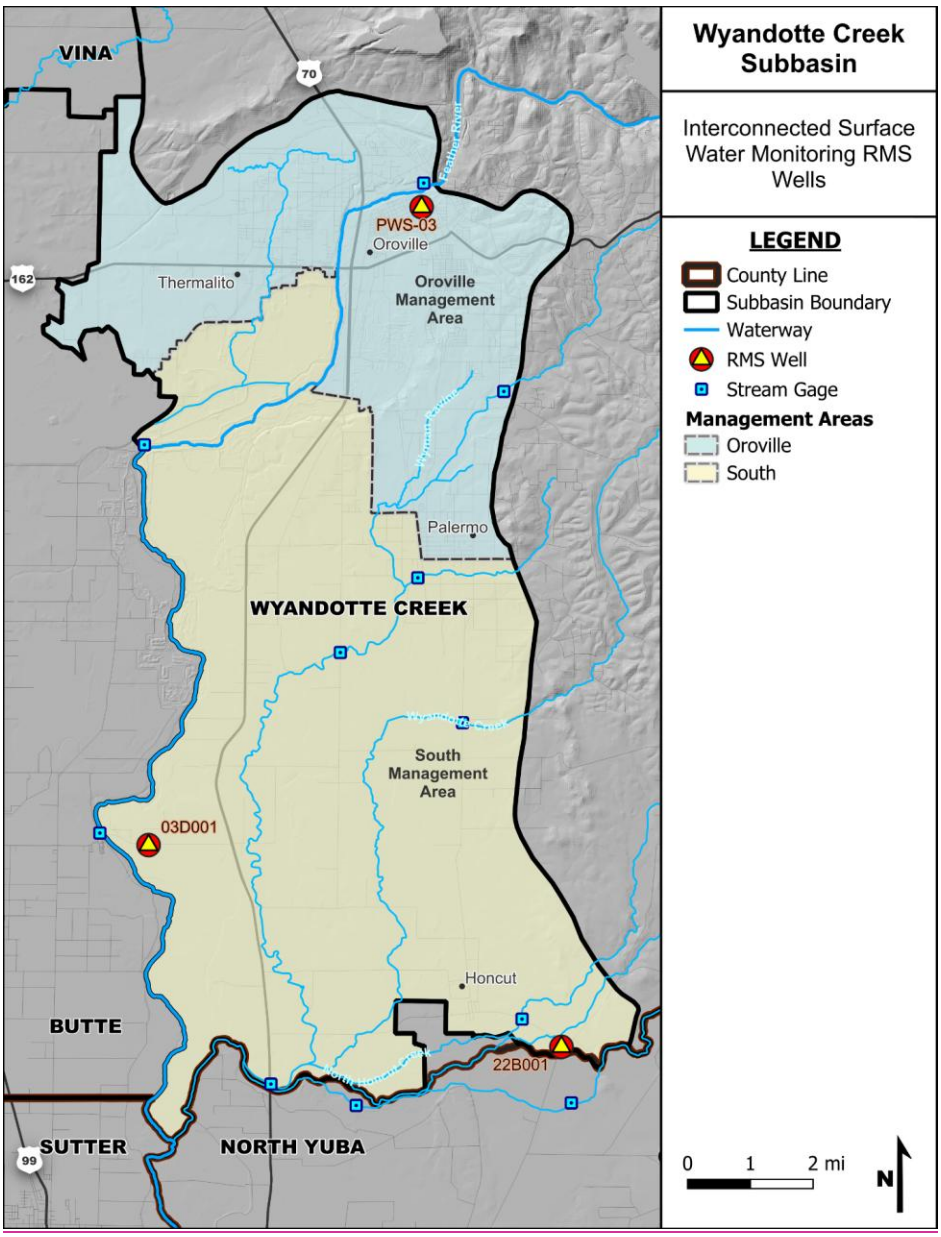

Figure 4-8: ISW Preliminary Representative Monitoring Site Network

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4.10 Network Assessment and Improvements

An assessment of the monitoring network is required to determine uncertainty and identify data gaps that could affect the achievement of sustainability goals. Improvements to the network to address data gaps will be planned and implemented to manage, focus, and prioritize monitoring.

Data gaps can result from monitoring information that is not of sufficient quantity or quality. Monitoring network data gaps can influence the development and understanding of the basin setting, including the HCM, groundwater conditions, and water budget; and proposed MTs and MOs. Updates to the data gaps will be included ~~within~~ the ~~annual reporting and 5-year assessment~~Periodic Evaluations of the GSP.

The following data gaps and proposed resolutions have been identified in the Wyandotte Creek Subbasin:

- ~~Water Quality – Temporal data gaps exist for water quality samples collected within the Wyandotte Creek – South RMS wells. The frequency of sampling proposed in the GSP is anticipated to provide consistent and comparable data to fill this data gap. In addition, one well in this MA, 18N04E28L001M (28L001M) (Figure 4-6), had reported specific conductance levels above 2,000 micrograms per liter in 1986. No samples have been collected since this time and it is unknown if these levels still exist. Well 28L001M may no longer be accessible. If not, to fill this data gap, a new existing well will be identified with a similar screen interval(s) (total depth of well approximately 200 feet bgs) or a new well may be installed.~~

    - Interconnected Surface Water~~/Associated impacts on~~ and GDEs – There is ~~a lack of sufficient~~limited data to analyze interaction of streams and pumping within the primary aquifer system. There is also limited data to assess groundwater level conditions in conditions in relation to GDEs. Additional wells and ~~other monitoring networks will be~~stream gages have been installed, as appropriate, following the framework discussed in Section 3.8. Within the 2027-2032 evaluation period, data will continue to be collected from the groundwater level and ISW networks to address this data gap.

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5. PROJECT AND MANAGEMENT ACTIONS

This section includes relevant information about projects and management actions to satisfy CCR Title 23 § 354.42 and 354.44. The projects and management actions described in this section will help achieve the Wyandotte Creek Subbasin's sustainability goal.

5.1 Projects, Management Actions, and Adaptive Management Strategies

The sustainability goal of the Wyandotte Creek Subbasin is to maintain a sufficient groundwater supply and quality that can be used by rural areas, communities, and agricultural users. Therefore, the overall approach will focus on investigating additional water sources to supplement groundwater and implementing various conservation programs. The projects described below were selected with this approach in mind.

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5.2 Projects

5.2.1 Project Identification

Projects were identified through an outreach effort involving the WAC and the Wyandotte Creek GSA. The process included soliciting input from governmental agencies, water purveyors, local organizations, and local landowners. The GSA website allowed project proponents to input the available information on each project.

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The majority of projects submitted were proposed by the Wyandotte Creek GSA. Some of the projects also include other proponents, such as the TWSD and SFWPA. The list of proponents and other potential entities involved in the projects is included in Tables 5-1, 5-2, and 5-3 below.

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The provided project information was compiled into an initial draft list with similar and overlapping projects combined as appropriate. The draft list was presented to the WAC and to the GSA Boards. The projects were evaluated based on the following priorities:

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- Project addresses one or more of the Undesirable Results
- Project is implementable with respect to technical complexity, regulatory complexity, institutional consideration, and public acceptance
- Project is implementable within the SGMA timeframe
- Project benefits Underrepresented Communities (URCs)
- Project is in an area where water quality is suitable for use

5.2.2 Project Implementation

Projects will be implemented through the individual project proponent(s) with the Wyandotte Creek GSA providing oversight. The GSA oversight may vary from acknowledging the implementation of the project to actively participating in the design and construction of the project or being the project proponent for some projects. The GSA will track the estimated effect on the water budget from projects annually.

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5.2.3 List of Projects

Several projects to achieve the Wyandotte Creek Subbasin's sustainability goal were identified. The initial set of projects was reviewed by the WAC. A final list of 15 possible projects is included in this GSP and they are categorized into four project types: direct recharge, ~~in-lieu~~

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~~recharge~~water supply/conjunctive use, intra-basin water transfers, and demand conservation. Projects are further classified into ~~three~~four categories based on project status: ~~Planned~~Completed, In-Progress, Potential, and ~~Longer-term or Conceptual,~~Other as defined below.

- ~~Planned Projects~~Completed – Projects in this category ~~will move forward to help achieve~~are finished and benefits have been reported
- In-Progress Projects – Projects in this category are in the ~~subbasin's sustainability before 2042.~~planning, design, or implementation phase and may require funding to proceed
- Potential Projects – Projects in this category ~~are currently in~~have been developed and are ready to be implemented as needed/funded
- Other Projects – Projects in this category potentially are potentially led by other agencies and not critical to achieving sustainability. Status will be tracked by the ~~planning stages and may move forward if funding becomes available.~~GSA as feasible (not subject to annual tracking and reporting).

- Completed, In-Progress, and Potential Projects ~~represent a "menu of options" for~~have been prioritized by the ~~Wyandotte Creek Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects.~~GSA. Projects may be moved between categories as prioritized and implementation status advances.

- ~~Longer-term or Conceptual Projects – Projects in this category are in the early conceptual planning stages and will require significant additional work to move forward. Longer term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Wyandotte Creek Subbasin in the future, but that would need to be further developed.~~

This subsection of the GSP satisfies the requirements of CCR Title 23 § 354.44. Consistent with SGMA requirements, the project descriptions contain information regarding:

- The MO benefitted by the project
- Permitting and regulatory processes
- Timetable for initiation and completion
- Expected benefits
- How the project will be accomplished
- Legal authority
- Estimated costs and plans to meet costs
- Implementation circumstances
- Public noticing

Tables 5-1, 5-2, 5-3, and 5-~~3~~4 provide a summary of the 15 projects. Full descriptions are included below.

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Table 5-1: List of ~~Planned~~Completed Projects

Project Name	Project Type	Project Proponent(s)/ Potential Participating Entities	Measurable Objective Expected to Benefit	Estimated Costs	Required Permitting and Regulatory Process	Observed Groundwater Demand Reduction (Acre-Feet/Year)
5.2.4.1 TWSD Water Treatment Plant Capacity Upgrade	Conservation	TWSD, DWR, Division of Drinking Water	Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence	$1.5 million-$3 million	Completed	300

Table 5-2: List of In-Progress Projects

Project Name	Project Type	Project Proponent(s)/ Potential Participating Entities	Measurable Objective Expected to Benefit	Current Status	Timetable (initiation and completion)	Estimated Costs
5.2.~~4~~5.1 Residential Water Conservation	Conservation	Wyandotte Creek GSA, municipal water providers	Groundwater Levels, Groundwater Storage	Ongoing~~Planning Stage~~	2022-2025	To be decided (TBD)
5.2.~~4~~5.2 ~~Agricultural~~ Palermo Clean Water Consolidation Project~~Irrigation Efficiency~~	~~Conservation~~Water Supply/Conjunctive Use	Butte County Department Water and Resource Conservation, SFWPA, Palermo Community Council~~Wyandotte Creek GSA Vina GSA, Agricultural Groundwater Users of Butte County, Butte County Farm Bureau~~	Groundwater Levels, Groundwater Storage	Implementation~~Planning Stage~~	~~2024-2030~~Expected 2026	$12~~4~~ million~~TBD~~

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Project Name	Project Type	Project Proponent(s)/ Potential Participating Entities	Measurable Objective Expected to Benefit	Current Status	Timetable (initiation and completion)	Estimated Costs	Required Permitting	Expected Groundwater Demand
5.2.4.3 Flood MAR	Direct Recharge, In-Lieu Recharge	Wyandotte Creek GSA	Groundwater Levels	Planning Stage	2022-2032	TBD	SWRCB Water Right Permit, California Environmental Quality Act (CEQA)	TBD
5.2.4.4 Oroville Wildlife Area Robinson's Riffle Project	In-Lieu Recharge	Sutter Butte Flood Control Agency, Golden State Salmon Association	Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence	Planning Stage	TBD; Sutter Butte Flood Control Agency (SBFCA) is currently seeking funding	$1.7 million (planning, design, environmental, permitting)	CEQA/National Environmental Policy Act (NEPA), United States Army Corps of Engineers (USACE) 408, USACE 404, CDFW ITP, CDFW 1600	TBD
5.2.4.5 Streamflow Augmentation	Direct Recharge, In-Lieu Recharge	TBDWyandotte Creek GSA, PG&E, surface water rights holders	N/AGroundwater Levels, Surface Water Depletion	Planning Stage	2022-2025	$50-100 per acre-foot	SWRCB Water Right Permit, CEQA	1,000-5Up to 4,000

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Project Name	Project Type	Project Proponent(s)/ Potential Participating Entities	Measurable Objective Expected to Benefit	Current Status	Timetable (initiation and completion)	Estimated Costs	Required Permitting	Expected Groundwater Demand
~~5.2.4.6 TWSD Water Treatment Plant Capacity Upgrade~~5.2.5.3 Regional Conjunctive Use Project	~~Conservation~~Direct Recharge, Water Supply/Conjunctive Use	~~TWSD, DWR, Division of Drinking Water~~Wyandotte Creek GSA, Agricultural Groundwater Users of Butte County, Farm Bureau, SFWPA, DWR	Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence	Planning ~~Stage~~and Design	~~6-12 months~~Expected 2032	$~~1.5 million~~ $3 million		
~~5.2.4.7 Water Loss Monitoring~~	~~Conservation~~	~~Wyandotte Creek GSA /SFWPA, Butte County~~	~~Surface Water Depletion~~	~~Planning Stage~~	~~2025~~	~~$800,000~~	~~TBD~~	~~Unknown~~
~~5.2.4.8 Palermo Clean Water Consolidation Project~~	~~In-Lieu Recharge~~	~~Butte County Department Water and Resource Conservation, SFWPA, Palermo Community Council~~	~~Groundwater Levels, Groundwater Storage~~	~~Planning Stage~~	~~Project design and evaluation of funding sources underway, implementation could begin in 2022~~	~~$12.4 million~~	~~TBD~~	~~TBD~~

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Table 5-~~2~~3: List of Potential Projects

Project Name	Project Type	Project Proponent/ Potential Participating Entities	Measurable Objective Expected to Benefit	Current Status	Timetable (initiation and completion)	Estimated Costs	Required Permitting and Regulatory Process	Expected Groundwater Demand Reduction (AFY)
~~5.2.5.1 Intra-Basin Water Transfer~~	~~Intra-basin water transfer~~	~~TWSD, Butte County, DWR, agricultural users~~	~~Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence~~	~~Planning Stage~~	~~6-12 months~~	~~TBD~~	~~DWR, Butte County~~	~~3,000-5,000~~
~~5.2.5.2. Agricultural Surface Water Supplies~~	~~Intra-Basin Water Transfer~~	~~Wyandotte Creek GSA, Agricultural Groundwater Users of Butte County, Farm Bureau~~	~~Groundwater Levels~~	~~Planning Stage~~	~~2025-2032~~	~~TBD~~	~~SWRCB Water Right Permit, CEQA, others TBD~~	~~2,000-3,000~~
~~5.2.5.3 Well Upgrades~~	~~Conservation~~	~~TWSD, DWR, Butte County, Wyandotte Creek GSA~~	~~Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence~~	~~Planning Stage~~	~~6-12 months~~	~~TBD~~	~~TBD~~	~~TBD~~
~~5.2.5.4 Fuel Management for Watershed Health~~5.2.7.2 Extend Orchard Replacement	Conservation	Wyandotte Creek GSA, Butte County ~~Fire Safe Council, Butte County Resource Conservation District, NRCS~~	Groundwater Levels~~, Groundwater Storage, Water Quality, Surface Water Depletion~~	Planning Stage	Dependent upon availability of financial incentives and willingness of growers to participate~~2022-2042~~	TBD	N/A~~CEQA~~	TBD
~~5.2.5.5 Removal of Invasive Species~~	~~Conservation~~	~~Wyandotte Creek GSA; other local, state, federal organizations and agencies~~	~~Groundwater Levels~~	~~Planning Stage~~	~~2022-2025~~	~~TBD~~	~~CEQA and/or NEPA (depending on project location and impact)~~	~~TBD~~

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Table 5-~~3~~4: List of ~~Conceptual~~Other Projects

Project Name	Project Type	Project Proponent/ Potential Participating Entities	Measurable Objective Expected to Benefit	Current Status	Timetable (initiation and completion)	Estimated Costs	Required Permitting and Regulatory Process	Expected Groundwater Demand Reduction (AFY)
5.2.7.1 Agricultural Irrigation Efficiency	Conservation	Agricultural Groundwater Users of Butte County, Butte County Farm Bureau	Groundwater Storage	Planning Stage	TBD	TBD	TBD	4,000
5.2.7.1 Oroville Wildlife Area Robinson's Riffle Project	Direct Recharge	Sutter Butte Flood Control Agency, Golden State Salmon Association	Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence	Planning Stage	TBD; Sutter Butte Flood Control Agency (SBFCA) is currently seeking funding	$1.7 million (planning, design, environmental, permitting)	CEQA/National Environmental Policy Act (NEPA), United States Army Corps of Engineers (USACE) 408, USACE 404, CDFW ITP, CDFW 1600 LSAA, State Lands Commission Lease, CVRWQCB 401, CVFPB Encroachment Permit, DWR Encroachment Permit	TBD
5.2.7.3	Direct Recharge, Water	Wyandotte Creek GSA, PG&E,	Groundwater Levels,	Planning Stage	2027-2042	$50-100 per acre-foot	SWRCB Water Right Permit, CEQA	1,000-5,000

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Project Name	Project Type	Project Proponent/ Potential Participating Entities	Measurable Objective Expected to Benefit	Current Status	Timetable (initiation and completion)	Estimated Costs	Required Permitting and Regulatory Process	Expected Groundwater Demand Reduction (AFY)
Streamflow Augmentation	Supply/ Conjunctive Use	surface water rights holders	Surface Water Depletion					
5.2.7.4 Water Loss Monitoring	Conservation	Wyandotte Creek GSA /SFWPA, Butte County	Surface Water Depletion	Planning Stage	2027-2042	$800,000	TBD	Unknown
5.2.~~6.1 Recharge~~7.5 Well ~~(Injection Well)~~Upgrades	Conservation ~~Direct Recharge~~	TWSD, DWR, Butte County, Wyandotte Creek GSA	Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence	Planning Stage	~~12-24 months~~2027-2042	TBD	TBD	TBD
~~5.2.6.2 Extend Orchard Replacement~~5.2.7.6 Fuel Management for Watershed Health	Conservation	Wyandotte Creek GSA, Butte County Fire Safe Council, Butte County Resource Conservation District, NRCS	Groundwater Levels, Groundwater Storage, Water Quality, Surface Water Depletion	Planning Stage	2027-2042~~Dependent upon availability of financial incentives and willingness of growers to participate~~	TBD	CEQA~~N/A~~	TBD
5.2.7.7 Removal of Invasive Species	Conservation	Wyandotte Creek GSA; other local, state, federal organizations and agencies	Groundwater Levels	Planning Stage	2027-2042	TBD	CEQA and/or NEPA (depending on project location and impact)	TBD
5.2.7.8 Recharge	Direct Recharge	TWSD, DWR, Butte County,	Groundwater Levels, Groundwater	Planning Stage	2027-2042	TBD	TBD	TBD

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Project Name	Project Type	Project Proponent/ Potential Participating Entities	Measurable Objective Expected to Benefit	Current Status	Timetable (initiation and completion)	Estimated Costs	Required Permitting and Regulatory Process	Expected Groundwater Demand Reduction (AFY)
Well (Injection Well)		Wyandotte Creek GSA	Storage, Water Quality, Land Subsidence					

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5.2.4 Completed Projects

Projects categorized as ~~Planned~~Completed Projects ~~are expected to move forward and be~~have been completed ~~to achieve~~by the Wyandotte Creek GSA or partner agency. Completed Projects are summarized in Table 5-1.

5.2.4.1 TWSD Water Treatment Plant Capacity Upgrade

~~Subbasin's sustainability goal by 2042.~~ The ~~estimated~~TWSD has increased the capacity of the water treatment plant serving the city of Oroville and surrounding area. By treating a greater volume of water for the area, the amount of groundwater pumped for drinking water has decreased.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / TWSD, Division of Drinking Water, DWR
Project Type:	Conservation
Groundwater Offset and/or Recharge:	300 acre-feet/year

Measurable Objective Expected to Benefit: Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence

Project Status: This project was completed in 20242024.

Required Permitting and Regulatory Process: Division of Drinking Water, DWR.

Expected Benefits and Evaluation: Since groundwater is a significant contributor to drinking water in the city of Oroville and the Wyandotte Creek Subbasin, increasing the capacity of the treatment plant will reduce the impact of groundwater pumping.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a demand-side conservation project by TWSD. No additional water source will be utilized for this project.

~~supply from these projects is expected~~**Legal Authority:** The project was conducted by the TWSD and Wyandotte Creek GSA.

Actual Costs and Method to Meet Costs: $1.5-$3 million; funding source DWR SGM Round 2 grant funds.

Trigger for Implementation and Termination: Increased groundwater pumping for drinking water.

Process for Determining Conditions Requiring the Project to have Occurred: This is ~~offset any potential overdraft~~completed due to securing DWR funding.

5.2.5 In-Progress Projects

Projects categorized as In-Progress Projects are ongoing or currently in the pilot, design, or implementation phase under the Wyandotte Creek GSA or partner agency. In-Progress Projects are summarized in Table 5-2.

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~~5.2.4.1~~5.2.5.1 *Residential Water Conservation*

Municipal water providers, who currently supply water to the City of Oroville and others throughout Butte County, are planning to implement water conservation practices in accordance with their 2020 UWMP. Some of these conservation projects include the installation of low flow fixtures, toilet replacements, urinal valve and bowl replacements, clothes washer replacements, residential conservation kits, smart controllers, and high efficiency irrigation nozzles. Other projects include water waste prevention ordinances, metering, conservation pricing, public education and outreach, programs to assess and manage distribution system real loss, water conservation program coordination and staffing support, and other demand management measures.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / Municipal water providers (including Cal Water Oroville, TWSD)
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	100 – 200 AFY

Measurable Objective Expected to Benefit: Groundwater Levels, Groundwater Storage

Project Status: This project is currently in the planning stages.

Required Permitting and Regulatory Process: N/A

Timetable for Initiation and Completion: 2022-2025

Expected Benefits and Evaluation: As groundwater is the primary source of water for the region, these various conservation projects will reduce groundwater demand, allowing groundwater levels and overall storage to recover.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a demand-side conservation project conducted by municipal water service providers. No additional water source will be utilized for this project.

Legal Authority: The project would be conducted by municipal water service providers in the City of Oroville and other municipalities in the Wyandotte Creek Subbasin.

Estimated Costs and Plans to Meet Costs: TBD; funding via grants and local entities.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward.

Trigger for Implementation and Termination: Increased water demand from planned developments in the City of Oroville and Butte County General Plans.

Process for Determining Conditions Requiring the Project to have Occurred: Not applicable; this is a Planned Project that is anticipated to move forward.

~~5.2.4.21.1.1.1 Agricultural Irrigation Efficiency~~

~~A survey is currently being conducted in North and South Vina by the Vina GSA, Agricultural Groundwater Users of Butte County, and Butte County Farm Bureau in order to evaluate current irrigation methods and practices, identify opportunities and methods to improve irrigation~~

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~~efficiency, determine potential issues preventing the adoption of efficiency practices, and provide recommendations for increasing participation in these practices. The results of this survey are expected to be available in September 2022, with implementation of the project expected to be initiated between 2024 and 2030. Recommendations from the survey will be made available to the local agricultural community, and implementation of the practices will be voluntary. The Wyandotte Creek GSA along with participating partners will pursue grant funds to help implement these practices. It is estimated that the adoption of more efficient practices could reduce groundwater demand by up to 2%, which translates to a reduction in groundwater demand of up to 4,000 AFY.~~

~~Project Summary~~	
~~Project Proponent / Other Potential Participating Entities:~~	~~Wyandotte Creek GSA, Vina GSA, Agricultural Groundwater Users of Butte County, Butte County Farm Bureau~~
~~Project Type:~~	~~Conservation~~
~~Estimated Groundwater Offset and/or Recharge:~~	~~4,000 AFY~~

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~~**Measurable Objective Expected to Benefit:** This project will address declining water levels and the declining volume of groundwater stored in the aquifer. The main objective of the project is to reduce groundwater demand by modifying irrigation practices.~~

~~**Project Status:** This project is in the planning stages.~~

~~**Required Permitting and Regulatory Process:** None~~

~~**Timetable for Initiation and Completion:** Project will be initiated in 2024~~

~~**Expected Benefits and Evaluation:** A survey that consolidates data on the adoption of irrigation methods and practices by agricultural groundwater users will identify where more efficient practices can be implemented. This can help focus efforts and finances on areas where a reduction in overall groundwater demand is needed and feasible.~~

~~**How Project Will Be Accomplished/Evaluation of Water Source:** This project is a demand-side conservation project. No additional water source will be utilized for this project.~~

~~**Legal Authority:** The project would be under the authority of Vina GSA and potential future participating partners.~~

~~**Estimated Costs and Plans to Meet Costs:** To be determined, funding via Proposition 1, Proposition 68, USDA, Drought Resiliency Grants~~

~~**Circumstances for Implementation:** This project is a Planned Project that is anticipated to move forward.~~

~~**Trigger for Implementation and Termination:** The project will be initiated after the recommendations from the initial survey results are available.~~

~~**Process for Determining Conditions Requiring the Project to Occur:** As mentioned above, the survey is already underway and once analysis is complete, recommendations based off the results will be made available for voluntary implementation.~~

~~5.2.4.3 Flood MAR~~

~~DWR originally developed the Flood MAR initiative to promote groundwater recharge programs. Under this project, the Wyandotte Creek GSA would adopt a similar approach to identify opportunities for recharge specific to the Wyandotte Creek Subbasin. Some projects already identified include the Wyandotte Creek, Wyman Ravine, Wilson Creek, North Honcut Creek, Feather River, and Ruddy Creek and will utilize water from the seasonal high flows from these creeks and streams for fields, recharge ponds, and recharge basins.~~

~~Project Summary~~	
~~Project Proponent / Other Potential Participating Entities:~~	~~Wyandotte Creek GSA~~
~~Project Type:~~	~~Direct Recharge, In-Lieu Recharge~~
~~Estimated Groundwater Offset and/or Recharge:~~	~~TBD~~

~~**Measurable Objective Expected to Benefit**: Groundwater Levels~~

~~**Project Status:** This project is currently in the planning stages.~~

~~**Required Permitting and Regulatory Process:** California SWRCB Water Right Permit, CEQA~~

~~**Timetable for Initiation and Completion:** 2022-2032~~

~~**Expected Benefits and Evaluation:** By identifying specific locations and resources for recharge projects through the Flood MAR initiative, the Wyandotte Creek GSA can focus its efforts and direct water from those locations to recharge areas and increase groundwater levels in the region.~~

~~**How Project Will Be Accomplished/Evaluation of Water Source:** The Wyandotte Creek GSA will identify specific water sources for the recharge projects. Some sources already identified include Wyandotte Creek, Wyman Ravine, Wilson Creek, North Honcut Creek, Feather River, and Ruddy Creek.~~

~~**Legal Authority:** The project is being conducted by the Wyandotte Creek GSA. Additional evaluation of water rights may be necessary as projects move forward.~~

~~**Estimated Costs and Plans to Meet Costs:** TBD; funding via Proposition 1 and Proposition 68.~~

~~**Circumstances for Implementation:** This project is a Planned Project that is anticipated to move forward.~~

~~**Trigger for Implementation and Termination:** Availability of water sources.~~

~~**Process for Determining Conditions Requiring the Project to have Occurred:** This is a Planned Project that is anticipated to move forward.~~

~~5.2.4.41.1.1.1 Oroville Wildlife Area Robinson's Riffle Project~~

~~The Robinson's Riffle Project is a major restoration project for the Oroville Wildlife Area, a 12,000-acre area located in Butte County and managed by DWR and the CDFW. Under this project, the Feather River would undergo major grading improvements that would lower the floodplain surface to a more naturalized condition by excavating tailing piles, reconnect the overbank areas to the main channel, and create new side-channel and floodplain habitat. This work would increase the overall area of riverine habitat, thereby improving the flow and quality of the water, removing invasive species along the banks, and increasing the surface available for~~

recharge into the aquifer during flood events. Additionally, increasing the overall streamflow in the river will benefit several local species. Necessary permits will be obtained by the SBFCA, in partnership with DWR and CDFW. SBFCA is in the process of conducting a series of workshops, during which they will share details of the project with potential stakeholders and resource agencies and obtain the necessary funding to move forward.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / SBFCA, Golden State Salmon Association
Project Type:	In-Lieu Recharge
Estimated Groundwater Offset and/or Recharge:	TBD

Measurable Objective Expected to Benefit: Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence

Project Status: This project is currently seeking stakeholders who will fund the work. Workshops are being held by SBFCA to present project details.

Required Permitting and Regulatory Process: CEQA/NEPA, USACE 408, USACE 404, CDFW Incidental Take Permit, CDFW 1600 Lake and Streambed Alteration, State Lands Commission Lease, CVRWQCB 401, Central Valley Flood Protection Board Encroachment Permit, DWR Encroachment Permit.

Timetable for Initiation and Completion: Once funding is obtained for the project, planning, design, and permitting will take approximately 18 months.

Expected Benefits and Evaluation: Expanding the overall area of riverine habitat near the Feather River will increase the surface available for water during flood events to recharge groundwater in the Wyandotte Creek Subbasin.

How Project Will Be Accomplished/Evaluation of Water Source: This project will improve streamflow in the Feather River, thereby increasing the area available for water during flood events to recharge groundwater levels and storage in the aquifer.

Legal Authority: The project is being conducted by the SBFCA.

Estimated Costs and Plans to Meet Costs: $1.7 million; funding via Proposition 1, Proposition 68, grants, DWR programs.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward.

Trigger for Implementation and Termination: Project implementation is dependent on funding and permitting issues.

Process for Determining Conditions Requiring the Project to have Occurred: This is a Planned Project that is anticipated to move forward.

***5.2.4.5*1.1.1 Streamflow Augmentation**

Under this project, flood waters from water right holders in the region would be diverted to certain creeks or streams in the Wyandotte Creek Subbasin. This flood waters would be used for

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direct and in-lieu recharge to restore groundwater levels in the basin, as well as increase stream flows. The Wyandotte Creek GSA would lead the project and initially conduct an investigation and feasibility study.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / PG&E, surface water right holders
Project Type:	Direct Recharge, In-Lieu Recharge
Estimated Groundwater Offset and/or Recharge:	1,000-5,000 acre-feet/year

Measurable Objective Expected to Benefit: Groundwater Levels, Surface Water Depletion

Project Status: This project is currently in the planning stage.

Required Permitting and Regulatory Process: SWRCB Water Right Permit, CEQA

Timetable for Initiation and Completion: 2022-2025

Expected Benefits and Evaluation: Diverting flood waters will increase surface water flows and groundwater levels in the basin.

How Project Will Be Accomplished/Evaluation of Water Source: Wyandotte Creek GSA will evaluate which surface water sources will be available in a particular year to divert to creeks, streams, and recharge ponds.

Legal Authority: The project is being conducted by the Wyandotte Creek GSA.

Estimated Costs and Plans to Meet Costs: $50-$100 per acre-foot; funding via Proposition 1 (funds provided by the Stream Flow Enhancement Program through the California Wildlife Conservation Board), Proposition 68, Wyandotte Creek GSA fees, Resource Renewal Institute.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward.

Trigger for Implementation and Termination: None

Process for Determining Conditions Requiring the Project to have Occurred: This is a Planned Project that is anticipated to move forward.

5.2.4.61.1.1.1 TWSD Water Treatment Plant Capacity Upgrade

The TWSD is planning to increase the capacity of the water treatment plant serving the city of Oroville and surrounding area. By treating a greater volume of water for the area, the amount of groundwater pumped for drinking water can decrease.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / TWSD, Division of Drinking Water, DWR
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	500+ acre-feet/year

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Measurable Objective Expected to Benefit: Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence

Project Status: This project is currently in the planning stage.

Required Permitting and Regulatory Process: Division of Drinking Water, DWR.

Timetable for Initiation and Completion: 6-12 months

Expected Benefits and Evaluation: Since groundwater is a significant contributor to drinking water in the city of Oroville and the Wyandotte Creek Subbasin, increasing the capacity of the treatment plant will reduce the impact of groundwater pumping.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a demand-side conservation project by TWSD. No additional water source will be utilized for this project.

Legal Authority: The project is being conducted by the TWSD and Wyandotte Creek GSA.

Estimated Costs and Plans to Meet Costs: $1.5-$3 million; funding sources TBD.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward.

Trigger for Implementation and Termination: Increased groundwater pumping for drinking water.

Process for Determining Conditions Requiring the Project to have Occurred: This is a Planned Project that is anticipated to move forward.

5.2.4.7*1.1.1.1 *Water Loss Monitoring

The water providers across the Wyandotte Creek subbasin recognize that water loss across their systems due to unpermitted use. SFWPA, which provides service to cities such as Oroville and Palermo, has recognized that fire hydrants, which are primarily used for fire suppression, are being used for other unmonitored purposes. The extended use of fire hydrants is negatively affecting the amount of available surface water in the service area. The hydrants do not have meters on them, making it difficult to monitor usage when used by those without portable meters. Under this project, water providers would evaluate and implement procedures to track usage and water loss more accurately from their systems. This evaluation could include implementation of new practices to reduce unregulated use or even installation of meters on hydrants.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA/ SFWPA, Butte County
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	Unknown

Measurable Objective Expected to Benefit: Surface Water Depletion

Project Status: This project is currently in the planning stage.

Required Permitting and Regulatory Process: N/A

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~~**Timetable for Initiation and Completion:** To be completed by 2025.~~

~~**Expected Benefits and Evaluation:** An improved monitoring system for unregulated water usage from fire hydrants will give a better indication as to the effect on surface water in the Wyandotte Creek Subbasin. This can prove useful for the Wyandotte Creek GSA when it comes to further water management decisions and strategies.~~

~~**How Project Will Be Accomplished/Evaluation of Water Source:** This project is a demand-side conservation project to be implemented by the water providers. No additional water source will be utilized for this project.~~

~~**Legal Authority:** The project will be conducted by water providers and Wyandotte Creek GSA. The water systems to be evaluated are owned by the water providers.~~

~~**Estimated Costs and Plans to Meet Costs:** $800,000; funding via state and federal water use efficiency grants.~~

~~**Circumstances for Implementation:** This project is a Planned Project that is anticipated to move forward. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Wyandotte Creek Subbasin.~~

~~**Trigger for Implementation and Termination:** The water providers have recognized that this unregulated water loss has been occurring for some time and are committed to proceeding with the evaluation once funding is secured.~~

~~**Process for Determining Conditions Requiring the Project to have Occurred:** This is a Planned Project that is anticipated to move forward.~~

~~*5.2.4.8*~~*5.2.5.2 Palermo Clean Water Consolidation Project*

The water quality in the ~~l~~ unincorporated community of Palermo is currently a public health concern for its nearly 2,000 residents. Most of the population obtain their potable water from individual water wells and use septic systems for wastewater treatment and disposal. The area's predominant soil type prevents surface water from properly percolating and draining, causing frequent flooding and the surfacing of untreated wastewater effluent. This, in turn, leads to septic system failures, plumbing back-ups into homes, and possible cross-contamination of pathogens in untreated wastewater with drinking water sources in the aquifer. Under this project, the SFWPA would expand its service areas and water delivery capabilities to provide treated drinking water to Palermo residents.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA, Butte County Department Water and Resource Conservation, SFWPA, Palermo Community Council
Project Type:	~~In-Lieu Recharge~~Water Supply/Conjunctive Use
Estimated Groundwater Offset and/or Recharge:	~~TBD~~500+ acre-feet/year

Measurable Objective Expected to Benefit: Groundwater Levels, Groundwater Storage, Water Quality

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~~**Project Status:** This project is in the planning stages with 100% project design expected by mid-2022.~~ **Project Status:** The first phase, the Dry Well Consolidation Project, is in progress focusing on installing pipelines and connecting properties. It's a multi-year effort, with construction progressing as funding allows, aiming to serve hundreds of parcels. Funding is being sought from multiple grant sources to fully fund the project.

Required Permitting and Regulatory Process: LAFCO and Butte County.

Timetable for Initiation and Completion: Project design ~~and evaluation of~~is completed, funding ~~sources underway,~~ is secured, and implementation ~~could begin~~is underway and is expected to be completed in ~~2022.~~2026.

Expected Benefits and Evaluation: Expanding the SFWPA service areas in Palermo would provide more residents with clean and safe drinking water using a surface water source and will reduce dependence on groundwater pumping wells that may be contaminated. This would also allow groundwater levels and water quality in the region to recover. This project will improve the resilience of drinking water supplies to households in Palermo.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a supply side ~~in-lieu recharge~~conjunctive use project conducted by the BCDWRC in partnership with SFWPA. Water will be supplied by surface water from SFWPA.

Legal Authority: The project would be under the authority of BCDWRC, SFWPA, and Wyandotte Creek GSA.

Estimated Costs and Plans to Meet Costs: ~~-~~$12.4 million met through multiple grant sources

Circumstances for Implementation: ~~This project~~Implementation is ~~a Planned Project that is anticipated to move forward~~currently underway with expected completion date within 2026.

Trigger for Implementation and Termination: Dependence on individual groundwater pumping wells for drinking water and frequent issues such as flooding, plumbing problems, and possible cross contamination.

Process for Determining Conditions Requiring the Project to have Occurred: Implementation ~~of Potential Projects will be based on long-term management or changing needs of the GSA or Wyandotte Creek Subbasin.~~

~~**5.2.5 Potential Projects**~~

~~Projects categorized as Potential Projects are~~is currently ~~in the planning stages and may move forward if funding becomes available. Potential Projects represent~~ underway. This is a ~~"menu of options"~~high priority project for the Wyandotte Creek ~~Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. The Potential Projects are presented in Table 5-2.~~GSA and partnering agencies.

~~***5.2.5.1 Intra-Basin Water Transfer***~~

~~Under this project, surface water would be supplied to agricultural groundwater users in the Wyandotte Creek Subbasin outside of the subbasin to offset groundwater pumping by with available surface water~~

~~**Project Summary**~~

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Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / TWSD, Butte County, agricultural users
Project Type:	In-Lieu Recharge
Estimated Groundwater Offset and/or Recharge:	3,000 – 5,000 AFY

Measurable Objective Expected to Benefit:

5.2.5.3 Regional Conjunctive Use Project

Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence

Project Status: This project is a potential project and the feasibility is still being evaluated.

Required Permitting and Regulatory Process: DWR, Butte County

Timetable for Initiation and Completion: 2025-2030

Expected Benefits and Evaluation: Intrabasin water transfers increase the surface water supply in the basin, offsetting groundwater pumping by agricultural or urban users and allowing groundwater levels and volume to recover.

How Project Will Be Accomplished/Evaluation of Water Source: This project is an in-lieu recharge project. The water would be supplied by surface water from entities such as TWSD, Butte County, or SFWPA.

Legal Authority: The project would be under the authority of TWSD.

Estimated Costs and Plans to Meet Costs: TBD

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages. Potential Projects represent a "menu of options" for the Wyandotte Creek Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management.

Trigger for Implementation and Termination: Availability of water sources and negotiations with water suppliers.

Process for Determining Conditions Requiring the Project to have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Wyandotte Creek Subbasin.

5.2.5.2 Agricultural Surface Water Supplies

In the 2018 "Evaluation of Restoration and Recharge Within Butte County Basins," Butte County identified surface water sources that could be diverted to fields, recharge basins, and/or recharge ponds in both the Vina and Wyandotte Creek Subbasins. For Wyandotte Creek, the main source of surface water would come from Lake Oroville, while other sources are owned by water right holders in the Wyandotte Creek Subbasin and upper watershed. Under this project, excess surface water supplies would be used in place of groundwater in both agricultural settingsand Flood MAR applications to allow groundwater levels in the Wyandotte Creek Subbasin to recover. Agricultural users may need a dual irrigation system that allows them to use surface water and switch to groundwater when surface water is not available. Feasible Flood MAR projects that have already identified include the Wyandotte Creek, Wyman Ravine, Wilson

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Creek, North Honcut Creek, Feather River, and Ruddy Creek, and will utilize water from the seasonal high flows from these creeks and streams for rice fields that have historically relied on groundwater, managed habitat, recharge ponds, and recharge basins. Recharge along Wyman Ravine, conducted in coordination with SFWPA and the Palermo Master Drainage Plan, has been determined to be most feasible. Work is currently underway to advance project concepts and designs.

The Regional Conjunctive Use Project combines the scopes of the Flood MAR, Intra-Basin Water Transfer, and Agricultural Surface Water Supplies projects that were described in the 2022 GSP.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / ~~Agricultural Groundwater Users of~~TWSD, Butte County, ~~Farm Bureau~~agricultural users
Project Type:	~~Intra-Basin~~ Water ~~Transfer, In-Lieu Recharge~~supply/Conjunctive Use
Estimated Groundwater Offset and/or Recharge:	~~2,000 – 3~~up to 4,000 AFY

~~**Measurable Objective Expected to Benefit**: Groundwater Levels, Groundwater Storage~~

~~**Project Status:** This project is a potential project and the feasibility is still being evaluated.~~

~~**Required Permitting and Regulatory Process:** SWRCB Water Right Permit, CEQA, other TBD.~~

~~**Timetable for Initiation and Completion:** 2025-2032~~

~~**Expected Benefits and Evaluation:** By using available surface water in place of groundwater for agricultural purposes, groundwater levels in the region will be allowed to recover.~~

~~**How Project Will Be Accomplished/Evaluation of Water Source:** This project will transfer and utilize available surface water in the region owned by water rights holders. Most of the surface water will come from the Feather River watershed.~~

~~**Legal Authority:** The project would be under the authority of Wyandotte Creek GSA.~~

~~**Estimated Costs and Plans to Meet Costs:** TBD; likely funding via Proposition 1 and Proposition 68.~~

~~**Circumstances for Implementation:** This project is a Potential Project, meaning it is currently in the planning stages. Potential Projects represent a "menu of options" for the Wyandotte Creek Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the **Potential Projects** can come online to bring additional resources for adaptive management.~~

~~**Trigger for Implementation and Termination:** Based on discussions with landowners.~~

~~**Process for Determining Conditions Requiring the Project to have Occurred:** Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Wyandotte Creek Subbasin.~~

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~~5.2.5.31.1.1.1 Well Upgrades~~

~~Under this project, TWSD would install variable frequency drives and telemetry on its groundwater wells to better utilize groundwater and to document groundwater pumping.~~

~~Project Summary~~	
~~Project Proponent / Other Potential Participating Entities:~~	~~Wyandotte Creek GSA, TWSD, Butte County, DWR~~
~~Project Type:~~	~~Conservation~~
~~Estimated Groundwater Offset and/or Recharge:~~	~~TBD~~

~~**Measurable Objective Expected to Benefit**: Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence~~

~~**Project Status:** This project is a potential project and the feasibility is still being evaluated.~~

~~**Required Permitting and Regulatory Process:** TBD~~

~~**Timetable for Initiation and Completion:** 2025-2030~~

~~**Expected Benefits and Evaluation:** By automating more of its groundwater wells, TWSD will be able to better monitor the amount of groundwater pumped, increasing the efficiency of pumping and allowing groundwater to stabilize in the Wyandotte Creek Subbasin.~~

~~**How Project Will Be Accomplished/Evaluation of Water Source:** This project is a demand-side conservation project conducted by TWSD. No additional water source will be utilized for this project.~~

~~**Legal Authority:** The project would be under the authority of TWSD and Wyandotte Creek GSA.~~

~~**Estimated Costs and Plans to Meet Costs:** TBD; funding via Wyandotte Creek GSA, DWR, Butte County.~~

~~**Circumstances for Implementation:** This project is a Potential Project, meaning it is currently in the planning stages. Potential Projects represent a "menu of options" for the Wyandotte Creek Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management.~~

~~**Trigger for Implementation and Termination:** Availability of funds.~~

~~**Process for Determining Conditions Requiring the Project to have Occurred:** Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Wyandotte Creek Subbasin.~~

~~5.2.5.41.1.1.1 Fuel Management for Watershed Health~~

~~Numerous fuel management projects would be implemented to protect various water sources in the Wyandotte Creek Subbasin and in the upper watershed of the Wyandotte Creek Subbasin and to better maintain overall watershed health. The implementation of fuel management projects in the Wyandotte Creek Subbasin will help with the protection of water bodies, maintaining quality and ensuring that those bodies can continue to be water sources for communities and agriculture.~~

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Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA, Butte County Fire Safe Council, Butte County Resource Conservation District, NRCS
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	TBD

Measurable Objective Expected to Benefit: Groundwater Levels, Groundwater Storage, Water Quality, Surface Water Depletion

Project Status: This project is a potential project and the feasibility is still being evaluated.

Required Permitting and Regulatory Process: CEQA

Timetable for Initiation and Completion: 2022-2042

Expected Benefits and Evaluation: Fuels have the potential to contaminate water sources, affecting water quality and their use for communities and agriculture. Fuel management will help to maintain water quality.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a demand-side conservation project conducted by Wyandotte Creek GSA. No additional water source will be utilized for this project.

Legal Authority: The project would be under the authority of Wyandotte Creek GSA.

Estimated Costs and Plans to Meet Costs: TBD; funding via CAL FIRE, Sierra Nevada Conservancy, California Fire Safe Council, other state/federal funding agencies.

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages. Potential Projects represent a "menu of options" for the Wyandotte Creek Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management.

Trigger for Implementation and Termination: None.

Process for Determining Conditions Requiring the Project to have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Wyandotte Creek Subbasin.

5.2.5.51.1.1.1 Removal of Invasive Species

Invasive species are a threat to the Wyandotte Creek Subbasin's ecosystem and water resources since they are known to consume water and hamper recharge. Under this project, invasive species and native grasses would be mapped to help track the effects these species have on water supplies and to help plan out future groundwater management actions. Following this initial mapping, management plans would be developed to establish groundwater management goals and propose actions towards the removal of invasive species. Appropriate funding mechanisms would be identified and secured to move the project forward.

Project Summary

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Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA, local, state, and federal organizations and agencies
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	TBD

Measurable Objective Expected to Benefit: Groundwater Levels

Project Status: This project is a potential project and the feasibility is still being evaluated.

Required Permitting and Regulatory Process: CEQA and/or NEPA depending on project location and impact.

Timetable for Initiation and Completion: 2022-2025

Expected Benefits and Evaluation: The removal of invasive species would benefit the natural ecosystem and prevent them from negatively affecting the amount of available water and the ability for water to recharge.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a demand-side conservation project conducted by the Wyandotte Creek GSA. No additional water source will be utilized for this project.

Legal Authority: The project would be under the authority of Wyandotte Creek GSA.

Estimated Costs and Plans to Meet Costs: TBD; funding via state and federal wildfire resiliency grants and other local, state, and federal organizations and agency programs.

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages. Potential Projects represent a "menu of options" for the Wyandotte Creek Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management.

Trigger for Implementation and Termination: Increase in the number of invasive species in the region and their negative effect on water supply.

Process for Determining Conditions Requiring the Project to have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Wyandotte Creek Subbasin.

5.2.6 Longer-term or Conceptual Projects

Projects categorized as Longer-term or Conceptual Projects are in the early conceptual stages and would require significant additional work to move forward. Longer-term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Wyandotte Creek Subbasin in the future, but that would need to be further developed.

5.2.6.11.1.1.1 Recharge Well (Injection Well)

Under this project, the TWSD treatment plant would install an injection well that would inject raw and backwash water from its operations into the basin.

Project Summary

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~~Project Proponent / Other Potential Participating Entities:~~	~~Wyandotte Creek GSA /TWSD, Butte County, DWR~~
~~Project Type:~~	~~Direct Recharge~~
~~Estimated Groundwater Offset and/or Recharge:~~	~~TBD~~

Measurable Objective Expected to Benefit: Groundwater Levels, Groundwater Storage, Water Quality, Land Subsidence

Project Status: This project is ~~conceptual planning stages~~an ongoing project and the feasibility and 60% designs completed.

Required Permitting and Regulatory Process: ~~TBD~~DWR, Butte Count, California SWRCB Water Right Permit, CEQA

Timetable for Initiation and Completion: ~~12-24 months~~2024-2032

Expected Benefits and Evaluation: ~~This project would use raw and backwash~~Utilization of flood waters and intra-basin water~~, which would be discharged from the treatment plant anyway, for direct recharge into~~ transfers to increase the ~~aquifer, thereby increasing~~surface water supply in the basin will offset groundwater pumping and allow groundwater levels and volume ~~in the Wyandotte Creek Subbasin~~to recover.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a direct recharge and water supply/conjunctive use project. The water would be supplied ~~from the raw and backwash water from operations at the TWSD treatment plant.~~by surface water from SFWPA and floodwater that has historically accumulated in Palermo.

Legal Authority: The project would be under the authority of ~~TWSD~~SFWPA~~SFWPA~~ and the Wyandotte Creek GSA. Additional evaluation of water rights may be necessary as projects move forward.

Estimated Costs and Plans to Meet Costs: TBD; likely funding via ~~DWR, Butte County, Wyandotte Creek GSA~~Proposition 4 or privately funded by willing landowners.

Circumstances for Implementation: This project is ~~a Longer-term/Conceptual~~an Ongoing Project, meaning it is ~~in the early conceptual planning stages and would require significant additional work to move forward. Longer-term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Wyandotte Creek Subbasin in the future. As scenarios change, Longer-term/Conceptual Projects can come online to bring additional resources for adaptive management. This~~currently being worked on. The project ~~could~~will be implemented ~~when agreements are reached with all federal and state regulatory agencies and when funding is available~~once additional grant funds have been secured.

Trigger for Implementation and Termination: ~~None~~Availability of water sources and negotiations with water suppliers and landowners.

Process for Determining Conditions Requiring the Project to have Occurred: This is an Ongoing Project that is anticipated to move forward due to strong stakeholder support.

Potential Projects

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5.2.6 Potential Projects~~Implementation of Longer-term/Conceptual~~

Projects ~~will be based on long-term management or changing needs of the GSA~~categorized as Potential Projects are currently in the planning stages and may move forward if funding becomes available or ~~Wyandotte Creek Subbasin~~if they become necessary to achieve sustainability. The Potential Projects are presented in Table 5-3.

~~5.2.6.2~~5.2.6.1 *Extend Orchard Replacement*

Under this project, various funding sources would incentivize local growers to increase the duration of their current fallowing practice between orchard removal and replanting by one growing season. The extra time would allow the soil to fallow and decrease the overall demand on groundwater and other water sources. Additionally, this program may also reduce the need for soil treatments such as fumigation and expand recycling options for the previous orchard. This project has the potential to fallow many acres although it is not determined at this time. As envisioned, this project would be dependent on the availability of financial incentives and willingness of landowners to participate. Participation in the program would be voluntary.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / Butte County
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	TBD

Measurable Objective Expected to Benefit: Groundwater Levels

Project Status: This project is still in the early conceptual planning stages.

Required Permitting and Regulatory Process: None

Timetable for Initiation and Completion: To be determined. The timetable would be dependent on the availability of financial incentives and willingness of farmers to participate.

Expected Benefits and Evaluation: By increasing the time between orchard removal and replanting, the soil may be allowed to fallow, restoring its fertility, and decreasing its water demand. This would decrease the overall use of groundwater in the Subbasin.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a demand-side conservation project. No additional water source will be utilized for this project.

Legal Authority: The project would be under the Wyandotte Creek GSA, local landowners and other entities ~~T~~to be determined.

Estimated Costs and Plans to Meet Costs: To be determined; funding via Proposition 1, Proposition 68, USDA, National Resource Conservation Service (NRCS)

Circumstances for Implementation: This project is a Conceptual project in the early conceptual planning stages and would require significant additional work to move forward.

Trigger for Implementation and Termination: None

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Process for Determining Conditions Requiring the Project to Occur: The project proponents are in the process of determining the feasibility of this project including the possibility of securing the necessary finances to move forward.

5.2.7 Other Projects

Projects categorized as Other Projects may have benefits to groundwater conditions but are not part of the GSA's strategy to maintain/achieve sustainability. Other Projects are not being led by the GSA, but will still be tracked, as feasible. These Other Projects are presented in Table 5-44.

5.2.7.1 Agricultural Irrigation Efficiency

A survey is currently being conducted in North and South Vina by the Vina GSA, Agricultural Groundwater Users of Butte County, and Butte County Farm Bureau in order to evaluate current irrigation methods and practices, identify opportunities and methods to improve irrigation efficiency, determine potential issues preventing the adoption of efficiency practices, and provide recommendations for increasing participation in these practices. The results of this survey are expected to be available in September 2022, with implementation of the project expected to be initiated between 2024 and 2030. Recommendations from the survey will be made available to the local agricultural community, and implementation of the practices will be voluntary. The Wyandotte Creek GSA along with participating partners will pursue grant funds to help implement these practices. It is estimated that the adoption of more efficient practices could reduce groundwater demand by up to 2%, which translates to a reduction in groundwater demand of up to 4,000 AFY.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA, Vina GSA, Agricultural Groundwater Users of Butte County, Butte County Farm Bureau
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	4,000 AFY

5.2.7.2 Oroville Wildlife Area Robinson's Riffle Project

The Robinson's Riffle Project is a major restoration project for the Oroville Wildlife Area, a 12,000-acre area located in Butte County and managed by DWR and the CDFW. Under this project, the Feather River would undergo major grading improvements that would lower the floodplain surface to a more naturalized condition by excavating tailing piles, reconnect the overbank areas to the main channel, and create new side-channel and floodplain habitat. This work would increase the overall area of riverine habitat, thereby improving the flow and quality of the water, removing invasive species along the banks, and increasing the surface available for recharge into the aquifer during flood events. Additionally, increasing the overall streamflow in the river will benefit several local species. Necessary permits will be obtained by the SBFCA, in partnership with DWR and CDFW. SBFCA is in the process of conducting a series of workshops, during which they will share details of the project with potential stakeholders and resource agencies and obtain the necessary funding to move forward.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / SBFCA, Golden State Salmon Association

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Project Type:	Direct Recharge
Estimated Groundwater Offset and/or Recharge:	TBD

5.2.7.3 Streamflow Augmentation

Under this project, flood waters from water right holders in the region would be diverted to certain creeks or streams in the Wyandotte Creek Subbasin. This flood waters would be used for direct and water supply/conjunctive use to restore groundwater levels in the basin, as well as increase stream flows. The Wyandotte Creek GSA would head the project and initially conduct an investigation and feasibility study.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA / PG&E, surface water right holders
Project Type:	Direct Recharge, Water Supply/Conjunctive Use
Estimated Groundwater Offset and/or Recharge:	1,000-5,000 acre-feet/year

5.2.7.4 Water Loss Monitoring

The water providers across the Wyandotte Creek subbasin recognize that water loss across their systems due to unpermitted use. SFWPA, which provides service to cities such as Oroville and Palermo, has recognized that fire hydrants, which are primarily used for fire suppression, are being used for other unmonitored purposes. The extended use of fire hydrants is negatively affecting the amount of available surface water in the service area. The hydrants do not have meters on them, making it difficult to monitor usage when used by those without portable meters. Under this project, water providers would evaluate and implement procedures to track usage and water loss more accurately from their systems. This evaluation could include implementation of new practices to reduce unregulated use or even installation of meters on hydrants.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA/ SFWPA, Butte County
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	Unknown

5.2.7.5 Well Upgrades

Under this project, TWSD would install variable frequency drives and telemetry on its groundwater wells to better utilize groundwater and to document groundwater pumping.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA, TWSD, Butte County, DWR
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	TBD

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5.2.7.6 Fuel Management for Watershed Health

Numerous fuel management projects would be implemented to protect various water sources in the Wyandotte Creek Subbasin and in the upper watershed of the Wyandotte Creek Subbasin and to better maintain overall watershed health. The implementation of fuel management projects in the Wyandotte Creek Subbasin will help with the protection of water bodies, maintaining quality and ensuring that those bodies can continue to be water sources for communities and agriculture.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA, Butte County Fire Safe Council, Butte County Resource Conservation District, NRCS
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	TBD

5.2.7.7 Removal of Invasive Species

Invasive species are a threat to the Wyandotte Creek Subbasin's ecosystem and water resources since they are known to consume water and hamper recharge. Under this project, invasive species and native grasses would be mapped to help track the effects these species have on water supplies and to help plan out future groundwater management actions. Following this initial mapping, management plans would be developed to establish groundwater management goals and propose actions towards the removal of invasive species. Appropriate funding mechanisms would be identified and secured to move the project forward.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA, local, state, and federal organizations and agencies
Project Type:	Conservation
Estimated Groundwater Offset and/or Recharge:	TBD

5.2.7.8 Recharge Well (Injection Well)

Under this project, the TWSD treatment plant would install an injection well that would inject raw and backwash water from its operations into the basin.

Project Summary	
Project Proponent / Other Potential Participating Entities:	Wyandotte Creek GSA /TWSD, Butte County, DWR
Project Type:	Direct Recharge
Estimated Groundwater Offset and/or Recharge:	TBD

~~5.2.7~~5.2.8 Notification Process

The GSA will continue to conduct public outreach and will be responsible for notification of the projects. Regular updates will be provided to the GSA Boards and presented on the website (www.wyandottecreekgsa.com) as projects are implemented. Outreach is likely to be provided via public notices, meetings, website, social media, and email lists.

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5.3 Management Actions

In order to achieve sustainable groundwater management, management actions can be implemented to focus on reduction of groundwater demand. The management actions can include increased data collection, education and outreach, regulatory policies, incentive programs, and enforcement actions. The GSA has prioritized the management actions by splitting them into two categories: potential management actions and other management actions.

The following sections will present management action options that the GSA may consider during GSP implementation. The GSA will monitor, participate, and coordinate with respective agencies for each of the Management Actions that may be considered. The schedule to implement the management actions is likely to vary depending upon Wyandotte Creek Subbasin conditions and the expected benefits may also vary year to year.

5.3.1 Potential Management Actions

Management Actions categorized as Potential Management Actions are currently in the planning stages and may move forward if funding becomes available or if they become necessary to prevent the occurrence of undesirable results.

~~*5.3.1 1.1.1.1 General Plan Updates*~~

~~Under this management action, the Wyandotte Creek GSA would monitor, participate, and coordinate with the City of Oroville and Butte County, who are currently updating their General Plans, to make necessary amendments so that the plans recognize important components of the Wyandotte Creek Subbasin's GSP.~~

~~*5.3.2*~~*5.3.1.1 Domestic Well Mitigation*

In order to protect domestic water supplies in the region, the Wyandotte Creek GSA would conduct the following under this management action:

1. Establish a voluntary registry for domestic wells.
2. Compile domestic well logs, screen depths, and locations.
3. Improve and deepen domestic wells so that well screens are at or below the MTs established for the Wyandotte Creek Subbasin.
4. Provide emergency supplies, such as bottled drinking water or potable water for sanitation, to communities with dry domestic wells. Priority would be given to DACs who are dependent on groundwater.

Creating a registry of domestic wells in the region, with information on well location and screen depths, would help the GSA compile important data into a centralized location. This would allow the GSA to determine which wells need to be updated to the current standards and which may need to be deepened, as well as to help them prioritize certain communities for emergency response.

Development of the mitigation program started in 2023, and the program will be implemented if groundwater conditions decline below historical lows or as domestic wells are being significantly impacted by declining groundwater levels. Local agencies are actively working to connect vulnerable residents with domestic wells to public water supply systems, such as the Palermo Clean Water Consolidation Project.

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5.3.2 Other Management Actions

Management Actions categorized as Other Management Actions may have benefits to groundwater conditions but are not part of the GSA's strategy to maintain/achieve sustainability.

5.3.2.1 General Plan Updates

Under this management action, the Wyandotte Creek GSA would monitor, participate, and coordinate with the City of Oroville and Butte County, who are currently updating their General Plans, to make necessary amendments so that the plans recognize important components of the Wyandotte Creek Subbasin's GSP.

~~5.3.3~~*5.3.2.2 Well Permitting Ordinance*

According to current Butte County Code, wells are required to be screened below groundwater levels measured during the 1989 to 1994 drought. With water levels continuing to decline in the Wyandotte Creek Subbasin, several domestic wells are becoming dry. Wyandotte Creek GSA in coordination with Butte County ~~would work~~is working to update the current well permitting ordinance to require all domestic wells in the Representative Monitoring Network area to be screened below the MT depths established for the Wyandotte Creek Subbasin.

~~5.3.4~~*5.3.2.3 Landscape Ordinance*

Wyandotte Creek GSA will coordinate with Butte County and the City of Oroville to update the landscape ordinance to encourage new residential, commercial, and industrial developments to use drought-resistant species and to limit the size of grass turf lawns. This ordinance would also promote xeriscaping and focus efforts and funds on reducing landscape irrigation and water use for swimming pools. The implementation of this ordinance would require a period of planning, public discussion, and code enforcement for each new building permit.

~~5.3.5~~*5.3.2.4 Expansion of Water Purveyors' Service Area*

Under this management action, water purveyors would expand their service areas and provide drinking water to residential areas that are currently using private domestic groundwater wells. Groundwater levels in the Wyandotte Creek Subbasin would be allowed to recover with the overall decrease in groundwater demand. This action would require approval from the Butte Local Agency Formation Commission and the California Public Utilities Commission.

5.4 Data Collection and Analysis

5.4.1 County Contour Mapping

As part of the efforts to collect the information necessary to fill the information needs and data gaps identified in Section 3, this project proposes to expand the existing monitoring program to include Butte, ~~Glen~~Glenn, Colusa, and Tehama counties and conduct these groundwater elevation surveys in the spring, summer, and fall. The monitoring program would gather data used to produce groundwater contours and estimates of lateral and vertical flow direction and volume. Producing this data for the four counties will help to identify interbasin flow patterns and influences on surface water flows and replenishment locations, thereby improving coordination between counties and water management decision-making.

Routine water table monitoring programs will track overall water table trends in the region and provide important, up-to-date data for making decisions on water management. Establishing these programs amongst the four counties will aid in the exchange of data and improve regional

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coordination on various water projects. The expanded water monitoring programs will be established by the Wyandotte Creek GSA, with assistance from the four counties.

5.4.2 Project: Update the Butte Basin Groundwater Model

The existing BBGM covers the Vina, Butte, and Wyandotte Creek Subbasins. This project will help fill the identified information needs and data gaps and will consist of 1) updating the BBGM with newly acquired data; and 2) using the updated version of the model to run simulations and better establish the basin's ~~-~~SMC as needed.

Some of the new data to be added is the AEM data and data on the different hydraulic conductivities of each layer of the aquifer. The AEM data will be used, among other things, to adjust the various surfaces in the model to better present the aquifer's hydrogeologic layers.

Once the model has been updated with the new data, it will be better suited for running simulations of different water or land management scenarios as well as predictions for climate and precipitation fluctuations. Lateral and vertical connectivity between aquifer layers and connections to surface water features will be more accurate and help identify areas of the basin where groundwater recharge may be needed. Overall, this will help shape management actions by focusing their efforts on those particular areas. Ongoing updates to the model will emphasize the importance of accurate and up-to-date data and help continue monitoring efforts such as measuring water levels and stream flows.

An updated groundwater model is vital for running accurate simulations that may be used to make important decisions regarding groundwater allocation, pumping, recharge, and other activities. The model should contain the most up-to-date data to represent the basin realistically and accurately. Two updates to the model are ~~current~~currently planned during SGMA implementation.

5.4.3 Community Monitoring Program

As discussed in Section 3.3, the MT for groundwater levels is based on the depths of domestic wells. The dataset used for this assessment is limited and likely includes wells no longer in use or poorly maintained. To resolve this data gap, the ~~GSAs~~GSA will conduct surveys of domestic wells within the Wyandotte Creek Subbasin to assess if the wells are still active and well construction details. As domestic well construction information may be limited, selected wells may be video logged to obtain additional information.

The ~~GSAs~~GSA will also maintain a record of verifiable domestic wells that go dry during the implementation period that will include depth of these wells, screen intervals, and available maintenance records. These data will be used to modify the MT over the implementation period, as appropriate. New groundwater level monitoring sites will be added to the community monitoring program pending stakeholder interest and funding.

5.4.4 Interconnected Surface Water/Associated Impacts on Groundwater Dependent Ecosystems

As presented Section 4.10, ~~the lack of sufficient~~there is limited data to analyze interaction of streams and pumping within the primary aquifer system. Additional wells and other monitoring networks ~~will be~~have been installed and may be expanded, as appropriate, and data is being collected at newly installed monitoring sites. The GSA may re-evaluate ISW/ GDE following the framework discussed in Section 3.8.

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5.5 Adaptive Management Strategies

The Wyandotte Creek GSA will be requesting annual reports from the project proponents to evaluate progress on implementation. If the projects are not progressing or if monitoring efforts demonstrate that those projects are not achieving their targets, the GSA will evaluate the need for additional or modified projects and ~~to~~ begin implementation of management actions.

5.6 Potential Available Funding Mechanisms

As listed above in the individual project descriptions, several funding mechanisms have been identified to help with the planning and implementation of the GSP projects. The following is an abbreviated list of some of the funding mechanisms proposed:

Project Type	Funding Type	Program	Dates
IRWM (projects included in an adopted IRWMP)	Implementation grant	~~Proposition 1, Water Quality, Supply, and Infrastructure Improvement Act of 2014~~TBD	~~Round 2 solicitation~~Proposition 4 funds expected ~~in late 2021~~2027
Recharge Projects	Planning, design, and construction grants	~~Proposition 68, California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access for All Act of 2018~~TBD	~~Round 2 solicitation to be released early 2022~~Proposition 4 funds expected 2027
Wastewater Treatment for URC Projects	Planning and construction grants	Small Community Grant Fund	Applications accepted continuously
Public Water Systems Improvement	Planning and construction grants	Drinking water grants	Applications accepted continuously
Land Conservation	USDA Farm Service Agency	Conservation Reserve Program	Applications accepted continuously

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6. PLAN IMPLEMENTATION

The SGMA requires the GSA to partner with groundwater users to develop and implement GSPs to achieve groundwater sustainability. SGMA requires the Wyandotte Creek Subbasin to be sustainable by 2042. The GSP includes provisions to evaluate current conditions in the Wyandotte Creek Subbasin (Section 2), establish the SMC (Section 3), gather and analyze groundwater data (Section 4), and report findings. The provisions in the GSP will be evaluated every 5 years and updated as necessary. The Wyandotte Creek Subbasin GSA is required to submit the amended GSP to DWR by January 31, ~~2022~~20277. DWR will evaluate the GSP within 24 months of submittal. Upon submittal of this GSP to DWR, GSP implementation will begin in the Wyandotte Creek Subbasin. The GSA will continue their efforts with public engagement and to secure funding to monitor and manage groundwater resources. This section presents the manner in which the GSA will execute the GSP consistent with the requirements in CCR Title 23 § 354.6(e).

The GSP includes provisions for:

- Gathering data at RMS locations
- Evaluation of SMC
- Report of findings and analysis
- PMAs

Each of these will require funding and schedule coordination to help achieve Wyandotte Creek Subbasin sustainability goals. The following sections describe the funding mechanisms and timetable for the GSP implementation.

6.1 Estimate of Groundwater Sustainability Plan Implementation Costs

Where feasible, the GSA will use existing funding and/or programs for use in the GSP implementation. The GSA, member agencies, and water purveyors will coordinate to implement the actions outlined in this GSP. The GSA will fund the implementation of the GSP where other sources are not available. The cost of implementation of the GSP by activity is presented below.

6.1.1 Administrative Costs

These include the cost of annually operating the GSA, including staff expenses, audit, outreach, legal and other administrative costs. This does not include agency specific project implementation costs. Costs are estimated to be in the range of approximately $100,000 to $300,000 annually~~.~~, as shown in Table 6-1.

Table 6-1: Estimated Administrative Costs

GSP Implementation	Estimated Annual Costs
Public Outreach	$15,000
Staff	$100,00
Legal	$20,000
Total Estimate	$135,000

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6.1.2 Monitoring

Monitoring for compliance with SGMA regulations will include periodic (e.g., biannual / monthly) collection of groundwater levels ~~at 9~~ RMS ~~locations~~wells and annual collection of groundwater quality ~~at 8 RMS locations.~~measurements. The GSA will maintain sites including all continuous measurement equipment at groundwater level sites and stream gages as conditions dictate and funding allows. The GSA will assess the value and need for added monitoring data annually and adjust their monitoring plan as needed. Monitoring activity costs will include labor (field data collection, surveying, laboratory analysis, data quality control / assurance, and project management) and equipment (vehicles, meters, pumps, field tools/supplies~~).~~), as shown in Table 6-2.

Table 6-2: Monitoring Activities and Estimated Cost

Monitoring Activity	Frequency	Estimated Annual Cost
Groundwater Levels (minimum required)	Biannual, 2 events	$~~1530~~,000
Groundwater Quality (minimum required)	Annual, 1 event	$6,000
Groundwater Levels & Stream Gages (as conditions dictate and funding allows)	Continuous sensors / telemetry	Up to $61,500

Some ~~RMS~~monitoring locations include wells that are monitored and funded under other existing programs.

6.1.3 Data Analysis

The data gathered from the monitoring will be analyzed to assess trends for determination of undesirable results. Analysis of the data may lead to modifications in the RMS network, the HCM, and the priority of PMAs. Data gaps that arise from analysis may require installation of new RMS locations. The estimated cost for data analysis activities is shown in Table 6-3.

Table 6-3: Data Analysis Activities and Estimated Cost

Data Analysis Activity	Frequency	Estimated Annual Cost
DMS	Annual	$5,000
Review of Groundwater Data	Annual	$5,000

6.1.4 Reporting and Evaluation

Annual reports are required after GSP adoption to provide updates to general GSP information, basin conditions, and plan implementation progress. Section 6.5 discusses the annual reporting plan in more detail. GSA are required to conduct an evaluation of the GSP and prepare a report every 5 years or whenever the GSP is amended. Section 6.6 discusses the evaluation report in more detail. The estimated cost for reporting and evaluation activities is shown in Table 6-4.

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Table 6-4: Reporting and Evaluation Activities and Estimated Cost

Reporting Activity	Frequency	Estimated Cost
Annual Report	Annual	$30,000
5-year Evaluation Report	5 Years	$100,000

6.1.5 Data Collection

A discussion of the data needed to improve groundwater management and address data gaps is presented in Section 5 and the estimated costs are presented in Table 6-5 below.

Table 6-5: Estimated Costs for Implementing Data Improvements to ~~address~~Address Data Gaps

Data Collection	Estimated Costs
Contour Mapping	$15,000 - $40,000
Interconnected Surface Water/GDEs	$100,000 - $200,000
Butte Basin Model Update 1	$25,000 - $75,000
Butte Basin Model Update 2	$25,000 - $75.,000

6.1.6 Project and Management Actions

The PMAs and anticipated costs are presented in Section 5. The PMAs with a planned initiation date in or before ~~2027~~204242 are presented in Table 6-6 below.

Table 6-6: Estimated Project Costs

Project Name	Capital Costs	Expected Groundwater Demand Reduction (AFY)
TWSD Water Treatment Plant Capacity Upgrade	$1.5 -$3M	500+
Palermo Clean Water Improvement Project	$12.4M	500+
Flood MAR	TBD	500+
Intra-Basin Water Transfer	TBD	Up to 4,000
Agricultural Surface Water Supplies	TBD	Up to 4,000
Residential Water Conservation	TBD	100 - 200
Agricultural Irrigation Efficiency	TBD	~~Up to 4,000~~TBD
~~Flood MAR~~	~~TBD~~	~~1000 - 3000~~
Oroville Wildlife Area Robinson's Riffle Project	$1.7M	TBD
Streamflow Augmentation	TBD	1,000 – 5,000
~~TWSD Water Treatment Plant Capacity Upgrade~~	~~$1.5 -$3M~~	~~500+~~
Water Loss Monitoring	$800,000	TBD

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~~Palermo Clean Water Improvement Project~~	~~TBD~~	~~TBD~~
~~Intra-Basin Water Transfer~~	~~TBD~~	~~3,000 – 5,000~~
~~Agricultural Surface Water Supplies~~		~~2,000 – 3,000~~
Well Upgrades	TBD	TBD
Fuel Management for Watershed Health	TBD	TBD
Removal of Invasive Species	TBD	TBD

6.2 Identify Funding Alternatives

The GSA will seek to capitalize on existing funding and programs that overlap with GSP requirements. For example, Butte County, DWR and other entities currently fund groundwater data collection programs at locations within the Wyandotte Creek Subbasin. The ~~GSAs~~GSA will ensure that the existing programs meet the technical requirements of the monitoring and reporting as outlined in the GSP.

In cases where no funding or programs are established, the GSA ~~will be~~is responsible for securing funding for the GSP implementation. In 2023, the GSA successfully passed a Proposition 218 process to assess landowners based on three user classes: non-irrigated, irrigated with surface water, and irrigated with groundwater. These fees fund administrative, legal, and SGMA-compliance costs. The GSA will ~~coordinate~~consider alternative funding ~~with their respective~~structures based on feedback from constituent members ~~within the Wyandotte Creek Subbasin. GSAs will fund the GSP through a cost-sharing collaboration to be determined after adoption of GSP.~~as needed.

Funding is anticipated to be met from one or a combination of the following sources: direct contributions from the GSA constituent members, State and Federal grant funding, and taxes or assessments levied on landowners and groundwater users in accordance with local and State law.

~~The GSAs are evaluating a variety of funding mechanisms including Proposition 218 or Proposition 26~~The GSA successfully applied for funding through the DWR's Sustainable Groundwater Management (SGM) Grant Program to support ongoing operational costs and to fund agency operations. These costs include retaining consulting firms and legal counsel to provide oversight and assist with SGMA compliance. Expenses consist of administrative support, GSP development, and GSP implementation. The GSA will continue to apply for grant funding to support GSP implementation.

6.3 Schedule for Implementation

The monitoring, data analysis and reporting will begin upon submittal of the GSP by DWR. The PMAs listed in Table 6-~~4~~6 are scheduled to be completed by ~~2027~~204242 or earlier. Each of the PMAs will be completed by priority as funding and resources become available. An implementation schedule is shown in Figure 6-1.

6.4 Data Management Systems

In development of this GSP, the GSA developed a groundwater model that was calibrated to estimate future scenarios. The DMS plans to build on existing data inputs in the groundwater model and develop a more formalized approach to collecting and capturing data. As stated in Section 4, Monitoring Network, future data will be gathered to develop annual reports as well as

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provide necessary information for future and ongoing update to the groundwater models at five-year intervals upon GSP implementation. The DMS that will be used is a geographical relational database that will include information on water levels, land elevation measurements, and water quality testing. The DMS will allow the GSA to store the necessary information for annual reporting.

The DMS will be on local servers and data will be transmitted annually to form a single repository for data analysis for the Wyandotte Creek Subbasin's groundwater, as well as to allow for preparation of annual reports. GSA representatives have access to data and will be able to ask for a copy of the regional DMS. The DMS currently includes the necessary elements required by the regulations, including:

- Well location and construction information for the representative monitoring points (where available)
- Water level readings and hydrographs including water year type
- Land based measurements
- Water quality testing results
- Estimate of groundwater storage change, including map and tables of estimation
- Graph with Water Year type, Groundwater Use, Annual Cumulative Storage Change

Reporting generated from data from the ~~GSAs~~GSA will include but is not limited to:

- Seasonal groundwater elevation contours
- Estimated groundwater extraction by category
- Total water uses by source

Additional items may be added to the DMS in the future as required. Data will be entered into the DMS by each GSA. The majority of the data will then be aggregated to the entity that is responsible for the regional DMS and summarized for reporting to DWR. Groundwater contours will be prepared outside of the DMS because of the need to evaluate the integrity of the data collected and generate a static contour set that has been reviewed and will not change once approved. Groundwater storage calculations will be calculated in accordance with the method described in Section 2, outside of the DMS. Results are uploaded to the DMS for annual reporting and trend monitoring. Since most of the pumping in the Wyandotte Creek Subbasin is not currently measured, the groundwater pumping estimates are also calculated outside of the DMS using the methods developed by GSA and uploaded to the DMS for annual reporting and trend analysis. The GSA may choose to have their own separate system for additional analysis.

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The one-time cost of expanding the existing data systems is estimated between $50,000 to $200,000 as the system is still being evaluated. The Board has indicated a desire to make the data transparent and available to the public while respecting the privacy of individual landowners.

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6.5 Annual Reporting

Annual reports will be submitted by April 1 for the prior year's activities. The report will include a general update in the form of an executive summary with accompanying map of the Wyandotte

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Creek Subbasin. The body of the report will include a detailed discussion and graphical representation of the following:

- Groundwater elevation data, including contour maps at seasonal high and low conditions and hydrographs using water year type and historical data from at least 2015.
- Groundwater extraction data divided into volume by water usage sectors with accompanying map, including a description of the methodology and accuracy of the groundwater extraction estimation.
- Surface water volume used or available for use for groundwater recharge or ~~in-lieu~~water supply/conjunctive use, including a description of the water sources.
- Total water volume use divided into water use sector and water source type, including a description of the methodology and accuracy of the water use estimation.
- Changes in groundwater storage with accompanying map, including a graph with water year type, groundwater use, annual change in groundwater storage, and cumulative change in groundwater storage using historical data from at least 2015.

The annual report will also include a discussion and update on the plan implementation including the status of IM and the execution of PMAs.

6.6 Periodic Evaluation Report

The ~~GSAs~~GSA will evaluate the GSP and provide ~~an evaluation~~ a Periodic Evaluation report every 5 years or whenever the GSP is amended for submittal to DWR~~.~~

~~The assessment will include a detailed discussion of the following:~~

- ~~Significant new information~~, as required by SGMA, and ~~whether the information warrants changes to the basin setting, MOs, MTs, and SIs, including completed or planned GSP amendments.~~in consideration of DWR guidance.
  - ~~Current groundwater conditions relating to each MO, MT and IM.~~
  - ~~Implementation of any project and management actions and the resulting effects on groundwater conditions.~~
  - ~~Assessment of the basin setting, MAs, undesirable results, MOs and MTs.~~
  - ~~Evaluation of the basin setting and overdraft conditions to include changes in water use, along with overdraft mitigation measures (if applicable).~~
  - ~~Assessment of the monitoring network with analysis of data collected to date, including identification of data gaps and suggested improvements of the network.~~
  - ~~Program to address data gaps, including timing and incorporation of data into the GSP, with prioritization on the installation of new data collection sites and analysis of new data based on the needs of the basin.~~
  - ~~Relevant actions taken by the GSAs including a summary of regulations, ordinances, legal enforcement or action related to the implementation of the GSP and sustainability goals.~~

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~~Summary of coordination by GSAs within the basin or within hydrogeologically connected basins and land use agencies.~~

6.7 ~~Interbasin~~Inter-basin Coordination

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Wyandotte Creek GSA intends to coordinate in the following ways with its neighboring subbasins and with subbasins in the Feather River Corridor (Wyandotte Creek, Butte, North Yuba, Sutter Subbasins):

1. Information Sharing

Wyandotte Creek Subbasin will work with GSA staff of Butte and North Yuba subbasins to identify lines of communication and methods for information sharing between subbasins and GSA Boards. This will continue throughout GSP implementation and may include:

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1. Inform each other on changing conditions (i.e., surface water cutbacks, land use changes, policy changes that inform groundwater management)
2. Share annual reports and interim progress reports
3. Share data and technical information and work towards building shared data across and/or along basin boundaries (e.g., monitoring data, water budgets, modeling inputs and outputs, and GDEs)

2. Conduct Joint Analysis and Evaluation of GSPs

Wyandotte Creek Subbasin ~~intends to pursue~~pursued grant funding and collaboratively ~~work~~worked with subbasins in the Feather River Corridor group to:

1. Contract with a consultant to conduct this work
2. Evaluate and compare contents of GSPs with a focus on establishing a common understanding of basin conditions at boundaries
3. Identify significant differences, uncertainties, and potential issues of concern related to groundwater interaction at the boundaries
4. Engage in analysis and evaluation of SMC between GSPs to assess impacts and identify significant differences and possible impacts between subbasins that could potentially lead to undesirable results

This work was completed in 2026.

3. Coordinate on mutually beneficial activities

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Wyandotte Creek GSA will work collaboratively with Feather River Corridor subbasins to identify items in our GSPs that are ripe for a coordinated project and pursuit of funding such as Projects and Management Actions, Data Gaps (new monitoring wells, stream gaging etc.)

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1. Wyandotte Creek will pursue grant funding to support a consultant to conduct this work
2. Wyandotte Creek will work collaboratively with the Northern California Water Association (NCWA) and others in their efforts to pursue funding and support local and state agency activities to identify and fill regional data gaps

4. Coordinated Communication and Outreach

Wyandotte Creek GSA staff will continue to participate in regional public engagement activities and efforts related to implementation of SGMA in the Northern Sacramento Valley. This may include:

1. Coordinate and collaborate on regional-scale public engagement and communication strategies that promote awareness on groundwater sustainability, enhance public trust, and maintain institutional knowledge
2. Maintain list of GSP/subbasin staff contacts and websites

5. Issue Resolution Process

Wyandotte Creek Subbasin will pursue development of an issue-resolution process with neighboring subbasins in the Feather River Corridor group.

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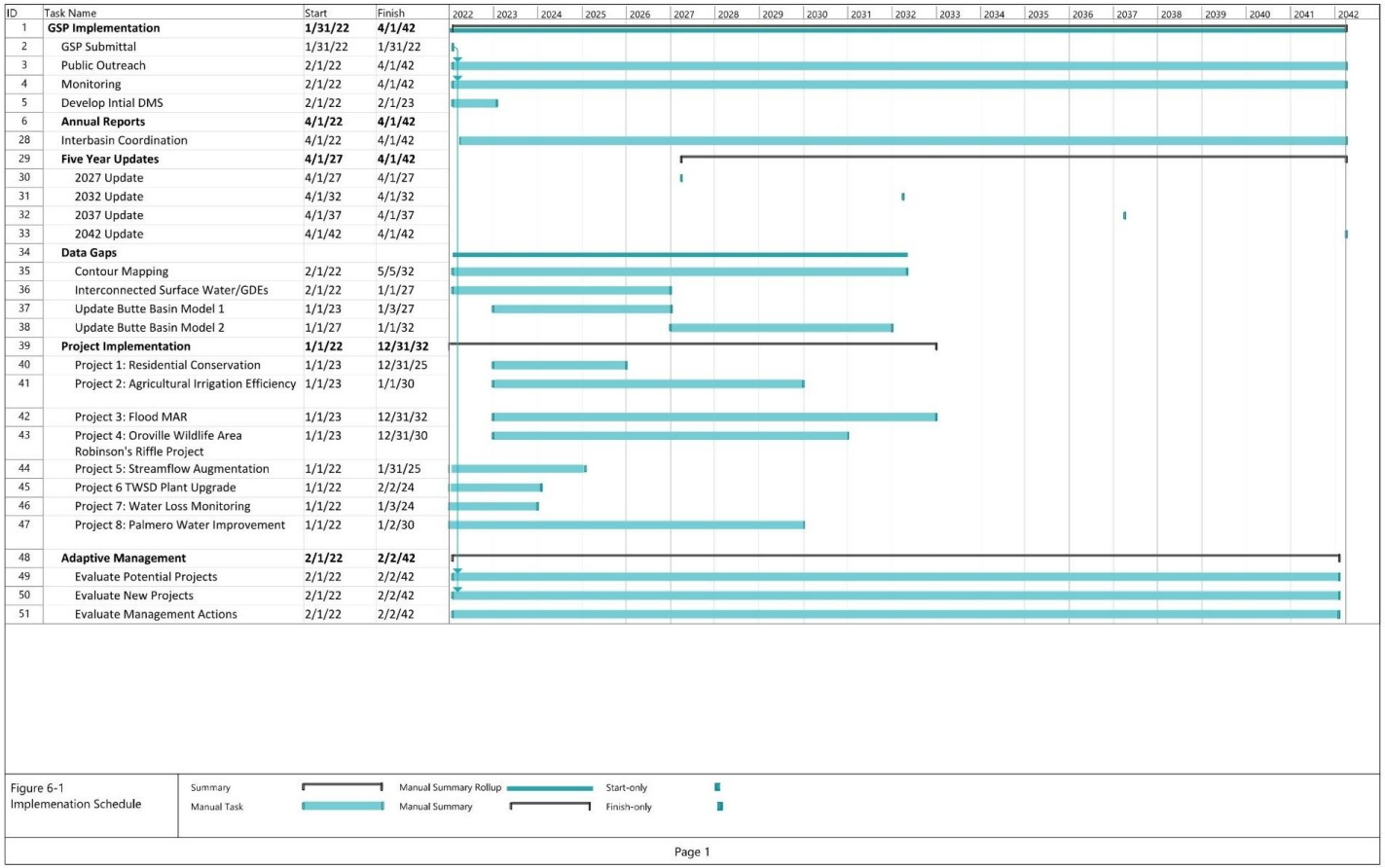

Figure 6-1 ~~placeholder page~~: Implementation Schedule

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APPENDIX 1-A
Preparation Checklist for Groundwater Sustainability Plan Submittal

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 3. Technical and Reporting Standards				
352.2		Monitoring Protocols	• Monitoring protocols adopted by the GSA for data collection and management • Monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin	4.7 4.7.1 4.7.2
Article 5. Plan Contents, Subarticle 1. Administrative Information				
354.4		General Information	• Executive Summary • List of references and technical studies	ES 7
354.6		Agency Information	• GSA mailing address • Organization and management structure • Contact information of Plan Manager • Legal authority of GSA • Estimate of implementation costs	1.1.3 1.1.4 1.1.4.1 1.1.4.2 6.1
354.8(a)	10727.2(a)(4)	Map(s)	• Area covered by GSP • Adjudicated areas, other agencies within the basin, and areas covered by an Alternative • Jurisdictional boundaries of federal or State land • Existing land use designations • Density of wells per square mile	1.1.4 1.2.1
354.8(b)		Description of the Plan Area	• Summary of jurisdictional areas and other features	1.2.1
354.8(c) 354.8(d) 354.8(e)	10727.2(g)	Water Resource Monitoring and Management Programs	• Description of water resources monitoring and management programs • Description of how the monitoring networks of those plans will be incorporated into the GSP • Description of how those plans may limit operational flexibility in the basin • Description of conjunctive use programs	1.3 1.4 1.3.5

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
354.8(f)	10727.2(g)	Land Use Elements or Topic Categories of Applicable General Plan	• Summary of general plans and other land use plans • Description of how implementation of the GSP may change water demands or affect achievement of sustainability and how the GSP addresses those effects • Description of how implementation of the GSP may affect the water supply assumptions of relevant land use plans • Summary of the process for permitting new or replacement wells in the basin • Information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management	1.3.1 1.3.2 1.3.3 1.3.4 1.3.5 1.3.6
354.8(g)	10727.4	Additional GSP Contents	**Description of Actions related to:** • Control of saline water intrusion • Wellhead protection • Migration of contaminated groundwater • Well abandonment and well destruction program • Replenishment of groundwater extractions • Conjunctive use and underground storage • Well construction policies • Addressing groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects • Efficient water management practices • Relationships with State and federal regulatory agencies • Review of land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity • Impacts on groundwater dependent ecosystems	1.3 1.4 1.5 2.2.7
354.10		Notice and Communication	• Description of beneficial uses and users • List of public meetings • GSP comments and responses • Decision-making process • Public engagement • Encouraging active involvement	1.8.3 1.8.4 1.8.5 1.8.4.1 1.8.4.2 1.8.4.3

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
			• Informing the public on GSP implementation progress	1.8.5
Article 5. Plan Contents, Subarticle 2. Basin Setting				
354.14		Hydrogeologic Conceptual Model	• Description of the Hydrogeologic Conceptual Model • Two scaled cross-sections • Map(s) of physical characteristics: topographic information, surficial geology, soil characteristics, surface water bodies, source and point of delivery for imported water supplies	2.1 2.1.6 2.1.2.1 2.1.2.2 2.1.2.3 2.1.3
354.14(c)(4)	10727.2(a)(5)	Map of Recharge Areas	• Map delineating existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas	2.1.2.4
	10727.2(d)(4)	Recharge Areas	• Description of how recharge areas identified in the plan substantially contribute to the replenishment of the basin	2.1.2.4
354.16	10727.2(a)(1) 10727.2(a)(2)	Current and Historical Groundwater Conditions	• Groundwater elevation data • Estimate of groundwater storage • Seawater intrusion conditions • Groundwater quality issues • Land subsidence conditions • Identification of interconnected surface water systems • Identification of groundwater-dependent ecosystems	2.2.2.1 2.2.2.3 2.2.3 2.2.4 2.2.5 2.2.6 2.2.7
354.18	10727.2(a)(3)	Water Budget Information	• Description of inflows, outflows, and change in storage • Quantification of overdraft • Estimate of sustainable yield • Quantification of current, historical, and projected water budgets	2.3.4 2.3.6 2.3.4.1 2.3.4.2 2.3.4.3
	10727.2(d)(5)	Surface Water Supply	• Description of surface water supply used or available for use for groundwater recharge or in-lieu use	2.3.4

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
354.20		Management Areas	• Reason for creation of each management area • Minimum thresholds and measurable objectives for each management area • Level of monitoring and analysis • Explanation of how management of management areas will not cause undesirable results outside the management area • Description of management areas	1.2.2 3.2.2 3.2.3 3.3.2 3.3.3 3.4.2 3.4.3 3.5.2 3.5.3 3.7.1 3.7.2 3.8.4 3.8.5 4.8 4.9
Article 5. Plan Contents, Subarticle 3. Sustainable Management Criteria				
354.24		Sustainability Goal	• Description of the sustainability goal	3.1
354.26		Undesirable Results	• Description of undesirable results • Cause of groundwater conditions that would lead to undesirable results • Criteria used to define undesirable results for each sustainability indicator • Potential effects of undesirable results on beneficial uses and users of groundwater	3.3.1 3.4.1 3.5.1 3.7.1 3.8.3
354.28	10727.2(d)(1) 10727.2(d)(2)	Minimum Thresholds	• Description of each minimum threshold and how they were established for each sustainability indicator • Relationship for each sustainability indicator • Description of how selection of the minimum threshold may affect beneficial uses and users of groundwater • Standards related to sustainability indicators	3.2.1 3.2.2 3.3.2 3.4.2 3.5.2 3.7.1 3.8.4
			• How each minimum threshold will be quantitatively measured	4.7 4.8 4.9

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
354.30	10727.2(b)(1) 10727.2(b)(2) 10727.2(d)(1) 10727.2(d)(2)	Measurable Objectives	• Description of establishment of the measurable objectives for each sustainability indicator • Description of how a reasonable margin of safety was established for each measurable objective • Description of a reasonable path to achieve and maintain the sustainability goal, including a description of interim milestones	3.2.3 3.3.3 3.4.3 3.5.3 3.7.2 3.8.5
Article 5. Plan Contents, Subarticle 4. Monitoring Networks				
354.34	10727.2(d)(1) 10727.2(d)(2) 10727.2(e) 10727.2(f)	Monitoring Networks	• Description of monitoring network • Description of monitoring network objectives • Description of how the monitoring network is designed to: demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features; estimate the change in annual groundwater in storage; monitor seawater intrusion; determine groundwater quality trends; identify the rate and extent of land subsidence; and calculate depletions of surface water caused by groundwater extractions • Description of how the monitoring network provides adequate coverage of Sustainability Indicators • Density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends • Scientific rational (or reason) for site selection • Consistency with data and reporting standards • Corresponding sustainability indicator, minimum threshold, measurable objective, and interim milestone • Location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used • Description of technical standards, data collection methods, and other procedures or protocols to ensure comparable data and methodologies	4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
354.36		Representative Monitoring	• Description of representative sites • Demonstration of adequacy of using groundwater elevations as proxy for other sustainability indicators • Adequate evidence demonstrating site reflects general conditions in the area	4.9
354.38		Assessment and Improvement of Monitoring Network	• Review and evaluation of the monitoring network • Identification and description of data gaps • Description of steps to fill data gaps • Description of monitoring frequency and density of sites	4.10
Article 5. Plan Contents, Subarticle 5. Projects and Management Actions				
354.44		Projects and Management Actions	• Description of projects and management actions that will help achieve the basin's sustainability goal • Measurable objective that is expected to benefit from each project and management action • Circumstances for implementation • Public noticing • Permitting and regulatory process • Time-table for initiation and completion, and the accrual of expected benefits • Expected benefits and how they will be evaluated • How the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included. • Legal authority required • Estimated costs and plans to meet those costs • Management of groundwater extractions and recharge	5 6
354.44(b)(2)	10727.2(d)(3)		• Overdraft mitigation projects and management actions	5 5.3

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) in the GSP
Article 8. Interagency Agreements				
357.4	10727.6	Coordination Agreements – Shall be submitted to the Department together with the GSPs for the basin and, if approved, shall become part of the GSP for each participating Agency.	**Coordination Agreements shall describe the following:** • A point of contact • Responsibilities of each Agency • Procedures for the timely exchange of information between Agencies • Procedures for resolving conflicts between Agencies • How the Agencies have used the same data and methodologies to coordinate GSPs • How the GSPs implemented together satisfy the requirements of SGMA • Process for submitting all Plans, Plan amendments, supporting information, all monitoring data and other pertinent information, along with annual reports and periodic evaluations • A coordinated data management system for the basin • Coordination agreements shall identify adjudicated areas within the basin, and any local agencies that have adopted an Alternative that has been accepted by the Department	NA

Note:

(a) The California Water Code and regulation sections, GSP requirements, and requirement descriptions listed in this table were taken verbatim from the California Department of Water Resources Guidance Document for the Sustainable Management of Groundwater: Preparation Checklist for GSP Submittal (December 2016).

APPENDIX 1-B
Joint Powers Agreement and Notice of Agreement

AMENDMENT #1
THE WYANDOTTE CREEK GROUNDWATER SUSTAINABILITY AGENCY JOINT EXERCISE OF POWERS AGREEMENT

The JOINT EXERCISE OF POWERS AGREEMENT ("Agreement") establishing the Wyandotte Creek Groundwater Sustainability Agency is amended pursuant to Section 18.3 by replacing Article 7 with the following effective upon the date when the last Member Agency signs this Amendment (Effective Date").

ARTICLE 7. AGENCY DIRECTORS AND OFFICERS

7.1. Formation of the Board of Directors. The Agency shall be governed and administered by a Board of Directors ("Board of Directors" or "Board") which is hereby established and which shall be composed of one (1) voting seat per Member. The governing board shall be known as the "Board of Directors of the Wyandotte Creek Groundwater Sustainability Agency." All voting power shall reside in the Board. The Board shall consist of the following representatives, who shall be appointed in the manner set forth in Section 7:

7.1.1. One (1) representative appointed by each Member's governing body, who shall hold a current position in the Member's governing body and be referred to as a "Member Director."

7.1.2. Two (2) Stakeholder Directors, one of which shall be representative of agricultural stakeholders and interests within the Basin and one of which shall be representative of domestic well user stakeholders and interests within the Basin. The two (2) Stakeholder Directors shall meet the following qualifications:

(a) One (1) Agricultural Stakeholder Director. The Agricultural Stakeholder Director shall meet the following criteria, determined at the sole discretion of the Butte County Board of Supervisors: (1.a) own/ lease real property in active commercial agricultural production overlying the Basin or (1.b) be an employee of a commercial agricultural production operation overlying the Basin involved with water use decisions and (2) the commercial agricultural production operation employing any Stakeholder Director must extract groundwater from the Basin for irrigation/frost protection. The Agricultural Stakeholder may not be a party to any pending litigation against the Agency or any of its Members.

(b) One (1) Non-Agricultural Domestic Well User Stakeholder Director. The Domestic Well User Stakeholder Director shall meet the following criteria, determined at the sole discretion of the Butte County Board of Supervisors: (1.a) own/ lease real residential property that is the stakeholder's primary residence overlying the Basin (2) extract from the Basin for domestic water use. The Domestic Well User Stakeholder may not be a party to any pending litigation against the Agency or any of its Members.

7.2. Duties of the Board of Directors. The business and affairs of the Agency, and all of the powers of the Agency, including without limitation all powers set forth in Article 5, are reserved to and shall be exercised by and through the Board of Directors, except as may be expressly delegated to others pursuant to this Agreement, Bylaws, or by specific action of the Board of Directors.

7.3. Appointment of Directors. The Directors shall be appointed as follows:

7.3.1. Member Directors. Each Member Director must sit on the governing board of the Member agency and be appointed by that governing board by notification, which shall be transmitted to the Chair of the Agency following adoption by the Member.

7.3.2. Stakeholder Directors. The two (2) Stakeholder Directors shall be appointed as follows:

a) Agricultural Stakeholder Director. The Directors shall select the Agricultural Stakeholder Director from a list of qualified nominees submitted to Butte County pursuant to an open application process. The Butte County Board of Supervisors shall consider the nominees at a regular meeting and shall appoint the Agricultural Stakeholder Director.

(b) Domestic Well User Stakeholder Director. The Directors shall confirm the nomination for the Domestic Well User Stakeholder Director from a list of qualified nominees submitted to Butte County pursuant to an open application process specified in the Bylaws. The Butte County Board of Supervisors shall consider the nominees at a regular meeting and shall appoint the Domestic Well User Stakeholder Director .

7.4. Alternate Directors. Each Member shall also appoint one Alternate Director to the Board of Directors, and an Alternate Director shall be appointed for each Stakeholder Director. All Alternate Directors shall be appointed in the same manner as set forth in Section 7.3. Alternate Directors shall have no vote and shall not participate in any discussions or deliberations of the Board unless appearing as a substitute for a Director due to absence or conflict of interest. If the Director is not present, or if the Director has a conflict of interest which precludes participation by the Director in any decision-making process of the Board, the Alternate Director appointed to act in his/her place shall assume all rights of the Director and shall have the authority to act in his/her absence, including casting votes on matters before the Board. Each Alternate Director shall be appointed prior to the third meeting of the Board. Alternate Directors are encouraged to attend all Board meetings and stay informed on current issues before the Board.

7.5. Terms of Office. The term of office for each member of the Agency's Board of Directors is four (4) years and may be reappointed. Each Member Director and Alternate Member Director of the Board of Directors shall serve at the pleasure of the appointing Member's Governing Body and may be removed from the Board of Directors by the appointing Members Governing Body at any time. If at any time a vacancy occurs on the Board of Directors, a replacement shall be appointed to fill the unexpired term of the previous Board Member pursuant to this Article 7 and within ninety (90) days of the date that such position becomes vacant.

7.6. Removal of Board Members. A Board Member that no longer meets the qualifications set forth in section 7.1.1 is automatically removed from the Agency Board of Directors. Upon removal of a Director, the Alternate Director shall serve as a Director until a new Director is appointed. Members must submit any changes in Member Director or Alternate Member Director positions to the Chair in writing and signed by the Member. A Stakeholder

Director may be removed for failure to attend three (3) consecutive meeting or as a result of no longer meeting the qualifications set forth in Article 7 of this Agreement.

7.7. Vacancies. A vacancy on the Board of Directors shall occur when a Director resigns or reaches the end of that Director's term, as set forth in Section 7.5. For Member Directors, a vacancy shall also occur when he or she is removed by his or her appointing Member. For Stakeholder Directors, a vacancy shall also occur when the Stakeholder Director is removed, as set forth in Section 7.6. Upon the vacancy of a Director, the Alternate Director shall serve as Director until a new Director is appointed as set forth in Section 7.4 unless the Alternate Director is already serving as an Alternate Director in the event of a prior vacancy, in which case, the seat shall remain vacant until a replacement Director is appointed as set forth in Section 7.4. Members shall submit any changes in Director or Alternate Director positions to the Chair by written notice signed by an authorized representative of the Member's governing body.

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the date of execution of this Agreement.

County of Butte

By: _____ Date: 3/12/19

Steve Lambert, Chair

Board of Supervisors

City of Oroville

By: _____ Date: 4-2-19

Chuck Reynolds, Mayor

City Council

Thermalito Water and Sewer District

By: _____ Date: 03-18-2019

TREVOR HATLEY

~~Brian Pulley,~~ President

Board of Directors

JOINT EXERCISE OF POWERS AGREEMENT ESTABLISHING THE WYANDOTTE CREEK GROUNDWATER SUSTAINABILITY AGENCY

This JOINT EXERCISE OF POWERS AGREEMENT ("Agreement") establishing the Wyandotte Creek Groundwater Sustainability Agency is made and entered into and effective upon the date when the last Member Agency signs this Agreement ("Effective Date") by and among the public agencies listed on the attached Exhibit A (Members) for the purpose of forming a Groundwater Sustainability Agency ("GSA") and achieving groundwater sustainability in the Wyandotte Creek Groundwater Subbasin ("Basin").

Recitals

WHEREAS, in the fall of 2014, the California legislature adopted, and the Governor signed into law, three bills (SB 1168, AB 1739, and SB 1319) collectively referred to as the "Sustainable Groundwater Management Act" ("SGMA"), that initially became effective on January 1, 2015, and that has been amended from time-to-time thereafter; and

WHEREAS, the stated purpose of SGMA, as set forth in California Water Code section 10720.1, is to provide for the sustainable management of groundwater basins at a local level by providing local groundwater agencies with the authority, and technical and financial assistance necessary, to sustainably manage groundwater; and

WHEREAS, SGMA requires the designation of Groundwater Sustainability Agencies ("GSAs") for the purpose of achieving groundwater sustainability through the adoption and implementation of Groundwater Sustainability Plans ("GSPs") or an alternative plan for all medium and high priority basins as designated by the California Department of Water Resources ("DWR"); and

WHEREAS, Pursuant to Article 6.1 and 6.2 of this agreement, each Member is a local agency, as defined by SGMA (Division 2, Part 2.74 (commencing with §10720), Part 5 (commencing with §4999), Part 5.1 (commencing with §5100) and Part 5.2 (commencing with §5200) of the California Water Code Section *et seq.*; "SGMA"), duly organized and existing under and by virtue of the laws of the State of California, and each Member has water supply, water management or land use responsibilities within the Wyandotte Creek Subbasin, which is designated basin number 5-021.69 in the DWR Bulletin Number 118 (update 2016); and

WHEREAS, Section 10720.7 of SGMA requires all basins designated as high or medium priority basins by the Department of Water Resources ("DWR") in its Bulletin 118 be managed under groundwater sustainability plans or coordinated groundwater sustainability plans pursuant to SGMA; and

WHEREAS, The Members have determined that the sustainable management of the Basin pursuant to SGMA may best be achieved through the cooperation of the Members operating through a joint powers agency; and

WHEREAS, in order to promote efficiency and sharing of resources, the Members, individually and collectively, encourage coordination; and

WHEREAS, the Joint Exercise of Powers Act (Chapter 5 (commencing with Section 6500) of Division 7 of Title 1 of the California Government Code; the "Act"), authorizes two or more public agencies to, by agreement, jointly exercise any power held in common by agencies entering into such an agreement and to exercise additional powers granted under the Act; and

WHEREAS, based on the foregoing legal authority, the Members desire to create a joint powers agency for the purpose of taking all actions deemed necessary by the joint powers agency to ensure sustainable management of the Basin as required by SGMA; and

WHEREAS, the governing board of each Member has determined it to be in the Member's best interest and in the public interest that this Agreement be executed;

NOW THEREFORE, in consideration of the matters recited and the mutual promises, covenant, and conditions set forth in this Agreement, the Members hereby agree as follows:

TERMS OF AGREEMENT

ARTICLE 1. DEFINITIONS

As used in this Agreement, unless context requires otherwise, the meanings of the terms set forth below shall be as follows:

1.1. "Act" means the Joint Exercise of Powers Act, set forth in Chapter 5 of Division 7 of Title 1 of the Government Code, sections 6500, *et seq.*, including all laws supplemental thereto.

1.2. "Agency" means the Wyandotte Creek Groundwater Sustainability Agency.

1.3. "Agreement" means this joint powers agreement, which creates the Wyandotte Creek Groundwater Sustainability Agency.

1.4. "Basin" means the Wyandotte Creek Subbasin, as shown on the map attached to this Agreement as Exhibit B, which is incorporated herein by this reference, as attached hereto and incorporated herein by this reference.

1.5. "Board of Directors" or "Board" means the governing body of the Agency as established by Article 7 of this Agreement.

1.6. "Board Member" or "Director" shall mean a member of the Agency's Board of Directors.

1.7. "Committee" shall mean any committee established pursuant to Article 11 of this Agreement.

1.8. "Effective Date" means the date on which the last Member executes this Agreement.

1.9. "Fiscal Year" means July 1 through June 30.

1.10. "GSA" shall mean a groundwater sustainability agency.

1.11. "GSP" shall mean a groundwater sustainability plan.

1.12. "Management Area" refers to an area within a basin for which a GSP may identify different minimum thresholds, measurable objectives, monitoring, and projects and actions based on unique local conditions. The GSP must describe each Management Area, including rationale for approach and demonstrate it can be managed without causing undesirable results out of the Area.

1.13. "Member" has the meaning assigned to it in the Preamble and further means each party to this Agreement that satisfies the requirements of section 6.1 of this Agreement, including any new members as may be authorized by the Board pursuant to Section 6.2 of this Agreement.

1.14. "Member Director" means a director or alternate director appointed by a Member pursuant to Article 7 of this Agreement.

1.15. "Member's Governing Body" means the board of directors or other voting body that controls the individual public agencies that are Members.

1.16. "SGMA" has the meaning assigned to it in the first Recital of the Agreement.

1.17. "Special Project" means a project undertaken by some, but not all Members of the Agency, pursuant to Article 14 of this Agreement.

1.18. "Stakeholder Director" means a Director appointed pursuant to Article 7 that represents stakeholder interests.

1.19. "State" means the State of California.

1.20. "DWR" means the California Department of Water Resources.

ARTICLE 2. THE AGENCY

2.1. Upon the effective date of this Agreement, Wyandotte Creek Groundwater Sustainability Agency ("Agency") is hereby created. Pursuant to the provisions of the Act, the Agency shall be a public agency separate from its Members.

2.2. The boundaries of the Agency shall be as shown on the map on Exhibit B, which is attached to this Agreement and incorporated herein by this reference. The boundary will reflect the most recent Bulletin 118 boundaries as they become available.

ARTICLE 3. PURPOSE OF THE AGENCY

3.1. The purpose of this Agreement is to create a joint powers agency (Agency) separate from its Members that elects to be the GSA for the entire Basin. The purpose of the Agency is to (a) develop, adopt, and implement a GSP for the Basin in order to implement

SGMA requirements and achieve the sustainability goals outlined in SGMA; and (b) involve the public and area stakeholders through outreach and engagement in developing and implementing the Wyandotte Creek Subbasin GSP.

ARTICLE 4. TERM

4.1. This Agreement shall become effective upon execution by each of the Parties and shall continue in full force and effect until terminated pursuant to the provisions of Article 17.

4.2. By execution hereof, each Member certifies and declares that it is a legal entity that is authorized to be a party to a joint exercise of powers agreement and to contract with each other for the joint exercise of a common power under Article 1, Chapter 5, Division 7, Title 1 of the Government Code, commencing with section 6500 or other applicable law including but not limited to California Water Code § 10720.3(c).

ARTICLE 5. POWERS OF THE AGENCY

5.1 Powers. The Agency shall possess the ability to exercise those powers specifically granted by the Act and SGMA. Additionally, the Agency shall possess the ability to exercise the common powers of its Members related to the purposes of the Agency, including, but not limited to, the following:

5.1.1 To designate itself as the exclusive GSA for the Basin pursuant to SGMA.

5.1.2 To develop, adopt and implement a GSP for the Basin pursuant to SGMA.

5.1.3 To adopt rules, regulations, policies, bylaws and procedures governing the operation of the Agency and adoption and implementation of a GSP for the Basin.

5.1.4 To adopt ordinances within the Basin consistent with the purpose of the Agency as necessary to implement the GSP and otherwise meeting the requirements of the SGMA.

5.1.6 To obtain legal, financial, accounting, technical, engineering, and other services needed to carry out the purposes of this Agreement.

5.1.7 To perform periodic reviews of the GSP including submittal of annual reports.

5.1.8 To require the registration and monitoring of wells within the Basin.

5.1.9 To issue revenue bonds or other appropriate public or private debt and incur debts, liabilities or obligations.

5.1.10 To exercise the powers permitted under Government Code section 6504 or any successor statute.

5.1.11 To levy taxes, assessments, charges and fees as provided in SGMA or otherwise provided by law.

5.1.12 To regulate and monitor groundwater extractions within the Basin as permitted by SGMA, provided that this Agreement does not extend to a Member's operation of its systems to distribute water once extracted or otherwise obtained, unless and to the extent required by other laws now in existence or as may otherwise be adopted.

5.1.13 To establish and administer projects and programs for the benefit of the Basin.

5.1.14 To cooperate, act in conjunction and contract with the United States, the State of California, or any agency thereof, counties, municipalities, special districts, GSAs, public and private corporations of any kind (including without limitation, PUC regulated utilities and mutual water companies), and individuals, or any of them, for any and all purposes necessary or convenient for the full exercise of powers of the Agency.

5.1.15 To accumulate operating and reserve funds and invest the same as allowed by law for the purposes of the Agency and to invest funds pursuant to California Government Code section 6509.5 or other applicable State Law.

5.1.16 To apply for and accept grants, contributions, donations and loans under any federal, state or local programs for assistance in development or implementing any of its projects or programs for the purposes of the Agency.

5.1.17 To acquire by negotiation, lease, purchase, construct, hold, manage, maintain, operate and dispose of any buildings, property, water rights, works or improvements within and without the respective boundaries of the Members necessary to accomplish the purposes described herein.

5.1.18 To sue and be sued in the Agency's own name.

5.1.19 To exercise the common powers of its Members to develop, collect, provide and disseminate information that furthers the purposes of the Agency, including but not limited to the operation of the Agency and adoption and implementation of a Groundwater Sustainability Plan for the Basin, to the Members' legislative, administrative, and judicial bodies, as well as the public generally.

5.1.20 To perform all other acts necessary or proper to carry out fully the purposes of this Agreement.

5.2 Preservation of Powers. The Agency and all of its Members confirm that nothing contained herein shall grant the Agency any power to:

5.2.1 Alter any water right, contract right, or any similar right held by its Members, or amend a Member's water delivery practice, course of dealing, or conduct without the express consent of the holder thereof.

5.2.2 Limit or interfere with the respective Members' rights and authorities over their own internal matters, including, but not limited to, a GSA's legal rights to surface water supplies and assets, groundwater supplies and assets, facilities, operations, water management and water supply matters.

5.2.3 Modify or limit a Member's police powers, land use authorities, well permitting or any other authority.

5.3 Coordination between Basins. In order to maintain consistency and the efficient use of resources, to the extent feasible, the Agency shall strive to coordinate between and among the other adjoining subbasins for administration, matters involving public communication and outreach, and for developing frameworks to support groundwater management, which may include agreement to certain areas of coordination, provided that the Agency retain its own authority and that such recommendations are ratified by the Board. The Agency may clarify and acknowledge coordination among the other GSAs through a document or agreement if deemed appropriate.

ARTICLE 6. MEMBERSHIP

6.1. Initial Members. The initial Members of the Agency shall be the County of Butte, City of Oroville, and Thermalito Water and Sewer District.

6.2. New Members. Additional Parties may join the Agency and become a Member provided that the prospective new member: (a) is eligible to join a GSA as provided by SGMA (Water Code §10723), (b) possesses powers common to all other Members, (c) pays all previously incurred costs, if any, (e) pays all applicable fees and charges, if any, and (f) receives unanimous consent of the existing Members, evidenced by the execution of a written amendment to this Agreement signed by all Members, including the additional public agency.

ARTICLE 7. AGENCY DIRECTORS AND OFFICERS

7.1. Formation of the Board of Directors. The Agency shall be governed and administered by a Board of Directors ("Board of Directors" or "Board") which is hereby established and which shall be composed of one (1) voting seat per Member. The governing board shall be known as the "Board of Directors of the Wyandotte Creek Groundwater Sustainability Agency." All voting power shall reside in the Board. The Board shall consist of the following representatives, who shall be appointed in the manner set forth in Section 7:

7.1.1. One (1) representative appointed by each Member's governing body, who shall hold a current position in the Member's governing body and be referred to as a "Member Director."

7.1.2. Two (2) Stakeholder Directors, one of which shall be representative of agricultural stakeholders and interests within the Basin and one of which shall be representative of domestic well user stakeholders and interests within the Basin. The two (2) Stakeholder Directors shall meet the following qualifications:

(a) One (1) Agricultural Stakeholder Director. The Agricultural Stakeholder Director shall meet the following criteria, determined at the sole discretion of the Board Members: (1.a) own/ lease real property in active commercial agricultural production overlying the Basin or (1.b) be an employee of a commercial agricultural production operation overlying the Basin involved with water use decisions and (2) the commercial agricultural production operation employing any Stakeholder Director must extract groundwater from the Basin for irrigation/frost protection. The Agricultural Stakeholder may not be a party to any pending litigation against the Agency or any of its Members.

(b) One (1) Non-Agricultural Domestic Well User Stakeholder Director. The Domestic Well User Stakeholder Director shall meet the following criteria, determined at the sole discretion of the Board Members: (1.a) own/ lease real residential property that is the stakeholder's primary residence overlying the Basin (2) extract from the Basin for domestic water use. The Domestic Well User Stakeholder may not be a party to any pending litigation against the Agency or any of its Members.

7.2. Duties of the Board of Directors. The business and affairs of the Agency, and all of the powers of the Agency, including without limitation all powers set forth in Article 5, are reserved to and shall be exercised by and through the Board of Directors, except as may be expressly delegated to others pursuant to this Agreement, Bylaws, or by specific action of the Board of Directors.

7.3. Appointment of Directors. The Directors shall be appointed as follows:

7.3.1. Member Directors. Each Member Director must sit on the governing board of the Member agency and be appointed by that governing board by notification, which shall be transmitted to the Chair of the Agency following adoption by the Member.

7.3.2. Stakeholder Directors. The two (2) Stakeholder Directors shall be appointed as follows:

(a) Agricultural Stakeholder Director. The Directors shall select the Agricultural Stakeholder Director from a list of qualified nominees submitted to the Directors pursuant to an open application process specified in the Bylaws. The Directors shall consider the nominees at a regular meeting and shall appoint the Agricultural Stakeholder Director upon unanimous vote of all Directors.

(b) Domestic Well User Stakeholder Director. The Directors shall confirm the nomination for the Domestic Well User Stakeholder Director from a list of qualified nominees submitted to the Directors pursuant to an open application process specified in the Bylaws. The Directors shall consider the nominees at a regular meeting and shall appoint the Domestic Well User Stakeholder Director upon unanimous vote of all Directors.

7.4. Alternate Directors. Each Member shall also appoint one Alternate Director to the Board of Directors, and an Alternate Director shall be appointed for each Stakeholder Director. All Alternate Directors shall be appointed in the same manner as set forth in Section 7.3. Alternate Directors shall have no vote and shall not participate in any discussions or deliberations of the Board unless appearing as a substitute for a Director due to absence or conflict of interest. If the Director is not present, or if the Director has a conflict of interest which precludes participation by the Director in any decision-making process of the Board, the Alternate Director appointed to act in his/her place shall assume all rights of the Director and shall have the authority to act in his/her absence, including casting votes on matters before the Board. Each Alternate Director shall be appointed prior to the third meeting of the Board. Alternate Directors are encouraged to attend all Board meetings and stay informed on current issues before the Board.

7.5. Terms of Office. The term of office for each member of the Agency's Board of Directors is four (4) years and may be reappointed. Each Member Director and Alternate Member Director of the Board of Directors shall serve at the pleasure of the appointing Member's Governing Body and may be removed from the Board of Directors by the appointing Members Governing Body at any time. If at any time a vacancy occurs on the Board of Directors, a replacement shall be appointed to fill the unexpired term of the previous Board Member pursuant to this Article 7 and within ninety (90) days of the date that such position becomes vacant.

7.6. Removal of Board Members. A Board Member that no longer meets the qualifications set forth in section 7.1.1 is automatically removed from the Agency Board of Directors. Upon removal of a Director, the Alternate Director shall serve as a Director until a new Director is appointed. Members must submit any changes in Member Director or Alternate Member Director positions to the Chair in writing and signed by the Member. A Stakeholder Director may be removed for failure to attend three (3) consecutive meeting or as a result of no longer meeting the qualifications set forth in Article 7 of this Agreement.

7.7. Vacancies. A vacancy on the Board of Directors shall occur when a Director resigns or reaches the end of that Director's term, as set forth in Section 7.5. For Member Directors, a vacancy shall also occur when he or she is removed by his or her appointing Member. For Stakeholder Directors, a vacancy shall also occur when the Stakeholder Director is removed, as set forth in Section 7.6. Upon the vacancy of a Director, the Alternate Director shall serve as Director until a new Director is appointed as set forth in Section 7.4 unless the Alternate Director is already serving as an Alternate Director in the event of a prior vacancy, in which case, the seat shall remain vacant until a replacement Director is appointed as set forth in Section 7.4. Members shall submit any changes in Director or Alternate Director positions to the Chair by written notice signed by an authorized representative of the Member's governing body.

ARTICLE 8. AGENCY MEETINGS

8.1. Initial Meeting. The initial meeting of the Agency's Board of Directors shall be called by the County of Butte and held in the Board of Supervisor Chambers 25 County Center Drive, Oroville CA 95965, within 60 days of the effective date of this Agreement.

8.2. Time and Place. The Board of Directors shall provide in its adopted bylaws or by other means authorized or required by law for the time and place for holding regular meetings, at least annually, and at such other times as determined by the Board of Directors.

8.3. Conduct. All meetings of the Board shall be noticed, held, and conducted in accordance with the Ralph. M. Brown Act to the extent applicable. Board Members and Alternate Board Members may use teleconferencing in connection with any meeting in conformance with and to the extent authorized by the applicable laws.

ARTICLE 9. BOARD OF DIRECTORS VOTING

9.1. Quorum. A majority of the members of the Board of Directors shall constitute a quorum for purposes of transacting business.

9.2. Director Votes. Each member of the Board of Directors of the Agency shall have one (1) vote. With the exception of items in section 9.3 below, an affirmative vote by a majority of all Board Members is required to approve any item. The Board of Directors shall strive for consensus of all members on items.

9.3. Supermajority Voting Requirement. A supermajority vote requires an affirmative vote of four (4) or more Directors. Items that require a supermajority vote to pass consist of the following, which may be amended from time to time by the Board by a supermajority, or as may otherwise be required by this Agreement or by law:

1. Bylaws adoption, modification or alteration
2. GSP adoption, modification or alteration
3. Adoption of assessment, charges and fees
4. Adoption of regulations and ordinances
5. Adoption or modification of annual budget, including capital projects
6. Property acquisition (excepting rights of way)
7. Appointment of Treasurer, Administrator, Plan Manager or General Counsel subject to the provisions in Article 12.
8. Modifications to the composition, selection, and number or removal of Advisory Committee Members
9. Approval and/or amendments to the Advisory Committee Charter
10. Removal of Stakeholder Directors
11. Acceptance of Management Area chapters submitted by Member(s)
12. Establishment of new or modification to existing Management Areas
13. Development of the Management Area chapter and associated cost allocations to Members within such Management Area in the event of a failure by a Member(s) to develop a Management Area chapter for their respective portion of the subbasin.

ARTICLE 10. OFFICERS

10.1. Officers. The Board of Directors shall select a Chair and Vice-Chair and any other officers as determined necessary by the Board of Directors.

10.1.1. The Chair shall preside at all Board Meetings.

10.1.2. The Vice-Chair shall act in place of the Chair at meetings should the Chair be absent.

10.1.3. All Officers shall be chosen at the first Board of Directors meeting and serve a term for one (1) year. An Officer may serve for multiple consecutive terms. Any Officer may resign at any time upon written notice to the Agency.

ARTICLE 11. COMMITTEE FORMATION

11.1 Management Committee. There shall be established by the Board of Directors a committee comprised of at least one (1) staff representative from each Member. The Management Committee shall exist for the term specified in the action establishing the committee, shall meet as directed by the Board of Directors, and shall recommend agenda items, administer the Stakeholder Advisory Committee, establish and administer technical working groups, and bring staff reports to the Board of Directors.

11.2 Internal Committee Formation. There shall be established such internal committees as the Board of Directors shall determine from time to time. Each such internal committee shall be comprised of two (2) Directors, shall exist for the term specified in the action establishing the committee, shall meet as directed by the Board of Directors, and shall make recommendations to the Board of Directors on the various activities of the Agency.

11.3. Stakeholder Advisory Committee Formation. The Board of Directors shall establish an advisory committee comprised of diverse social, cultural, and economic elements of the population and area stakeholders within the Basin. The Board of Directors shall encourage the active involvement of the advisory committee(s) prior to and during the development and implementation of the GSP. The Stakeholder Advisory Committee is subject to the Ralph M. Brown Act. At-large members are appointed by the Wyandotte Creek GSA Board of Directors. The Stakeholder Advisory Committee will initially include:

1. South Feather Water and Power (1)
2. California Water Service-Oroville (1)
3. Tribal representative(s)
4. At-large agricultural water users (3)
5. At-large domestic well users (2)
6. At-large environmental representative (1)
7. At-large business association representative (1)

The Board of Directors may appoint other Interests of Beneficial Uses and Users of Groundwater (Water Code §10723.3) to the Stakeholder Advisory Committee.

The Board of Directors will ensure that at least one (1) member from the Management Committee administers advisory committee(s). The advisory committee shall meet as directed by the Board of Directors and as specified in Exhibit C, and shall make recommendations to the Board of Directors as requested.

11.4. Technical Working Groups. There may be established by the Management Committee technical working groups from time to time, the purpose of which shall be to provide advice to the Management Committee on issues of a technical nature related to the activities of the Agency. The Board of Directors will ensure that at least one (1) member from the Management Committee administers technical working groups.

ARTICLE 12. OPERATIONS AND MANAGEMENT

12.1 Administrator and Plan Manager

12.1.1 Administrator: The Board may appoint an Administrator, from time-to-time and when it deems appropriate. If appointed, the Administrator shall serve at the pleasure of the Board of Directors and his/her duties and responsibilities shall be set forth by the Board in their bylaws or actions.

12.1.2 Plan Manager: The Board shall appoint a Plan Manager. The Administrator and Plan Manager may be the same individual. The Plan Manager shall serve at the pleasure of the Board of Directors and his/her duties and responsibilities shall be set forth by the Board.

12. 2 Treasurer and Controller. The County of Butte shall act as treasurer and controller for the Agency. The controller of the Agency shall cause an independent audit of the Agency's finances to be made by a certified public accountant in compliance with California Government Code section 6505. The treasurer of the Agency shall be the depositor and shall have custody of all money of the Agency from whatever source. The controller of the Agency shall draw warrants and pay demands against the Agency when the demands have been approved by the Agency or any authorized representative pursuant to any delegation of Agency adopted by the Agency. The treasurer and controller shall comply strictly with the provisions of statutes relating to their duties found in Chapter 5 (commencing with section 6500) of Division 7 of Title 1 of the California Government Code.

12.2. Legal Counsel and Other Officers. The Board of Directors may appoint legal counsel who shall serve at the pleasure of the Board. Subject to the limits of the Agency's approved budget, the Board shall also have the power to appoint and contract for the services of other officers, consultants, advisers and independent contractors as it may deem necessary or convenient for the business of the Agency, all of whom shall serve at the pleasure of the Board. The appointed General Legal Counsel and other appointed officers of the Agency shall not be employees or contractors of one or more of the Members. Appointment of a General Legal Counsel shall be subject to all applicable Rules of Professional Responsibility, and notwithstanding anything to the contrary in this Agreement, each of the Members expressly reserve and do not waive their rights to approve or disapprove of potential conflicts of Agency General Legal Counsel.

12.3 Employees and Management. The Agency will not have any employees. In lieu of hiring employees, the Agency may engage one or more Members to manage any of the business of the Agency on terms and conditions acceptable to the Board of Directors. Any Member so engaged shall have such responsibilities as set forth in an agreement for such Member's services, which shall be approved by a super-majority vote of the Directors. The Agency shall have the power to employ competent registered civil engineers and other consultants to investigate and to

carefully devise a plan or plans to carry out and fulfill the objects and purposes of SGMA, and complete a GSP.

12.4 Principal Office. At the initial meeting of the Board, the Board shall establish a principal office for the Agency, which shall be located at a place overlying the Basin. The Board may change the principal office from time to time so long as that principal office remains at a location overlying the Basin.

12.5 Bylaws. The Board shall adopt Bylaws governing the conduct of the meetings and the day-to-day operations of the Agency within six months of the Effective Date of this Agreement.

12.6 Official Seal and Letterhead. The Board may adopt, and/or amend, an official seal and letterhead for the Agency.

12.7 Conflict of Interest Code. The Board shall adopt and file a Conflict of Interest Code pursuant to the provisions of the Political Reform Act of 1974 within six months of the Effective Date. The Board may review and revise the Conflict of Interest Code from time to time as appropriate or when required by law.

ARTICLE 13. MANAGEMENT AREAS

13.1 Formation of Management Areas. As is consistent with state regulations, there will be two Management Areas in the Wyandotte Creek subbasin. One Management Area will encompass the municipal areas within and directly adjacent to the City of Oroville. The other Management Area will be in the rural area of the Wyandotte Creek subbasin. The final boundaries of the Management Areas shall be determined by the Agency in consultation with the Wyandotte Creek Advisory Committee.

13.2 Management Areas Chapters. The Management Areas would have distinct "chapters" in the GSP establishing different minimum thresholds, measurable objectives, monitoring and projects. All chapters must be consistent with the subbasin-wide sustainability goals. Management Areas refer to an area within a basin for which a GSP may identify minimum thresholds, measurable objectives, monitoring, and projects and actions based on unique local conditions.

13.3 Role of Agency. Subject to the Reservation of Authority set forth in Section 13.5, the Agency will serve a coordination and administrative role in the development of the Management Area chapter conducted by the lead Member agencies. The Agency will be responsible for accepting the Management Area chapters determined by the Agency to be compliant with SGMA and applicable regulations for inclusion into the GSP. Upon inclusion of Management Area chapters into the GSP, the Agency will be responsible for implementation and enforcement pursuant to Article 5.

13.4 Management Area Lead Responsibility. The City of Oroville, Butte County, and Thermalito Water and Sewer District will be responsible for overseeing the development of the Management Area chapter for the municipal portion of the subbasin. Butte County will be responsible for overseeing the development of the Management Area chapter for the rural portion of the subbasin.

13.5 Reservation of Authority. In the event of a failure by a Member to develop a Management Area chapter for their respective portion of the basin, the Agency reserves and retains all requisite authority to (1) develop the Management Area chapter and (2) allocate the cost of development of the Management Area chapter to Members within such Management Area.

13.6 Additional Management Areas. Additional Management Areas may be defined and established by the Board of Directors as set forth in 9.3.

ARTICLE 14. SPECIFIC PROJECTS

14.1. Projects. The Agency intends to carry out activities in furtherance of its purposes and consistent with the powers established by the Agreement with the participation of all Members.

14.2. Member Specific Projects. In addition to the general activities undertaken by all Members of the Agency, the Agency may initiate specific projects that involves less than all Members. No Member shall be required to be involved in a Project that involves less than all the Members.

14.3. Project Agreement. Prior to undertaking any project that does not involve all Member Agencies, the Members electing to participate in the Project shall enter into a Project Agreement. A Member may elect not to participate in a specific project matter by providing notice and not entering into the Project Agreement specific to the matter in which the Member has elected not to participate. Each Project Agreement shall provide the terms and conditions by which the Members that enter into the Project Agreement will participate in the Project. All assets, rights, benefits, and obligations attributable to the Project shall be assets, rights, benefits, and obligations of those Members which have entered into the Project Agreement. Any debts, liabilities, obligations, or indebtedness incurred by the Agency in regard to a particular Project shall be the debts, liabilities, obligations, and indebtedness of those Members who have executed the Project Agreement in accordance with the terms thereof and shall not be the debts, liabilities, obligations, and indebtedness of those Members who have not executed the Project Agreement.

14.4. Board of Directors Approval. The Board of Directors shall have the authority to disapprove any Project Agreement upon a determination that the Project Agreement has specific, substantial adverse impacts upon Members that have not executed the Project Agreement.

ARTICLE 15. FINANCIAL PROVISIONS

15.1. Agency Funding and Contributions. In order to provide the needed capital to initially fund the Agency, the Agency shall be initially funded through a GSP grant awarded by the Department of Water Resources and through in-kind contributions of Members. In subsequent years and as needed, the Agency may be funded through additional voluntary contributions by Members and as otherwise provided in Chapter 8 of SGMA (commencing with section 10730 of the Water Code).

15.2. Budgets. Within ninety (90) days after the first meeting of the Board of the Agency, and thereafter prior to the commencement of each fiscal year, the Board of Directors shall adopt a budget for the Agency for the ensuing fiscal year.

15.3. Long-Term Funding. Upon formation of the Agency, the Board of Directors shall work on the development, adoption and implementation of a long-term funding plan to cover the operating and administrative expenses of the Agency.

ARTICLE 16. LIABILITY AND INDEMNIFICATION

16.1. Liability. The Members do not intend hereby to be obligated either jointly or severally for the debts, liabilities or obligations of the Agency, except as may be specifically provided for in California Government Code section 895.2, as amended or supplemented. Therefore, unless and to the extent otherwise required by law or agreed to herein by the Members, in accordance with California Government Code section 6507 the debts, liabilities and obligations of the Agency shall not be the debts, liabilities or obligations of the Member entities. The Agency shall own and hold title to all funds, property and works acquired by it during the term of this Agreement.

16.2. Indemnification. Funds of the Agency may be used to defend, indemnify, and hold harmless the Agency, each Member, each Director, and any officers, agents and employees of the Agency for their actions taken within the course and scope of their duties while acting on behalf of the Agency. Other than for gross negligence or intentional acts, to the fullest extent permitted by law, the Agency agrees to save, indemnify, defend and hold harmless each Member from any liability, claims, suits, actions, arbitration proceedings, administrative proceedings, regulatory proceedings, losses, expenses or costs of any kind, whether actual, alleged or threatened, including attorney's fees and costs, court costs, interest, defense costs, and expert witness fees, where the same arise out of, or are in any way attributable in whole or in part to, negligent acts or omissions of the Agency or its employees, officers or agents or the employees, officers or agents of any Member, while acting within the course and scope of a Member relationship with the Agency.

ARTICLE 17. WITHDRAWAL AND TERMINATION

17.1. Withdrawal. A Member may unilaterally withdraw from this Agreement without causing or requiring termination of this Agreement, effective upon sixty (60) days written notice to the remaining Members.

17.2. Termination of Agency. This Agreement may be rescinded and the Agency terminated by unanimous written consent of all Members, except during the outstanding term of any Agency indebtedness.

17.3. Effect of Withdrawal or Termination. The JPA may be terminated and the Agency dissolved by a unanimous vote of the Member Directors. Upon termination of this Agreement or unilateral withdrawal, a Member shall remain obligated to pay its share of all debts, liabilities and obligations of the Agency required of the Member pursuant to the terms of this Agreement which were incurred or accrued prior to the date of such termination or withdrawal, including without limitation, those debts, liabilities and obligations pursuant to

Section 5. Any Member that withdraws from the Agency shall have no right to participate in the business and affairs of the Agency or to exercise any rights of a Member under this Agreement or the Act, but shall continue to share in distributions from the Agency on the same basis as if such Member had not withdrawn, provided that a Member that has withdrawn from the Agency shall not receive distributions in excess of the contributions made to the Agency while a Member. The right to share in distributions granted under this section shall be in lieu of any right the withdrawn Member may have to receive a distribution or payment of the fair value of the Member's interest in the Agency.

A Member may, in its sole discretion, withdraw from the Agency, effective 60 days after written notice to the Agency. Upon withdrawal or termination of the Agency, the withdrawing Member(s) retain all rights and powers to become or otherwise participate as a GSA for lands within its jurisdiction. In such an event, the Agency and its remaining Members will not object to or interfere with the lands in the withdrawing Member's boundaries; will facilitate such a transition to the extent necessary; and will withdraw from management that portion of the subbasin and so notify DWR.

17.4. Disposition of Agency Assets upon Termination.

17.4.1. Surplus Funds. Upon termination of this Agreement, any reserves or surplus money on-hand shall be returned to the Members in the same proportion said Members have funded such reserves or surplus, in accordance with California Government Code section 6512.

17.4.2. Agency Property. The Agency shall first offer any assets of the Agency for sale to the Members on terms and conditions determined by the Board of Directors. If no such sale to Members is consummated, the Board shall offer the assets of the Agency for sale to any non-member for good and adequate consideration on terms and conditions determined by the Board of Directors.

ARTICLE 18. MISCELLANEOUS

18.1. No Predetermination or Irretrievable Commitment of Resources. Nothing in this Agreement shall constitute a determination by the Agency or any of its Members that any action shall be undertaken or that any unconditional or irretrievable commitment of resources shall be made, until such time as the required compliance with all local, state, or federal laws, including without limitation the California Environmental Quality Act, National Environmental Policy Act, or permit requirements, as applicable, has been completed.

18.2. Notices. Notices hereunder shall be sufficient if delivered via electronic mail, First-Class mail or facsimile transmission to the addresses below:

County of Butte: Department of Water and Resource Conservation, 308 Nelson Ave, Oroville, CA 95965

City of Oroville: 1735 Montgomery Street, Oroville, CA 95965

Thermalito Water and Sewer District: 410 Grand Avenue, Oroville, CA 95965

18.3. Amendment. This Agreement may be amended at any time, by unanimous agreement of the Members, provided that before any amendments shall be operative or valid, it shall be reduced to writing and signed by all Members hereto.

18.4. Agreement Complete. This Agreement constitutes the full and complete agreement of the Members. This Agreement supersedes all prior agreements and understandings, whether in writing or oral, related to the subject matter of this Agreement that are not set forth in writing herein.

18.5. Severability. If any provision of this Agreement is determined to be invalid or unenforceable, the remaining provisions will remain in force and unaffected to the fullest extent permitted by law and regulation.

18.6. Execution in Counterparts. The Parties intend to execute this Agreement in counterparts. It is the intent of the Parties to hold one (1) counterpart with single original signatures to evidence the Agreement and to thereafter forward four (4) other original counterparts on a rotating basis for all signatures. Thereafter, each Member shall be delivered an originally executed counterpart with all Member signatures.

18.7. Withdrawal by Operation of Law. Should the participation of any Member to this Agreement be decided by the courts to be illegal or in excess of that Member's authority or in conflict with any law, the validity of this Agreement as to the remaining Members shall not be affected thereby.

18.8. Assignment. The rights and duties of the Members may not be assigned or delegated without the written consent of all other Members. Any attempt to assign or delegate such rights or duties in contravention of this Agreement shall be null and void.

18.9. Binding on Successors. This Agreement shall inure to the benefit of, and be binding upon, the successors or assigns of the Members.

18.10. Other JPAs. Nothing in this Agreement shall prevent the Members from entering into other joint exercise of power agreements.

18.11. Venue. This Agreement shall be governed by and construed in accordance with the laws of the State of California, and any action related to the terms of this Agreement shall be brought and tried in Butte County Superior Court.

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the date of execution of this Agreement.

County of Butte

By: _____ Date: 9-11-18

Steve Lambert, Chair

Board of Supervisors

City of Oroville

By: _____ Date: 9-18-18

Linda Dahlmeier, Mayor

City Council

Thermalito Water and Sewer District

By: _____ Date: 9-18-18

Brian Pulley, President

Board of Directors

Exhibit A: List of Member Agencies

Exhibit B: Wyandotte Creek Subbasin Map

Exhibit C: Draft Wyandotte Creek Advisory Committee Charter

EXHIBIT A
LIST OF MEMBER AGENCIES

County of Butte
Department of Water and Resource Conservation
308 Nelson Avenue
Oroville, CA 95965

City of Oroville
1735 Montgomery Street
Oroville, CA 95965

Thermalito Water and Sewer District
410 Grand Avenue
Oroville, CA 95965

Exhibit B
Wyandotte Creek Subbasin Map

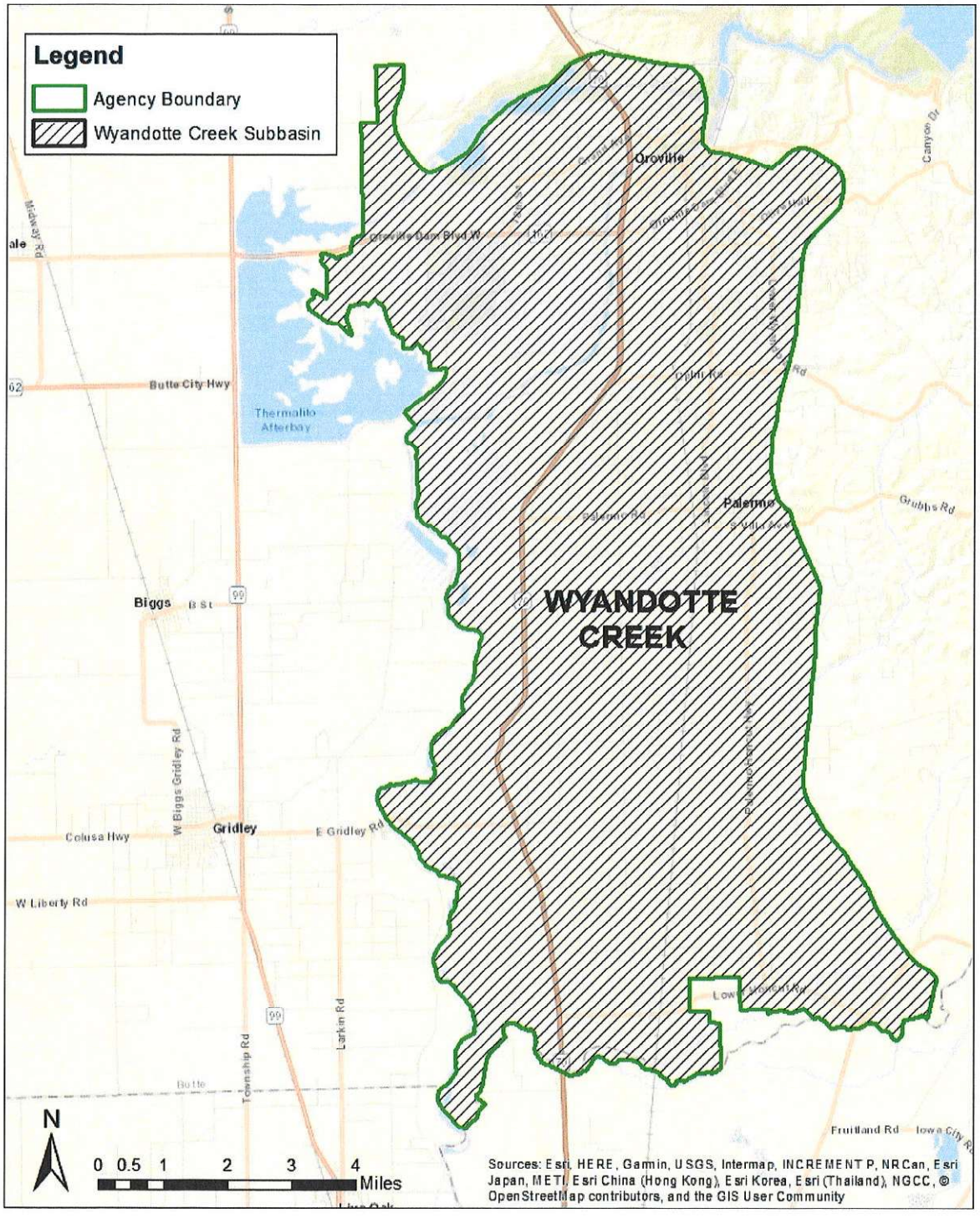

Exhibit C
Wyandotte Creek Groundwater Sustainability Agency
DRAFT Advisory Committee Charter
Version: August 18, 2018

I. Purpose

The purpose of the Wyandotte Creek Advisory Committee (AC) is to provide input and recommendations to the Groundwater Sustainability Agency (Agency) Board of Directors on groundwater sustainability plan (GSP) development and implementation. The intent of the AC is to provide community perspective and participation in Sustainable Groundwater Management Act (SGMA) implementation.

The AC will review and/or provide recommendations to the Agency Board on groundwater-related issues that may include:

1. Development, adoption, amendment of the GSP
2. Sustainability goals and objectives
3. Best management practices
4. Monitoring programs
5. Annual work plans and reports (including mandatory 5-year milestone reports)
6. Modeling scenarios
7. Inter-basin coordination activities
8. Projects and management actions to achieve sustainability
9. Community outreach
10. Local regulations to implement SGMA
11. Fee proposals
12. Other

The AC will not be involved in the Agency's day to day operations, such as contracting, budgeting, etc.

II. Brown Act, Open Process, and Conflicts of Interest

All meetings of the AC are open to the public. The Agency will announce AC meetings through its regular communication channels.

AC meetings are subject to the Brown Act. The AC shall adopt a schedule and location for regular meetings, and meeting agendas shall be posted in accordance with the Brown Act.

All AC meetings shall provide for public comment in accordance with the Brown Act, including non-agenda public comment and public comment on individual agenda items. As needed, time limits may be placed on public comments to ensure the AC is reasonably able to address all agenda items during the course of the meeting. Speakers will generally be limited to three minutes, but time may be adjusted based upon meeting circumstances. Special and emergency

meetings need not provide for non-agenda public comment, but such comment may be allowed in the AC's discretion. Members of the AC are subject to all applicable conflict of interest laws including Government Code section 1090 and the California Political Reform Act. The Agency shall adopt a conflict of interest code for the AC.

III. Roles and Responsibilities

Agency Board of Directors

The Agency Board commits to the value of the AC and will consider AC recommendations when making decisions.

Advisory Committee

The role and responsibility of the AC is to solicit and incorporate community and stakeholder interests into recommendations on SGMA implementation in the Wyandotte Creek subbasin for the Board to consider in its decision-making processes.

Criteria for Advisory Committee Membership

AC Members must:

1. Serve as a strong, effective advocate for the interest group represented
2. Work collaboratively with others
3. Commit time needed for ongoing discussions
4. Collectively reflect diversity of interests within the stakeholder group they represent
5. Complete any required Brown Act trainings by all applicable deadlines

As part of membership, members agree to:

1. Arrive at each meeting fully prepared to discuss the issues on the agenda. Preparation may include reviewing meeting summaries, technical information, and draft documents distributed in advance of each meeting
2. Present their constituent members' views on the issues being discussed and be willing to engage in respectful, constructive dialogue with other members of the group
3. Develop a problem-solving approach in which they consider the interests and viewpoints of all group members, in addition to their own
4. Keep their constituencies informed about the deliberations and actively seek their constituents' input

Management Committee

The Management Committee comprised of staff from each Member of the Agency are responsible for administering the AC which includes:

1. Maintaining a current roster of AC members
2. Working with Agency Board to fill AC vacancies, as needed
3. Preparing agendas for AC meetings
4. Noticing all meetings in accordance with the Brown Act

5. Staffing all meetings, recording minutes and developing and distributing meeting summaries
6. Working with AC and the Agency Board to develop annual work plans and schedules for AC meetings
7. Facilitating the process of incorporating AC recommendations in staff reports into Board packets
8. Ensuring that the records for AC member Brown Act Training are filed and updated as required
9. Maintaining a record of all meeting materials

Facilitator

As resources allow, a third-party facilitator may provide impartial facilitation services for AC meetings. The facilitator's primary responsibility is to ensure an open process where all AC member interests are heard and thoughtfully considered. To this end, the facilitator works on behalf of the process and the members contributing to AC efforts. Specific facilitator responsibilities include:

1. Supporting the Management Committee in developing and distributing Committee agendas and relevant materials
2. Advocating for a fair, effective, and credible process, but remain impartial with respect to the outcome of the deliberations
3. Applying collaborative, mutual-gain negotiation methods that foster openness and identify areas of preliminary and final consensus agreement for advice and recommendations to the Board
4. In the absence of consensus, helping to identify areas of agreement and disagreement
5. Checking in with members as needed to ensure all issues are identified and explored
6. Coordinating with Management Committee members to ensure accurate, impartial documentation of meetings and agreements (i.e. meeting summaries and recommendation reports)
7. Ensuring all members uphold the tenets of the charter

IV. Membership

Composition of the AC is intended to represent the beneficial uses and users of groundwater identified in SGMA. AC members only fill one seat on the AC and may not serve concurrently on the Agency Board or on the Management Committee. Members must live or work within the Wyandotte Creek subbasin or represent an organization with a presence in the Wyandotte Creek subbasin.

The Agency Board will appoint representatives to the AC. The following represents a draft, proposed list of possible AC representation:

1. Cal Water - Oroville (1)
2. South Feather Water and Power (1)

3. Tribal representative(s)
4. Agricultural groundwater users:
   a. Two (2) at-large members
   b. One (1) Groundwater Pumpers Advisory Committee (GPAC) member. In the event that the GPAC dissolves, this position will transition to an at-large position
5. At-large domestic well users (2)
6. At-large environmental representative (1)
7. At-large business association representative (1)

The Agency Board may appoint other interests representing beneficial users and uses of groundwater as per Water Code Section 10723.3).

Member Appointment

The Agency Board will appoint at-large members to fill AC seats. Interested individuals from the community or organizations may apply to the Agency Board, specifying in the application the seat(s) that the applicant intends to be considered for.

The Agency Board encourages candidates with experience and familiarity with groundwater and its groundwater management. The Agency Board will also give preference to applicants who have the backing of multiple organizations or individuals, have experience working with diverse community-based groups and can represent the interests of disadvantaged populations or interests that are otherwise under-represented on the Advisory Committee.

Application Timeline

Following Agency formation, the Agency Board will establish a timeline and process for appointment of the initial AC using the application process for the at-large seats on the AC and appointing the non-at-large seats as presented by the respective governing bodies of those non-at-large seats. In subsequent years, at-large applicants will submit applications for vacant at-large seats when they become vacant. The Agency will post blank applications on its website.

Advisory Committee Member Terms

The initial AC appointments will include approximately half of the seats with three-year terms ending in December 2022 and the remaining seats with two-year terms ending in December 2021. Following initial Committee appointment, all terms will be two years in length, ending in December. Appointees are not term-limited; however, at-large members would be required to apply for open seats each term. If a vacancy occurs for a seat before the end of the term, the Board will appoint a new individual to complete the term (using the application process for the at-large seats).

The Agency Board can remove an AC member if the member fails to attend three consecutive meetings or if the AC member no longer meets the criteria for AC membership. If deemed necessary by the Board, alternates may be appointed by the Agency Board.

V. Decision Making and Recommendations to the Agency Board

To inform Agency Board decision-making, the AC will provide written recommendations to the Agency included in Management Committee reports.

Any AC member(s) who disagree with a recommendation made by the AC to the Agency should provide an alternative that attempts to meet the interests they are representing as well as the interests of other members. The Committee will strive for consensus; however if unanimous agreement among all participants cannot be reached after all interests and options have been thoroughly identified, explored, and discussed, the AC shall not limit itself to strict consensus. When unable to reach consensus on advice or recommendations, the AC will outline the areas of disagreement and provide an explanation about such disagreements to inform the Agency Board for decision-making processes.

Pursuant to Agency Board direction, the Management Committee will develop an annual work plan(s) and schedule(s) for AC meetings. The AC will adopt a charter describing the purpose, operating principles and ground rules of the AC. This charter will be subject to approval by the Agency Board of Directors.

The Agency Board will consider AC recommendations when making decisions. If the Agency Board does not agree with the recommendations of the AC, the Agency Board shall state the reasons for its decision.

In order to conduct business (e.g. make and advance a recommendation to the Board), a quorum of the AC seated must be present. A simple majority of AC members constitutes a quorum.

VI. Process Agreements and Ground Rules

To conduct a successful collaborative process, all AC members will work together to create a constructive, problem solving environment. To this end, all members agree to the following process agreements which the AC will use, and to ground rules which will guide individual and group behavior.

Process Agreements

1. Everyone agrees to negotiate in good faith. All participants agree to participate in decision making, to act in good faith in all aspects of this effort and to communicate their interests during meetings. Good faith also requires that members not make commitments they do not intend to follow through with, and that members act consistently in the meetings and in other forums where the issues under discussion in these meetings are also being discussed.

2. Everyone agrees to address the issues and concerns of the participants. Everyone who is joining in the AC is doing so because s/he has a stake in the issue at hand. For the process to be successful, all the members agree to validate the issues and concerns of the other members and strive to reach an agreement that takes all the issues under consideration. Disagreements should be viewed as problems to be solved, rather than battles to be won.

3. Everyone agrees to inform and seek input from their constituents about the outcome of the facilitated discussions. To the extent possible, scheduling will allow for members to inform and seek input from their constituents, and others about discussions.

4. Everyone agrees that members can meet with other organizational or interest group members. AC members may find it helpful to meet with other organizations or interest group members and to consult with constituents outside of the meeting so the member is better able to communicate community concerns on the issues at hand.

5. Everyone agrees to attend all of the meetings to the extent possible. Continuity of the conversations and building trust are critical to the success of the AC.

Management Committee member(s)and / or the facilitator will coordinate the AC meeting schedule.

Ground Rules

1. Use Common Conversational Courtesy: Treat each other with mutual respect as you discuss and deliberate groundwater issues. Members are encouraged to turn off cell phones and focus on the issue at hand.
2. All Ideas and Points of View Have Value: The goal is to achieve understanding. Simply listen, you do not have to agree. If you hear something you do not agree with or you think is "silly" or "wrong," please remember that the purpose of the forum is to share ideas.
3. Be Honest, Fair, and as Candid as Possible: Put your interests forward, help others understand you and listen actively in order to understand others.
4. Avoid Editorials: It will be tempting to analyze the motives of others or offer editorial comments. Please talk about your own ideas and thoughts. Avoid commenting on why you believe another participant thinks something.
5. Honor Time, Be Concise and Share the Air: Help ensure an inclusive discussion by being cognizant of time constraints, stating your views clearly and concisely, and sharing the air so others can participate as well.
6. Think Innovatively and Welcome New Ideas: Creative thinking and problem solving are essential to success. "Climb out of the box" and attempt to think about the problem in a new way.
7. Invite Humor and Good Will: Don't hesitate to bring levity and humor to the process when warranted.

VII. Amendments

The AC can recommend future changes to the charter. The Agency Board may amend the charter when needed using its decision-making procedure.

Wyandotte Creek
GROUNDWATER SUSTAINABILITY AGENCY

308 Nelson Ave, Oroville, California • (530) 552-3591 • WyandotteGSA@gmail.com

CITY OF OROVILLE • THERMALITO WATER AND SEWER DISTRICT • COUNTY OF BUTTE

June 28, 2021

Paula Daneluk, Director
Butte County Department of Development Services
7 County Center Drive
Oroville, CA 95965

Re: Wyandotte Creek Groundwater Sustainability Plan

Director Daneluk:

Under the Sustainable Groundwater Management Act (SGMA), Groundwater Sustainability Agencies (GSA) must submit a Groundwater Sustainability Plan (Plan) that will assure groundwater is sustainable within 20 years. In Butte County, the Wyandotte Creek subbasin is required to have a Plan submitted by January 31, 2022. The Wyandotte Creek GSA is in the process of developing the Plan for the Wyandotte Creek subbasin in compliance with SGMA. SGMA requires that the GSAs provide at least a 90 day notice to cities and counties prior to adoption of a Plan. Through this letter, we are providing notice of the Plan development and seek your review of the draft Plan. (Water Code §10728.2)

SGMA recognizes the linkage between land use and groundwater management. Many of the projects and actions include recommendations for changes to land use, general plans, zoning and ordinances under your jurisdiction. The Plan takes into account projected growth from existing general plans. In the future, anytime a city or county readopts or substantially amends their general plan the planning agency shall review and consider an adoption of, or update to, a groundwater sustainability plan. (Under Government Code § 65350.5) We look forward to collaborating with you on groundwater sustainability in the Wyandotte Creek subbasin.

Various chapters of the Wyandotte Creek subbasin Plan are in draft form. The entire Wyandotte Creek subbasin Plan is expected to be released for a 60 day comment period in September, with a hearing to be held in November. Adoption of the Plan is expected in December. When the entire draft Plan is prepared in September, we will provide you with a notice of its availability. In the meantime, draft chapters are available for review at www.wyandottecreekgsa.com.

If you have any questions or would like more information please contact me.

Thank you.

Paul Gosselin, Administrator

Cc: Andy Pickett, Butte County CAO

Wyandotte Creek
GROUNDWATER SUSTAINABILITY AGENCY

308 Nelson Ave, Oroville, California • (530) 552-3591 • WyandotteGSA@gmail.com

CITY OF OROVILLE • THERMALITO WATER AND SEWER DISTRICT • COUNTY OF BUTTE

June 28, 2021

Bill LaGrone, City Administrator
Oroville City Hall
1735 Montgomery Street
Oroville, CA 95973

Re: Wyandotte Creek Groundwater Sustainability Plan

Mr. LaGrone:

Under the Sustainable Groundwater Management Act (SGMA), Groundwater Sustainability Agencies (GSA) must submit a Groundwater Sustainability Plan (Plan) that will assure groundwater is sustainable within 20 years. In Butte County, the Wyandotte Creek subbasin is required to have a Plan submitted by January 31, 2022. The Wyandotte Creek GSA is in the process of developing the Plan for the Wyandotte Creek subbasin in compliance with SGMA. SGMA requires that the GSAs provide at least a 90 day notice to cities and counties prior to adoption of a Plan. Through this letter, we are providing notice of the Plan development and seek your review of the draft Plan. (Water Code §10728.2)

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If you have any questions or would like more information please contact me.

Thank you.

Paul Gosselin, Administrator

APPENDIX 1-C

Groundwater Status Report for the ~~2020~~2025 Water Year

2026

Groundwater Status Report 2025 Water Year

PREPARED BY

BUTTE COUNTY DEPARTMENT OF WATER AND RESOURCE CONSERVATION

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Attachments

Attachment A – Links to the Butte, Vina and Wyandotte Creek Subbasins Annual Reports

Acronyms and Definitions

2025 WY - 2025 water year means the 2025 hydrological year spanning from October 1, 2024 – September 30, 2025 designated by the calendar year in which it ends.

Department - Butte County Department of Water and Resource Conservation means the Butte County department formed on July 1, 1999 with the mission to manage and conserve water and other resources for the citizens of Butte County.

DWR - California Department of Water Resources means the state agency established in 1956 by the California State Legislature to protect, conserve, develop and manage much of California's water supply.

GSA - Groundwater Sustainability Agency means one or more local agencies with water supply, water management, or land use responsibilities within a groundwater basin that implements the provisions of the Sustainable Groundwater Management Act.

GSP - Groundwater Sustainability Plan means a plan of a GSA adopted pursuant to the Sustainable Groundwater Management Act.

MO - Measurable Objective refers to specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted GSP to achieve the sustainability goal for the basin.

Margin of Operational Flexibility – refers to the range of active management between the Minimum Threshold and the MO.

MT - Minimum Threshold refers to a numeric value for each sustainability indicator used to define undesirable results. For groundwater levels, a minimum threshold is caused by levels dropping below the threshold. However, for groundwater quality, it is a highest allowable value, rather than lowest.

Periodic Evaluation – means the Groundwater Sustainability Agencies' periodic evaluations of their Groundwater Sustainability Plans that are required by the California Department of Water Resources at least every five years to assess plan performance, progress toward sustainability goals, and implementation of projects.

PMA - Projects and Management Action means projects and management actions developed by the GSAs and identified in the GSPs, that when implemented would help to achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.

Report - Butte County Groundwater Status Report refers to this annual report on groundwater conditions which meets Butte County Chapter 33 reporting requirements.

RMS wells - Representative monitoring site wells means wells intended to be representative of general conditions within the area allowing for a focused and specific monitoring location to effectively represent a larger geographical area.

Salinity - is a measure of the amount of salts in the water. Salts and other substances affect the quality of water used for irrigation and drinking as well as have an influence on aquatic species and habitat.

SC - Specific conductivity means a measure of the ability of the material to conduct an electrical current and is used to measure salinity in groundwater quality monitoring.

SGMA - Sustainable Groundwater Management Act means a package of bills collectively signed into law September 16, 2014, requiring local sustainable management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results and providing the state with broad oversight authority and the ability to intervene.

TAF - Thousand Acre-feet refers to a volume of water in thousands of acre-feet.

Butte County Groundwater Status Report

1. Executive Summary

The 2025 Water Year (2025 WY) spanning from October 1, 2024 to September 30, 2025 brought average hydrologic conditions to Butte County, marking the third consecutive year of improved water supply following the 2020-2022 drought. **All three groundwater Subbasins within the County, Butte, Vina, and Wyandotte Creek, experienced stable or improving groundwater levels, supported by average precipitation, full local surface water allocations, and typical groundwater pumping volumes for the conditions.**

In the 2025 WY, groundwater conditions continued to improve in this third year of above-normal water year conditions. **Groundwater levels rose in most monitoring wells since the previous water year, with average increases of approximately one to three feet across Subbasins and seasons.** Table 1 shows the one-year changes in groundwater levels and those across recent three-year wet and dry periods per Subbasin. In the 2025 WY groundwater levels also rose about 14 and seven feet above the Groundwater Sustainability Plans' (GSPs) measurable objectives on average at the Representative Monitoring Site wells (RMS) in the spring and fall, respectively. All measured groundwater levels remained within operational thresholds across all Subbasins. Groundwater storage also improved in two Subbasins, with notable gains of 44 thousand acre-feet (TAF) in the Vina Subbasin and 19 TAF in the Wyandotte Creek Subbasin while there were slight decreases of about 11 TAF in the Butte Subbasin, likely due to the timing and intensity of the precipitation in the area. Long-term trends starting from the year 2000 through 2025, indicate a downward trend in groundwater levels in the Vina Subbasin, underscoring the need for continued collaboration with each Groundwater Sustainability Agency (GSA) to implement groundwater management projects that focus on: 1) demand reduction and water conservation, 2) Recharge 3) an increased use of surface water supplies, and 4) expanded planning and policy development. **Water Year 2025 marked the second consecutive year in which no domestic well owners reported dry or reduced-capacity household wells to the California Department of Water Resources (DWR) Dry Well Reporting System.**

Table 1. Average seasonal groundwater-level changes over a 1-year period and over 3-year periods during recent drought and wet conditions in the Butte, Vina, and Wyandotte Creek Subbasins.

Subbasin	Average Spring Groundwater Level Change: 2024 to 2025 (feet):	Average Fall Groundwater Level Change: 2024 to 2025 (feet)	Average Spring Groundwater Level Decline during Drought period: 2019-2022 (feet)	Average Spring Groundwater Level Increase during Wet period: 2022-2025 (feet)
Butte	1	0	-7	6
Vina	3	3	-13	10
Wyandotte Creek	3	-1	-6	7

To pursue and maintain sustainable conditions, Butte County, local agencies, and GSA partners continued implementation of priority projects, expansion and enhancement of groundwater monitoring networks, and drought resilience efforts. State grant funding and local cost-share initiatives further supported these efforts. The Department remains committed to providing its GSA partners technical assistance through ongoing monitoring of groundwater conditions, tracking key indicators, implementing projects and management actions (PMAs) in partnership with other agencies, providing technical staff support, and collaborating with local and state partners to maintain or achieve long-term groundwater sustainability by 2042.

Butte Subbasin

In the Butte Subbasin, groundwater conditions were relatively stable during the 2025 water year. Over both seasons, groundwater levels in the RMS wells showed a slight increase on average from WY 2024; however, there was a slight overall decrease in groundwater storage of about 11 TAF from the previous year, likely due to the timing and intensity of the precipitation in the area. Groundwater levels and the corresponding changes in groundwater storage Subbasin-wide continue to be stable and generally fluctuate in response to water year type and surface water availability. The cumulative change in groundwater storage since 2000, a decrease of about 19 TAF is about 1 TAF of decline per year since 2000. In consideration of estimate uncertainty, this is a small and relatively nominal change in groundwater storage. The Subbasin is not considered to be in a state of overdraft.

In the Butte Subbasin, groundwater levels are generally stable and shallow, supported by substantial and reliable surface water supplies and recharge, resulting from surface water applied throughout the Subbasin (thereby reducing groundwater demand). Groundwater conditions have generally been stable since 2000, apart from years in which there are surface water cutbacks to Feather River diverters. Since 1992, the only cutback years have been 2015, 2021 and 2022. Some portions of the Subbasin rely on groundwater for irrigation in all years, however groundwater extraction increases significantly in cutback years in some areas of the Subbasin where it is a feasible option. **Continued maintenance of, access to and use of surface water from the Sacramento River, Feather River, and Butte Creek for both agricultural and municipal water demands will be important to maintain stable groundwater levels.** The GSAs in this Subbasin are being proactive in working towards the shared goal of sustainably managing groundwater in this Subbasin as can be seen in recent actions to develop the first Periodic Evaluation of the Butte Subbasin GSP, and the continued progress on numerous PMAs aimed at improving groundwater conditions in the Subbasin and a cost share plan to support these efforts.

Vina Subbasin

In the Vina Subbasin, groundwater conditions improved during the 2025 water year. Over both spring and fall seasons, groundwater levels in the RMS wells increased by about 3 feet on average from last year resulting in a positive gain in groundwater storage of about 44 TAF from WY 2024. Most groundwater levels and the corresponding changes in groundwater storage Subbasin-wide have generally been on a downward decline since 2000, but show improvements in the shorter term 10-year timeframe. The longer-term declines correspond with an extended dry period Statewide, punctuated by periodic average and wet years, reflected in these gradual groundwater level declines over the past 25 years. The cumulative change in groundwater storage since 2000, a decrease of about 327 TAF amounts to an average of about 11 TAF per year of decline. While it is important to realize that it is not the management goal of the GSAs to bring groundwater levels back up to the conditions of 2000, flattening out the declining trend is the goal. Over the past 10 years, however, this trend has been positive, averaging about 11 TAF

per year of increased storage and over half of the monitoring wells show gradual increases in groundwater level change. **Actions now can help to adequately address longer trends in groundwater declines and the associated deficits in groundwater storage in preparation for the next drought cycles.** The County is supporting a four-pronged approach to reach sustainability in this Subbasin including 1. Demand reduction and water conservation activities; 2. Increasing surface water supplies to offset and reduce groundwater demand; 3. Increasing recharge, and 4. Planning and policy development. In upcoming years, it will be important to continue understanding the connection between the specific monitoring wells showing long-term declines and areas in the Subbasin where residents have previously reported dry or reduced capacity wells, especially as it relates to future County well ordinance updates. The two GSAs in this Subbasin acknowledge these current conditions and are applying the four-pronged approach to work towards the shared goal of sustainably managing groundwater. This is being accomplished through local and grant funding for GSA operations, projects and addressing data gaps identified in the GSP including the installation of additional monitoring wells in WY 2026.

Wyandotte Creek Subbasin

In the Wyandotte Creek Subbasin, groundwater conditions remained robust during the 2025 water year. Over both seasons, groundwater levels have remained similar to last year; with an associated positive gain in groundwater storage of about 19 TAF. The cumulative change in groundwater storage since 2000 is about 46 TAF which is an increase of about 2 TAF per year.

In the Wyandotte Creek Subbasin, groundwater users benefit from generally stable and shallow groundwater levels supported by the mix of groundwater and surface water supplies to meet water demands in the Subbasin. Review of the hydrographs from monitoring wells in the Subbasin indicate that groundwater elevations, and hence groundwater storage, are relatively stable over time. Groundwater levels seem to track well with wet and dry cycles and respond accordingly, as expected.

The near-term focus for the Wyandotte Creek GSA will be on continued and expanded monitoring through a grant-funded project which included installation of additional monitoring wells in WY 2026. Ongoing access to and use of surface water supplies will also be crucial to preserve the sustainability of the Subbasin. The Wyandotte Creek GSA is proactive in its goal of sustainably managing groundwater in this Subbasin, as can be seen in the recent efforts to generate local funds to support GSA operations and securing grant funds to fill data gaps and advance projects aimed at improving groundwater conditions.

2. Background

This Groundwater Status Report (Report) has been prepared for Butte County annually since 2000, first by the Butte Basin Water Users Association (dissolved in 2012) followed by the Butte County Department of Water and Resource Conservation (Department). The report contents are presented to the Water Commission and the Board of Supervisors in the spring to early summer of each year for the preceding water year (defined as October 1 through September 30). **This report meets the requirements of County Code Chapter 33 which requires the preparation of a groundwater status report based upon the data gathered and analyzed pursuant to Section 33-4 – "Groundwater Monitoring."** This section requires groundwater level measurements to be taken from designated monitoring wells at least four times per year. Wells are monitored DWR and Department staff with a minimum frequency of March, July, August and October of each year.

Butte County hydrogeology includes two different types of groundwater aquifers, fractured rock and alluvial aquifers. In the eastern foothill and mountainous areas of the County, fractured rock aquifers provide variable amounts of water, primarily to domestic wells. In these aquifers, water fills the space between cracks and fractures in the rock. Therefore, the degree of fracturing and the extent to which those fractures are connected, highly influence potential well production. Conditions are highly variable, and the water levels or production of a well in one location do not necessarily provide information on what conditions may be in another well, even if it is nearby. Therefore, groundwater level monitoring is not conducted in the fractured rock areas of the County. This report is directed towards an explanation of groundwater conditions in the alluvial portions of the County as defined by the DWR Bulletin 118 document, which delineates each Subbasin within the valley floor area.

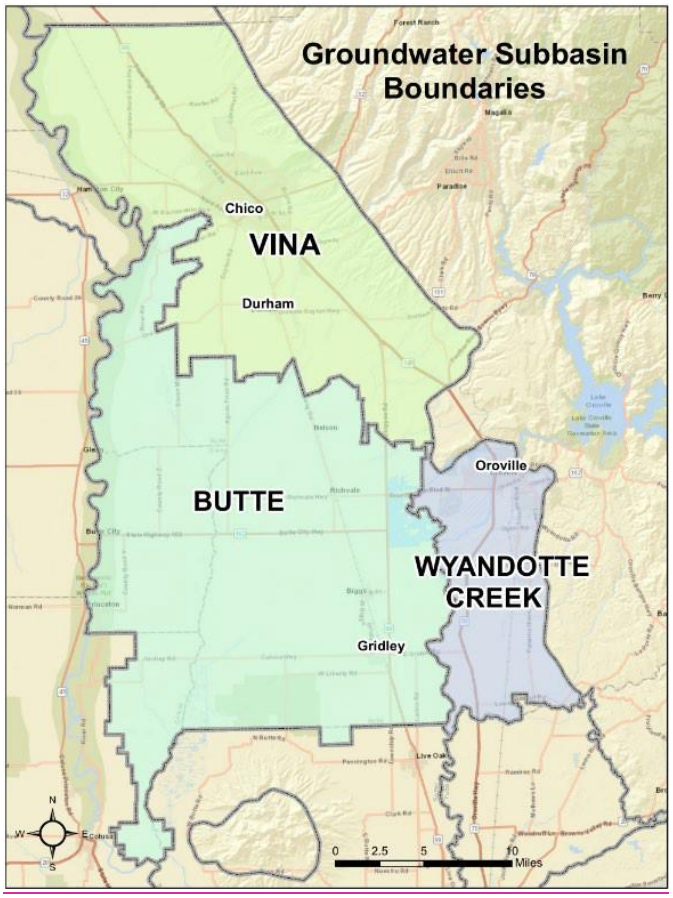

Figure 1. Map of the Subbasins in Butte County

On September 16, 2014, Governor Brown signed into law a package of bills collectively called the Sustainable Groundwater Management Act (SGMA). SGMA requires local management of groundwater Subbasins and provides the state with broad oversight authority and the ability to intervene. Local management of Subbasin(s) are the responsibility of a local public agency or combination of local agencies that designate themselves as the GSA for all or a portion of their Subbasin. **Butte County is one of three member agencies of the two Joint Power Agreements that have been established to form a GSA in both the Vina and Wyandotte Creek Subbasins. In the Butte Subbasin, the County serves as one of the 11 individual GSAs collectively responsible for managing groundwater within this Subbasin**. The County of Butte GSA presides over land within the Butte Subbasin boundaries that are not within any other GSA's jurisdictions. All three of the groundwater Subbasins (see map) within Butte County (Vina, Butte and Wyandotte Creek Subbasins) have one or more GSAs responsible for the development and implementation of a GSP.

Individual GSPs were adopted by the respective GSAs by the regulatory deadline of January 31, 2022, for each of the three Subbasins. GSAs must also submit annual reports to the DWR by April 1st each year (see Attachment A). Annual reports must include the following information:

- General information and location map of the Subbasin
- Groundwater level data (shown as graphs and contour maps)
- Annual aggregated data identifying groundwater extraction for the preceding water year
- Surface water supply used or available for use in the Subbasin
- Total water use
- Change in groundwater storage (shown on a map and graphically)

- Description of progress toward implementing the GSP

A consulting firm, in cooperation with the Department and the GSAs in the three Subbasins, prepared an annual report for each Subbasin to meet the requirements of SGMA. These reports were submitted to the DWR SGMA Portal (https://sgma.water.ca.gov/portal/) and links to the reports are provided in Attachment A to this report.

This is the fourth Butte County Groundwater Status Report (Report) since adoption of the GSPs by the GSAs in the three Subbasins. **The objective of this report is to use the information from each of the three Subbasin's annual reports to help inform a broad County-wide perspective of groundwater conditions and trends.** While recognizing that Subbasin-specific annual reports focus on performance as compared to each Subbasin's policies outlined in their respective GSPs, this Report seeks to recognize a broader County perspective which may differ from the perspective of those managing the Subbasins in accordance with SGMA. **As such, this report outlines some conditions that call for attention, describes efforts to improve groundwater resilience County-wide, offers overall conclusions about Butte County's groundwater resource, and when warranted, offers recommendations for consideration by the Board of Supervisors.** For greater Subbasin specific detail, descriptions, figures, and tables, please refer to the complete annual reports linked in Attachment A.

3. 2025 Hydrological Conditions and Water Supplies

Statewide Conditions

The 2025 Water Year began in the fall of 2024 with an extremely wet November, followed by an exceptionally dry January, and ended with below-average precipitation statewide. Regional conditions however varied significantly, with above-normal precipitation in northern portions of the state and below-normal precipitation in south, where several counties ranked within the bottom 10% of historical levels. Statewide, some hydrologic indicators were below historical averages, including precipitation, snowpack, and temperature, however reservoir storage was above historical averages as seen below.

At the end of the 2025 WY on September 30, 2025 Statewide hydrologic conditions were as follows:

- precipitation was 84% of average at 23 inches (Figure 2.)
- snowpack was 96% of the historical average on April 1
- temperature was 96% of average at a mean 66° Fahrenheit
- reservoir storage was 109% of average at 23.2-million-acre feet

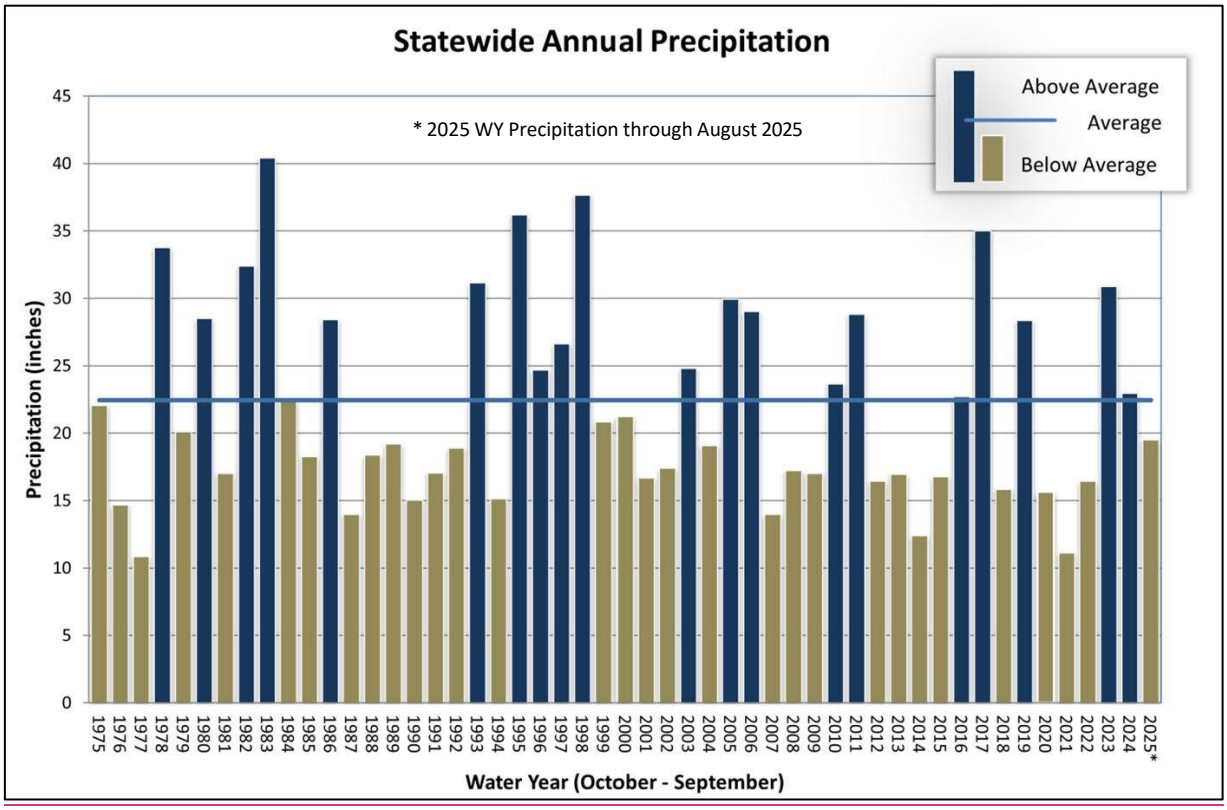

Figure 2. Statewide Annual Precipitation from NOAA National Centers for Environmental Information (DWR, 2025).

Regional Conditions

The Northern Sierra 8-Station Precipitation Index is a collection of eight precipitation gages in the mountains of Northern California which serves as a precipitation index for the Sacramento River hydrologic region. This index provides a regional perspective and indication of statewide water supplies, reflecting higher elevation precipitation and the resulting runoff conditions into the Sacramento Valley. **According to the Northern Sierra 8-Station Precipitation index, the 2025 WY ended with 106% of the long term (1991 - 2020) average.** The California Irrigation Management Information System local climate stations provide an indication of climate conditions (precipitation and evapotranspiration) in the more localized valley region. **Locally, Butte County experienced above average precipitation for the 2025 Water Year**. In the 2025 WY, the Biggs station recorded a total of just under 19 inches of precipitation which is 120% of the long-term average (2016-2024) as seen in Figure 3. below.

In the 2025 WY, the combination of above-average precipitation along with normal snowpack for the region resulted in above-average runoff from the Sierra-Cascade snowpack. This resulted in **Sacramento River Region unimpaired runoff of about 20.3 million acre-feet, or 116% of average at the end of the 2025 WY.** These conditions also contributed to the average flow rates observed locally in both the Sacramento and Feather Rivers as well as in Butte Creek and Big Chico Creek.

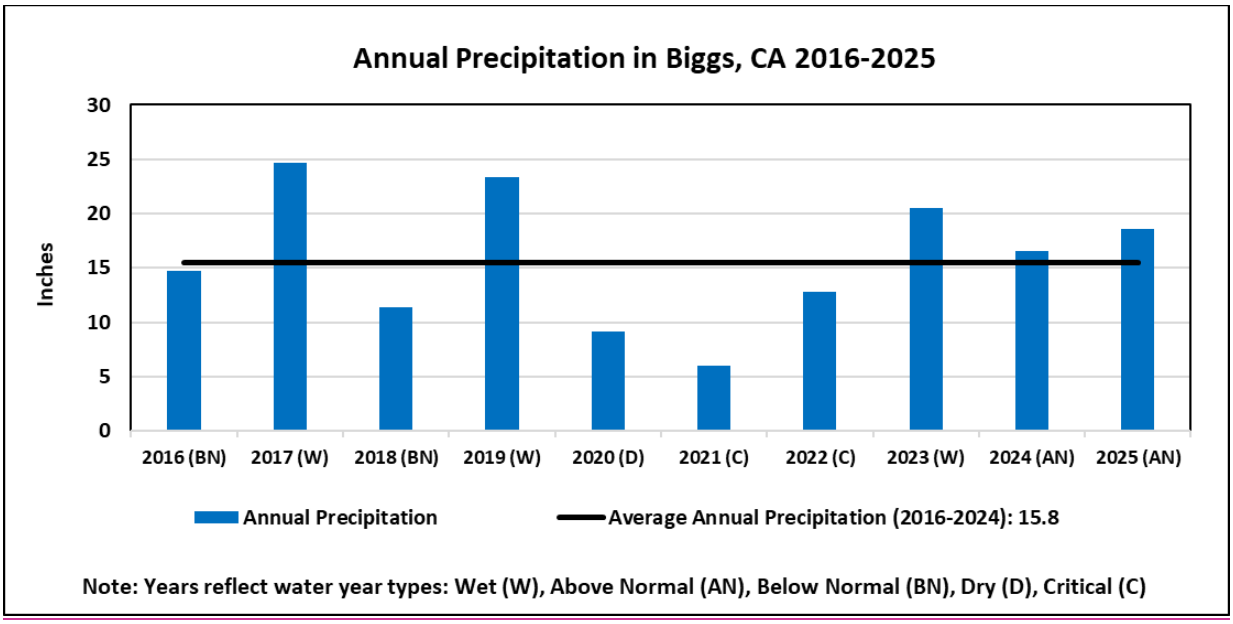

Figure 3. Annual Precipitation from the Biggs, CA California Irrigation Management Information System station from 2016 to 2025 and long-term average

The Sacramento Valley 40-30-30 Water Year Index classification system, developed by the California State Water Resources Control Board for the Sacramento hydrologic basin, is based on Sacramento River runoff. Water year types are based on the index and are identified as *wet, above-normal, below normal, dry*, or *critical*. **In 2025, the Sacramento Hydrologic region was classified as an *above-normal* water year, following an *above-normal* year and one *wet* year.**

Regional Water Supply and Use

All of the statewide and regional conditions mentioned above, including the series of three above-average water years have brought some relief to the water supply conditions including improved groundwater levels and supply (see Table 1), continued availability of local surface water supplies in the waterways within the County, and above-average local reservoir storage levels. 2025 WY water supply conditions led to:

- Table A allocation of 50 percent for State Water Project contractors statewide
- Local Butte County Table A contracted water requests fully supplied (includes Cal Water Oroville and Del Oro Water Company)
- No cutbacks to Feather River diversions in the Butte Subbasin to Western Canal Water District or the Joint Districts (which includes Richvale Irrigation District, Butte Water District, and Biggs-West Gridley Water District within Butte County).
- Sacramento River Settlement Contractor agreements honored with a 100% allocation from the Central Valley Project

Similar to the last two years, these full 2025 WY local allocations significantly increased overall surface water supplies compared to drought or cutback years, particularly in the Butte Subbasin where approximately 84% of the water supply for irrigation was supplied from surface water. This results in less fallowing of rice acreage and a reduction in groundwater pumping to help meet irrigation demands as compared to dry years.

As is typical, groundwater served as the primary water source in the Vina and Wyandotte Creek Subbasins in the 2025 WY, whereas surface water continued to serve as the majority of total water used in the Butte Subbasin through diversions from the Sacramento River, Feather River, and Butte Creek. In all three Subbasins the agricultural sector used most of the groundwater extracted and surface water diverted in 2025. Groundwater continued to serve municipal and rural residential demands in all three Subbasins and provided water for managed wetlands in the Butte Subbasin as shown in Figure 4 below. Surface water was also used to irrigate managed wetlands in the Butte Subbasin.

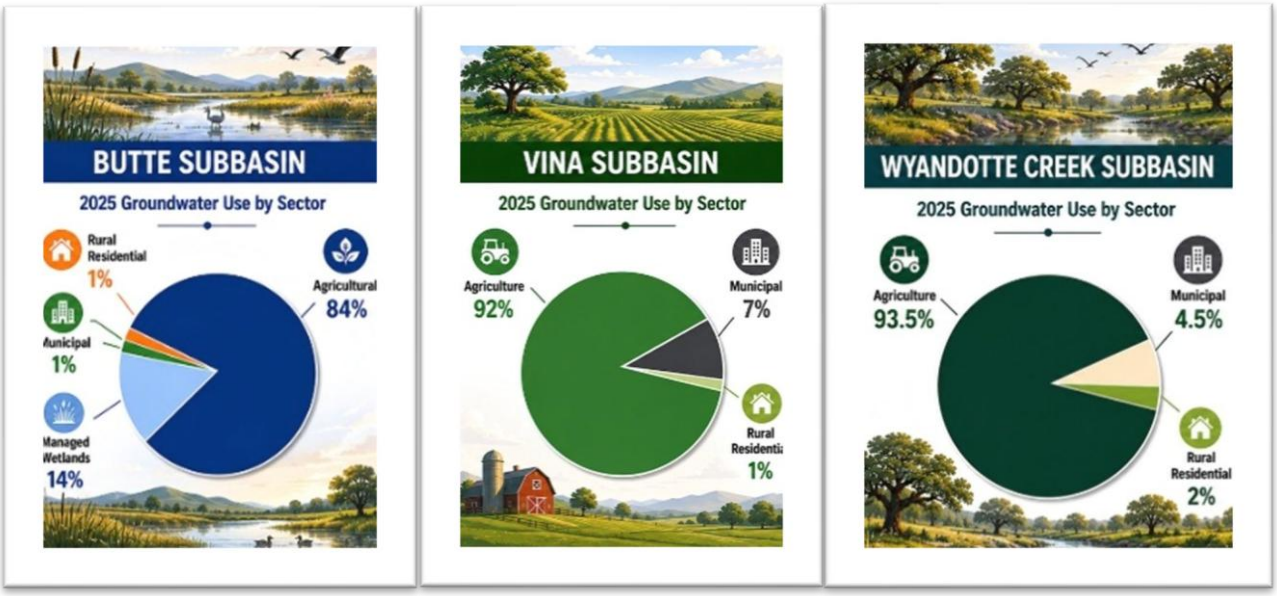

Figure 4. Groundwater Use by Sector in the Butte, Vina and Wyandotte Creek Subbasins in the 2025 Water Year

The Vina and Wyandotte Creek Subbasins used more groundwater in 2025 than 2024, likely due to slightly drier hydrological conditions than the previous year. Between 2024 and 2025, groundwater extractions increased slightly by about 18 TAF in the Vina Subbasin (up to about 262 TAF) and increased approximately 7 TAF in the Wyandotte Creek Subbasin (up to about 41 TAF). However, in the Butte Subbasin which had a full supply of surface water, there was a slight one-year 10 TAF reduction in the amount of groundwater used (down to about 160 TAF).

4. Trends in Groundwater Conditions

Groundwater Levels

About 140 groundwater level monitoring wells in the County have been measured for decades, some back to the 1950s and 1960s. There are several monitoring wells in the Vina Subbasin that show a similar pattern of relatively stable conditions in the 1950s and 60s, sharp declines during the 1976-77 drought followed by recovery, declines during the 1990s drought and again followed by recovery, after five wet

years during the late 1990s. This resulted in historically high groundwater levels observed around the year 2000 in these monitoring wells. Therefore, the year 2000 is a useful reference point. Recent observed trends on groundwater levels include the following:

- **All wells in the Vina Subbasin have seen recovery from the historical lows observed in the most recent droughts of 2020-22 and 2013-2015.** Groundwater levels in the Vina Subbasin's RMS wells increased as compared to last year by an average of about three feet. However, many wells still do have a declining trend line since roughly the year 2000 and there is a long-term deficit in groundwater storage in this Subbasin. Three wetter-than-normal years have not been enough in some areas to recover from groundwater conditions impacted by a series of dry and drought periods that have recurred over the last 20-plus years. However, within the last 10 years most wells in the Vina Subbasin have shown gradual increases in groundwater levels.

- **Groundwater levels in the Butte Subbasin continued to improve with the above-normal 2025 WY conditions and another year of full surface water supply allocations as expected.** This was the third year of three consecutive wetter-than-normal water years, since 2006. Longer-term trends show that conditions are relatively stable and shallow when full surface water allocations are available.

- **Groundwater levels in the Wyandotte Creek Subbasin have continued to rebound in the 2025 WY and have increased in the RMS wells as compared to last year by an average of about three feet.** Longer-term trends show relatively stable conditions and variability associated with wet and dry year cycles.

Many areas of the County have seen groundwater levels rebound and improve during these past three consecutive wetter-than-normal water years. Each of the Subbasin's GSAs have developed GSPs which include a unique measurable objective (MO) for each of the RMS wells within each Subbasin. These MOs are specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions to achieve the sustainability goal for the Subbasin. On average, all RMS wells across all three Subbasins and over both seasons have seen about a 1-foot increase in groundwater levels since last year. On average groundwater levels in the RMS wells were above the MOs in both the spring and fall of 2024 and were on average about 9 feet above the MOs

Groundwater Storage

During years with above-normal hydrological conditions, such as the 2025 WY, increased precipitation and surface water availability results in reduced groundwater pumping compared to dry years. This reduction in groundwater use, combined with enhanced natural recharge rates, improves groundwater storage. In wetter years, there is generally an increased volume of groundwater stored by the end of the WY and in drier years, there is generally a reduced amount of groundwater in storage. Conditions in the 2025 WY led to increases in groundwater storage in two of the three Subbasins from spring 2024 to 2025 as shown in Table 1. Annual groundwater storage increased by about 40 TAF in the Vina Subbasin, and 20 TAF in the Wyandotte Creek Subbasin, but saw slight declines of about 11 TAF in the Butte Subbasin, likely due to the timing and intensity of the precipitation in the area. Two of the three Subbasins still show overall (cumulative) storage lower than it was two decades ago since 2000. In the Butte Subbasin there has been a nominal 19 TAF decrease (a decrease of less than 1 TAF per year) and in the Vina Subbasin there has been an estimated 330 TAF decrease since 2000, (about a 11 TAF decrease per year) however, in the Wyandotte Creek Subbasin there has been an estimated 46 TAF increase since 2000 resulting in

about a 2 TAF increase per year as shown in Table 1. The cumulative change in groundwater storage takes into account each year's annual groundwater storage change over time since 2000 to show the net effect of each annual change.

Table 1. Short- and long-term comparisons of groundwater use, elevation changes and storage conditions across the Butte, Vina and Wyandotte Creek Subbasins (rounded)

Subbasin	2025 Pumping Estimates (TAF*)	Average Spring Change in Groundwater Levels** 2024 to 2025 (feet)	Estimated Change in Groundwater Storage 2024-2025 (TAF)	Cumulative Change in Groundwater Storage since 2000 (TAF)	Change in Cumulative Groundwater Storage since 2000 (TAF) per year
Butte	160	0.4	-11	-20	<-1
Vina	260	3.0	45	-330	-11
Wyandotte Creek	40	3.2	20	45	2

* TAF – Thousand acre-feet
**Groundwater level changes are shown for the Representative Monitoring Site wells.

5. Conditions to Track

Considering the groundwater conditions and trends described above, over the next year there are a few conditions that will be important to monitor closely, which include the following actions:

Track groundwater storage change estimates to support consistent and transparent methods for estimating groundwater storage change across Subbasins. The Department will continue to work with the GSAs and their technical consultant teams to better understand, re-evaluate, and standardize the methods used to estimate change in groundwater storage over time. Previous annual reporting and technical analyses have used different methodologies for different portions of the 2000–2025 time series, which can make it difficult to compare storage change estimates across years and across Subbasins. As part of the Periodic Evaluation work underway in each Subbasin, the Department is providing technical support to review how prior estimates were developed, understand how methods have changed over time, and identify a clear and consistent approach for future annual reporting. Reproducibility, transparency, and stakeholder understanding will be important considerations in any refined methodology. The goal is to work with the GSAs to improve the consistency and usefulness of groundwater storage change information as a tool for understanding long-term trends, communicating conditions, and supporting future groundwater management decisions.

Track and monitor the implementation of projects in the Vina and Wyandotte Creek Subbasins, with a focus on recharge and irrigation efficiency efforts that either enhance the groundwater supply or reduce annual groundwater use. The GSAs in both Subbasins were awarded grant funding to conduct feasibility

and pilot studies for several priority projects identified in their respective GSPs. Key projects in the Vina Subbasin include the Surface Water Supply and Recharge Feasibility Study (led by the Department on behalf of the Vina Subbasin GSAs), a Demand Reduction Strategies project that includes the design of an Extended Orchard Replacement Program and a Precision Irrigation Program, and the Lindo Channel Recharge Feasibility Study. In Wyandotte Creek, the Regional Conjunctive Use Project includes designing an Agricultural Irrigation Efficiency Program and a Surface Water Supply Program. These efforts are intended to support sustainable groundwater management by minimizing groundwater reliance, maximizing recharge opportunities, and providing a clearer understanding of the costs and benefits to guide future implementation and investment decisions.

During the 2025 WY recharge pilot projects were advanced in both Subbasins by grant-funded projects, in line with the County's Recharge Action Plan and Water Code 1242.1 which enables recharge during flooding under specific conditions. Even though the results yielded small volumes overall, the lessons learned were key in informing planning efforts for future projects. The Department anticipates continued involvement through technical support and facilitating collaboration between entities as these efforts continue forward through the GSAs or other implementing partners such as the Tuscan Water District.

Track dry and low production wells and those in areas with longer-term groundwater declines. Groundwater conditions have stabilized over the past three wetter-than-normal water years and are responding as expected. Throughout the groundwater Subbasins in the valley, groundwater conditions are no longer near historical lows, thereby alleviating the risk to domestic wells of impacts due to groundwater level declines. There were no reports to DWR's Dry Well Reporting System or the Butte County Department of Public Health Division of Environmental Health over the 2025 WY.

During the 2025 WY there were five reports to the County's Drought Resilience and Outreach program (https://www.buttecounty.net/2039/Drought-Resilience-Outreach-Project) of households with dry or low production issues that started in the 2025 WY. This program provides resource aid to residents with dry and low production wells. In the 2025 WY the method for dry well reporting shifted from online and call-in reporting to an online application for income based eligible residents to apply to receive access to a broader range of resources than in previous years to help address these conditions. This shift may have resulted in more or less reports than usual. Of those five reports, three were in fractured rock areas of the County near Bangor, Palermo and Lime Saddle Road. Two reports were from the alluvial Wyandotte Creek Subbasin area, near and south of Palermo. Four of the five reports did not indicate how deep the impacted wells were, however; one report from the fractured rock region about three miles east of Palermo indicated that an 800' deep well was impacted. It is unknown if the issues at these wells are due to groundwater level conditions or other issues such as deterioration of aging well infrastructure or equipment (i.e. pumps, wiring, well casings or screens) however assessments to make those determinations are planned for 2026, made possible by the grant-funded program.

The Department will continue to track groundwater conditions in relation to historical low levels to assess upcoming risk of impacts in the near-term and upcoming years depending on what type of hydrological conditions future water years bring. It will also be important to continue to gain a better understanding of the spatial distribution of the dry or low production wells and if the well equipment and infrastructure have reached its useful life. This can inform where and to what extent additional work may be needed to improve groundwater conditions and avoid impacts on domestic wells from lowering groundwater levels.

Track and monitor saline groundwater County-wide. Groundwater quality conditions for salinity, measured as specific conductivity (SC) has been monitored by the Department annually each summer since 2001. Although water quality thresholds defined by the County's Basin Management Objective program sunset in 2022, the Department continues its Groundwater Quality Trend monitoring program for salinity and continues to support the data collection and monitoring needs of the GSAs. The GSAs in each subbasin have established Minimum Thresholds (MT) for salinity as defined in each GSP. In 2025, there were two wells with exceedances of MTs set by the GSAs in their respective Subbasins. One well is in the Colusa County portion of the Butte Subbasin near the Sutter Buttes, an area known to have high naturally occurring concentrations of specific conductivity due to marine sedimentary rocks brought closer to the surface by faulting associated with the formation of the Sutter Buttes. The second well is in the Wyandotte Creek Subbasin southwest of Palermo, a multi-completion well drilled in 2021. This multi-completion well includes three individual wells screened at different depths to monitor conditions in the shallow, intermediate and deep portions of the aquifer system. The SC exceedances were recorded in the intermediate and deep portions of the aquifer. The well has had high levels of SC in these zones (greater than the MT) since the wells were initially developed. It will be important to continue to track conditions in 2026 but also of note is that better characterization of naturally occurring salinity in the Wyandotte Creek Subbasin is needed to help improve appropriate monitoring and management of groundwater with respect to water quality and naturally occurring high levels of salinity in this Subbasin. In the year ahead, the Department anticipates working with DWR to pursue the installation of continuous SC data loggers to understand how these conditions change seasonally and to monitor newly installed monitoring wells to refine the monitoring network and adapt to changing conditions.

Track surface water issues and projects within the Butte Creek watershed. Butte Creek flows through the Vina and Butte Subbasins and is critical habitat for salmonids as well as a significant source of water supply for irrigation. During certain times of the year and in some reaches, Butte Creek recharges the aquifer where it flows. In the Vina Subbasin surface water from Butte Creek provides a small portion of the water supply for irrigators who likely would otherwise use groundwater. Butte Creek is also a significant surface water supply source for irrigation in the Butte Subbasin, reducing reliance on groundwater use. Maintaining the use of surface water, specifically Butte Creek water for irrigation, will be an important aspect of addressing groundwater declines in the Vina Subbasin and will be essential for continued stability in groundwater conditions within the Butte Subbasin.

Support updates to the Butte County well ordinance in coordination with Environmental Health. The Department of Public Health, Division of Environmental Health was awarded funding from the State Water Board to update the Chapter 23B Water Well Ordinance and the Chapter 19 Onsite Wastewater Systems Ordinance. The Department will be participating in the Technical Advisory Committee for the well ordinance review to identify opportunities for improvement, evaluate potential revisions, and ensure consistency with applicable regulations, standards, and policies.

Track groundwater conditions in Subbasins adjacent to the Butte, Vina and Wyandotte Subbasins. There are five Subbasins which share a border with one or more of the three Subbasins: Butte, Vina and Wyandotte Creek. The GSAs in adjacent Subbasins (Los Molinos, Corning, Colusa, Sutter and North Yuba Subbasins) are required to submit an annual report of groundwater conditions to DWR. The Department has and will continue to provide a cursory review of issues identified in the annual reports of adjacent Subbasins, to gauge any potential impacts to County conditions while highlighting any reports of undesirable results. In the 2025 WY, there were no reports of undesirable results in any of the adjacent Subbasins, however; there are two Subbasins noteworthy of tracking closer in the upcoming year, the

Corning and Colusa Subbasins. The Corning Subbasin may potentially be in a stressed state as indicated by several wells that approached groundwater level MTs in the 2025 WY. Nine wells had groundwater levels below their MT and 43 had levels below their MO in fall of 2025. Conditions in the Colusa Subbasin are also worth tracking. Although this Subbasin shows no MT exceedances for groundwater levels in the 2025 WY, some wells along the western boundary have not recovered since the 2000-2022 drought period. Additionally, the areas of Orland and Arbuckle continue to experience subsidence although the rates have slowed in recent wetter-than normal years. The GSAs in both Subbasins have or are planning to implement demand management and well mitigation programs.

During the 2025 WY the Inter-Basin Coordination project continued to evaluate any significant differences, uncertainties, and potential issues of concern related to groundwater interaction at the Subbasin boundaries and conducted a comparison of the modeling tools identified in GSPs. Documents and webinars presenting the results are available online at https://www.buttecounty.net/2218/Inter-Basin-Coordination-in-the-Northern

6. Current Efforts to Improve Groundwater Resilience

The County, in coordination with the GSAs within all three Subbasins, is committed to sustainable groundwater management through continued monitoring, reporting, public outreach and providing technical staff support to the GSAs. DWR's Northern Region Office and the Department directly collect groundwater level measurements from monitoring wells within all three Subbasins at least four times per year while some wells are monitored monthly by DWR staff. Some wells are also equipped with hourly data loggers and telemetry stations to obtain continuous real-time data which is easily accessible on public webpages. Additionally, the Department has been coordinating with DWR and the GSAs to incorporate wells designated as groundwater quality RMS by the GSAs into the County's monitoring network. The Department and DWR have also been working to acquire new access agreements for the continued monitoring of wells throughout the County and have started video-logging a portion of the wells in the network to enhance and update our understanding of the monitoring network by verifying well types, proximity to surface waters and well construction details such as well depths and screening intervals. Planning for installation of new monitoring wells was underway in WY 2025 in all three Subbasins as well. The Vina and Wyandotte Creek GSAs also initiated grant-funded work to inventory and better characterize domestic well infrastructure (i.e. well locations and depths), assess the current monitoring network and suggest enhancements to fill data gaps through the Periodic Evaluation efforts. Additionally, a community well monitoring program was initiated in 2025. The Department has provided input to these efforts given historical interaction with these datasets and relevance to County-wide planning.

Reporting on groundwater conditions has and will continue to refine and enhance the County's understanding of complex groundwater conditions and trends within Butte County. The Department remains committed to continuing to provide a service to residents by providing timely, succinct and understandable information to residents of Butte County to increase awareness and knowledge about groundwater resources and their condition.

The GSAs are seeking to form collaborative opportunities to implement future GSP projects. Grant-funded projects will be completed in the Vina and Wyandotte Creek Subbasins in WY 2026. The GSAs are planning beyond the grant-funded phase to identify the next steps that build off the efforts and lessons learned from the completed grant-funded feasibility studies and are planning for future collaborative opportunities with other entities. In the Butte Subbasin a cost-share agreement amongst all 11 GSAs

continues to fund SGMA compliance efforts such as development of the 2027 Periodic Evaluation, annual reporting efforts each year and shallow well installation efforts.

The County is assessing the degree to which domestic wells may become vulnerable to negative impacts from potential future declines in groundwater levels within each Subbasin. The Department has been involved in updating the Drought Preparedness and Mitigation Plan as related to Senate Bill 552 (2021) which assigned new responsibilities and requirements for the state and local agencies to help small water suppliers and rural communities reduce their risks of inadequate water supply amid a water shortage event. As part of compliance with Senate Bill 552, the County has continued revising the Drought Preparedness and Mitigation Plan which will include a drought and water shortage risk assessment, identify short-term and long-term response actions that specifically address state small water systems and domestic wells, and will incorporate other mitigation considerations. Implementation of these efforts is consistent with Board direction resulting from the Drought Impact Analysis Study conducted in 2022.

Additionally, during the 2025 WY the Department, in collaboration with the South Feather Water and Power Agency continued its efforts to initiate the Palermo Clean Water Consolidation Project, focused on bringing clean drinking water to more than 380 households dependent on domestic groundwater wells impacted by localized flooding and water quality issues. A portion of the Clean Water Consolidation Project was implemented to provide Palermo residents with dry wells, treated surface water from a local municipal service water provider and also to offset groundwater use in this area.

The Department has continued to engage on work on the Palermo master drainage project to address drainage deficiencies in the south Oroville watershed, particularly Maintenance District No. 6. The work has expanded to include engagement with the Wyandotte Creek GSA consultants working on the Regional Conjunctive Use grant-funded project which is aimed at promoting drought resilience through reduced reliance on groundwater use. The drainage project and Regional Conjunctive Use project teams worked towards an integrated and multi-benefit approach to flood management, surface water use, and recharge opportunities.

7. Conclusions and Recommendations

Groundwater conditions in all three Subbasins are on track to meet the first 5-year 2027 interim milestones for groundwater levels at each of the RMS wells. On average groundwater levels in RMS monitoring wells over both the spring and fall of 2025 across all Subbasins were above their Measurable Objectives by an average of about nine feet. Groundwater levels remained within each Subbasin's Margin of Operational Flexibility and were well above the MT defined for each groundwater level RMS well in 2025, with no reports of undesirable results. While there were two exceedances of the salinity-related MTs, better characterization of naturally occurring salinity in the future will help improve appropriate monitoring and management of groundwater with respect to groundwater quality in these Subbasins.

In years with above-normal hydrological conditions such as the 2025 WY, attention is drawn to the importance of capturing, conveying, and storing high flows from precipitation events. While these consecutive wet and above-normal conditions can help fill reservoirs and improve surface water supplies locally, they are more of a rare occurrence than a regular one. Since 2000, there have been 16 *below-normal, dry or critical* water years and only 10 *above-normal or wet* water years. The 2005-2006 and 2023-2025 periods were the only consecutive wet and above-normal year cycles. **The 2026 WY has been classified as another *above-normal* year, and as a result, a continued similar positive response in**

groundwater conditions in all three Subbasins as seen in the 2025 WY, as well as little to no reports of dry or low production wells, are expected. Over the long-term, as the Butte, Vina and Wyandotte Creek Subbasin GSPs and neighboring GSPs are implemented, these Subbasins and the surrounding region will be better positioned to manage and mitigate drought conditions with increased groundwater resiliency and thus impacts of future droughts may be less severe and / or less costly. Recent progress and activities described herein and detailed in the Annual Reports, linked in Attachment A, demonstrate the commitment of the County and GSAs to implement the GSPs by allocating the necessary time and resources to achieve long-term sustainable management of the groundwater resources in the three Subbasins.

8. References

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California Department of Water Resources (DWR). 2025. California's Groundwater Conditions Semi-Annual Update. October 2025. Fall bulletin 118 Information Update Available at: https://data.cnra.ca.gov/dataset/california-s-groundwater-semi-annual-conditions-updates/resource/25b2404a-1a01-4c9f-8b74-8eaa7586b071

Appendix A

Links to the Butte, Vina and Wyandotte Creek Subbasin's Annual Report - 2025 Water Year

Links to the Butte, Vina and Wyandotte Creek Subbasin's Annual Report - 2025 Water Year

Butte Subbasin Annual Report link:

https://www.buttebasingroundwater.org/gsp-info

Vina Subbasin Annual Report link:

https://www.vinagsa.org/vina-groundwater-sustainability-agency-documents

Wyandotte Creek Annual Report link:

https://www.wyandottecreekgsa.com/gsp-and-annual-reports

APPENDIX 1-E

Comments to the Draft 2027 Groundwater Sustainability Plan and Responses

APPENDIX 2-A
Historical Annual Water Budget Estimates

Appendix 2-A – Historical Annual Water Budget Estimates

This appendix contains detailed annual water budget results for the land and surface water system (**Table 2A-1**) and for the groundwater system (**Table 2A-2**).

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Table 2A-1. Historical Land and Surface Water System Water Budget, 2000-2018.

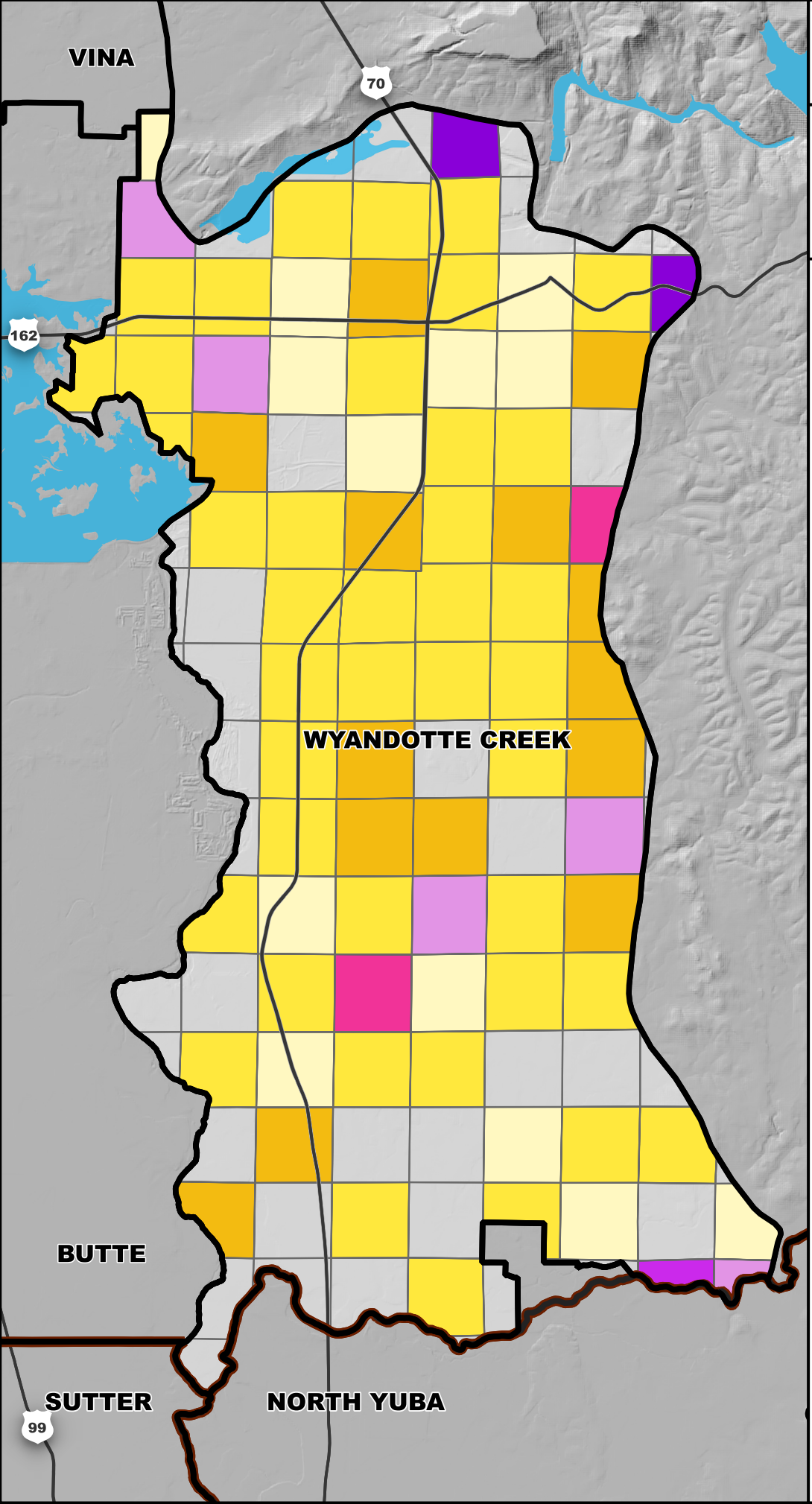
Component	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Inflows (AFY)																			
Surface Water Inflows	505,700	491,500	513,900	516,200	546,400	515,500	1,945,300	538,500	534,400	520,400	549,800	971,600	699,700	1,188,500	819,000	922,800	1,139,500	6,547,300	809,900
Outside Diversions	*5,900*	*5,900*	*6,000*	*5,900*	*6,000*	*5,800*	*5,600*	*5,400*	*5,800*	*5,700*	*5,600*	*5,400*	*5,700*	*5,700*	*5,600*	*5,700*	*5,700*	*5,600*	*5,700*
Feather River	*456,200*	*463,100*	*470,400*	*464,800*	*506,100*	*469,100*	*1,871,500*	*502,000*	*499,300*	*482,100*	*507,100*	*908,600*	*653,100*	*1,142,000*	*778,600*	*885,300*	*1,086,100*	*6,458,700*	*759,900*
North Honcut Creek	*43,100*	*22,200*	*37,200*	*45,100*	*33,800*	*40,200*	*67,500*	*30,800*	*28,900*	*32,200*	*36,500*	*56,800*	*40,400*	*40,300*	*34,400*	*31,400*	*47,000*	*81,800*	*43,700*
Precipitation Runoff	*400*	*200*	*300*	*400*	*300*	*400*	*700*	*200*	*300*	*400*	*500*	*700*	*400*	*400*	*300*	*400*	*500*	*1,100*	*600*
Applied Water Return Flows	*100*	*100*	*100*	*100*	*0*	*0*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
Precipitation	137,200	101,400	123,600	151,500	126,700	153,400	210,800	91,600	104,200	111,300	140,200	197,600	111,100	110,900	79,000	93,300	126,600	205,600	108,800
Groundwater Pumping	49,700	48,000	50,000	45,500	49,200	40,400	43,800	53,200	57,300	48,900	44,600	38,900	52,700	51,600	56,900	50,900	43,000	33,300	37,600
Agricultural	*44,100*	*41,900*	*42,900*	*37,900*	*40,900*	*31,500*	*34,400*	*43,700*	*48,100*	*40,600*	*36,700*	*31,400*	*44,600*	*44,000*	*48,000*	*43,300*	*36,100*	*26,800*	*30,900*
Urban and Industrial	*200*	*100*	*400*	*200*	*200*	*500*	*1,200*	*1,100*	*1,400*	*1,000*	*700*	*1,100*	*1,200*	*1,100*	*800*	*400*	*400*	*400*	*400*
Managed Wetlands	*5,500*	*6,000*	*6,600*	*7,500*	*8,100*	*8,500*	*8,200*	*8,400*	*7,800*	*7,300*	*7,200*	*6,400*	*6,900*	*6,400*	*8,200*	*7,200*	*6,400*	*6,100*	*6,300*
Stream Gains from Groundwater	47,500	40,100	40,500	42,600	41,600	43,500	60,700	34,700	32,800	26,800	32,100	48,000	33,800	29,300	18,900	19,200	20,300	47,000	30,800
Total Inflow	***740,100***	***681,000***	***728,000***	***755,800***	***763,900***	***752,800***	***2,260,600***	***718,000***	***728,700***	***707,400***	***766,700***	***1,256,100***	***897,300***	***1,380,300***	***973,800***	***1,086,200***	***1,329,400***	***6,833,200***	***987,100***
Outflows (AFY)																			
Evapotranspiration	88,000	88,100	87,000	92,200	80,400	94,700	86,700	95,800	89,300	92,500	90,200	92,000	92,500	84,500	83,700	73,600	80,200	82,400	81,000
Agricultural	*45,300*	*45,400*	*45,900*	*44,600*	*44,000*	*40,900*	*41,900*	*48,000*	*49,300*	*46,600*	*43,800*	*41,400*	*47,600*	*46,800*	*45,000*	*39,600*	*39,900*	*38,400*	*38,200*
Urban and Industrial	*7,000*	*7,100*	*7,100*	*8,000*	*6,800*	*9,700*	*8,400*	*9,400*	*8,600*	*9,800*	*9,900*	*11,200*	*9,800*	*9,300*	*9,200*	*8,000*	*7,800*	*7,900*	*7,600*
Managed Wetlands	*4,300*	*4,600*	*5,200*	*6,400*	*6,200*	*6,900*	*6,400*	*6,800*	*5,500*	*5,900*	*5,700*	*5,400*	*5,200*	*4,900*	*5,600*	*4,500*	*4,300*	*4,400*	*4,500*
Native Vegetation	*31,400*	*31,000*	*28,800*	*33,100*	*23,500*	*37,200*	*30,000*	*31,600*	*25,900*	*30,100*	*30,800*	*33,900*	*29,800*	*23,400*	*23,900*	*21,400*	*28,100*	*31,600*	*30,700*
Canal Evaporation	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Deep Percolation	80,500	54,900	74,200	82,200	81,100	79,700	123,900	41,000	60,900	53,000	73,500	107,300	55,500	58,100	40,300	51,600	68,600	111,300	47,600
Precipitation	*54,300*	*33,600*	*48,900*	*57,800*	*52,200*	*57,900*	*91,900*	*20,800*	*34,700*	*30,800*	*50,300*	*80,500*	*31,700*	*33,100*	*19,000*	*28,800*	*47,400*	*87,900*	*32,100*
Applied Surface Water	*7,100*	*5,700*	*6,600*	*7,100*	*8,800*	*6,300*	*9,300*	*4,600*	*6,200*	*5,900*	*6,700*	*8,000*	*5,900*	*6,200*	*3,600*	*5,100*	*5,300*	*6,600*	*3,600*
Applied Groundwater	*19,200*	*15,600*	*18,700*	*17,300*	*20,000*	*15,500*	*22,700*	*15,700*	*20,000*	*16,300*	*16,500*	*18,800*	*17,900*	*18,800*	*17,700*	*17,600*	*15,900*	*16,800*	*11,900*
Seepage	7,600	7,600	8,200	8,600	8,900	7,700	14,400	9,100	8,700	9,600	9,000	9,700	9,600	10,200	9,000	9,500	10,800	23,600	8,600
Streams	*1,400*	*1,300*	*1,900*	*2,500*	*2,400*	*1,700*	*8,100*	*2,600*	*2,200*	*3,200*	*2,800*	*3,700*	*3,000*	*3,900*	*4,000*	*4,700*	*6,000*	*18,800*	*3,800*
Lakes	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*
Canals and Drains	*2,600*	*2,700*	*2,600*	*2,500*	*2,900*	*2,400*	*2,600*	*2,900*	*2,900*	*2,800*	*2,600*	*2,400*	*2,900*	*2,700*	*1,400*	*1,200*	*1,200*	*1,200*	*1,200*
Surface Water Outflows	563,300	530,300	559,100	571,600	594,300	570,500	2,036,400	571,000	571,500	551,600	593,800	1,047,200	740,500	1,225,300	842,300	951,400	1,170,100	6,616,100	849,800
Precipitation Runoff	*17,100*	*8,800*	*13,800*	*19,000*	*16,300*	*17,300*	*36,700*	*9,300*	*14,200*	*13,900*	*18,300*	*31,700*	*16,000*	*17,400*	*10,100*	*15,300*	*15,800*	*33,000*	*13,600*
Applied Surface Water Return Flows	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Applied Groundwater Return Flows	*1,800*	*1,800*	*1,700*	*1,700*	*1,800*	*1,800*	*1,900*	*1,800*	*2,000*	*2,000*	*2,000*	*1,900*	*2,100*	*2,000*	*1,700*	*1,300*	*1,200*	*1,100*	*1,000*
Streams	*3,500*	*3,300*	*3,200*	*3,100*	*3,100*	*3,300*	*3,600*	*3,800*	*4,300*	*4,000*	*4,000*	*3,500*	*4,300*	*3,700*	*3,900*	*2,200*	*2,700*	*1,700*	*1,500*
Butte Creek Diversions to Sutter	*540,900*	*516,500*	*540,400*	*547,800*	*573,100*	*548,100*	*1,994,200*	*556,100*	*551,000*	*531,700*	*569,500*	*1,010,100*	*718,100*	*1,202,200*	*826,600*	*932,600*	*1,150,400*	*6,580,300*	*833,600*
Total Outflow	***739,400***	***680,900***	***728,500***	***754,600***	***764,700***	***752,600***	***2,261,400***	***716,900***	***730,400***	***706,700***	***766,500***	***1,256,200***	***898,100***	***1,378,100***	***975,300***	***1,086,100***	***1,329,700***	***6,833,400***	***987,000***
Change in Storage (Inflow - Outflow)	***700***	***100***	***-500***	***1,200***	***-800***	***200***	***-800***	***1,100***	***-1,700***	***700***	***200***	***-100***	***-800***	***2,200***	***-1,500***	***100***	***-300***	***-200***	***100***

Table 2A-2. Historical Groundwater System Water Budget, 2000-2018.

Component	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Inflows (AFY)																			
Subsurface Inflows	26,800	26,100	27,800	27,500	27,200	24,900	25,700	25,400	25,800	25,100	25,200	25,400	24,500	23,900	24,300	23,000	21,100	21,400	21,700
Butte Subbasin	*14,800*	*15,100*	*16,800*	*17,100*	*16,900*	*15,200*	*15,700*	*15,300*	*15,800*	*16,000*	*16,300*	*16,200*	*15,100*	*14,500*	*15,100*	*14,200*	*13,100*	*13,200*	*13,000*
North Yuba Subbasin	*3,700*	*3,200*	*2,900*	*2,700*	*2,800*	*2,800*	*2,700*	*2,700*	*2,500*	*2,000*	*2,300*	*2,900*	*3,200*	*2,900*	*2,700*	*2,300*	*2,100*	*2,300*	*2,900*
Sutter Subbasin	*500*	*600*	*900*	*900*	*800*	*500*	*600*	*700*	*700*	*800*	*700*	*500*	*600*	*700*	*800*	*800*	*700*	*600*	*600*
Vina Subbasin	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Foothill Area	*7,700*	*7,200*	*7,200*	*6,800*	*6,700*	*6,400*	*6,700*	*6,700*	*6,800*	*6,300*	*5,800*	*5,800*	*5,700*	*5,700*	*5,600*	*5,700*	*5,400*	*5,400*	*5,200*
Deep Percolation	80,500	54,900	74,200	82,200	81,100	79,700	123,900	41,000	60,900	53,000	73,500	107,300	55,500	58,100	40,300	51,600	68,600	111,300	47,600
Precipitation	*54,300*	*33,600*	*48,900*	*57,800*	*52,200*	*57,900*	*91,900*	*20,800*	*34,700*	*30,800*	*50,300*	*80,500*	*31,700*	*33,100*	*19,000*	*28,800*	*47,400*	*87,900*	*32,100*
Applied Surface Water	*7,100*	*5,700*	*6,600*	*7,100*	*8,800*	*6,300*	*9,300*	*4,600*	*6,200*	*5,900*	*6,700*	*8,000*	*5,900*	*6,200*	*3,600*	*5,100*	*5,300*	*6,600*	*3,600*
Applied Groundwater	*19,200*	*15,600*	*18,700*	*17,300*	*20,000*	*15,500*	*22,700*	*15,700*	*20,000*	*16,300*	*16,500*	*18,800*	*17,900*	*18,800*	*17,700*	*17,600*	*15,900*	*16,800*	*11,900*
Seepage	7,600	7,600	8,200	8,600	8,900	7,700	14,400	9,100	8,700	9,600	9,000	9,700	9,600	10,200	9,000	9,500	10,800	23,600	8,600
Streams	*1,400*	*1,300*	*1,900*	*2,500*	*2,400*	*1,700*	*8,100*	*2,600*	*2,200*	*3,200*	*2,800*	*3,700*	*3,000*	*3,900*	*4,000*	*4,700*	*6,000*	*18,800*	*3,800*
Lakes	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*	*3,600*
Canals and Drains	*2,600*	*2,700*	*2,600*	*2,500*	*2,900*	*2,400*	*2,600*	*2,900*	*2,900*	*2,800*	*2,600*	*2,400*	*2,900*	*2,700*	*1,400*	*1,200*	*1,200*	*1,200*	*1,200*
Total Inflow	***114,900***	***88,600***	***110,200***	***118,300***	***117,200***	***112,300***	***164,000***	***75,500***	***95,400***	***87,700***	***107,700***	***142,400***	***89,600***	***92,200***	***73,600***	***84,100***	***100,500***	***156,300***	***77,900***
Outflows (AFY)																			
Subsurface Outflows	27,900	27,300	27,300	26,700	26,500	26,300	28,500	27,100	25,600	25,000	23,900	23,900	23,600	24,000	23,200	23,800	24,800	25,400	24,100
Butte Subbasin	*16,000*	*14,900*	*14,400*	*14,400*	*14,600*	*14,700*	*15,900*	*14,800*	*13,500*	*12,900*	*12,500*	*13,300*	*13,100*	*13,000*	*12,300*	*13,000*	*13,900*	*14,900*	*14,000*
North Yuba Subbasin	*10,400*	*10,900*	*11,400*	*10,800*	*10,400*	*10,000*	*10,900*	*10,900*	*10,700*	*10,800*	*9,900*	*8,900*	*9,000*	*9,500*	*9,600*	*9,600*	*9,600*	*8,800*	*8,700*
Sutter Subbasin	*500*	*500*	*400*	*400*	*300*	*500*	*400*	*300*	*400*	*200*	*300*	*400*	*400*	*400*	*200*	*200*	*300*	*300*	*400*
Vina Subbasin	*200*	*200*	*200*	*200*	*200*	*200*	*300*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*300*	*300*	*200*
Foothill Area	*900*	*900*	*900*	*900*	*900*	*900*	*1,000*	*900*	*800*	*800*	*900*	*900*	*900*	*900*	*900*	*700*	*700*	*1,100*	*700*
Groundwater Pumping	49,700	48,000	50,000	45,500	49,200	40,400	43,800	53,200	57,300	48,900	44,600	38,900	52,700	51,600	56,900	50,900	43,000	33,300	37,600
Agricultural	*44,100*	*41,900*	*42,900*	*37,900*	*40,900*	*31,500*	*34,400*	*43,700*	*48,100*	*40,600*	*36,700*	*31,400*	*44,600*	*44,000*	*48,000*	*43,300*	*36,100*	*26,800*	*30,900*
Urban and Industrial	*200*	*100*	*400*	*200*	*200*	*500*	*1,200*	*1,100*	*1,400*	*1,000*	*700*	*1,100*	*1,200*	*1,100*	*800*	*400*	*400*	*400*	*400*
Managed Wetlands	*5,500*	*6,000*	*6,600*	*7,500*	*8,100*	*8,500*	*8,200*	*8,400*	*7,800*	*7,300*	*7,200*	*6,400*	*6,900*	*6,400*	*8,200*	*7,200*	*6,400*	*6,100*	*6,300*
Stream Gains from Groundwater	47,500	40,100	40,500	42,600	41,600	43,500	60,700	34,700	32,800	26,800	32,100	48,000	33,800	29,300	18,900	19,200	20,300	47,000	30,800
Total Outflow	***125,100***	***115,400***	***117,800***	***114,800***	***117,300***	***110,200***	***133,000***	***115,000***	***115,700***	***100,700***	***100,600***	***110,800***	***110,100***	***104,900***	***99,000***	***93,900***	***88,100***	***105,700***	***92,500***
Change in Storage (Inflow - Outflow)	***-10,200***	***-26,800***	***-7,600***	***3,500***	***-100***	***2,100***	***31,000***	***-39,500***	***-20,300***	***-13,000***	***7,100***	***31,600***	***-20,500***	***-12,700***	***-25,400***	***-9,800***	***12,400***	***50,600***	***-14,600***

APPENDIX 3-A

Figures Showing Average Depth of Domestic, Irrigation, and Public Supply Wells



Wyandotte Creek Subbasin

Average Well Completion Depth by Section - Domestic

LEGEND

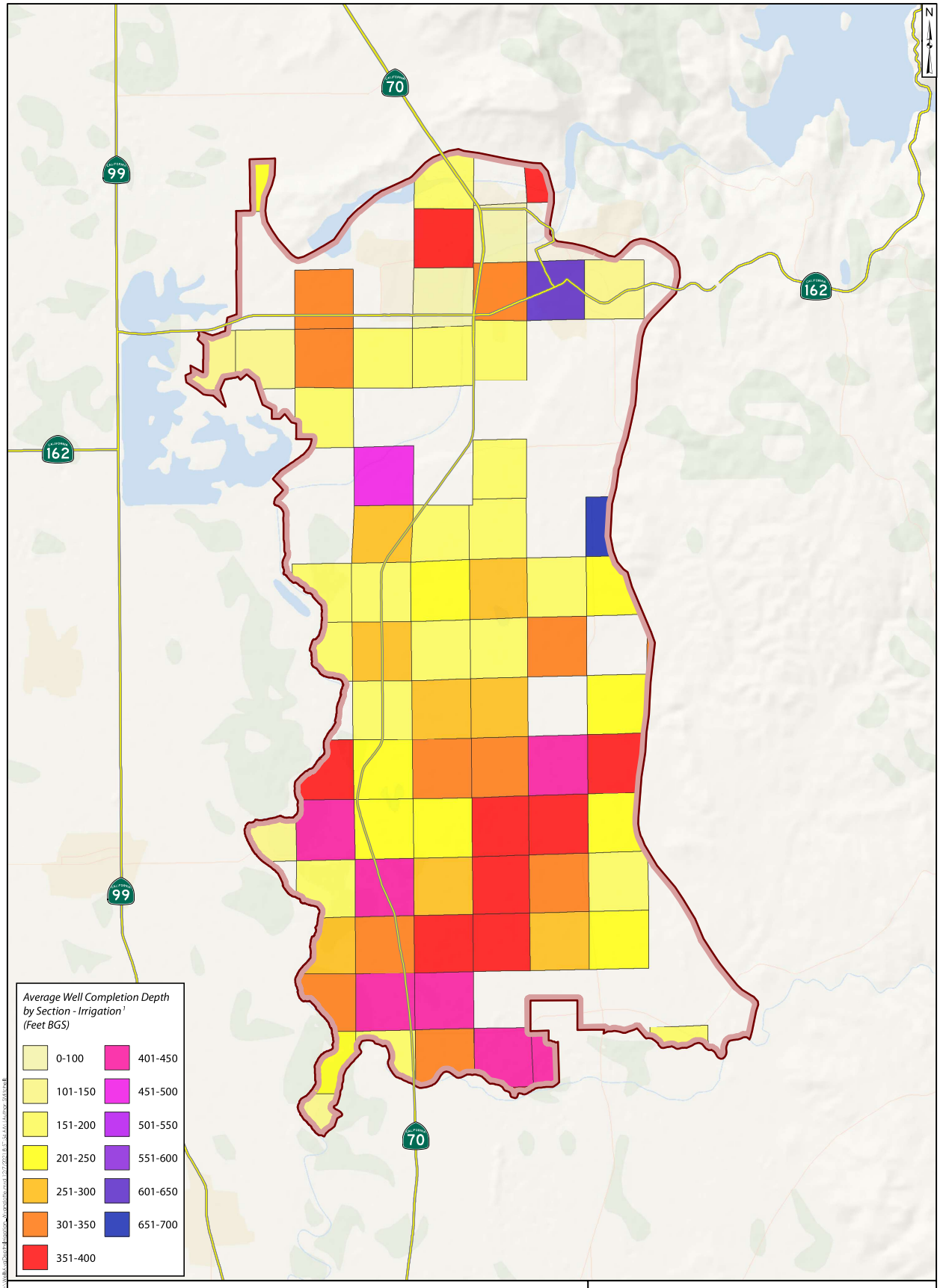
- County Line
- Subbasin Boundary
- Management Area

Average Well Depth (feet BGS)

- 1 - 100
- 100 - 150
- 150 - 200
- 200 - 250
- 250 - 300
- 300 - 350
- 350 - 400
- No Wells

0 1 2 mi

N



Legend

Wyandotte Creek Subbasin[1]

Roads[2]

Highways

2 1 0 2 Miles

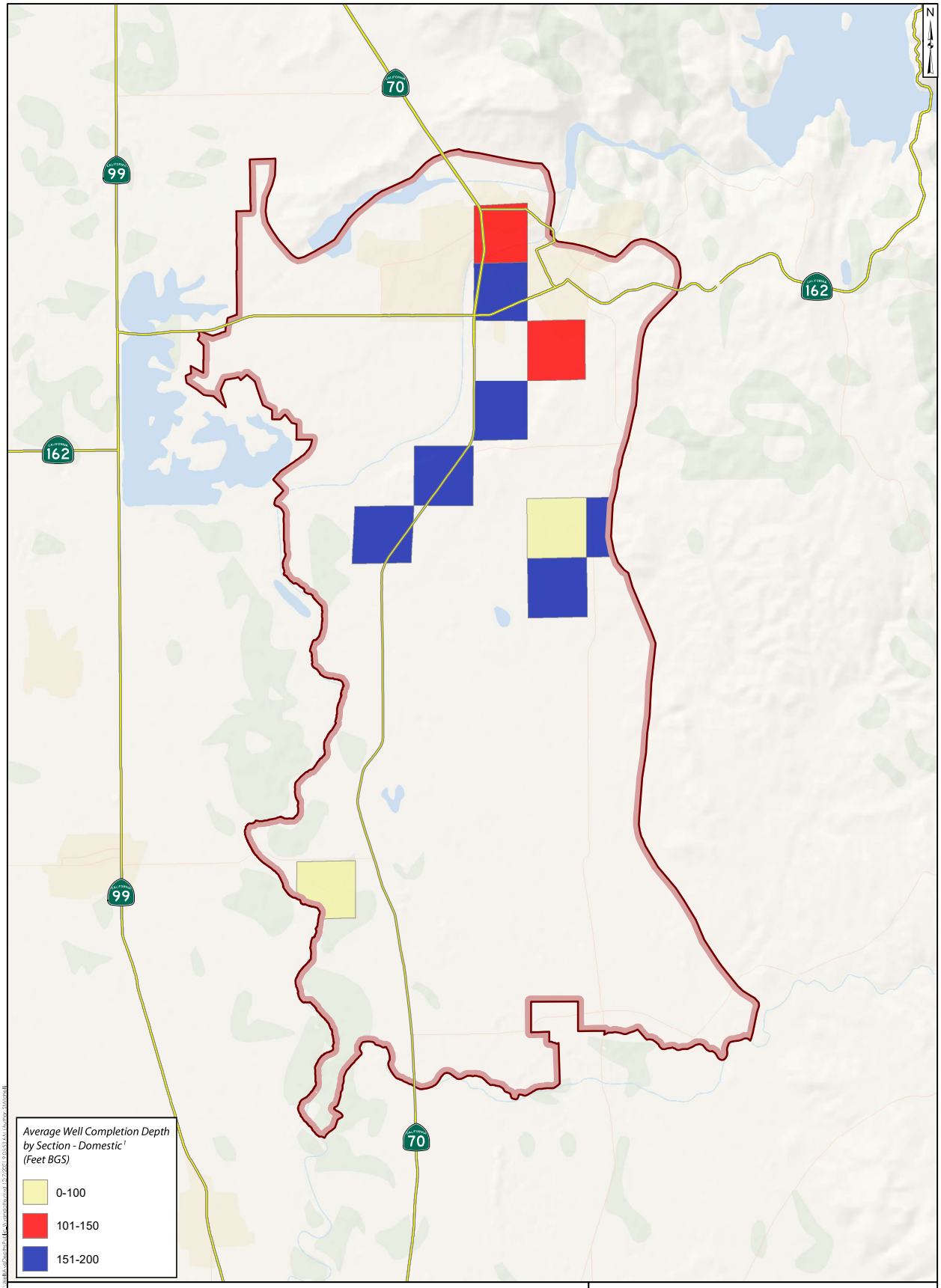
Average Completion Depth of Irrigation Wells per Section

Wyandotte Creek Subbasin GSP

Geosyntec consultants

Project No.: SAC282 | December 2021

Notes:
1) California Department of Water Resources (CA DWR).
2) TIGER/Line, U.S. Census Bureau.



Legend

Wyandotte Creek Subbasin[1]

Roads[2]

Highways

2 1 0 2 Miles

Average Completion Depth of Public Wells per Section

Wyandotte Creek Subbasin GSP

Geosyntec consultants

Project No.: SAC282 | December 2021

Notes:
1) California Department of Water Resources (CA DWR).
2) TIGER/Line, U.S. Census Bureau.

APPENDIX 3-B

~~Figures of Representative Monitoring Sites Well Radius and Box and Whisker Plots~~

GWL RMS Selection Process and Domestic Well Risk Assessment

Domestic Well Inventory

As discussed in Section 3.3.2., the domestic well risk assessment was performed to (1) address data gaps identified in the 2022 GSP, (2) quantify risks to domestic wells due to lowering groundwater levels and (3) establish new MTs for groundwater levels using the new domestic well dataset. To perform the risk assessment, the GSA's inventory of domestic wells in the Subbasin and the groundwater level RMS network had to first be updated.

To develop a functional domestic well dataset, 785 Well Completion Reports (WCRs) corresponding to a well within the Subbasin were compiled from DWR's Online System for Well Completion Reports (OSWCR). Well data, including location, installation date, perforation depths, and total completion depth, were algorithmically extracted from all 785 WCRs, and then each report was manually reviewed to verify the extracted information and extract supplementary data, if available. Through this review, an exact location was found for 61% of the domestic wells in the Subbasin. The other 39% of wells were not located and had to their location had to be assigned as the corresponding centroid of the PLSS section, a 1-mile by 1-mile area.

Lastly, for the new domestic well inventory to be useful for the risk assessment, a standard 'pump elevation', or elevation below which the well would not be able to draw water, had to be formulated. To account for differences in available information between WCRs, the pump elevation was selected as the shallower of:

A. Ten feet above the completion depth of the well.

B. The bottom of the well's deepest perforated interval.

Table 1 shows domestic wells summarized by installation date and includes a depth range for each date range.

Table 3B-1. Domestic wells by installation date

Year Installed	Number of Wells	Well Depth Range
1900 – 1969	108	25' – 440'
1970 – 1979	129	44' – 350'
1980 – 1999	287	48' – 575'
2000 – 2024	261	14' – 990'
Total:	**785**	

GWL RMS Well Selection Process

The risk assessment, to be applicable to the Subbasin, was based on the groundwater level RMS network. Prior to the risk assessment, the GSA wanted to review all possible groundwater monitoring network wells and decide if the RMS network for groundwater levels should be changed.

Data available on the water data library for each well was reviewed and the following were identified or calculated for each well:

- Measurement history
- Measurement frequency
- Measurement quality issues
- Well construction information (e.g., GSE, RPE, well depth, perforated intervals, if available)

- Minimum/maximum/average groundwater levels and trends

In addition, site visits were conducted to verify the data available online and:

- Determine if wells could be consistently accessed for measurement.
- Identify nearby surface water features.
- Confirm well use and well depth.
- Identify any other barriers to collecting consistent, high-quality measurements.

All of this collected data led the GSA to evaluate the wells on the following criteria:

1. Does the well have at least 5 years of good-quality historical data for both spring and fall?
2. Is the site consistently measured biannually, at least? If not, could the well easily be measured more often?
3. Are at least 80% of the measurements taken of good quality (i.e., no pumping, no oil problems, etc.)?
4. Do historical measurements suggest influence of nearby surface water features or underlying geologic features that may make the measured groundwater levels not representative of the general area?
5. Does the well have sufficient construction information to determine which aquifer layer the well is screened in?
6. Does the well have access problems or other barriers that would prevent taking consistent measurements at the well?
7. Would inclusion of the well in the RMS network be redundant?

If the well passes all seven of the above criteria, or is a multi-completion well and passes at least six of the criteria, then the well can be considered an RMS well. To determine whether a well would be redundant as an RMS well, wells were prioritized based on depth. If a deep well was located closely to a shallow well, the shallow well was selected to be RMS over the deep well. This analysis was performed for 16 groundwater monitoring wells in the Subbasin. Table 2 summarizes the data collected and the determination of which wells should become RMS.

Table 3B-2. Groundwater level monitoring network well RMS selection data.

	SWN	MA	RMS	Nearby SW Feature	Measure-ment History (Years)	Number of Measure-ments	Percentage of Good-quality Measure-ments	Measure-ment Frequency	Aquifer Layer Class-ification	Access	Latitude	Long-itude	Total Depth (ft)	Well Use	Pump	GSE (ft)	Max WSE (ft)	Min WSE (ft)
19N03	E16Q001M	Oroville	**Yes**		24	108	97%	semi-annual/ quarterly	shallow	Ask landowner	39.4977	-121.6369	120	Residential	Yes	179.32	149.92	131.32
19N04	E32P001M	Oroville	**Yes**		65	210	89%	semi-annual/ quarterly	shallow	Ask landowner	39.454	-121.5503	150	Residential	Yes	187	141.3	107
CWS-03[1]		Oroville	**Yes**		46	125	99%	semi-annual/ quarterly	shallow	Confid-ential	-	-	-	Public Supply	-	-	139	88
CWS-02[1]		Oroville	No[4]		46	124	99%	semi-annual/ quarterly	both	Confid-ential	-	-	-	Public Supply	-	-	159	107
CWS-01[1]		Oroville	No[4]		46	124	100%	semi-annual/ quarterly	shallow	Confid-ential	-	-	-	Public Supply	-	-	142	85
17N03	E13B002M	South	**Yes**	intermittent pond (~5')	23	58	97%	semi-annual/ quarterly	deep	GSA directed	39.3336	-121.5853	320	Observation	No[2]	89.27	79.97	42.17
17N04	E22B001M	South	**Yes**	intermittent pond (~20')	48	182	92%	semi-annual/ quarterly	shallow	Ask landowner	39.319	-121.5089	80	Irrigation	Yes	117.26	108.76	33.06
18N03	E25N001M	South	**Yes**		48	184	84%	semi-annual/ quarterly	shallow	Ask landowner	39.3818	-121.5916	164	Residential	Yes	127.26	80.26	46.26
18N04	E08M001M	South	**Yes**		63	204	85%	semi-annual/ quarterly	deep	Ask landowner	39.4283	-121.5586	656	Irrigation	Yes	147.26	119.96	54.96
18N04	E16C001M	South	**Yes**	irrigation canal (~5')	77	235	89%	semi-annual/ quarterly	both	Ask landowner	39.4239	-121.5318	165	Residential[3]	Yes	203.26	128.66	94.36
19N04	E31F001M	South	**Yes**		24	116	94%	semi-annual/ quarterly	shallow	Free access	39.4606	-121.5725	200	Observation	No	259.27	148.47	107.97
18N04	E19D003M	South	**Yes**		4	1270	86%	daily	both	GSA directed	39.40512	-121.5736	200	Observation (MCW)	No	122	92.311	53.24
18N04	E19D002M	South	No[5]		4	1262	98%	daily	both	GSA directed	39.40512	-121.5736	570	Observation (MCW)	No	122	100.626	93.61
18N04	E19D001M	South	No[5]		4	1269	86%	daily	both	GSA directed	39.40512	-121.5736	720	Observation (MCW)	No	122	105.871	101.24
17N03	E03D001M	South	No[6]	Feather River (~1000')	77	256	94%	semi-annual/ quarterly	shallow	Ask landowner	39.364	-121.6328	179	Irrigation	Yes	97.27	85.27	63.27
17N04	E09N002M	South	No[7]		23	94	66%*	semi-annual/ quarterly	deep	N/A	39.3387	-121.5363	325	Irrigation	Yes	102.26	87.26	39.66

1. These wells do not have state well numbers
2. Pump exists but is not operable and will not be repaired
3. DWR has this well recorded as an irrigation well
4. Rendered redundant by CWS-03
5. Rendered redundant by 18N04E19D003M
6. Not RMS due to heavy influence from Feather River
7. Not RMS due to persistent oil problems

Domestic Well Risk Assessment

With the domestic well inventory complete, the dataset could then be refined for the assessment. During the domestic well inventory, GSA staff noted that not all of the wells being identified would be relevant when developing SMC for groundwater levels. The following three assumptions were used to filter wells that would not be relevant:

1. Wells installed before 1980 were considered as passed their useful life and have likely been decommissioned, abandoned, or replaced. 237 wells were excluded from the risk assessment from this assumption.
2. Wells within a public water supplier's service area are likely not relied on for drinking water and thus not considered at-risk of lowering groundwater levels. Eight wells within Cal Water – Oroville, 25 wells within TWSD, and 135 wells within SFWPA (including newly annexed parcels) were excluded from the risk assessment from this assumption.
3. Wells with a pump elevation that is lower than the historical low of the nearest groundwater level RMS well were deemed not sustainable. 35 wells were excluded from the risk assessment from this assumption.

After filtering the domestic well dataset to account for these assumptions, 345 domestic wells remained for the risk assessment. Figure 1 shows domestic wells symbolized by installation date, with public water supplier service areas also being shown on the map. The Subbasin was then divided up into ten different 'RMS Zones', each zone corresponding to a different groundwater level RMS well, which are also shown on Figure 1. Groundwater levels at the RMS well are assumed to be roughly uniform across the zone, hence why the wells were selected as RMS.

The risk assessment considers four different groundwater levels for each RMS Zone: the groundwater surface elevation when 5% of domestic wells go dry, 10% of domestic wells go dry, 15% of domestic wells go dry, and the original MT established in the initial GSP. Results of the risk assessment are shown in Table 3. Ultimately, the 5th percentile level was chosen for Criterion 1 in the final approach for calculating groundwater level MTs. Figure 2 through Figure 10 display the groundwater levels suggested in Table 3 for each RMS Zone, as shown on the map on the following page (Figure 1). A plot was not made for CWS-03, which only contains one domestic well that meets the outlined criteria. Criterion 2 (historical minimum groundwater elevation minus 20 feet) was used for the MT for CWS-03.

Table 3B-3. Approaches considered for Criterion 1 of the groundwater level MTs and the corresponding number of dry wells and well replacement costs. Criterion 2 for determining groundwater level MTs was also considered in cases where the Criterion 2 groundwater level was deeper than the Criterion 1 groundwater level. The number of dry wells in these cases was adjusted to the Criterion 2 groundwater level.

MT Approach	Number of Dry Wells	Mitigation Cost at MTs
MTs established in 2022 GSP	53 (or 15%)	$1.59 million
5th Percentile Dry	38 (11%)	$1.14 million
10th Percentile Dry	46 (13%)	$1.38 million
15th Percentile Dry	56 (or 16%)	$1.68 million

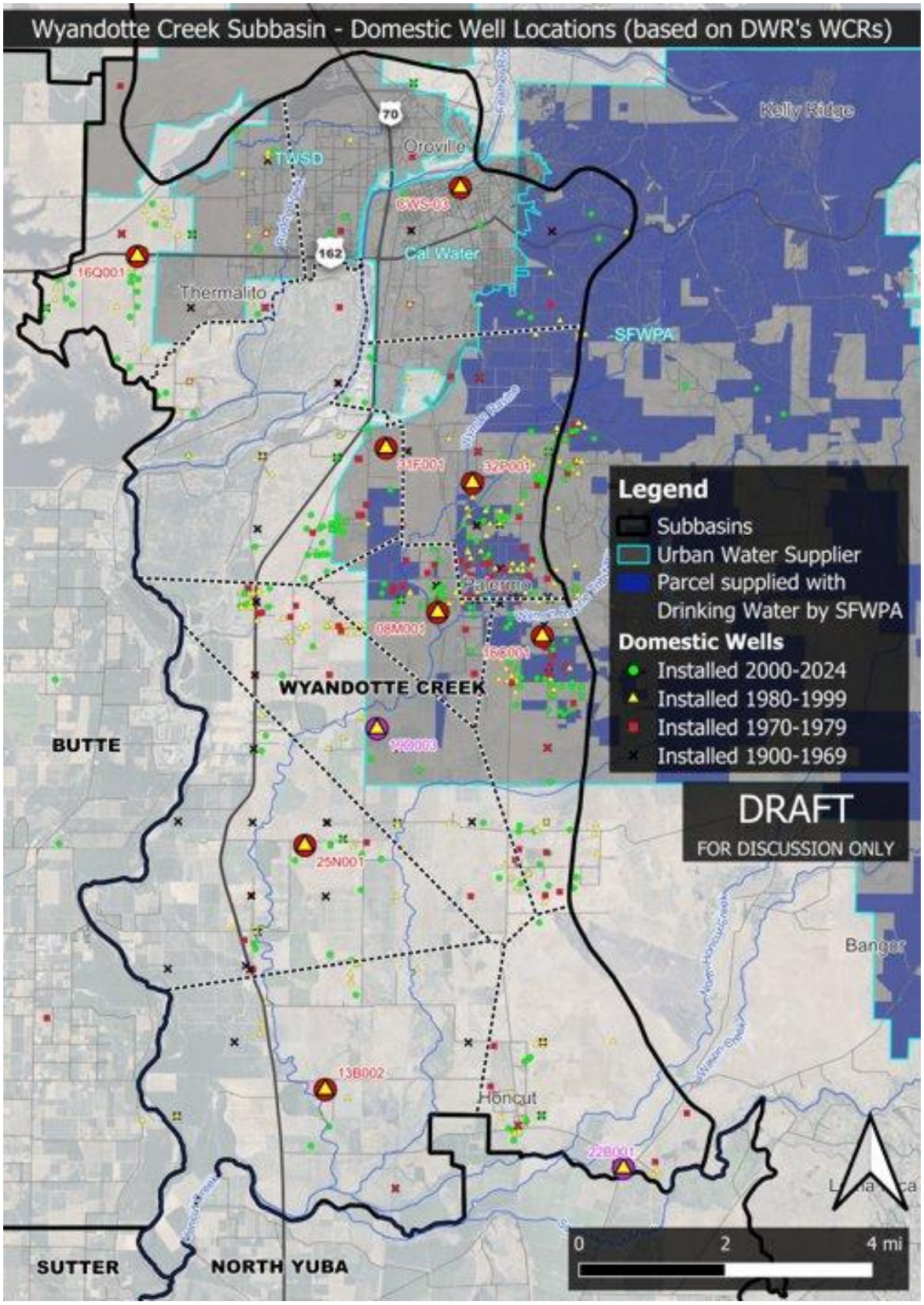


Figure 3B-1. Map of domestic wells in each RMS zone, symbolized by installation date.

RMS Zone Domestic Well Depth Charts

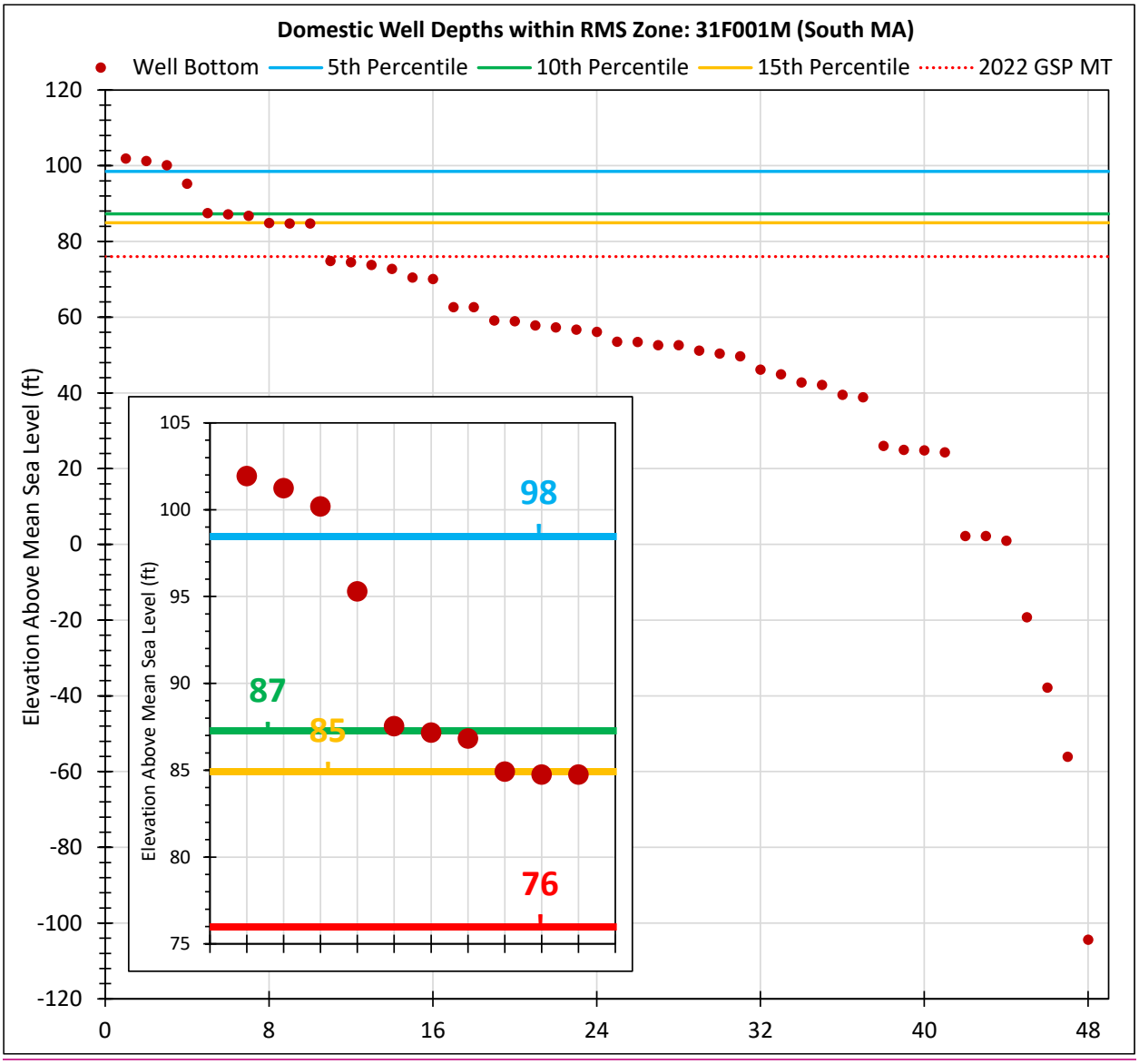


Figure 3B-2. Depths of domestic wells near RMS Well 19N04E31F001M plotted sequentially by elevation of pump; the RMS Zone contains 48 domestic wells. A zoomed-in window on the plot explicitly shows the 5th percentile, 10th percentile, 15th percentile, and prior MT groundwater levels.

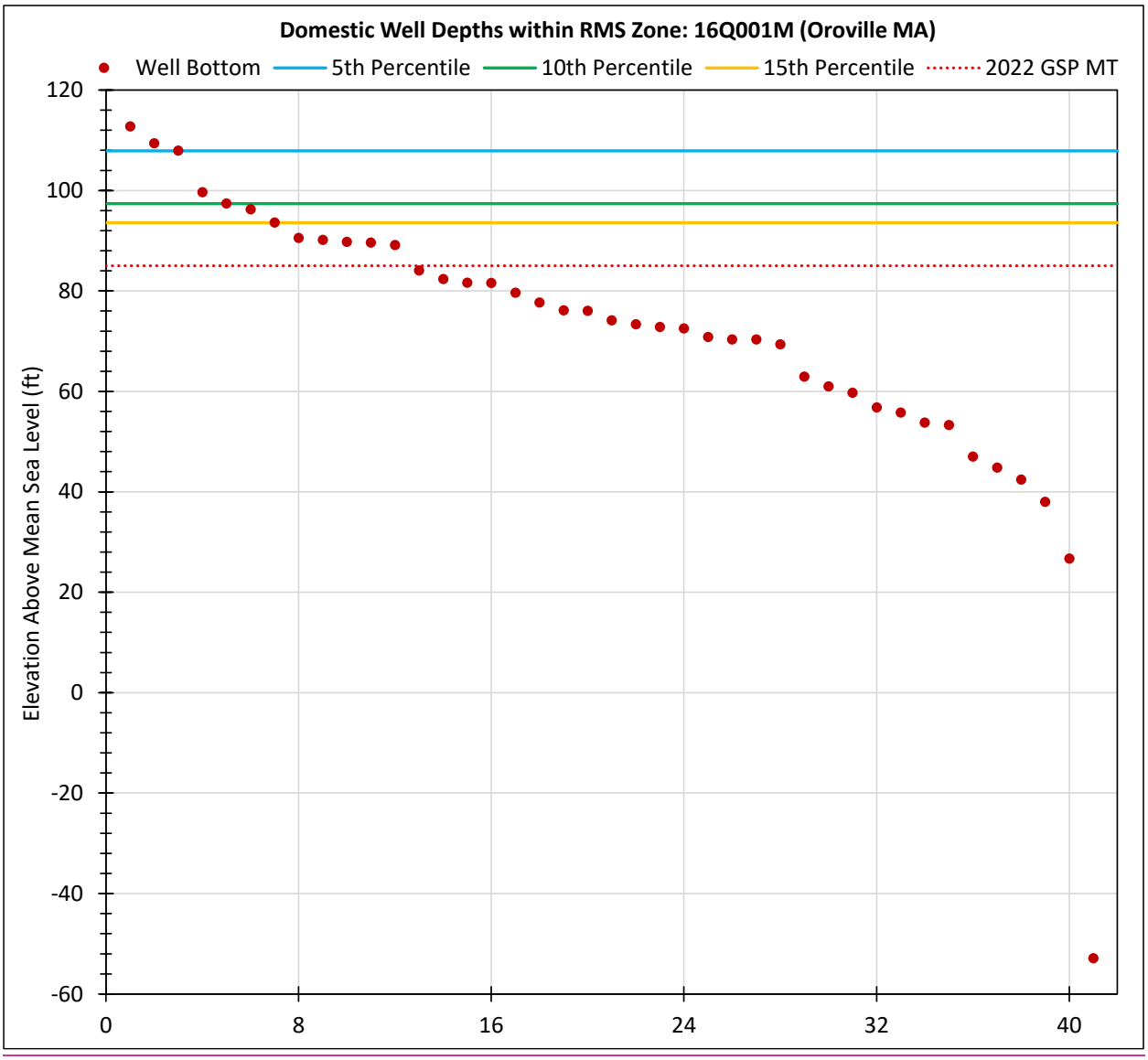


Figure 3B-3. Depths of domestic wells near RMS Well 19N03E16Q001M plotted sequentially by elevation of pump; the RMS Zone contains 41 domestic wells.

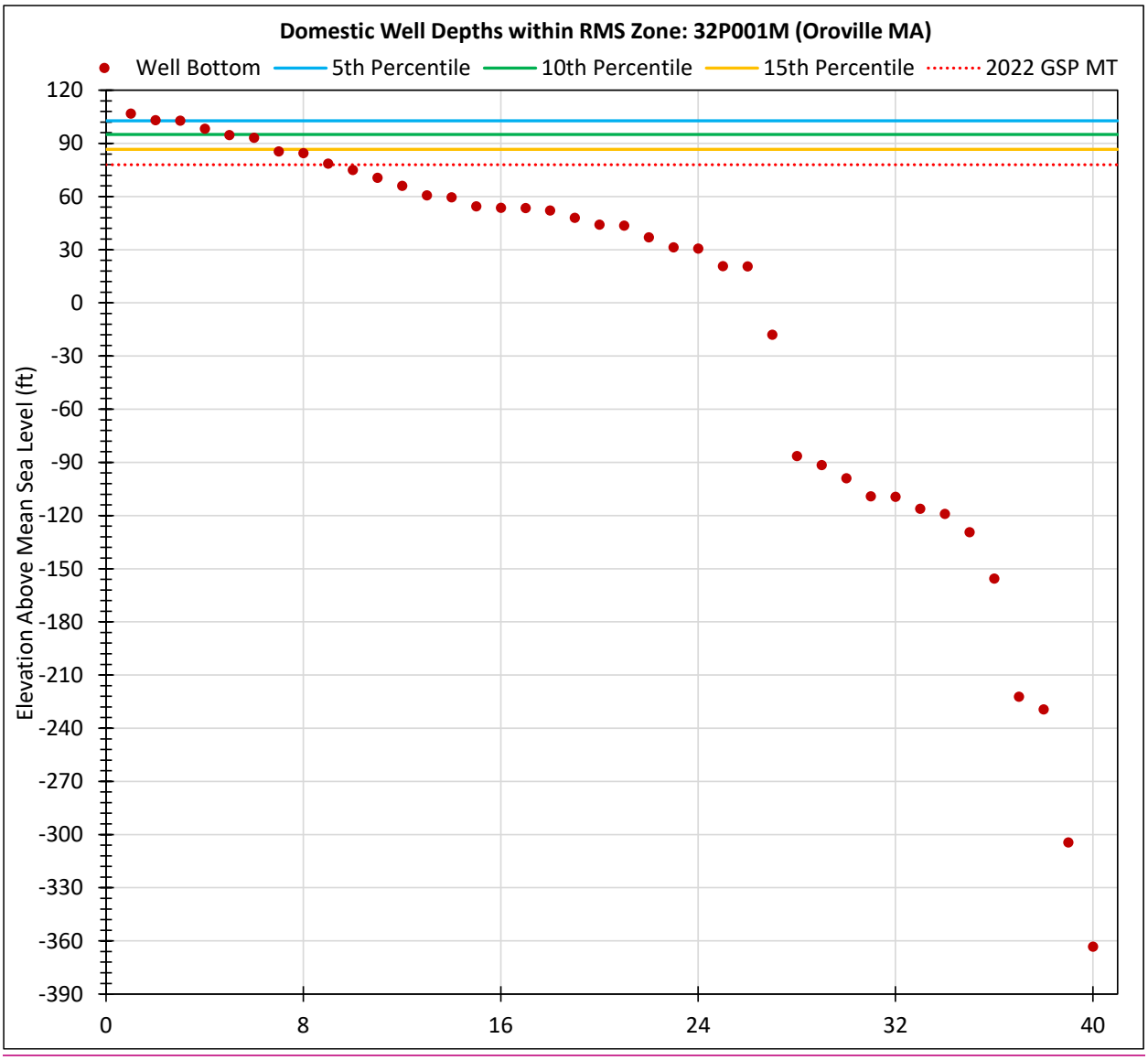


Figure 3B-4. Depths of domestic wells near RMS Well 19N04E32P001M plotted sequentially by elevation of pump; the RMS Zone contains 40 domestic wells.

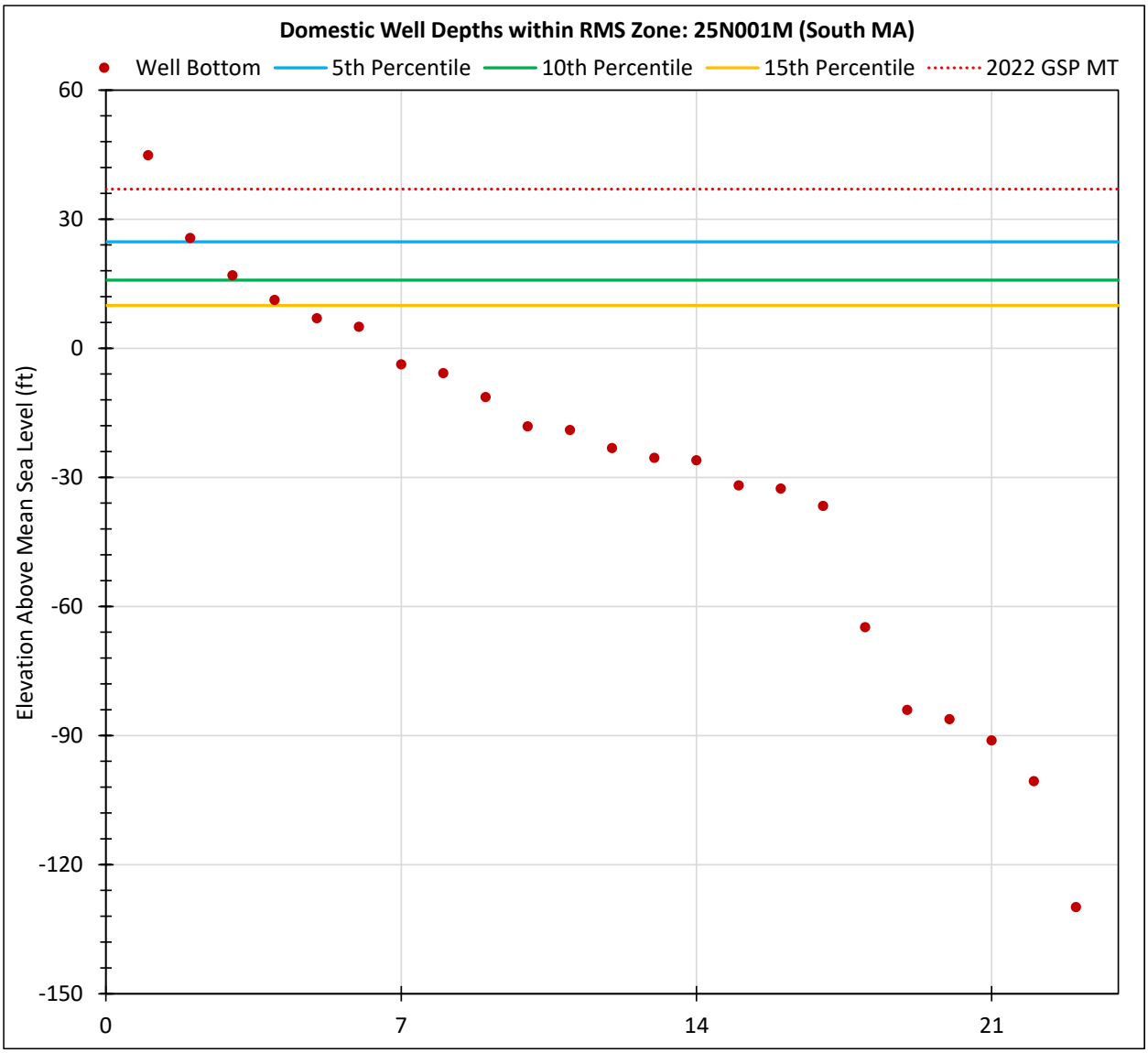


Figure 3B-5. Depths of domestic wells near RMS Well 18N03E25N001M plotted sequentially by elevation of pump; the RMS Zone contains 23 domestic wells.

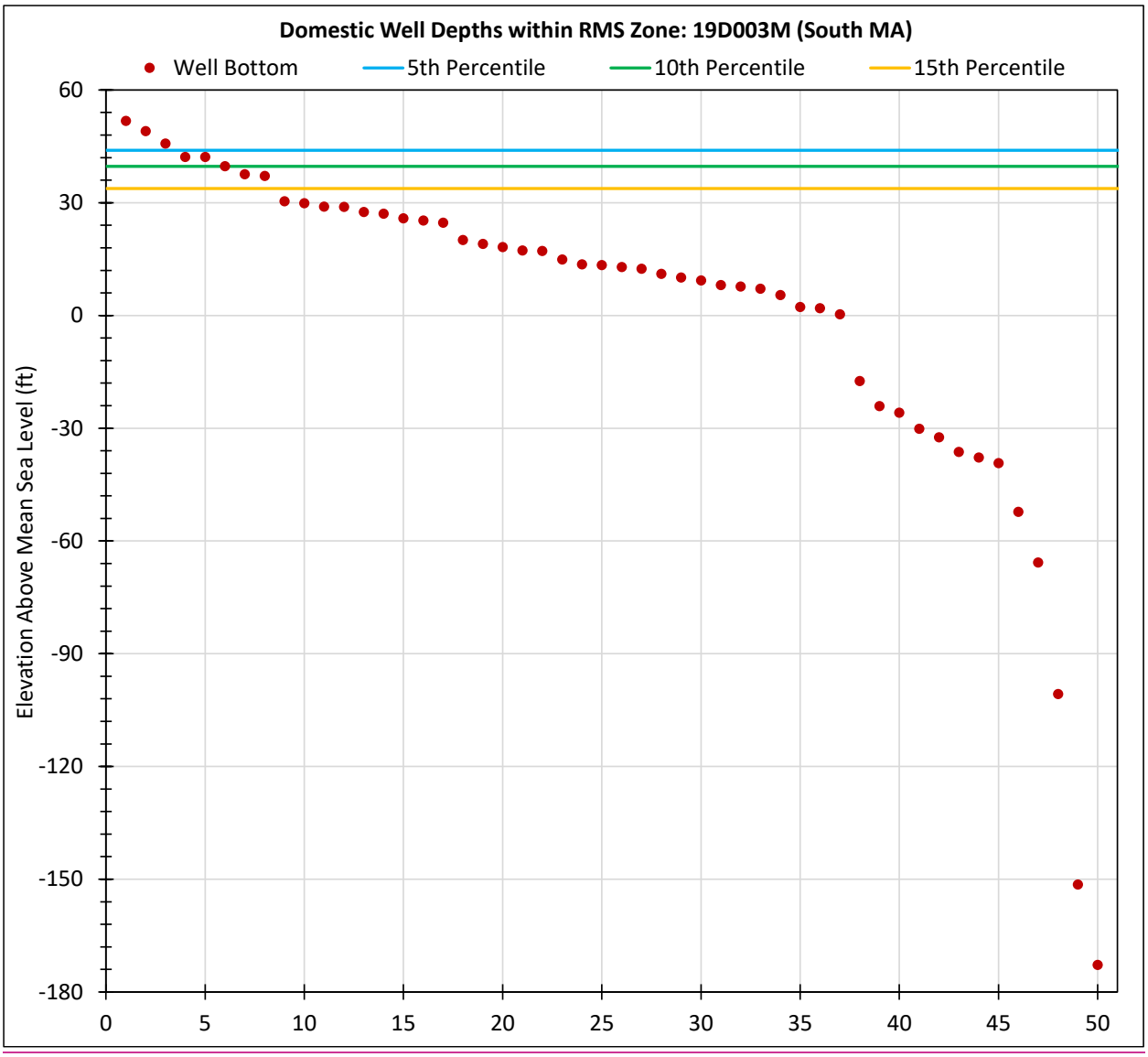


Figure 3B-6. Depths of domestic wells near RMS Well 18N04E19D003M plotted sequentially by elevation of pump; the RMS Zone contains 51 domestic wells. One well was too deep to be included on the plot, with a pump elevation of 375 feet below mean sea level.

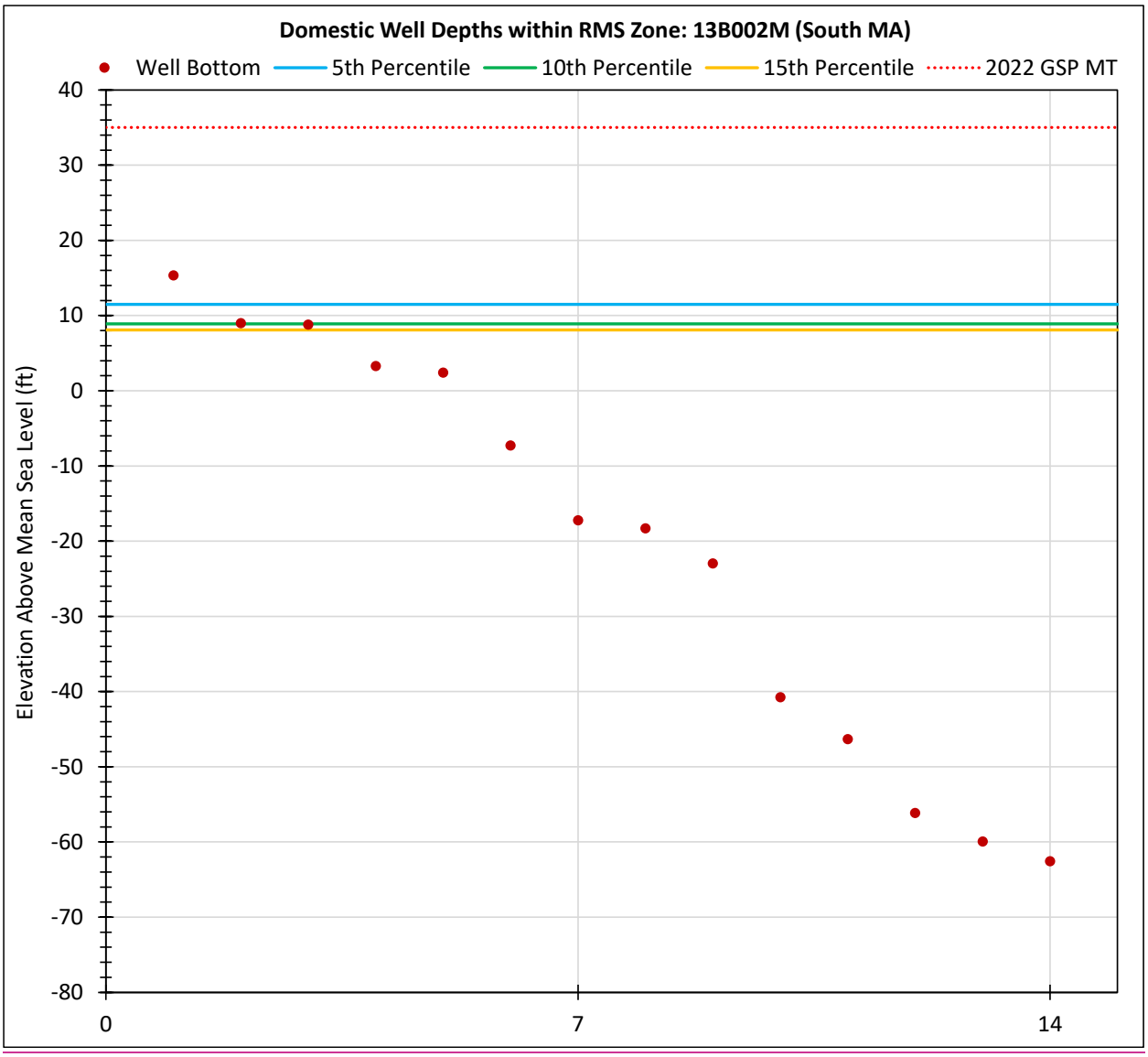


Figure 3B-7. Depths of domestic wells near RMS Well 17N03E13B002M plotted sequentially by elevation of pump; the RMS Zone contains 14 domestic wells.

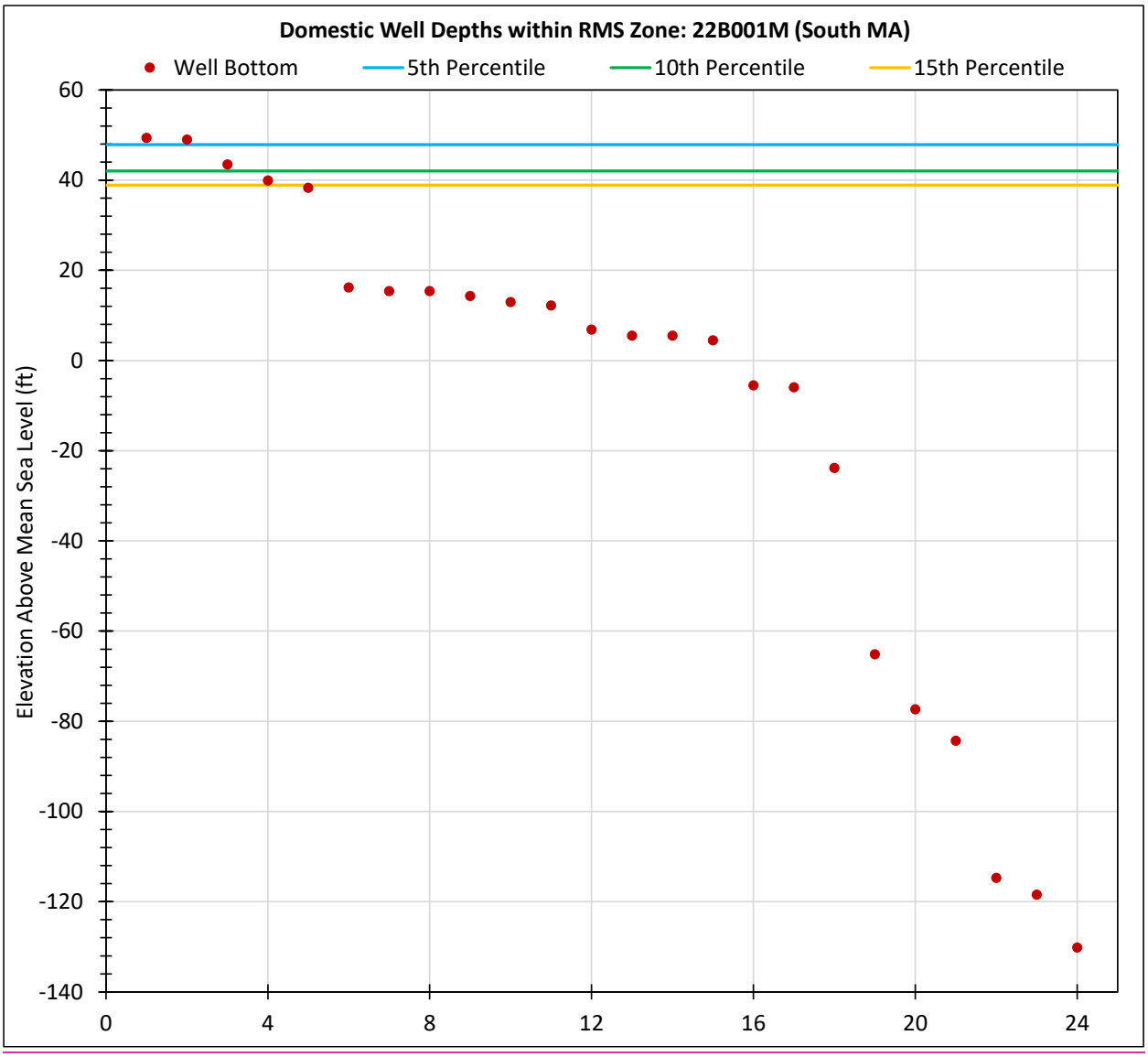


Figure 3B-8. Depths of domestic wells near RMS Well 17N04E22B001M plotted sequentially by elevation of pump; the RMS Zone contains 25 domestic wells. One well was too deep to be included on the plot, with a pump elevation of 412 feet below mean sea level.

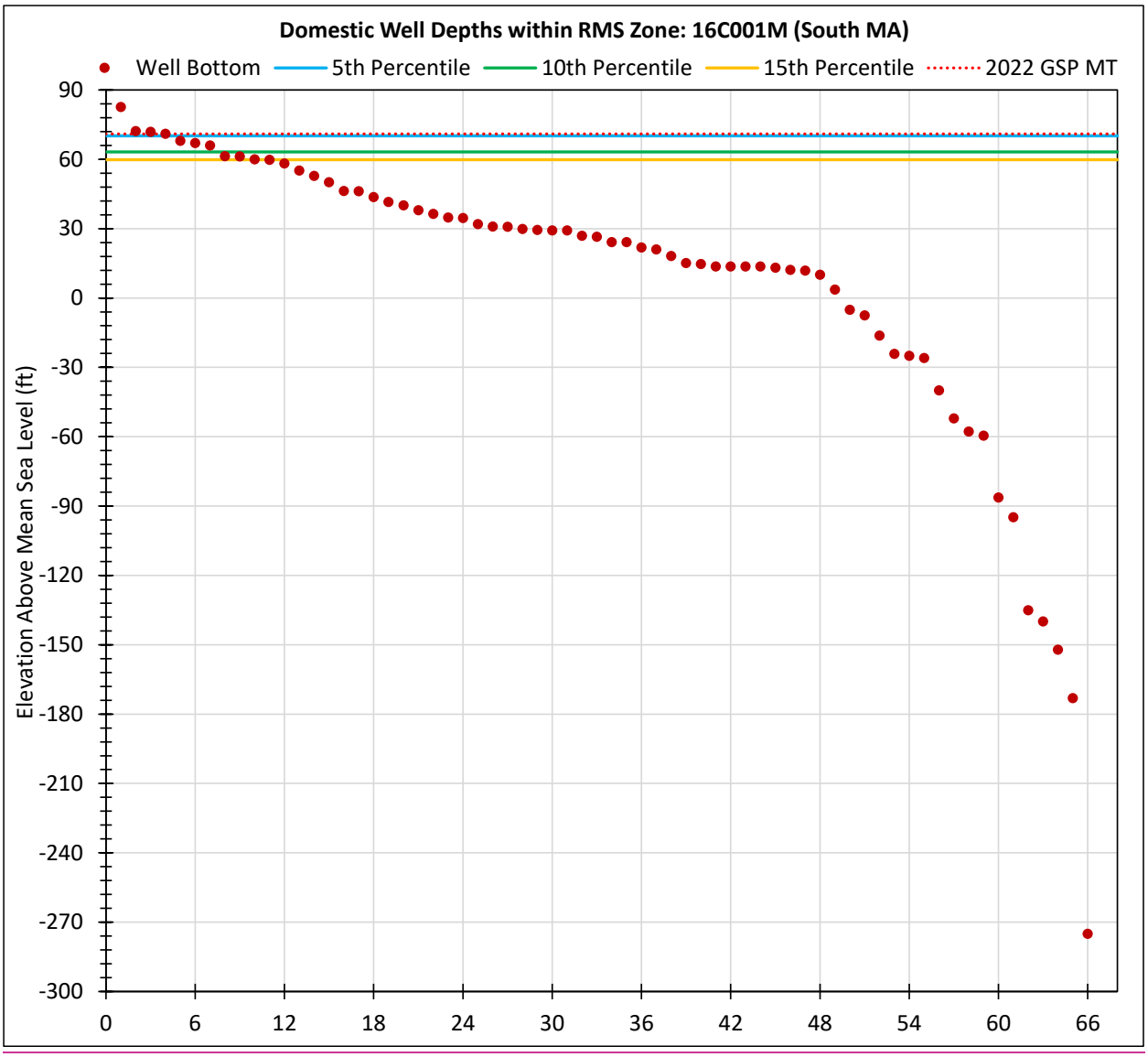


Figure 3B-9. Depths of domestic wells near RMS Well 18N04E16C001M plotted sequentially by elevation of pump; the RMS Zone contains 67 domestic wells. One well was too deep to be shown on the plot, with a pump elevation of 765 feet below mean sea level.

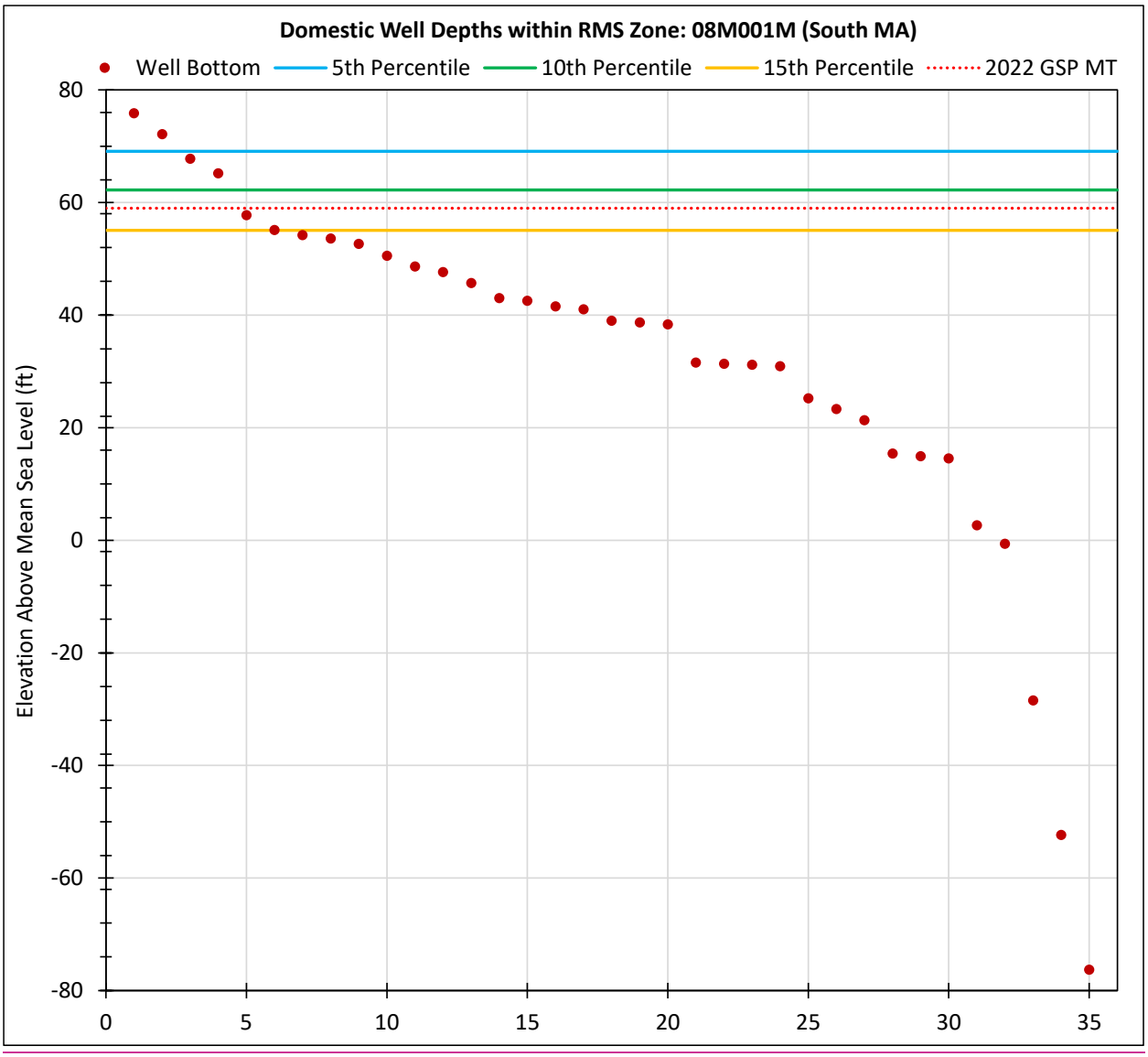
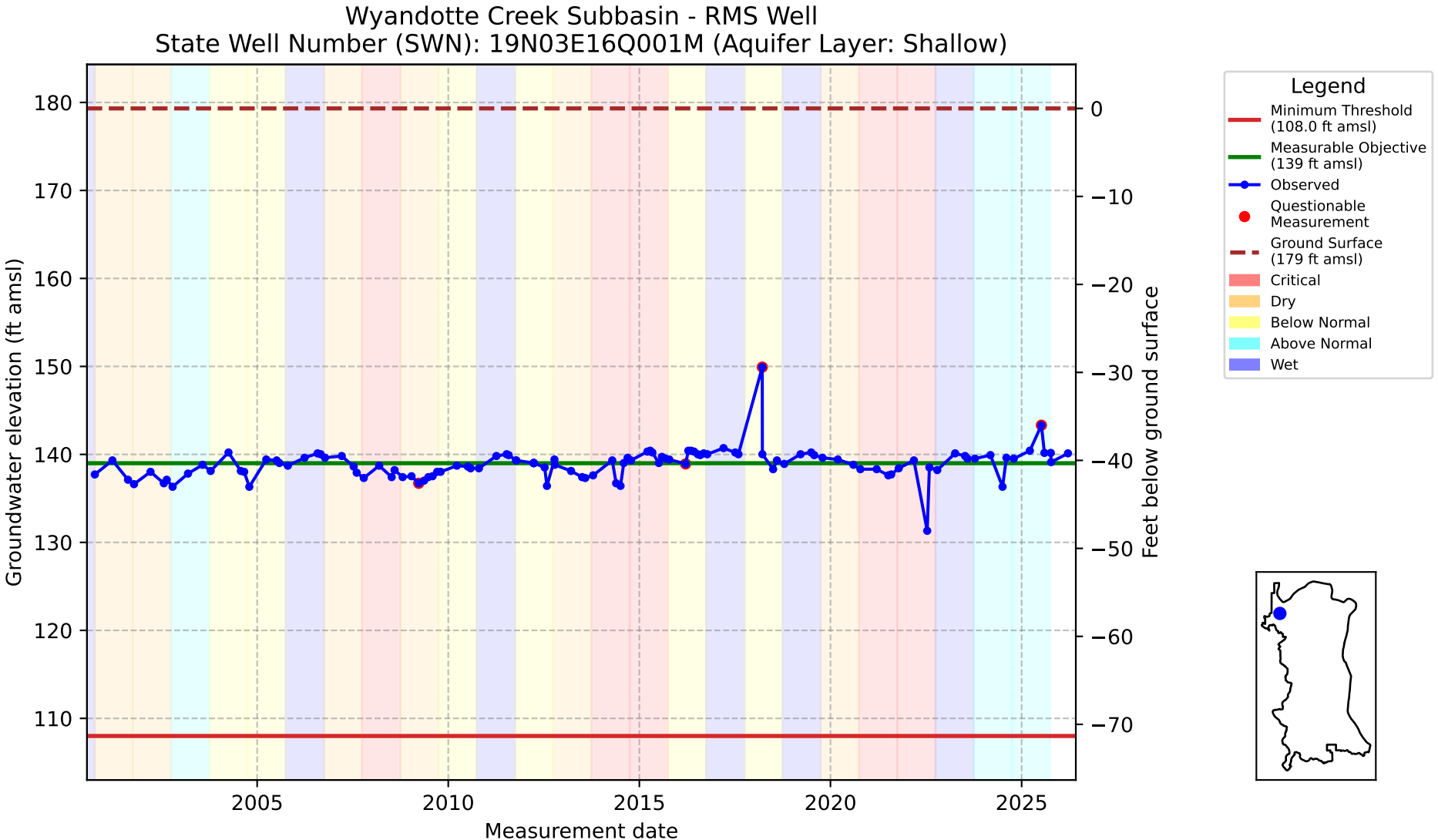


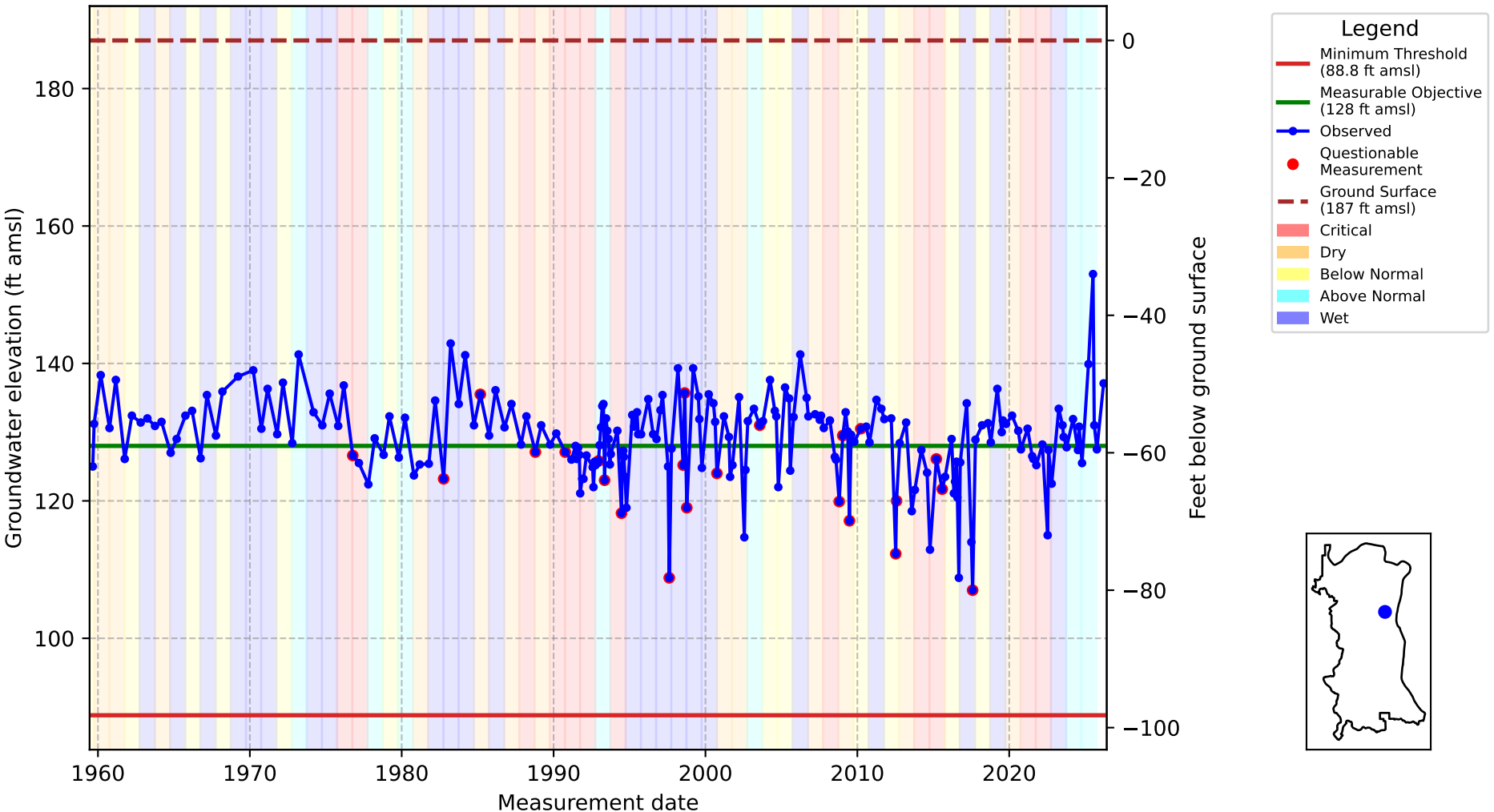
Figure 3B-10. Depths of domestic wells near RMS Well 18N04E08M001M plotted sequentially by elevation of pump; the RMS Zone contains 35 domestic wells.

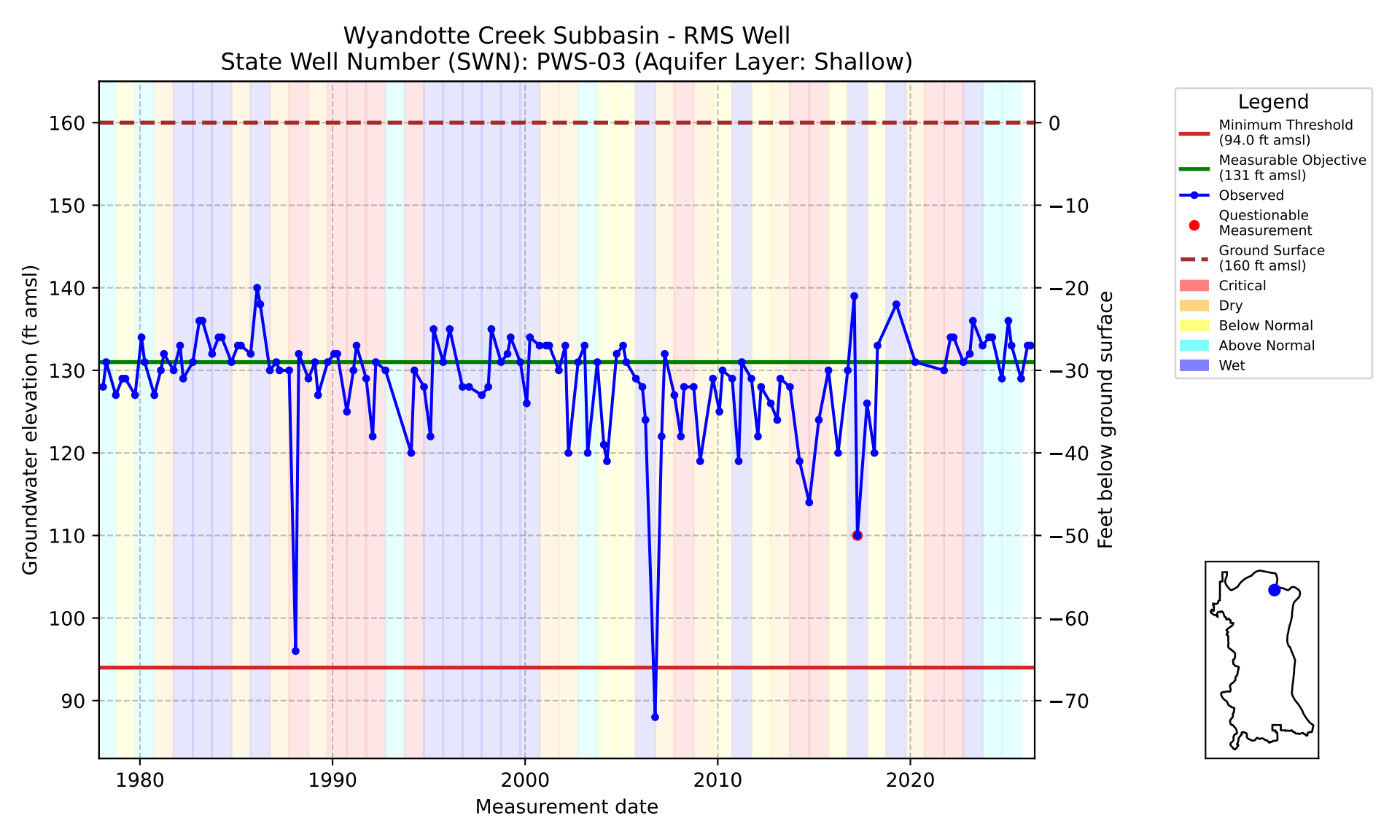
APPENDIX 3-C

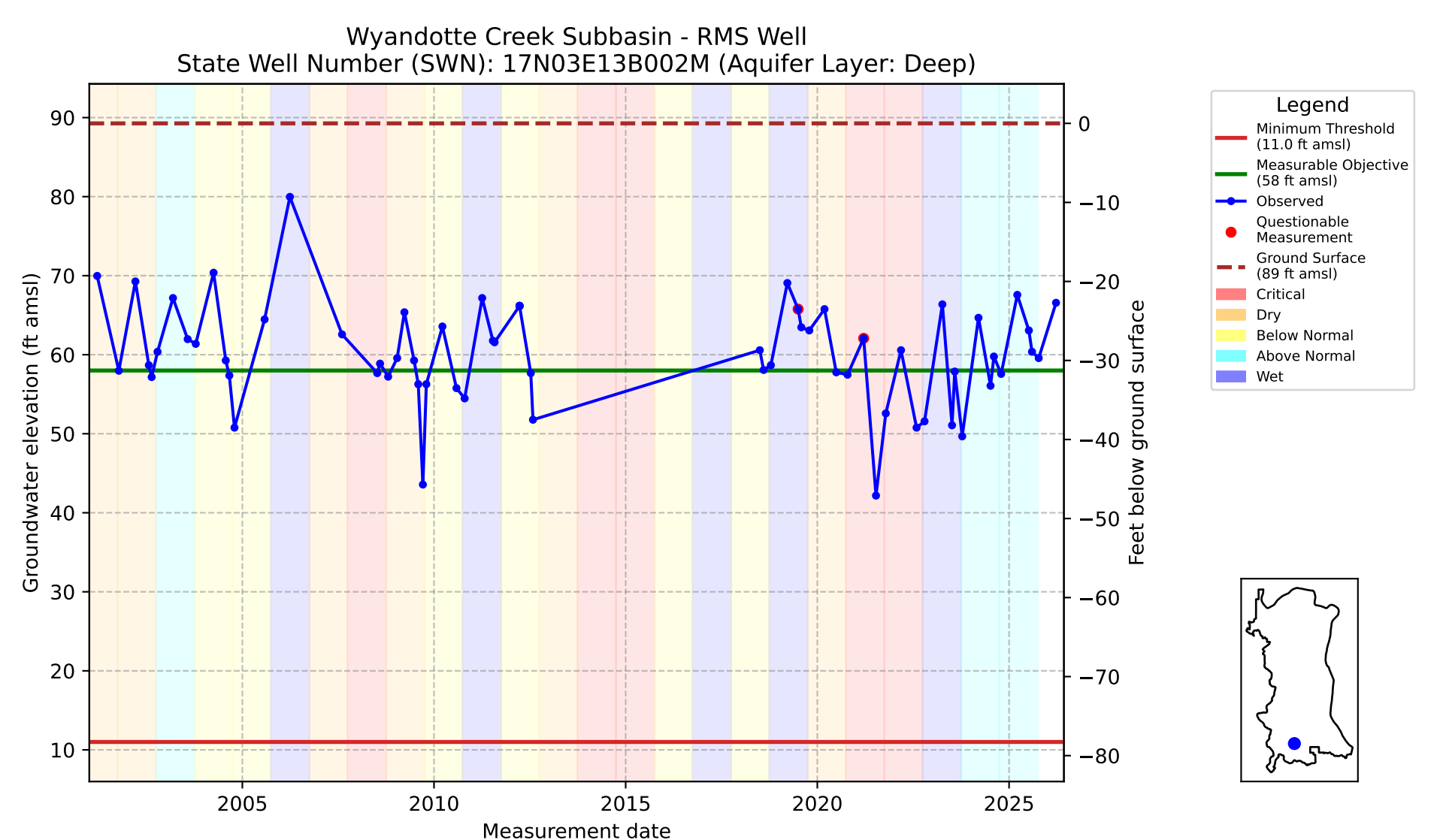
~~Representative Monitoring Site~~

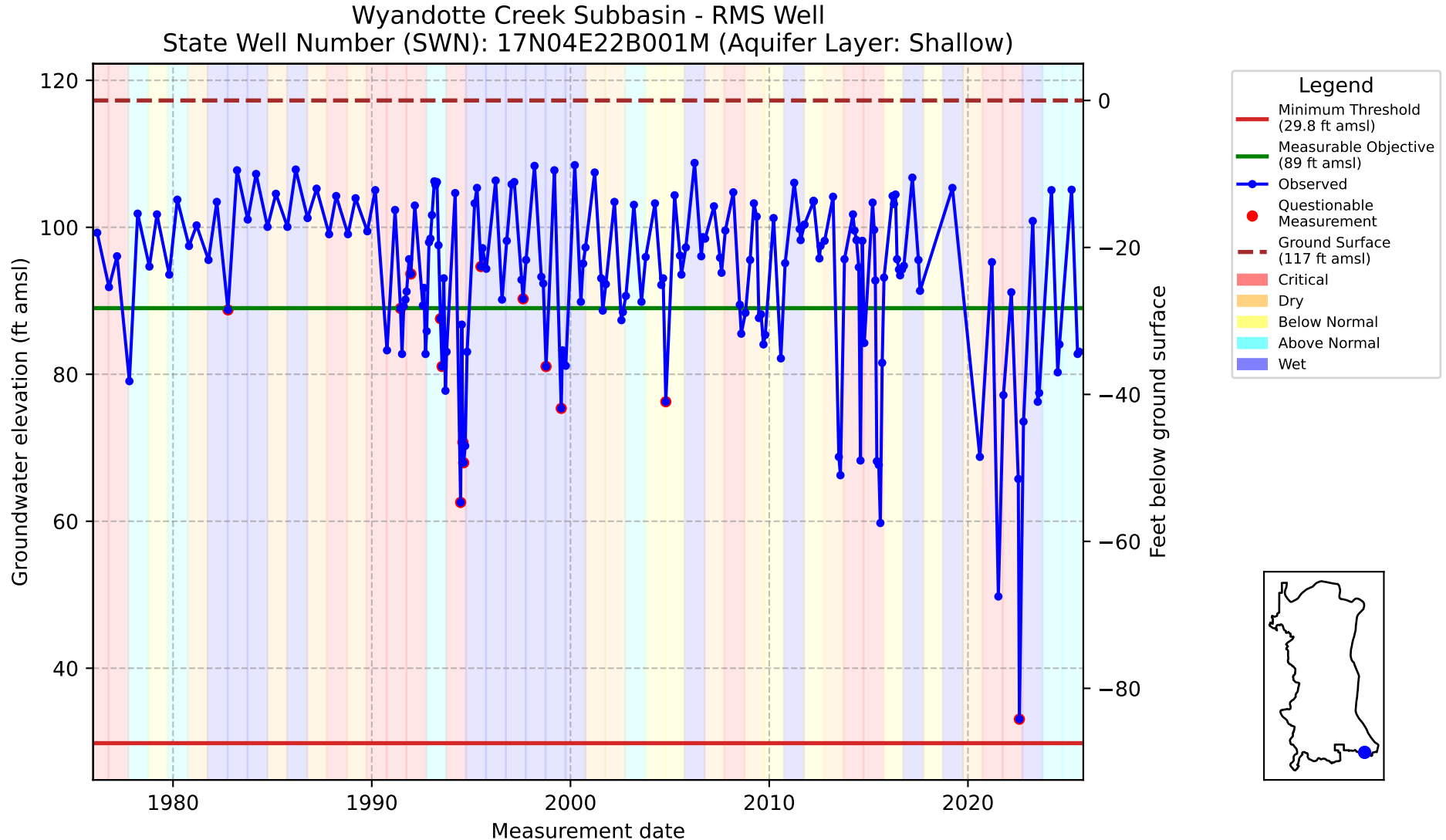
GWL RMS Well Hydrographs

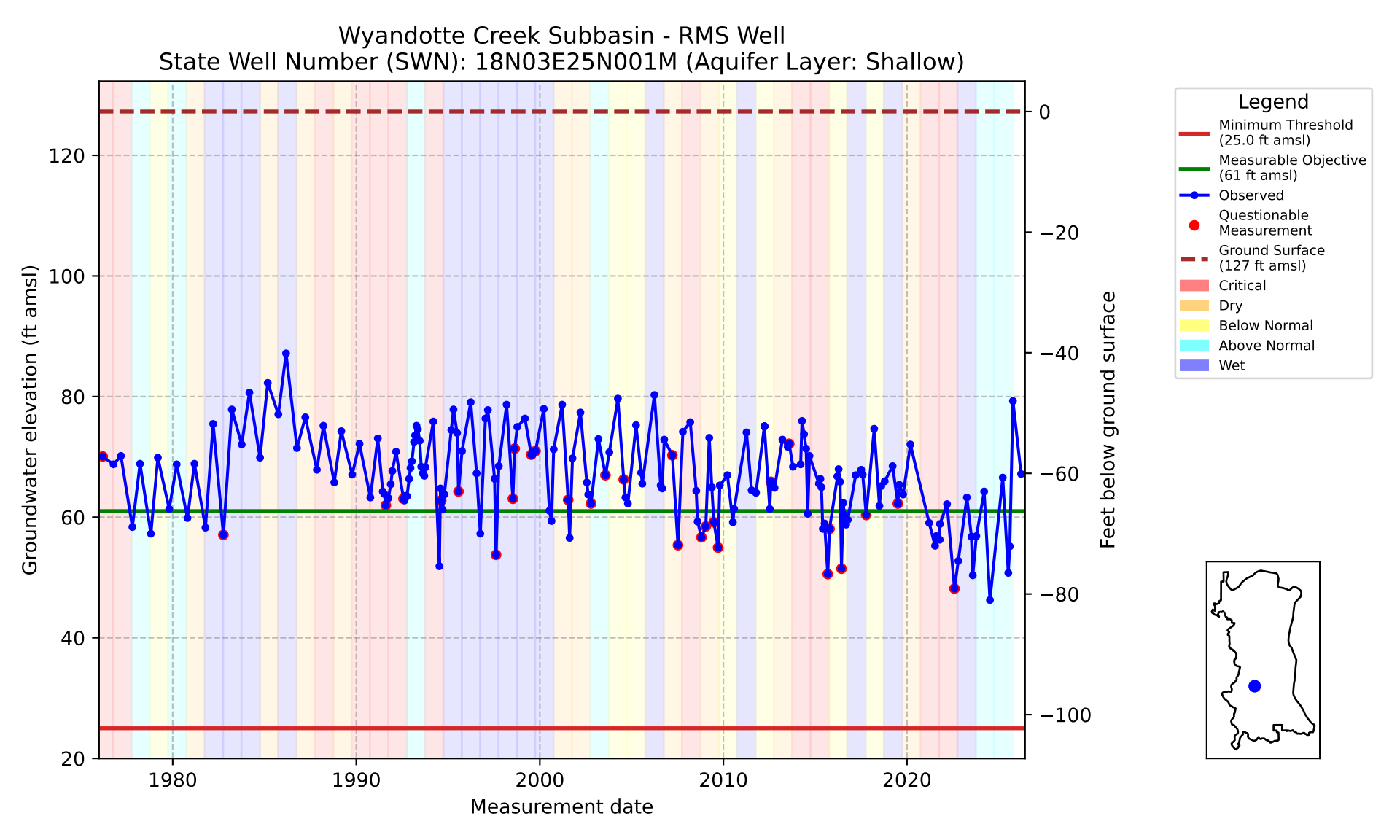

Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): 19N03E16Q001M (Aquifer Layer: Shallow)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
180
170
160
150
140
130
120
110
0
−10
−20
−30
−40
−50
−60
−70
2005
2010
2015
2020
2025
Legend
Minimum Threshold (108.0 ft amsl)
Measurable Objective (139 ft amsl)
Observed
Questionable Measurement
Ground Surface (179 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet

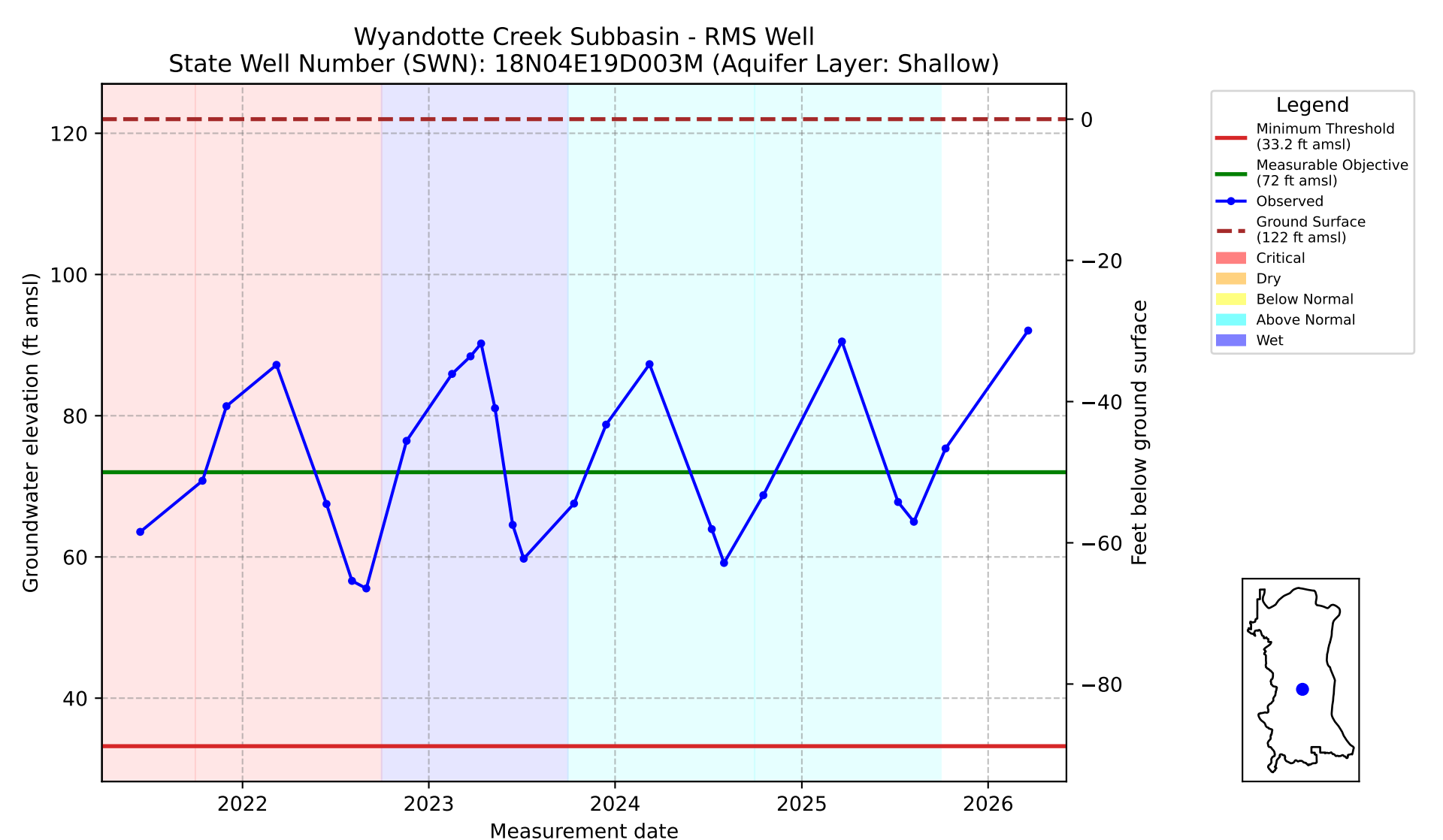

Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): 19N04E32P001M (Aquifer Layer: Shallow)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
180
160
140
120
100
0
−20
−40
−60
−80
−100
1960
1970
1980
1990
2000
2010
2020
Legend
Minimum Threshold (88.8 ft amsl)
Measurable Objective (128 ft amsl)
Observed
Questionable Measurement
Ground Surface (187 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet

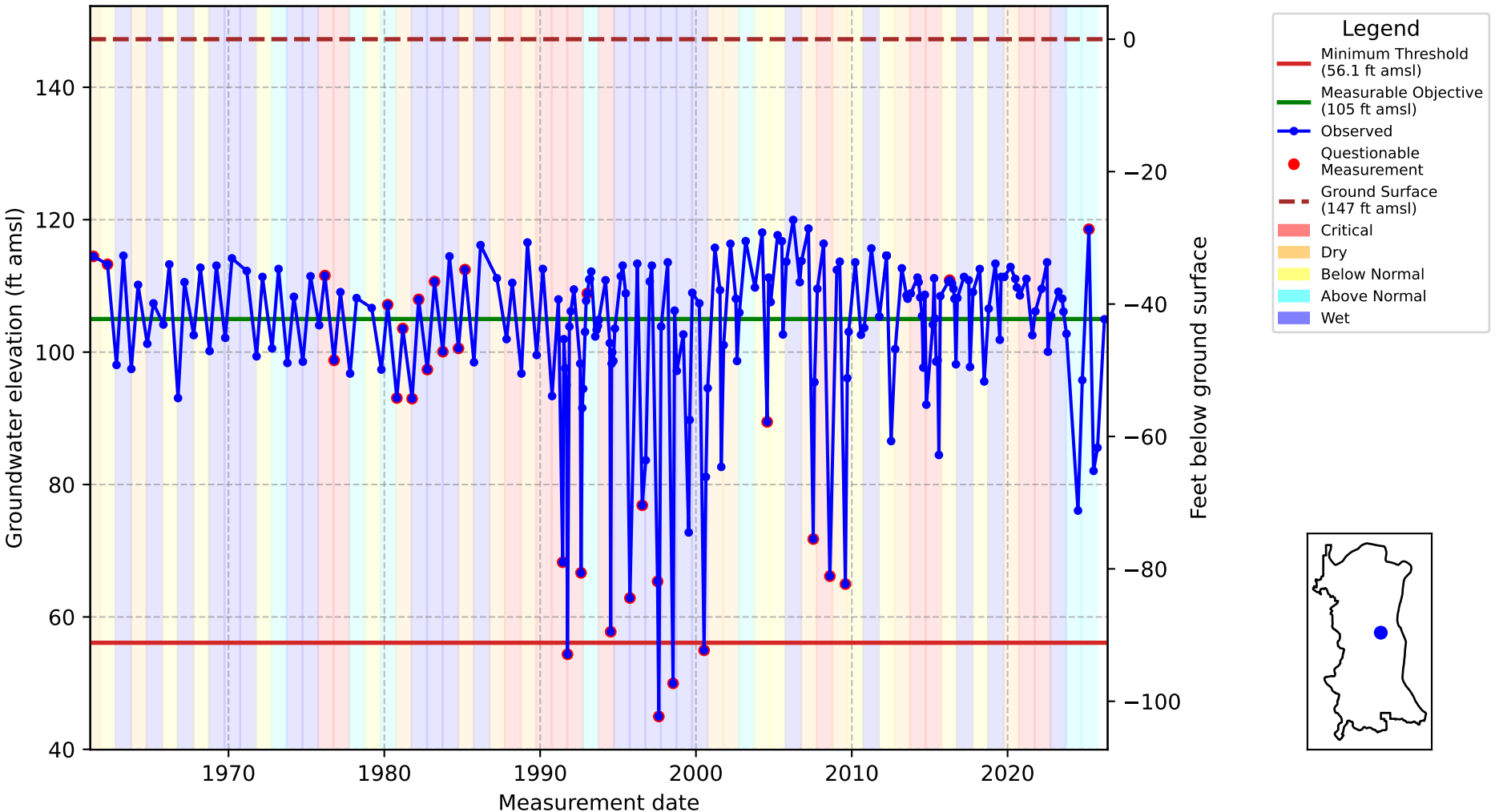

Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): PWS-03 (Aquifer Layer: Shallow)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
160
150
140
130
120
110
100
90
0
−10
−20
−30
−40
−50
−60
−70
1980
1990
2000
2010
2020
Legend
Minimum Threshold (94.0 ft amsl)
Measurable Objective (131 ft amsl)
Observed
Questionable Measurement
Ground Surface (160 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet

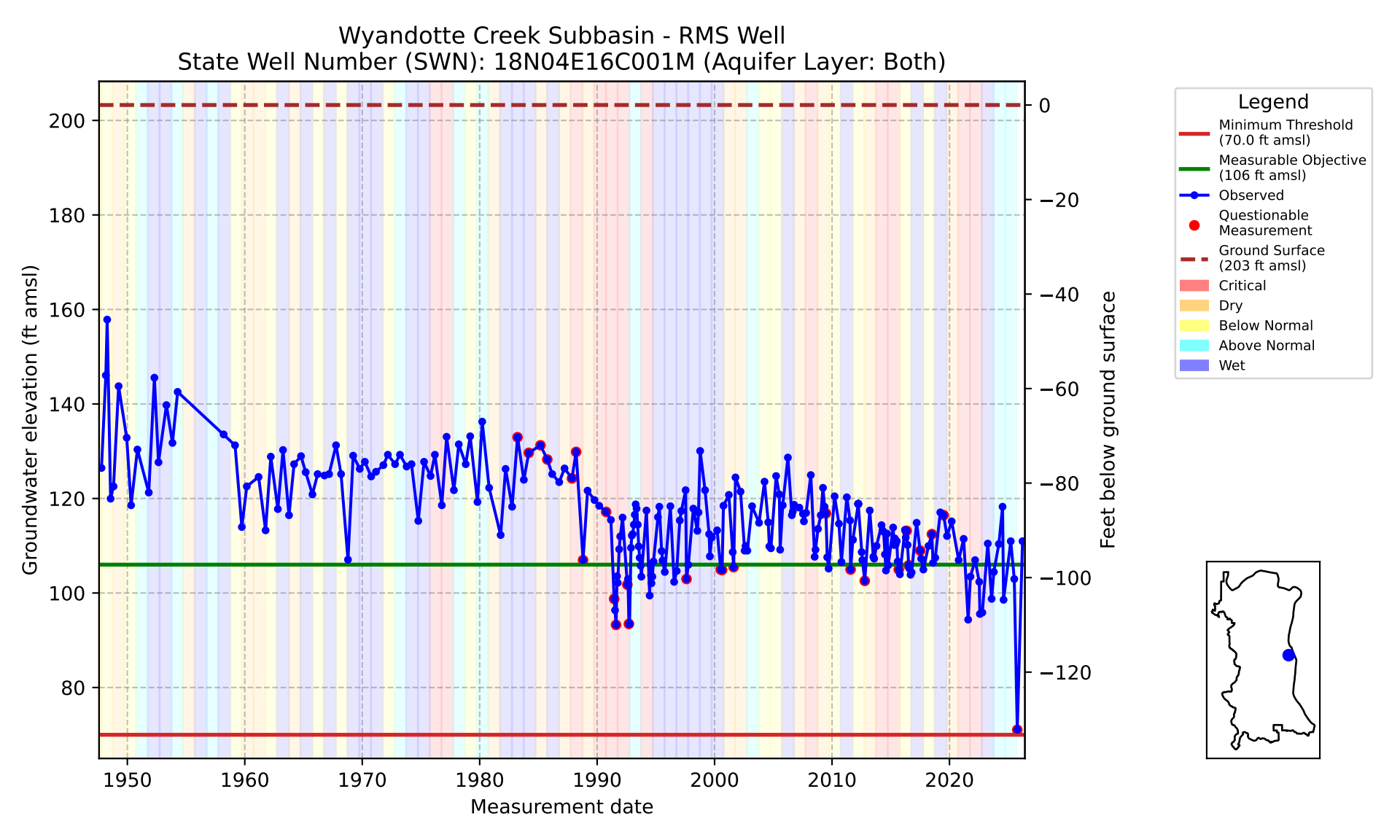

Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): 17N03E13B002M (Aquifer Layer: Deep)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
90
80
70
60
50
40
30
20
10
0
−10
−20
−30
−40
−50
−60
−70
−80
2005
2010
2015
2020
2025
Legend
Minimum Threshold (11.0 ft amsl)
Measurable Objective (58 ft amsl)
Observed
Questionable Measurement
Ground Surface (89 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet

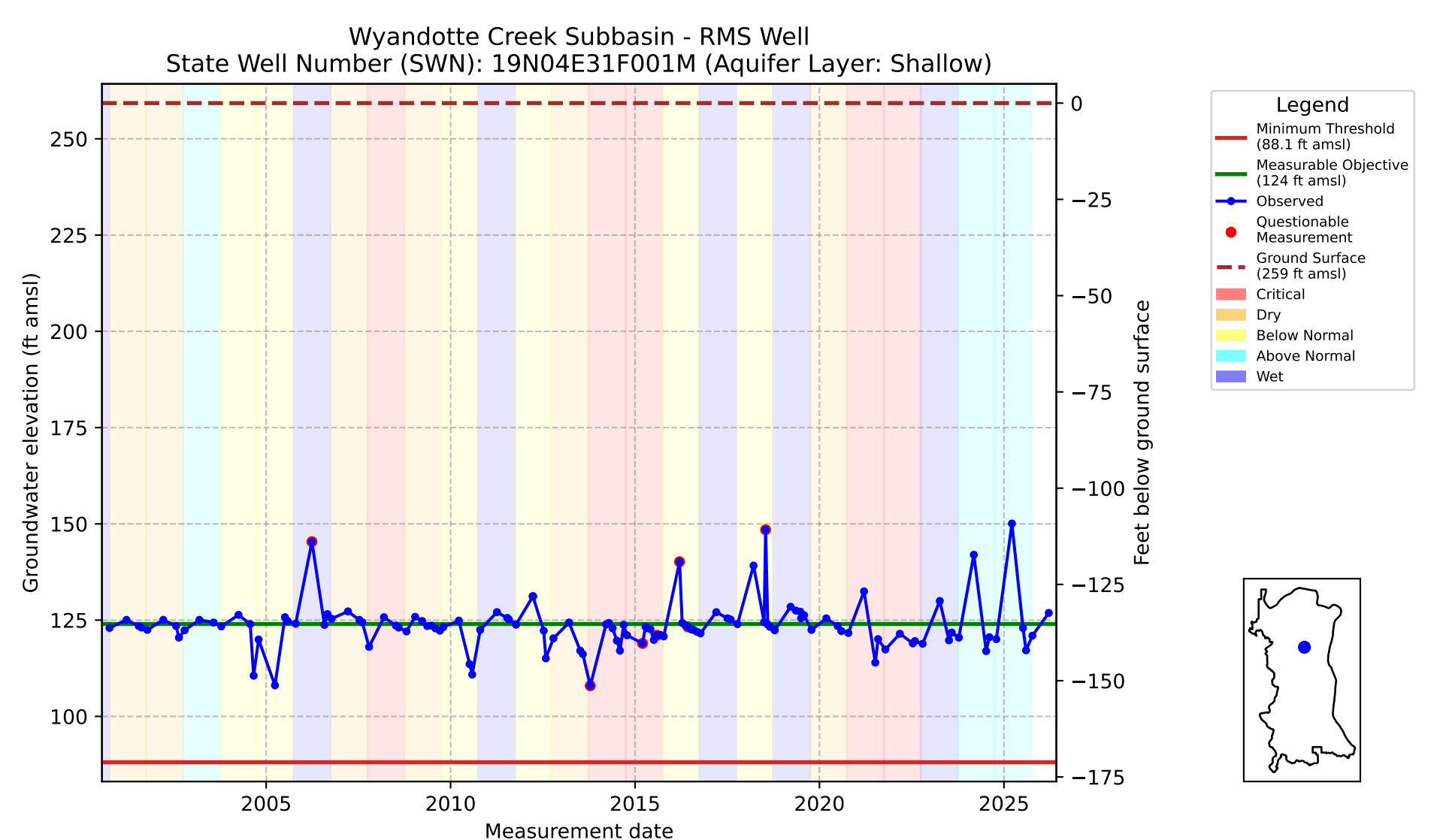

Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): 17N04E22B001M (Aquifer Layer: Shallow)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
120
100
80
60
40
0
−20
−40
−60
−80
1980
1990
2000
2010
2020
Legend
Minimum Threshold (29.8 ft amsl)
Measurable Objective (89 ft amsl)
Observed
Questionable Measurement
Ground Surface (117 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet


Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): 18N03E25N001M (Aquifer Layer: Shallow)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
120
100
80
60
40
20
0
−20
−40
−60
−80
−100
1980
1990
2000
2010
2020
Legend
Minimum Threshold (25.0 ft amsl)
Measurable Objective (61 ft amsl)
Observed
Questionable Measurement
Ground Surface (127 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet


Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): 18N04E19D003M (Aquifer Layer: Shallow)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
120
100
80
60
40
0
−20
−40
−60
−80
2022
2023
2024
2025
2026
Legend
Minimum Threshold (33.2 ft amsl)
Measurable Objective (72 ft amsl)
Observed
Ground Surface (122 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet


Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): 18N04E08M001M (Aquifer Layer: Deep)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
140
120
100
80
60
40
0
−20
−40
−60
−80
−100
1970
1980
1990
2000
2010
2020
Legend
Minimum Threshold (56.1 ft amsl)
Measurable Objective (105 ft amsl)
Observed
Questionable Measurement
Ground Surface (147 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet


Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): 18N04E16C001M (Aquifer Layer: Both)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
200
180
160
140
120
100
80
0
−20
−40
−60
−80
−100
−120
1950
1960
1970
1980
1990
2000
2010
2020
Legend
Minimum Threshold (70.0 ft amsl)
Measurable Objective (106 ft amsl)
Observed
Questionable Measurement
Ground Surface (203 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet


Wyandotte Creek Subbasin - RMS Well
State Well Number (SWN): 19N04E31F001M (Aquifer Layer: Shallow)
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
250
225
200
175
150
125
100
0
−25
−50
−75
−100
−125
−150
−175
2005
2010
2015
2020
2025
Legend
Minimum Threshold (88.1 ft amsl)
Measurable Objective (124 ft amsl)
Observed
Questionable Measurement
Ground Surface (259 ft amsl)
Critical
Dry
Below Normal
Above Normal
Wet

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APPENDIX 3-D
ISW RMS Selection Process and Hydrographs

ISW RMS Well Selection Process

The same list of monitoring wells that were reviewed for the groundwater level (GWL) RMS network were also considered for the interconnected surface water (ISW) RMS network. The criteria used to evaluate the wells for the ISW RMS network was slightly different from those used for the GWL RMS network, and are as follows:

1. Is the well screened only in the shallowest aquifer layer?
2. Does the well have at least 5 years of good-quality historical data for both spring and fall?
3. Is the site consistently measured biannually, at least? If not, could the well easily be measured more often?
4. Are at least 80% of the measurements taken of good quality (i.e., no pumping, no oil problems, etc.)?
5. Do historical measurements suggest underlying geologic features that may make the measured groundwater levels not representative of the general area?
6. Does the well have access problems or other barriers that would prevent taking consistent measurements at the well?
7. Is the well within half a mile of the Feather River or Honcut Creek?

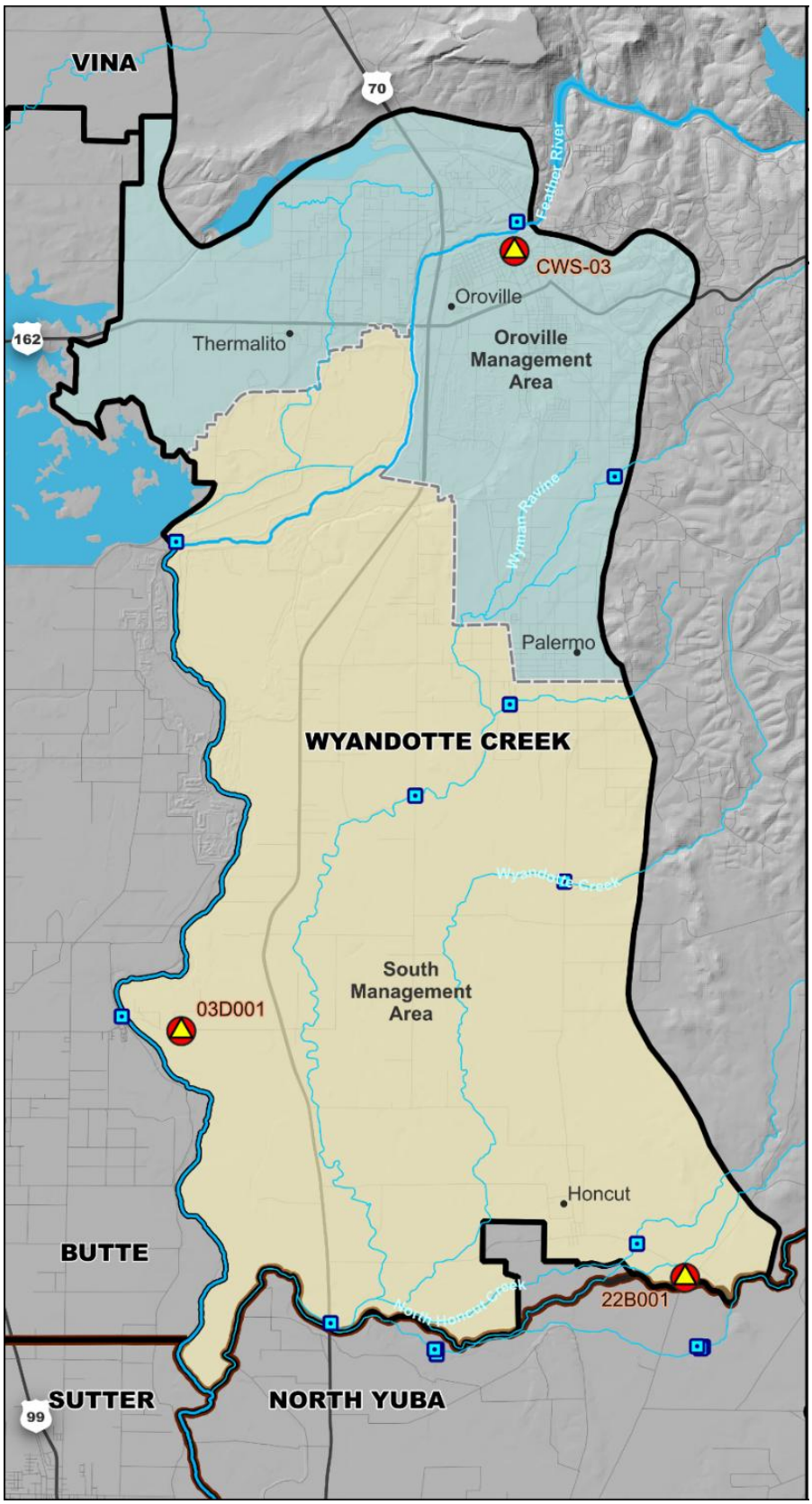

Figure 3D-1. Wyandotte Creek ISW RMS Wells, symbolized as yellow triangles inscribed in red circles on the map.

ISW Sustainable Management Criteria Hydrographs

Only three well met the seven criteria, and are shown on the map on the previous page (Figure 1). The following three hydrographs (Figure 2, Figure 3, and Figure 4) correspond to the three RMS wells, and display the historical record of the well, the MT (approach discussed previously in Section 3.8.4), the MO (approach discussed previously in Section 3.8.5), and the ground surface elevation (GSE) of the well and nearby streambed. If the MO was defined using the trend of fall low measurements, then the trendline is also included.

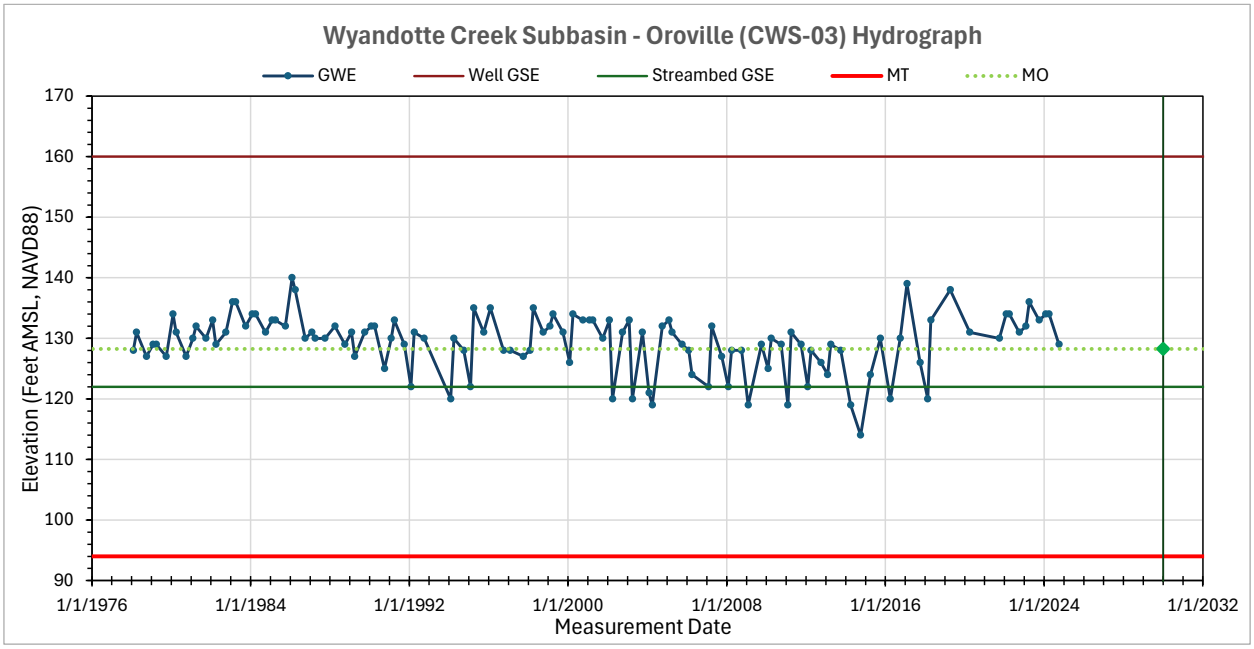

Figure 3D-2. Hydrograph for RMS Well CWS-03 near the Feather River in Oroville MA.

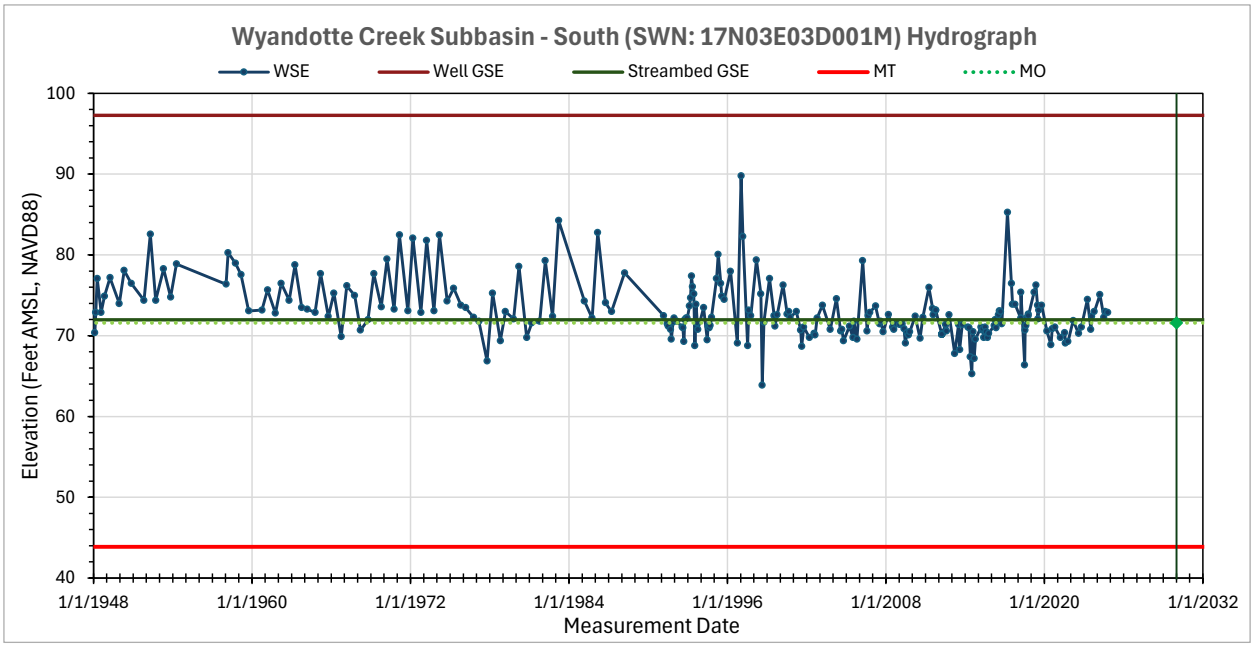

Figure 3D-3. Hydrograph for RMS Well 17N03E03D001M near the Feather River in the South MA.

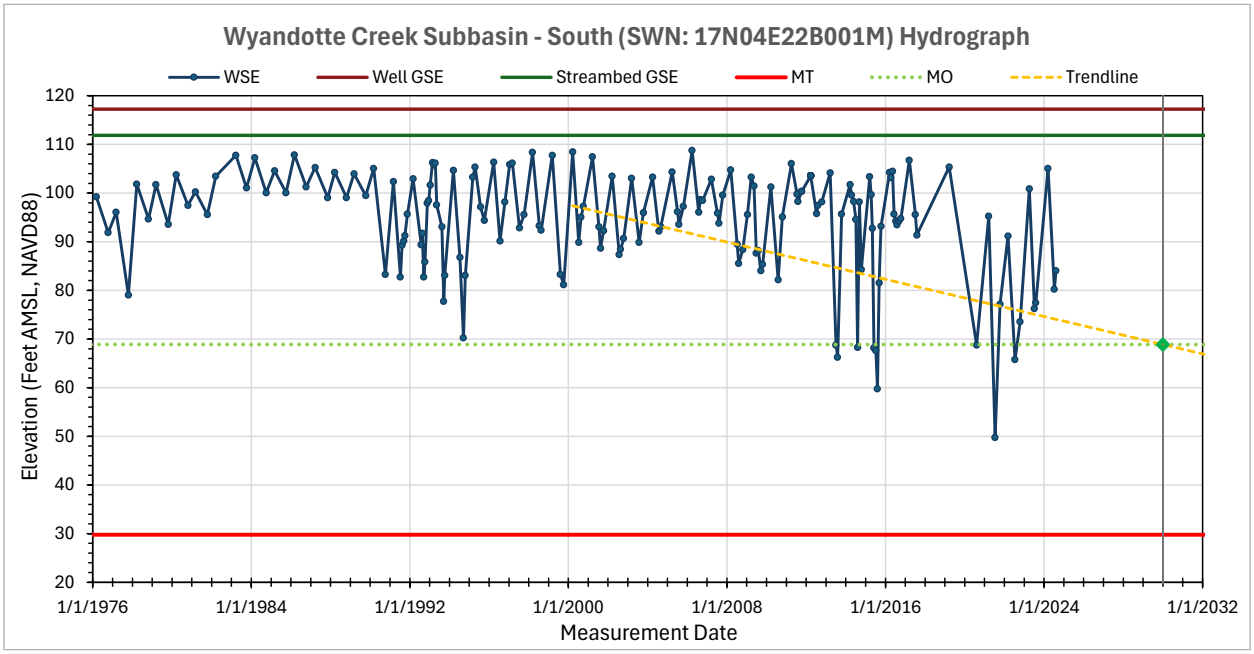

Figure 3D-4. Hydrograph for RMS Well 17N04E22B001M near Honcut Creek in the South MA.

APPENDIX 6-A
Northern Sacramento Valley Inter-basin Coordination Report

Northern Sacramento Valley Inter-basin Coordination Report

Antelope | Bowman | Butte | Colusa | Corning | Los Molinos | Red Bluff | Sutter | Vina | Wyandotte Creek | Yolo

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5. Conclusion and Next Steps ***8***

Appendices ***9***

Glossary of Acronyms

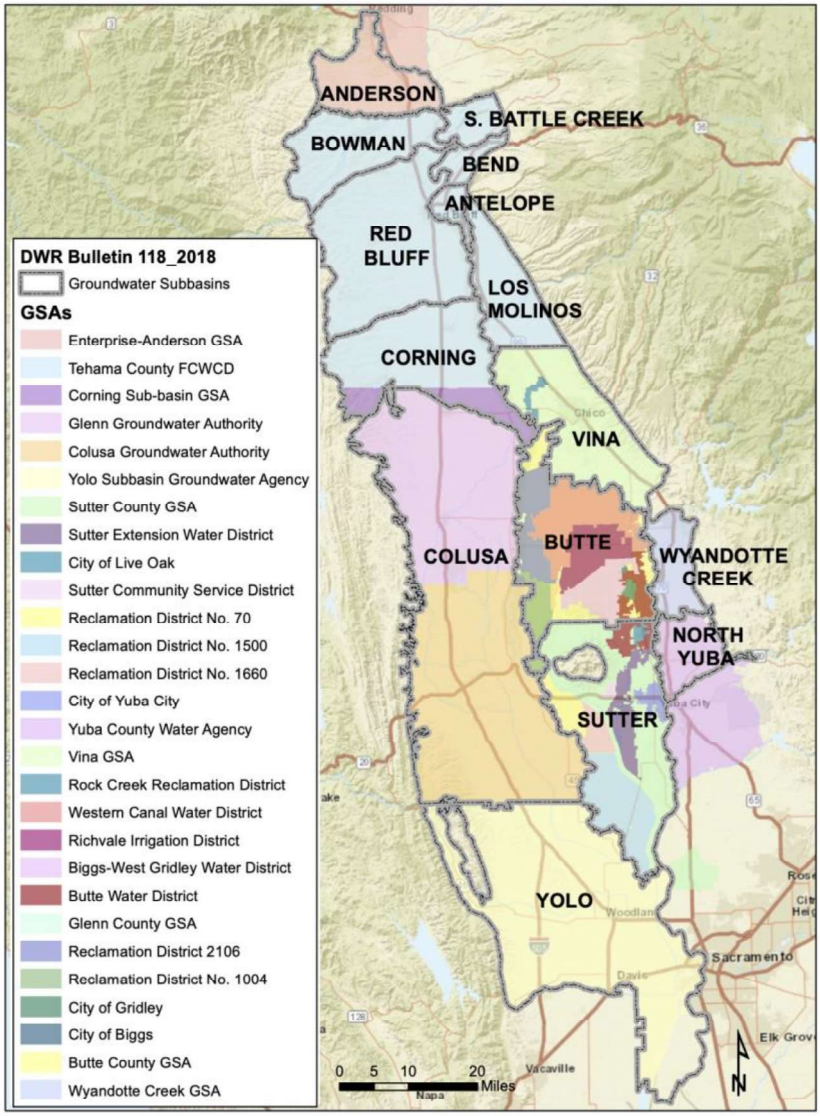
- ***CBI*** – *Consensus Building Institute [link]*
- ***DWR*** – *California Department of Water Resources*
- ***GSA*** – *Groundwater Sustainability Agency*
- ***GSP*** – *Groundwater Sustainability Plan*
- ***MOU*** – *Memorandum of Understanding*
- ***NCWA*** – *Northern California Water Association*
- ***NSV IRWM***– *Northern Sacramento Valley Integrated Regional Water Management*
- ***PMAs*** – *Projects and Management Actions*
- ***SGMA*** – *Sustainable Groundwater Management Act*
- ***SMC*** – *Sustainable Management Criteria*

1. Introduction & Background

The content of the report is the result of staff recommendations resulting from regional inter-basin coordination staff meetings in the Northern Sacramento Valley (2020-2021). The content will be presented to inform discussions among Groundwater Sustainability Agencies (GSAs) and gather public input through existing public venues, such as advisory committees, groundwater commissions, and GSA Board meetings.

Inter-basin coordination is critical in the Northern Sacramento Valley as GSAs develop and implement Groundwater Sustainability Plans (GSPs). Since groundwater subbasins in the Northern Sacramento Valley are hydrologically interconnected, water management decisions and actions in subbasins (i.e., groundwater pumping and processes affecting recharge, water demand, and supply including climate change) could change aquifer conditions. Understanding and accounting for these processes is important towards achieving sustainability in all subbasins.

Figure 1. Map of the Northern Sacramento Valley



Inter-basin coordination is described in the GSP Regulations in Article 8. Under the regulations, GSAs must describe how they coordinate with adjoining subbasins to demonstrate implementation will not adversely affect adjoining subbasins. The Department of Water Resources (DWR) is required to evaluate whether a GSP adversely affects the ability of an adjacent basin to implement their GSP or impedes achievement of sustainability goals in an adjacent basin (Water Code 17033(c)). Coordination among GSAs can be formalized in different ways and inter-basin agreements are voluntary. Appendix A describes components of Sec 357.2.

Inter-basin coordination discussions among staff representatives from 11 subbasins (Antelope, Bowman, Butte, Colusa, Corning, Los Molinos, Red Bluff, Sutter, Vina, Wyandotte Creek, and Yolo), with facilitation support from the Consensus Building Institute (CBI) began during the summer of 2020. While efforts have focused on these subbasins, coordination will occur, as warranted, with other neighboring subbasins (Anderson and North Yuba).

Initial stages of inter-basin coordination efforts (May-December 2020) were closely aligned with the GSP Regulations in Article 8 components and delineated in Section 3 *Evolution of Inter-basin Coordination Efforts*. After an initial attempt to compile technical information to better understand basin conditions at respective boundaries, staff realized differing timelines for the completion of Basin Setting content in each subbasin meant there would not be sufficient time during initial GSP development to fully characterize or address major inconsistencies. Therefore, the goal for regional inter-basin coordination shifted towards establishing a framework for long-term inter-basin coordination and dialogue (post GSP submittal in 2022). Informal coordination discussions among staff and consultants between neighboring subbasins continued during the GSP development process.

This report outlines the intent and purpose of inter-basin coordination in the Northern Sacramento Valley. It describes the process followed and materials developed throughout the process. It also outlines foundational elements, referred to as "key pillars," of a framework for sustained coordination through GSP implementation.

2. Intent & Purpose

Inter-basin coordination efforts in the Northern Sacramento Valley are focused on establishing a foundation and guidelines for sustained inter-basin coordination through GSP implementation, following the initial submittal of GSPs by January 31, 2022. GSAs intend to:

1. *Establish a framework allowing for continued dialogue and a venue to address issues and discrepancies during the implementation of the GSPs;*
2. *Coordinate on consistent messaging and communicate shared expectations at a regional level;*
3. *Demonstrate regional coordination efforts and outcomes; and*
4. *Leverage existing agreements and arrangements in the region (e.g., Northern Sacramento Valley Integrated Regional Water Management (NSV IRWM), the Six County Memorandum of Understanding among Butte, Colusa, Glenn, Tehama, Shasta, and Sutter).*

The proposed deliverable from this effort is the development of a common approach and draft language for incorporation into each subbasin's GSP. This narrative describes the facilitated effort as well as the framework and scope for long-term coordination during plan implementation. The public will have opportunities to weigh in and provide input on the proposed framework through each subbasin's existing public venues, such as advisory committees, groundwater commissions, and GSA board meetings.

3. Evolution of Inter-basin Coordination Efforts

Inter-basin coordination efforts, facilitated by the Consensus Building Institute (CBI) began in summer 2020 among Subbasin staff from Antelope, Bowman, Butte, Colusa, Corning, Los Molinos, Red Bluff, Vina, and Wyandotte Creek subbasins to identify priorities and resources available for inter-basin coordination. Soon after, staff representatives from the Sutter and Yolo subbasins joined the meetings. To date, CBI has facilitated nine inter-basin coordination meetings with staff and periodically with technical consultants from the subbasins. Subbasin staff and/or CBI communicated regular updates to GSA Boards and advisory committees in each of the subbasins regarding the status of inter-basin coordination activities [Access Webpage Here].

Initial stages of inter-basin coordination efforts were closely aligned with the GSP Regulations in Article 8:

1. ***General information*** *of subbasins, plans and agencies participating in the coordination agreement,*
2. ***Technical information*** *including consistent and coordinated data or methodology for inter-basin boundary flows and stream-groundwater interactions at basin boundaries, and information on sustainable management criteria and monitoring that would confirm that no adverse impacts of implementing the GSPs would result to any party to the agreement,*
3. *A description of the* ***process for identifying and resolving conflicts*** *between Agencies that are parties to an inter-basin coordination agreement.*
   Reference: *Sections 10727.2, 10733, and 10733.2, Water Code.*

The goal at the initial stage was to compile general and technical information identified by DWR in a consistent manner to establish an accurate basis of comparison and to identify any significant inconsistencies that may need to be addressed or resolved. This included developing a series of information-sharing documents and outreach materials, summarized below.

1. ***Inter-basin Coordination Directory–*** *This document provides an updated and centralized directory with contact information for GSA managers, technical consultants, and facilitators in the various subbasins. This document seeks to facilitate communication among the various representatives leading GSP development [Access Here].*
2. ***Technical Information-Sharing Template–*** *This template was developed among the managers and technical consulting teams to compile and compare information on modeling tools and water budget results for inter-basin flows, stream-aquifer interactions, and hydro-geologic conditions in the subbasins. Potentially, this document could be used to compile information about Sustainable Management Criteria and Monitoring Networks [Access Draft Template Here]. The first output from the technical information-sharing template summarizes the highlights of compiled model information across the subbasins [Access Here].*
3. ***Outreach Presentation–****This PowerPoint presentation provides updates on inter-basin coordination activities to the various SGMA public venues (GSA boards, advisory committees, etc.) and an overview of the scope and timeline of inter-basin coordination efforts. This presentation is continuously updated*

after each inter-basin coordination staff meeting for use in consistently communicating with GSA Boards/advisory committees and the public throughout the region [Access Here].

4. ***Outreach Factsheet–*** *The inter-basin coordination factsheet aims to support public outreach and information sharing in the various subbasins. This two-page flier or factsheet summarizes why regional coordination is important under SGMA, who is involved in ongoing efforts, what the coordination priorities are, and includes a table with links to each subbasin's website for additional subbasins' specific information [Access Here].*
5. ***Inter-basin Coordination Webpage–*** *Butte County hosts a webpage to provide the most up-to-date information on inter-basin coordination efforts in the Northern Sacramento Valley. The webpage provides an overview of the scope and makes available documentation and results of the inter-basin coordination work, including meeting agendas, summaries, and outputs [Access Here].*
6. ***Meeting Summaries–****CBI develops meeting summaries after each regional inter-basin coordination staff meeting to summarize key discussion themes, action items, and next steps. These summaries are publicly available on the inter-basin coordination webpage [Access Here].*

After an initial attempt to compile technical information, staff realized the broad aspirations were not feasible during the initial stages of GSP development. The process of compiling and comparing modeling outputs from the diverse regional hydrological models required a significant amount of time, resources, and varying levels of data. Further, subbasins were at different stages of GSP development and GSAs were facing tight timelines, competing priorities, and capacity limitations to meet the regulatory deadline. While communication on a neighbor-to-neighbor basis on technical components was encouraged through GSP development, subbasin staff representatives realized more robust technical analysis and coordination between and among subbasins was not possible until initial plans (including water budgets) were more fully developed or after adoption of the initial GSPs.

Following reflection from the separate inter-basin efforts and priorities moving forward, subbasin staff recommended shifting the focus of regional coordination meetings to establishing a framework for long-term inter-basin coordination and dialogue following GSP submission in January 2022. To do so, subbasin staff identified desired outcomes in the short-term (during initial GSP development), mid-term (first 5-year update), and long-term (GSP Implementation through 2042) [Access Here]. This approach recognizes adoption of the 2022 GSPs as an initial step in sustainable groundwater management, not the final step. Subbasin staff acknowledged while model outputs may not match perfectly, the main objective is to identify and acknowledge significant discrepancies, understand why those differences exist, and evaluate to the extent they need to be reconciled. Inter-basin coordination has been characterized as "a marathon not a sprint," and current efforts will serve to pave the path for long-term collaboration. Further, GSAs can take advantage of annual reporting and five-year GSP updates to identify and address discrepancies. Lastly, subbasin staff representatives acknowledge public participants are interested in inter-basin coordination efforts and concerns from some subbasins can easily affect others. Subbasin staff understand the need to share and educate the public on what is in the various GSPs, and the SGMA requirements for inter-basin coordination. Staff will continue to provide updates and gather GSA Board and public input related to the direction of current efforts and desired priorities, shared concerns, and possible ideas for inter-basin coordination during GSP implementation.

4. Inter-basin Coordination Framework

This section outlines the foundational pillars that comprise the framework for inter-basin coordination under SGMA between and among subbasins in the Northern Sacramento Valley. These pillars build upon a long-standing history of regional collaboration and embody a commitment for continued coordination, collaboration, and communication for successful groundwater management in the region. Honoring the individual authorities of the GSAs, these pillars represent a menu of options neighboring subbasins can draw upon, based on individual or neighboring subbasins' needs and challenges. GSA Boards can decide which of these options they would like to support and implement, acknowledging circumstances may change over time.

Pillars	Scale(s)	Timing
1. Information-sharing a. Inform each other on changing conditions (i.e., surface water cutbacks, land use changes, policy changes that inform groundwater management) b. Share annual reports and interim progress reports c. Share data and technical information and work towards building shared data across and/or along basin boundaries (e.g., monitoring data, water budgets, modeling inputs and outputs, and Groundwater Dependent Ecosystems)	• Neighbor-to-neighbor • Coordination groups [Refer to section 4.1 below]	• *Ongoing (GSP Development)* • *Near-term (5-year update)* • *Long-term (GSP implementation)*
2. Joint analysis & evaluation a. Evaluate and compare contents of GSPs with a focus on establishing a common understanding of basin conditions at boundaries b. Identify significant differences, uncertainties, and potential issues of concern related to groundwater interaction at the boundaries c. Engage in analysis and evaluation of SMCs between GSPs to assess impacts and identify significant differences and possible impacts between subbasins that could potentially lead to undesirable results	• Neighbor-to-neighbor • Coordination groups [Refer to section 4.1 below]	• *Near-term (5-year update)* • *Long-term (GSP implementation)*
3. Coordination on mutually beneficial activities a. Communicate, coordinate, and collaborate on mutually beneficial activities, which could include joint monitoring, joint reporting, regional modeling, and other efforts to address data gaps at subbasin boundaries b. Collectively pursue funding and collaborate on mutually agreed upon projects and management actions that provide benefits across boundaries c. Leverage existing collaboratives (NSV IRWM, NCWA etc.)	• Neighbor-to-neighbor • Coordination groups • Regional: NSV IRWM, NCWA Groundwater Task Force	• *Ongoing (GSP Development)* • *Near-term (5-year update)* • *Long-term (GSP implementation).*
4. Coordinated communication and outreach a. Coordinate and collaborate on regional-scale public engagement and communication strategies that promote awareness on groundwater sustainability, enhance public trust, and maintain institutional knowledge b. Maintain list of GSP/subbasin staff contacts and websites	• Regional: NSV IRWM and NCWA Groundwater Task Force	• *Ongoing (GSP Development)* • *Near-term (5-year update)* • *Long-term (GSP implementation)*
5. Issue-resolution process a. Establish and follow an agreed-upon process for identifying and resolving conflicts between GSAs by the first five-year update [Refer to Appendix D for more details and discussion prompts on issue resolution processes]	• Neighbor-to-neighbor • Coordination groups	• *Near-term (5-year update)* • *Long-term (GSP implementation).*

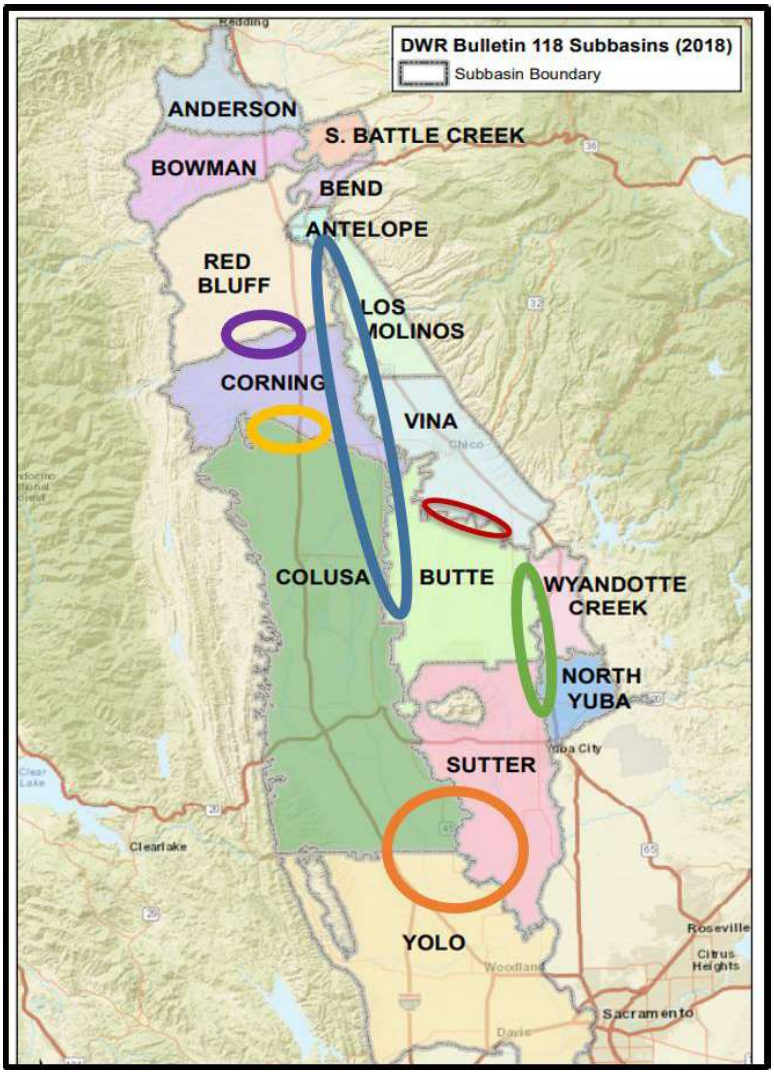
4.1. Inter-basin Coordination Groups

Inter-basin coordination efforts, as outlined in the pillars above, would require resources and technical support. Subbasin staff recommend organizing inter-basin coordination priorities by specific subbasin boundaries. One suggested approach identifies specific "Coordination Groups" (see Figure 3 and list below). Some of these groups are pairs and others include multiple subbasins around a river boundary.

1. ***Feather River Corridor***- *Butte, Wyandotte Creek, North Yuba, Sutter*
2. ***North Sacramento River Corridor***- *Antelope, Los Molinos, Red Bluff, Corning, Vina, Butte, Colusa*
3. ***South Sacramento Corridor***- *Colusa, Sutter, Yolo*

Neighbor to Neighbor, examples:

4. ***Stony Creek***- *Corning, Colusa*
5. ***Thomes Creek***- *Red Bluff, Corning*
6. ***Butte/Vina***- *Vina, Butte*



5. Conclusion and Next Steps

In sum, this report outlines a framework for inter-basin coordination for sustainable groundwater management in the Northern Sacramento Valley. The inter-basin coordination framework describes a menu of options for ongoing communication and collaboration around substantive issues over the twenty-year implementation of SGMA.

The pillars and other content from this report could be used by GSAs to support GSP development and implementation in a number of ways. This inter-basin coordination report could be included as an Appendix to the GSP and could be updated on a yearly basis. Individual subbasins can incorporate sections of the report into the body of the GSP, depending upon specific boundary conditions at adjoining subbasins. Finally, subbasins could draw on the inter-basin coordination framework if they would like to consider entering into one or more voluntary inter-basin agreements during GSP implementation.

The content of the report is the result of staff recommendations resulting from regional inter-basin coordination staff meetings. Staff will present the framework as a supporting document to guide and inform discussions with the GSA Boards and other existing public venues, such as advisory committees or groundwater commissions. GSAs in turn will discuss the menu of options for inter-basin coordination outlined in this report to determine their priorities and desired approach to draw on the inter-basin coordination framework in their individual GSPs. Lastly, Subbasin staff will come together to share input received and determinations from their respective GSAs.

Subbasin staff acknowledge that while this report builds upon a long-standing history of regional collaboration, this is just the beginning of inter-basin coordination efforts under SGMA. Therefore, this framework and inter-basin coordination activities will be continually refined throughout GSP implementation.

Appendices

Appendix A: GSP Emergency Regulations, Article 8: Interagency Agreements §357.2

§ 357.2. Inter-basin Agreements (access here)

Two or more Agencies may enter into an agreement to establish compatible sustainability goals and understanding regarding fundamental elements of the Plans of each Agency as they relate to sustainable groundwater management. Inter-basin agreements may be included in the Plan to support a finding that implementation of the Plan will not adversely affect an adjacent basin's ability to implement its Plan or impede the ability to achieve its sustainability goal. Inter-basin agreements should facilitate the exchange of technical information between Agencies and include a process to resolve disputes concerning the interpretation of that information. Inter-basin agreements may include any information the participating Agencies deem appropriate, such as the following:

(a) General information:
  (1) Identity of each basin participating in and covered by the terms of the agreement.
  (2) A list of the Agencies or other public agencies or other entities with groundwater management responsibilities in each basin.
  (3) A list of the Plans, Alternatives, or adjudicated areas in each basin.

(b) Technical information:
  (1) An estimate of **groundwater flow across basin boundaries**, including consistent and coordinated data, methods, and assumptions.
  (2) An estimate of **stream-aquifer interactions** at boundaries.
  (3) A **common understanding of the geology and hydrology** of the basins **and the hydraulic connectivity** as it applies to the Agency's determination of groundwater flow across basin boundaries and description of the different assumptions utilized by different Plans and how the Agencies reconciled those differences.
  (4) **Sustainable management criteria and a monitoring network** that would confirm that no adverse impacts result from the implementation of the Plans of any party to the agreement. If minimum thresholds or measurable objectives differ substantially between basins, the agreement should specify how the Agencies will reconcile those differences and manage the basins to avoid undesirable results. The Agreement should identify the differences that the parties consider significant and include a plan and schedule to reduce uncertainties to collectively resolve those uncertainties and differences.

(c) A description of the **process for identifying and resolving conflicts** between Agencies that are parties to the agreement.

(d) Inter-basin agreements submitted to the Department shall be posted on the Department's website.

Note: Authority cited: Section 10733.2, Water Code.
Reference: Sections 10727.2, 10733, and 10733.2, Water Code.

Appendix B: Inter-basin Coordination Fact Sheet

Northern Sacramento Valley | Sustainable Groundwater Management Act

Regional Coordination Between Subbasins

Antelope | Bowman | Butte | Colusa | Corning | Los Molinos | Red Bluff | Sutter | Vina | Wyandotte Creek | Yolo

Sustainable Groundwater Management Act

What is SGMA? California enacted the Sustainable Groundwater Management Act (SGMA) in 2014 to better manage groundwater over the long term. Sustainability is achieved by avoiding significant and unreasonable conditions for the six "sustainability indicators."

- Lowering of Groundwater Levels
- Reduction of Groundwater Storage
- Land Subsidence
- Surface Water Depletion
- Water Quality Degradation
- Sea Water Intrusion

Why is regional coordination important? In the Sacramento Valley, inter-basin coordination is critical as Groundwater Sustainability Agencies (GSA) develop their Groundwater Sustainability Plans (GSP). Since groundwater subbasins in the Northern Sacramento Valley (NSV) are hydrologically interconnected, water management decisions and actions in one subbasin (e.g. groundwater pumping) and processes like climate change could change aquifer conditions and affect flows to other subbasins. Understanding and accounting for these processes is key to achieve sustainability in all subbasins.

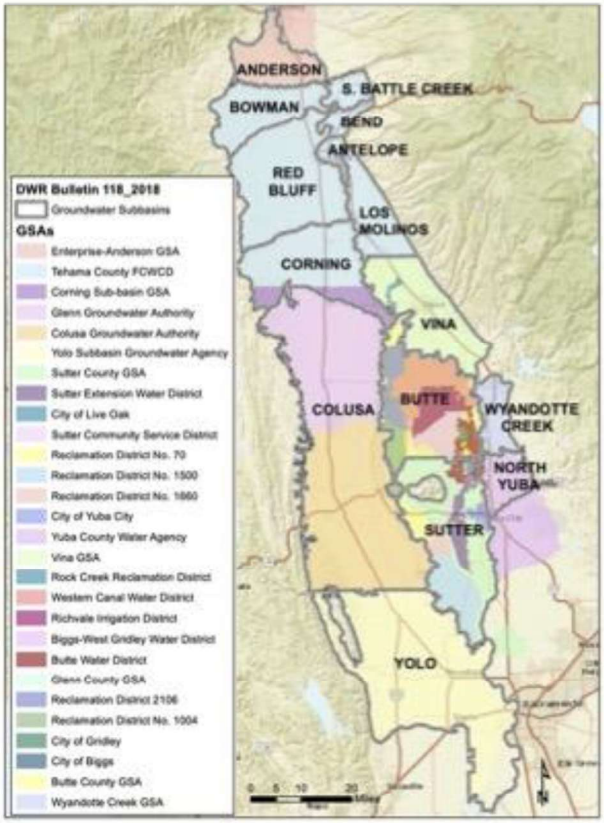
Who is involved in ongoing efforts?

Collaborative efforts have begun among representatives from 11 subbasins (Antelope, Bowman, Butte, Colusa, Corning, Los Molinos, Red Bluff, Sutter, Vina, Wyandotte Creek, Yolo), with facilitation support from the Consensus Building Institute. While efforts have focused on the subbasins mentioned, coordination will occur, as warranted, with other neighboring subbasins (Anderson and North Yuba).

What are the coordination priorities?

Groundwater Sustainability Agencies are working together to establish a foundation for open and transparent inter-basin coordination and communication by developing tools to:

- SHARE & COMPILE INFORMATION IN A CONSISTENT WAY
- OUTLINE A PROCESS TO IDENTIFY & RESOLVE ISSUES
- DOCUMENT COORDINATION EFFORTS



CBI
CATALYZING COLLABORATION

Learn More & Get Involved

Receive Updates
Sign up for your GSA's interested parties list.

Contact Your GSA
Talk to your GSA representative

Attend Meetings
Attend public workshops, Advisory Board, and GSA Board meetings

Subbasin	GSA(s)	Website
Antelope	Tehama County Flood Control and Water Conservation District (FCWCD)	Website
Bowman	Tehama County FCWCD	Website
Butte	Biggs West Gridley WD, Butte County, Butte WD, City of Biggs, City of Gridley, Colusa Groundwater Authority, Glenn County, RD 1004, RD 2106, Richvale ID, Western Canal WD	Website
Los Molinos	Tehama County FCWCD	Website
Red Bluff	Tehama County FCWCD	Website
Corning	Corning Sub-basin GSA, Tehama County FCWCD	Website
Colusa	Glenn Groundwater Authority; Colusa Groundwater Authority	Websites (Glenn) I (Colusa)
Sutter	Butte WD, City of Live Oak, Sutter Community Service District, Sutter County, Sutter Extension Water District, RD 70, RD 1660, RD 1500, City of Yuba City	Website
Vina	Rock Creek Reclamation District, Vina GSA	Websites (Vina) I (RCDC)
Wyandotte Creek	Wyandotte Creek GSA	Website
Yolo	Yolo Subbasin Groundwater Agency	Website

Find more information about regional inter-basin coordination at:
ButteCounty.net/waterresourceconservation/Sustainable-Groundwater-Management-Act/Inter-basin-Coordination

APPENDIX C

Memorandum of Understanding
Four County (Butte, Colusa, Glenn, and Tehama Counties)
Regional Water Resource Coordination, Collaboration, and Communication

Memorandum of Understanding
Four County (Butte, Colusa, Glenn, and Tehama Counties) Regional Water Resource Coordination, Collaboration, and Communication

1. BACKGROUND
The counties of Butte, Colusa, Glenn, and Tehama share common surface water and groundwater resources. Based on these common resources, local water resource managers understand that regular coordination, collaboration, and communication can result in an improved water resource understanding at both the county and regional level.

2. PURPOSE
The purpose of this document is to establish the mutual understandings of the four counties with respect to their voluntary joint efforts toward regional coordination, collaboration, and communication.

3. GOALS
The goals of the Four County Memorandum of Understanding (MOU) are:

2.1. To foster coordination, collaboration and communication between the four counties on water-related issues, to achieve greater efficiencies, and enhance public services.

2.2. To provide a framework for the management and disbursement of funding associated with activities pursued jointly under this MOU.

2.3. To improve competitiveness for State and Federal grant funding.

4. DEFINITIONS
4.1. Four County. Participants including the counties of Butte, Colusa, Glenn, and Tehama, with representation by the following:

- Butte County: Department of Water and Resource Conservation
- Colusa County: Department of Planning and Building
- Glenn County: Department of Agriculture
- Tehama County: Flood Control and Water Conservation District

4.2. Project Manager. A project manager will be determined by the Counties signatory to this MOU for any given project regardless of funding source to meet the goals set forth in this MOU.

5. MUTUAL UNDERSTANDINGS
5.1. Participation. Signatories to this MOU constitute the current participants. Participation is strictly on a voluntary basis and may be

terminated at any time without recourse. Neighboring counties who share water resources common to the participating counties and who are engaged in similar activities will be invited to be signatory to this MOU. Signatories aspire to work collaboratively with other regional programs and technical outreach efforts.

5.2. Activities. Efforts pursued under this agreement will remain consistent with and will not exceed the current authority for any individual participating county. Efforts will include the study and investigation of water resources common to participants, monitoring and reporting, information dissemination and sharing between counties and with other county departments, public outreach and education, and other activities at the agreement and direction of individual county governing bodies.

5.3. County Funding. Counties are not required to commit funding associated with activities completed under this MOU. It is understood that activities under this MOU may result in the more efficient use of existing and future department funding resulting from improved collaboration and coordination.

5.4. External Funding. Signatories will work collaboratively in pursuit of external funding associated with common interest activities based on voluntary participation and agreement. When required, a mutually agreed upon County representative will serve as the Project Manager for activities completed under a contract with an external funding source. Existing county contracting mechanisms will be utilized where available for contractual and invoicing purposes between participating counties. Nothing in this MOU precludes individual counties from the individual pursuit, contracting and completion of work from an externally funded source regardless of a real or perceived regional interest.

5.5. Decision-making. Consensus will be sought when the need for a decision arises.

5.6. Non-binding nature. This document and participation under this MOU are nonbinding, and in no way suggest that a county may not continue its own activities as each county is expected to continue its own policies and procedures and undertake efforts to secure project funding from any source. A county may withdraw from participation at any time.

5.7. Termination. Because the MOU will require periodic review and updating for use into the future, it is envisioned that the joint efforts of those involved will be ongoing in maintaining a living document. Thus this document will remain as a reflection of the understandings of the participants. Individual signatories of this MOU may terminate their involvement at any time with no recourse.

6. SIGNATORIES TO THE MEMORANDUM OF UNDERSTANDING

We, the undersigned representatives of our respective counties, acknowledge the above as our understanding of how the Four County Coordination, Collaboration, and Communication MOU will be implemented.

MAR 14 2006 APPROVED JAN 24 2006

Date

Curt Josiassen, Chairman
Butte County Board of Supervisors

2/28/06

Approved As To Form:
Bruce Alpert, Butte County Counsel

6. SIGNATORIES TO THE MEMORANDUM OF UNDERSTANDING
We, the undersigned representatives of our respective counties, acknowledge the above as our understanding of how the Four County Coordination, Collaboration, and Communicative MOU will be implemented.

Date April 4, 2006

By Christy Scofield

Christy Scofield, Chairperson
Colusa County Board of Supervisors

Approved As To Form:
Henry Rodegerdts, Colusa County Counsel

EXHIBIT B
PAGE 3 OF 3

6. SIGNATORIES TO THE MEMORANDUM OF UNDERSTANDING

We, the undersigned representatives of our respective counties, acknowledge the above as our understanding of how the Four County Coordination, Collaboration, and Communication MOU will be implemented.

12-13-05
Date

Vice Chairman, Tehama County Flood Control
And Water Conservation District

Approved As To Form:

by:
County Counsel, Tehama County

Date

By Board Chair

County
Approved As To Form:

County Counsel

Date

By Board Chair

County
Approved As To Form:

County Counsel

Date

By Board Chair

County
Approved As To Form:

TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
MINUTE ORDER

December 13, 2005

8. Approval of Four-County Regional Water Resource Coordination- MOU: Ernie Ohlin reviewed that in August 2004, the Board authorized staff to participate in the four county water effort. The MOU attached is allowing all counties to participate together in water resource collaboration and communication. This non-binding voluntary MOU recognizes coordination among Butte, Colusa, Glenn and Tehama County.

Roger Sherrill encouraged the four-county groups to participate and noted in Item 5.1 "Participation" is strictly voluntary. Shasta County provides a major part of the recharge for the northern part of the Sacramento Valley and to move forward could only make for a stronger overall group.

Mark Black, Ag Commissioner for Glenn County, added this will be presented to Glenn County next Tuesday for support. Discussions with Sutter and Yuba County brings interest and they are awaiting the outcome of the four counties. This is a good collaborative effort, giving us strength of possible capturing of funding.

Motion by Director Warner to approve the MOU for signature.

Director Willard questioned if this has been reviewed by County Counsel. Upon his approval, signature will be completed.

Motion revised by Director Warner to approve the MOU for signature by the Chair upon review of County Counsel. Second by Director Avilla and carried by those present 3-0 with 2 absent.

Ayes: Directors':, Charles Willard; Ron Warner; Gregg Avilla
Noes: None
Absent or Not Voting: Director's: Ross Turner, George Russell

STATE OF CALIFORNIA)
) ss
COUNTY OF TEHAMA)

I, Gary Antone, Director of the Tehama County Flood Control and Water Conservation District of the County of Tehama, State of California, hereby certify the above and foregoing to be full, true and correct copy of an order adopted by said Tehama County Flood Control and Water Conservation District on this **13th day of December, 2005**

Dated: This 13th day of **December, 2005**.

Gary Antone
Director of the Tehama County Flood Control and Water Conservation District of the County of Tehama, State of California

By Linda Madea
Linda Madea, Deputy

F:\ADMIN\MEETING\MINORDER\05MinOrd\Dec.wpd

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM ONE:
Statement of Principles Regarding Water Related Programs and Projects

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and require regional solutions, the parties identified in the Four County Memorandum of Understanding hereby agree to adhere to the following Statement of Principles Regarding Water Related Programs and Projects:

1. Programs and projects related to groundwater level and water quality monitoring shall be conducted in a cooperative manner and related data shall be shared between the participants to prevent negative impacts to our constituents.
2. Environmental documents associated with water projects and programs will automatically be circulated to all four counties for review and comment.
3. Incidents of abnormal water level or water quality readings will be immediately communicated to all participating counties resulting in a collaborative review and dissemination of related information.
4. Project and program related information will be disseminated on a regional basis through the independent county websites, augmented by regional public outreach meetings.
5. The parties will work cooperatively to acquire grant funding to conduct aquifer studies that further identify the linkages of the common groundwater resources.
6. Efforts pursued under this agreement will remain consistent with and will not exceed the current authority of any participating county.

We, the undersigned representatives of our respective counties, agree to adhere to the conditions of **Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects.** The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006.

Chair, Butte County Board of Supervisors	3/8/07 Date	County Counsel Approved As to Form	2/23/07 Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date

Vice-Chair, Colusa County
Board of Supervisors

4-17-07
Date

County Counsel
Approved As to Form

Date

EXHIBIT A
PAGE 2 OF 2

COUNTY CONTRACT
1788

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM ONE:
Statement of Principles Regarding Water Related Programs and Projects

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and require regional solutions, the parties identified in the Four County Memorandum of Understanding hereby agree to adhere to the following Statement of Principles Regarding Water Related Programs and Projects:

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5. The parties will work cooperatively to acquire grant funding to conduct aquifer studies that further identify the linkages of the common groundwater resources.
6. Efforts pursued under this agreement will remain consistent with and will not exceed the current authority of any participating county.

We, the undersigned representatives of our respective counties, agree to adhere to the conditions of **Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects.** The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006.

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	4/3/2007 Date	County Counsel Approved As to Form	3/26/07 Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM TWO:
Adding Sutter County to the Four County MOU

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and therefore require regional solutions, the parties identified in the original Four County Memorandum of Understanding: Counties of Butte, Colusa, Glenn and Tehama are hereby joined by Sutter County in the regional efforts discussed in the Four County MOU and the Statement of Principles Regarding Water Related Programs and Projects as discussed in Addendum One to the Four County MOU.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of the **Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects. And Addendum Two: Adding Sutter County to the Four County MOU.**

The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006. Through approval of this addendum, Sutter County makes the same commitment to regional cooperation and coordination that is outlined in the original MOU.

Bill Connelly	05 MAY 2009	Bruce L. Alpert	
Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date

C09-082

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM TWO:
Adding Sutter County to the Four County MOU

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and therefore require regional solutions, the parties identified in the original Four County Memorandum of Understanding: Counties of Butte, Colusa, Glenn and Tehama are hereby joined by Sutter County in the regional efforts discussed in the Four County MOU and the Statement of Principles Regarding Water Related Programs and Projects as discussed in Addendum One to the Four County MOU.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of the **Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects. And Addendum Two: Adding Sutter County to the Four County MOU.**

The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006. Through approval of this addendum, Sutter County makes the same commitment to regional cooperation and coordination that is outlined in the original MOU.

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	5/5/09 Date	County Counsel Approved As to Form	Date 5/5/09

C09-082

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM TWO:
Adding Sutter County to the Four County MOU

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and therefore require regional solutions, the parties identified in the original Four County Memorandum of Understanding: Counties of Butte, Colusa, Glenn and Tehama are hereby joined by Sutter County in the regional efforts discussed in the Four County MOU and the Statement of Principles Regarding Water Related Programs and Projects as discussed in Addendum One to the Four County MOU.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of the **Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects. And Addendum Two: Adding Sutter County to the Four County MOU.**

The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006. Through approval of this addendum, Sutter County makes the same commitment to regional cooperation and coordination that is outlined in the original MOU.

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	5/21/09 Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	5/5/09 Date	County Counsel Approved As to Form	5/5/09 Date

Chair, Sutter County
Board of Supervisors

Date

William J. Vanasek

County Counsel
Approved as to Form

4/14/09
Date

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM TWO:
Adding Sutter County to the Four County MOU

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and therefore require regional solutions, the parties identified in the original Four County Memorandum of Understanding: Counties of Butte, Colusa, Glenn and Tehama are hereby joined by Sutter County in the regional efforts discussed in the Four County MOU and the Statement of Principles Regarding Water Related Programs and Projects as discussed in Addendum One to the Four County MOU.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of the **Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects. And Addendum Two: Adding Sutter County to the Four County MOU.**

The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006. Through approval of this addendum, Sutter County makes the same commitment to regional cooperation and coordination that is outlined in the original MOU.

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Flood Control & Water Conservation District	6-23-09 Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date

FOUR COUNTY MEMORANDUM OF UNDERSTANDING:
ADDENDUM THREE
Expression of a Commitment to Begin An
Integrated Regional Water Management Planning Process
Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter

Through adoption of this addendum, the signatories agree to begin a regional water management planning process pursuant to the Four County MOU, geographically covering the area of Butte, Colusa, Glenn, Tehama and Sutter Counties. The planning process shall utilize and incorporate existing plans and processes. The California legislature has recently adopted new criteria associated with the Integrated Regional Water Management Planning process. This new legislative criteria requires that acceptance and approval of the composition of all Integrated Regional Water Management Planning Areas be completed prior to accepting public funding associated with IRWMP grant funds. All IRWMP planning Regions and Plans must comply with the requirements as set forth in the Final Regional Acceptance Process Program Guidelines.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of **The Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects; Addendum Two: Adding Sutter County to the Four County MOU; Addendum Three: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter.**

Bill Connelly Chair, Butte County Board of Supervisors	05 MAY 2009 Date	Bruce L. Alpert County Counsel Approved As to Form	_____ Date
_____ Chair, Glenn County Board of Supervisors	_____ Date	_____ County Counsel Approved As to Form	_____ Date
_____ Chair, Tehama County Board of Supervisors	_____ Date	_____ County Counsel Approved As to Form	_____ Date

Chair, Colusa County Board of Supervisors	5/5/09 Date	County Counsel Approved As to Form	5/5/09 Date
Chair, Sutter County Board of Supervisors	Date	County Counsel Approved as to Form	Date

C09-095
5-5-09

FOUR COUNTY MEMORANDUM OF UNDERSTANDING:
ADDENDUM THREE
Expression of a Commitment to Begin An
Integrated Regional Water Management Planning Process
Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter

Through adoption of this addendum, the signatories agree to begin a regional water management planning process pursuant to the Four County MOU and geographically covering the area of Butte, Colusa, Glenn Tehama and Sutter Counties. The planning process shall utilize and incorporate existing plans and processes. The California legislature has recently adopted new criteria associated with the Integrated Regional Water Management Planning process. This new legislative criteria requires that acceptance and approval of the composition of all Integrated Regional Water Management Planning Areas be completed prior to accepting public funding associated with IRWMP grant funds. All IRWMP planning Regions and Plans must comply with the requirements as set forth in the Final Regional Acceptance Process Program Guidelines.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of **The Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects; Addendum Two: Adding Sutter County to the Four County MOU; Addendum Three: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter.**

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	5/21/09 Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date

CBI
CATALYZING COLLABORATION

Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Sutter County Board of Supervisors	Date	County Counsel Approved as to Form	4/14/09 Date

FOUR COUNTY MEMORANDUM OF UNDERSTANDING:
ADDENDUM THREE
Expression of a Commitment to Begin An
Integrated Regional Water Management Planning Process
Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter

Through adoption of this addendum, the signatories agree to begin a regional water management planning process pursuant to the Four County MOU and geographically covering the area of Butte, Colusa, Glenn, Tehama and Sutter Counties. The planning process shall utilize and incorporate existing plans and processes. The California legislature has recently adopted new criteria associated with the Integrated Regional Water Management Planning process. This new legislative criteria requires that acceptance and approval of the composition of all Integrated Regional Water Management Planning Areas be completed prior to accepting public funding associated with IRWMP grant funds. All IRWMP planning Regions and Plans must comply with the requirements as set forth in the Final Regional Acceptance Process Program Guidelines.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of **The Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects; Addendum Two: Adding Sutter County to the Four County MOU; Addendum Three: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter.**

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
George Lowell Chair, Tehama County Flood Control & Water Conservation District	6-23-09 Date	County Counsel Approved As to Form	Date

FOUR COUNTY MEMORANDUM OF UNDERSTANDING:
ADDENDUM FOUR
Expression of a Commitment to Begin An
Integrated Regional Water Management Planning Process
Within the Counties of Butte, Colusa, Glenn, Tehama, Sutter and Shasta

Through adoption of this addendum, the signatories agree:

1. Shasta County shall join the parties involved in the original Four County Memorandum of Understanding (MOU) and Addendum Two;

2. Signatories to the MOU and its addenda shall be called the Northern Sacramento Valley Integrated Regional Water Management Planning Group; and,

3. Begin a regional water management planning process pursuant to the Four County MOU, geographically covering the area of Butte, Colusa, Glenn, Tehama, Sutter and Shasta Counties. The planning process shall utilize and incorporate existing plans and processes. The California legislature has recently adopted new criteria associated with the Integrated Regional Water Management Planning process. This new legislative criteria requires that acceptance and approval of the composition of all Integrated Regional Water Management Planning Areas be completed prior to accepting public funding associated with IRWMP grant funds. All IRWMP planning Regions and Plans must comply with the requirements as set forth in the Final Regional Acceptance Process Program Guidelines.

4. The signatories to the MOU and its addenda reaffirm the provisions of section 5.6 of the MOU that the MOU and its addenda and participation under the MOU and its addenda are nonbinding.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of **The Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects; Addendum Two: Adding Sutter County to the Four County MOU; Addendum Three: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter; Addendum Four: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama, Sutter and Shasta.**

Bill Connelly — Chair, Butte County Board of Supervisors

APR 13 2010 — Date

County Counsel Approved As to Form

4.9.10 — Date

Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Sutter County Board of Supervisors	Date	County Counsel Approved as to Form	Date
Chair, Shasta County Board of Supervisors	4/27/10 Date	County Counsel Approved as to Form	5/6/10 Date

Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Sutter County Board of Supervisors	4/20/10 Date	County Counsel Approved as to Form	4/13/10 Date
Chair, Shasta County Board of Supervisors	Date	County Counsel Approved as to Form	Date

Appendix D: Issue Resolution Process for Discussion Purposes

This document aims to guide discussions and provide pertinent information as subbasins consider inclusion of an issue resolution process in the Northern Sacramento Valley inter-basin coordination framework. These discussions will take place in the period leading up to the first five-year GSP update.

Discussion Prompts

1. *What are potential benefits/challenges or concerns of including an issue/dispute resolution process in the inter-basin coordination framework?*
2. *What are shared expectations between and among subbasins?*
3. *What are the GSAs preferences for addressing conflicts if/when they arise?*

Background

The Groundwater Sustainability Plan Regulations in Article 8 recommend including a "description of a process for identifying and resolving conflicts between Agencies" as a part of inter-basin coordination (Sections 10727.2, 10733, and 10733.2, Water Code). A recent study by Tara Moran, Janet Martinez, and William Blomquist, part of Stanford University's Water in the West found that the ability of interagency coordination "to solve complex challenges will be contingent on the ability of these organizations to effectively prevent and manage conflicts before they arise and to resolve these conflicts equitably and efficiently when they do." (Moran, Martinez, and Blomquist, 2021). Further, given how likely it is for disagreements at a local level to occur during SGMA implementation, the study suggests investing in establishing issue resolution processes before disagreements arise. Meanwhile, deferring their development could complicate the resolution process in times of conflict. Given these recommendations, consider the following questions for reflection and discussion.

Purposes of issue resolution processes

There are many options to identify and resolve issues that involve different parties, goals/objectives, and resources. Ideally, issue resolution processes are thoughtfully designed and tailored to specific contexts. **The broader goal for such a process can be to meet the agencies' long-term needs, considering local dynamics, desired outcomes, and expected uses**. Goals can include keeping things simple and efficient, maintaining relationships, ensuring quality of the process, fostering participation and community engagement, etc.

The figure below shows different types of dispute resolution processes. In some cases, agencies draft clauses that outline a tiered approach. They often begin with negotiation, which gives the parties control over the process and outcomes. Then, mediation, which brings in a neutral third-party (mediator) to facilitate the discussion and help parties work towards resolving issues. Often, negotiation and mediation lead to "non-binding" outcomes, non-enforceable by courts. Parties could opt to move towards arbitration or litigation, which are controlled by a third party (arbitrator or judge/jury) and can lead to binding and non-binding outcomes (Moran, Martinez, and Blomquist, 2019).

Figure 2. The spectrum of dispute resolution process. Modified from Amsler et al. (2020a).

Negotiation	Mediation	Arbitration	Trial
• No third party	• Third part (mediator)	• Third party (arbitrators)	• Third party (judge/jury)
• Non-binding	• Non-binding	• Non-binding or binding	• Binding

From Moran, Martinez, and Blomquist, 2019

Examples

1. Example from Moran, Martinez, and Blomquist, 2019

Box 2. A Draft Dispute Resolution Clause.

The blue text notes indicate how each of the preceding five questions are incorporated into the dispute resolution language.

In the event that any dispute [Q1: Provides instruction on what disputes can be addressed. Additional process goals, while not explicit should be subject to discussion.] arises among the Members relating to (i) this Agreement, (ii) the rights and obligations arising from this Agreement, (iii) a Member proposing to withdraw from membership in the Agency, or (iv) a Member proposing to initiate litigation within the Basin or the management of the Basin, the aggrieved Member or Members proposing to withdraw from membership shall provide written notice to the other Members of the controversy or proposal to withdraw from membership [Q2: Provides instruction on who can initiate and participate in the process.]. Within forty-five (45) days after such written notice, the Members shall attempt in good faith to resolve the controversy through informal negotiation [Q3: Describes a series of processes for dispute resolution, beginning with negotiation. Also includes a timeline for process stages.]. If the Members cannot agree upon a resolution of the controversy within forty-five (45) days from the providing of written notice specified above, the dispute shall be submitted to mediation prior to commencement of any legal action or prior to withdrawal of a Member proposing to withdraw from membership. The mediation shall be no less than a full day (unless agreed otherwise among the Members) and the cost of mediation shall be paid in equal proportion among the Members [Q4: Provides instruction on who will pay for dispute resolution processes.]. The mediator shall be either voluntarily agreed to or appointed by the Superior Court upon a suit and motion for appointment of an impartial mediator [Q3a: Provides a clear process for choosing an impartial mediator.]. Upon completion of mediation, if the controversy has not been resolved, any Member may exercise all rights to bring a legal action relating to the controversy or withdraw from membership as otherwise authorized pursuant to this Agreement. The Agency may, at its discretion, participate in mediation upon request by a stakeholder [to be defined by the parties to the Agreement] concerning a dispute alleged by the stakeholder concerning the management of the Basin or rights to extract groundwater from the Basin, with the terms of such mediation to be determined in the sole discretion of the Member Directors [Q2: Allows third-party participation in the dispute resolution process].

Note: This above dispute resolution clause is not intended to serve as an endorsement or illustration of effective practice.

2. Example from Butte Subbasin Cooperation Agreement

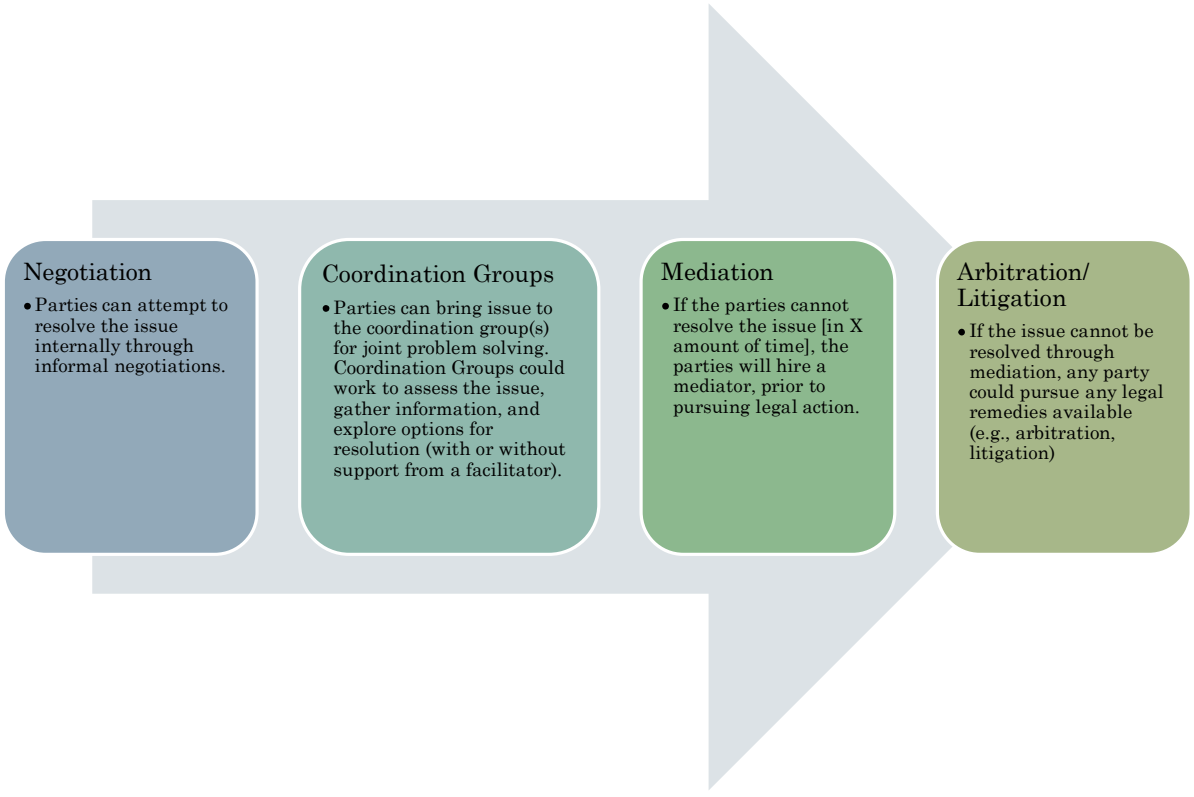
Note: This example doesn't provide much specificity. However, acknowledges shared intent to resolve disputes.

ARTICLE 9. DECISION-MAKING AND DISPUTE RESOLUTION

9.1. Decision-making Authority. Topics where the Members desire coordinated decision-making will be considered by the Advisory Board, and the Member Directors will strive for unanimous recommendations that will be presented to each Member's governing body for consideration. Such topics include, but are not limited to, development and implementation of the GSP, and associated financial arrangements. When unable to reach unanimous recommendations, the Advisory Board will outline the areas in which it does not agree, providing some explanation to inform the respective GSAs' governing bodies. Despite the recommendations of the Advisory Board, ultimate decision-making authority for topics considered by the Advisory Board resides with each Member's governing body.

9.2. Dispute Resolution. It is the desire of Members to informally resolve all disputes and controversies related to this Agreement, whenever possible, at the least possible level of formality and cost. If a dispute occurs, the disputing Members shall meet and confer in an attempt to resolve the matter. If informal resolution cannot be achieved, the matter will be referred to the Advisory Board for resolution. The Advisory Board may engage the services of a trained mediator or resort to all available legal and equitable remedies to resolve disputes.

Possible Process in the Northern Sacramento Valley



Worksheet: Key Questions and Considerations for Issue Resolution Process

The questions below could be used to guide the development of a specific issue resolution process in the context of inter-basin coordination in the Northern Sacramento Valley by the first 5-year GSP update. These questions could help to clarify the level of specificity that subbasins would find beneficial and mutually agreeable when/if conflict occurs.

Adapted from Moran, Martinez, and Blomquist, 2019

1) What are the process goals? a) Consider what disputes the process aims to address – all disputes arising at basin boundaries or only a subset? b) Consider inclusivity and transparency of the process, cost efficiency for parties and the GSA(s), timeframes, and other factors important to your agency(ies). c) Other potential objectives include dispute prevention, enhanced relationships, procedural and substantive fairness, legal compliance, durability of resolution and organizational improvement.	
2) Who can initiate and participate in the dispute resolution process? a) Consider what parties can initiate the dispute resolution process – is it only parties to the agreement or can external parties invoke it? There are pros and cons to both choices, so discussing this in advance will ensure thoughtful consideration.	
3) What processes are used to make decisions related to dispute resolution and what information is necessary? a) What is the process for selecting a mediator, facilitator, lawyer or other impartial party? b) Consider including a range of processes beginning with internal negotiations and escalating based on clear timelines.	
4) Who pays for the dispute resolution process? a) Consider who will pay for the mediator, facilitator, lawyer or other impartial party. Will it be paid for by the disputing parties, the GSA(s) or through a state-funded program? b) How could you assess whether the outcome of the dispute resolution process was successful?	

Other Resources

- Dutton, A. SGMA Updates, Coordination Considerations, and Potential Next Steps, Cosumnes Subbasin Working Group. February 21, 2018. http://cosumnes.waterforum.org/wp-content/uploads/2018/02/EKI_Cosumnes_TAC_meeting_2018-02-21.pdf
- Moran T., Martinez, J., and Blomquist W. Dispute Resolution Processes: Thinking through SGMA Implementation. Water in the West. Fall, 2019. https://waterinthewest.stanford.edu/publications/dispute-resolution-processes-thinking-through-sgma-implementation
- Moran T. Basin-scale Coordination is Key to SGMA's Success: Thoughts on DWR's Draft GSP Regulations. March 1, 2016. Stanford University. Water in the West. https://waterinthewest.stanford.edu/news-events/news-press-releases/basin-scale-coordination-key-sgma%E2%80%99s-success-thoughts-dwr%E2%80%99s-draft-gsp
- Moran et al. Dispute Resolution Clauses in Interorganizational Coordination Agreements: A Comparative Analysis. 2021. pending publication.
- Butte County. 2017. Technical Collaboration on Interconnected Subbasins to Advance Sustainable Groundwater Management: Assessment of Interconnected Subbasins. Available at: https://www.buttecounty.net/wrcdocs/Reports/SpecialProjects/InterbasinGWFlow/InterbasinSBAssessment-FINAL.pdf
- Butte County. 2017. Inter-basin Groundwater Flows Fact Sheet. Available at: https://www.buttecounty.net/wrcdocs/Reports/SpecialProjects/InterbasinGWFlow/FactSheet.pdf
- Buck, Christina. 2017. Butte County Inter-Basin Groundwater Flows Presentation, https://www.buttecounty.net/wrcdocs/Reports/SpecialProjects/InterbasinGWFlow/NSVBoardAssessment20170615.pdf