Fillmore and Piru Basins Sustainable Management Criteria Technical Memorandum

Submitted to
Fillmore and Piru Basins Groundwater Sustainability Agency

Prepared by

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Certification

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List of Acronyms and Abbreviations

AB	assembly bill
ADCP	acoustic doppler current profiler
AF	acre-feet
AFY	acre-feet per year
Ag	agriculture
AMI	automated (or advanced) metering infrastructure
amsl	above mean sea level
APN	assessor parcel number
B	boron
bgs	below ground surface
BMP	best management practices
BOS	bottom of screen
CA	California

CalGEM	Geologic Energy Management Division (formerly DOGGR)
CASGEM	California statewide groundwater elevation monitoring
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Public Health
CFS	cubic feet per second
CIMIS	California irrigation management information system
Cl	chloride
COC	chemical of concern
CWC	California Water Code
CWL	Critical Water Level
DBS&A	Daniel B. Stephens & Associates, Inc.
DDW	[SWRCB] Division of Drinking Water
DEM	digital elevation model
DOGGR	Division of Oil, Gas, and Geothermal Resources (reorganized as CalGEM)
DQO	data quality objective
DTW	depth to water
DWR	[CA] Department of Water Resources
DWUs	downstream water users
EGM96	Earth Gravitational Model of 1996
ENSO	El Niño Southern Oscillation
EPA	U.S. Environmental Protection Agency
ET	evapotranspiration
ET_0	reference evapotranspiration
FCGMA	Fox Canyon Groundwater Management Agency
FICO	Farmers Irrigation Company
FPBGSA	Fillmore and Piru Basins Groundwater Sustainability Agency (also called GSA or Agency)
FT	feet
GAMA	[USGS] groundwater ambient monitoring & assessment
GIS	geographic information system
GPS	global positioning system

GSP	groundwater sustainability plan
HASP	health and safety plan
HCM	hydrogeologic conceptual model
Hydrodata	[VCWPD] hydrologic data server
ID	identification
LARWQCB	Los Angeles Regional Water Quality Control Board
LiDAR	light detection and ranging
NCCAG	natural communities commonly associated with groundwater
M&I	municipal and industrial
MCL	maximum contaminant level
MOU	memorandum of understanding
MS4	municipal separate storm sewer system
NAD	North American datum
NAVD88	North American vertical datum of 1988
ND	not detected
NGVD29	national geodetic vertical datum of 1929
NO3	nitrate
NWIS	national water information system
OFR	open file report
PBP	priority basin project
PDO	Pacific Decadal Oscillation
PSI	pounds per square inch
PSW	public-supply well
PVC	polymerizing vinyl chloride
QA	quality assurance
QC	quality control
RASA	regional aquifer-system analysis
RP	reference point (elevation)
RWQCB	[CA] Regional Water Quality Control Board
SAP	sampling and analysis plan
SCE	Southern California Edison
SCV-GSA	Santa Clarita Valley Groundwater Sustainability Agency

SMC	Sustainable Management Criteria
SNMP	Salt and Nutrient Management Plan
SO4	sulfate
SUM	summation
SWL	static water level
SWN	[CA DWR] state well number
SWRCB	[CA] State Water Resource Control Board
TD	total depth
TDS	total dissolved solids
TFR	total filterable residue
TMDL	total maximum daily load
TNC	The Nature Conservancy
TOS	top of screen
URL	uniform resource locator (web address)
USGS	U.S. Geological Survey
UWCD	United Water Conservation District
VC	Ventura County
VCWPD	Ventura County Watershed Protection District
VCWWD#16	Ventura County Waterworks District Number 16
VRGWFM	Ventura Regional Groundwater Flow Model
WGS84	world geodetic system 1984
WL	water level
WLE	water level elevation
WQ	water quality
WY	water year

1. Introduction

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this Fillmore and Piru Groundwater Basins Sustainable Management Criteria (SMC) Technical Memorandum (Tech Memo) for the Fillmore and Piru Basins Groundwater Sustainability Agency (FPBGSA or Agency) and is under contract to prepare their mandated Groundwater Sustainability Plans (GSP or Plan) under the Sustainable Groundwater Management Act (SGMA) of 2014. Although SGMA requires separate Plans to be prepared for each basin, Fillmore and Piru subbasins (Figure 1-1)(hereafter referred to as "basins") are hydrogeologically connected and have historically been managed and monitored together. The FPBGSA Board of Directors has memorialized in Resolution 2021-05 their intent continue this precedent and to manage these basins together. In keeping with this historical precedent, this Tech Memo has been prepared to cover both basins.

SMC are foundational elements of the GSPs. This document provides a background discussion on the development of the SMCs, and their potential impacts on the groundwater resources in the basins and its uses and users.

This document includes references to Appendices in the GSPs to provide supplemental information on several topics. Additional information included as a part of this Tech Memo are referred to as Attachments.

2. Background

The development of the SMCs occurred over a several month period that started with an ad hoc committee of the Board of Director setting some of the introductory contextual framework for discussing how to approach establishing SMCs and their various elements. Draft SMCs were discussed by the FPBGSA Board of Directors and stakeholders at multiple regular board meetings, as well as a series of Special Board meetings and stakeholder workshops.

2.1 Sustainability Goal

The sustainability goal for the FPBGSA is memorialized in the Guiding Principles (https://bit.ly/3sQp8LR) adopted by the Board of Directors in November 2019 and includes principles of understanding covering the governance, communication and education, funding and finances, as well as SGMA Implementation and Sustainability. These principles describe commitments and common interests that combined leadership from the FPBGSA and were agreed on as a way to influence current and future compliance with SGMA. The FPBGSA Joint Exercise of Powers Agreement (JPA) (GSP Appendix A) is the legal foundational document for the groundwater sustainability agency (GSA). These Guiding Principles are intended to be consistent with and in furtherance of the JPA. In the event of a conflict between the JPA and these principles, the JPA takes precedence.

These Guiding Principles can be digested into two of the General Principles:

Gen 6 - Sustainable groundwater conditions in the Basins are critical to support, preserve, and enhance the economic viability, social well-being, environmental health, and cultural norms of all Beneficial Users and Uses including Tribal, domestic, municipal, agricultural, environmental and industrial users; and

Gen 7 - FPBGSA is committed to conduct sustainable groundwater practices that balance the needs of and protect the groundwater resources for all Beneficial Users in the Basins.

The beneficial uses of water, pertaining to water rights, are defined in the California Code of Regulations (CCR) §659-672 to include: domestic; irrigation; power; municipal; mining; industrial; fish and wildlife preservation and enhancement; aquaculture; recreational; stockwatering; water quality; frost protection; and heat control. Water quality control plans (basin plans) also designate beneficial uses and establish water quality objectives for waters of the State. Basin plans commonly designate beneficial uses in addition to those uses identified for water rights in CCR §659-672.
(https://www.waterboards.ca.gov/waterrights/water_issues/programs/public_trust_resources/#beneficial)

The basin plan pertinent to the Fillmore and Piru Basins is the Los Angeles Regional Water Quality Control Board (LARWQCB) Basin Plan for Coastal Watersheds in Los Angeles and Ventura Counties (LARWQCB, 2020), in which, beneficial users of groundwater and surface water are identified (Tech Memo Attachment A). Based on FPBGSA stakeholder engagement over the past couple of years, the beneficial users of surface water and groundwater in the basins include domestic, agricultural, municipal, industrial, and fish and wildlife preservation and enhancement.

2.2 Historical Groundwater Management Program

The Guiding Principles leaned heavily upon the extensive history of groundwater monitoring, study and management in the basins. California Assembly Bill 3030 was enacted in 1992, which established in the California Water Code sections 10750-10756, a systematic procedure for a local agency to develop a groundwater management plan. Subsequently, in 1995, a Memorandum of Understanding (M.O.U.) was signed among United Water Conservation District (United Water or United), the City of Fillmore, water companies and other pumpers to establish how an AB 3030 groundwater management plan would be formulated for the Piru and Fillmore groundwater basins (M.O.U.,1995). The M.O.U. established that the Management Plan would be a cooperative plan for the Basins. After the adoption of the M.O.U., a Groundwater Management Plan (Plan) was formulated and adopted in 1996. The Plan outlined the roles of the various parties in implementing a groundwater management program, including the establishment of a Groundwater Management Council to manage the Plan. The Council consisted of seven members: two City Council representatives from Fillmore, four pumpers (of which two were from private entities and two from investor-owned companies or mutual water companies), and one elected board member from United Water.

SB 1938 (2002) and AB 359 (2013) required additional elements be included in all AB 3030 management plans, and an updated Draft Piru/Fillmore Basins AB 3030 Groundwater Management Plan was submitted to the AB 3030 Groundwater Management Council in 2011. The Draft Plan update included Basin Management Objectives (BMOs) for groundwater elevations, groundwater quality and surface water quality at various locations. It also included a groundwater export policy which provoked considerable discussion. In 2013 an updated version of the Draft Plan was submitted to the Council. The revised draft of the Plan was never adopted by the Council and therefore never finalized. The AB 3030 process has since been superseded by the SGMA.

2.3 Future Groundwater Management Considerations

The FPBGSA Board of Directors has carefully considered the Guiding Principles and the hydrologic conditions of the basins in establishing how sustainability can be achieved in these basins. Consideration was given to how future land use and climate change are expected to impact hydrologic conditions in the basins. Future land use is expected to remain similar to historical (primarily agricultural with some urban) because of Ventura County policies to preserve agricultural and open space land use designations (Figure 1-1). Modest growth in urban water use is expected in both basins. Future climate change is expected to have greater variability in precipitation (e.g., more intense floods and droughts) and higher annual average air temperature (UWCD, 2021).

2.4 Basin Hydrology

The hydrology of the basins is strongly influenced by the wet-dry cycles (Figure 2-1) common to Southern California. The basins exhibit a repetitive sequence of lower water levels during drought periods with recovery of the water levels during subsequent wet periods (Figure 2-2). The basins do not exhibit evidence of chronic, long-term water level declines or prolonged declines in groundwater storage based on groundwater level measurements (Appendix K). Interpretation of long-term groundwater level records indicate water year 2011 is representative of "basin full" conditions, when water levels plateau at highest values.

The basins' responses to varying degrees of stresses (e.g., pumping, precipitation and evapotranspiration) were evaluated using the numerical groundwater flow model developed by United Water to better understand how alternate climate/pumping scenarios can affect groundwater levels. The historical model period (1985 through 2019) was simulated with several scenarios of increased pumping (by 20%, 40%, 60%, 80% and even 100% relative to baseline)(Figure 2-3) to evaluate how much lower and for how much longer groundwater levels would be (Attachment B). Results indicated that water levels become progressively deeper in each scenario, especially during significant drought periods (e.g., 2012-2016), yet water levels in all scenarios recover to similar "basin full" levels upon the return of wet or normal precipitation periods (implying sustainable groundwater level trends without long-term, chronic declines).

Stream flow measurements are available at a limited number of locations along the Santa Clara River within the Fillmore and Piru basins. Hydrologists from UWCD have identified an empirical relationship between groundwater levels in nearby wells (Figure 2-4) and the surface water flow measurements near the Cienega/Fish Hatchery and Willard Road/East End areas of rising groundwater (i.e., shallow groundwater discharges to the land surface). This empirical relationship allows forecasts of the rising groundwater rates at these areas to be developed for future modeled groundwater levels and were extensively relied upon for the analysis and formulation of the sustainable management criteria for multiple indicators.

During prolonged dry periods (i.e., multi-year droughts), the surface water flows in the Santa Clara River disappear in an east to west pattern as the drought progresses. Figure 2-5 was compiled by UWCD hydrologists and shows the progression of the most recent 2011-2017 drought period. The surface water in the Cienega/Fish Hatchery disappears earliest, then retreats westward as the drought continues for multiple years. This is a common trend on how the rising groundwater that supplies the surface water flows slowly diminishes in the Cienega/Fish Hatchery area before other areas in the Fillmore basin.

Projections of future groundwater conditions in the basins were simulated by applying climate change factors (i.e., 2070 central tendency scenario provided by DWR) to precipitation and evapotranspiration values in the United Water model, along with increases in pumping (due to urban growth and higher temperatures that should increase agricultural demand) (Figure 2-6) , to evaluate groundwater level trends (Attachment C). Comparison of analogous time periods (years 1990 to 2019 vs. projected 2067 to 2096) exhibited similar patterns of groundwater level responses during dry and wet periods, indicating that the basins are resilient to projected climate change and pumping increases of about 10%.

A model scenario was also run with a 50% reduction in historical and projected pumping, by turning off wells within an approximate one mile band centered along the Santa Clara River channel, to evaluate the relative effects of droughts and pumping on groundwater levels near significant wildlife corridors that correspond with zones of rising groundwater (see Section 3 in this document). Results indicated that pumping near the River causes groundwater levels to decline faster during droughts, yet groundwater levels would decrease below a critical depth of 10 feet below 2011 levels even without pumping along the River during the last major (2012 to 2016) drought. The critical water depth below 2011 levels applies to groundwater dependent vegetation and is based on preliminary research presented by Christopher Kibler at the January 21, 2021 Board Meeting (Kibler, 2021b).

3. Sustainable Management Indicators

The following matrix summarizes the SMC for the six sustainability indicators specified in SGMA.

Table 3-1 Sustainable Management Criteria (SMC) Matrix

SMC	Undesirable Results	Metric	MT (June 10, 2021)	MO	Comments
GW Elevation	Loss of ability to pump GW	GW elevation	WL declines below the base of well screens in more than 25% of representative wells	GW levels at 2011 high WL	maximizes range between MT and MO
	Significant and unreasonable GDE vegetation die-off due to GSP implementation	Depth to GW at the Fillmore - Piru basin boundary	WL declines below the Critical Water Level defined as 10 ft lower than 2011 low WL*	GW levels at 2011 high WL	*when the CWL is exceeded, mitigation water (e.g., pumped GW) will be provided to CDFW for use at the Cienega Springs restoration project site, if the WL has not recovered to CWL by the subsequent May 1st
GW Storage Reduction	inadequate GW storage to last through multi-year drought without GW extraction limitations	GW elevation	WL declines below the base of well screens in more than 25% of representative wells	GW levels at 2011 high WL	maximizes range between MT and MO
SW Depletion	Surface water flow declines due to GW extractions that interfere with the beneficial use and users	Rising GW rates at the Fillmore-Piru basin boundary (Fish Hatchery area)	A MT is not applicable for this sustainability indicator.	GW levels at 2011 high WL	**Future rising GW conditions are not expected to be materially different from historical conditions.** The GSP does not propose projects or management actions that would change the operational regime of the basins. Therefore, implementation of the GSP does not cause significant and unreasonable effects.
Land Subsidence	Land subsidence amounts that interfere with infrastructure operations	Subsidence rates	Total inelastic subsidence of 1ft/yr or 1ft over 5 yrs	Inelastic subsidence rates within +/- 0.1 ft/yr as determined by InSAR	Monitor subsidence amount - InSAR data from DWR; study to identify susceptible infrastructure (e.g., long-span bridges, gravity sewage systems) for 5 yr GSP update
Degraded WQ	Water quality degradation that impairs the beneficial use of the resource	WQ values	Water quality parameters established in existing or future regulations	FPBGSA is not a water purveyor and lacks regulatory authority for WQ compliance, but will cooperate with appropriately empowered entities	
Seawater Intrusion	NA	NA	NA	NA	

Version: Approved by the FPBGSA Board at the June 10, 2021 Board Meeting (Item 3A).

Several definitions are integral to the understanding the process of establishing sustainable management criteria for the Fillmore and Piru basins. The following definitions are taken from §351. Definitions from the GPS Emergency Regulations and Title 23, Division 2 of the California CCR.

Metric refers to how a minimum threshold will be measured (e.g., groundwater levels, water quality, rates of seawater intrusion).

(t) "**Minimum threshold**" refers to a numeric value for each sustainability indicator used to define undesirable results.

(s) "**Measurable objectives**" refer to specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin.

(x) "**Undesirable result**" means one or more of the following effects caused by groundwater conditions occurring throughout the basin:

(1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

(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.

Significant and unreasonable - GSAs must consider and document the conditions at which each of the six sustainability indicators become significant and unreasonable in their basin, including the reasons for justifying each particular threshold selected. These general descriptions of significant and unreasonable conditions are later translated into quantitative undesirable results, as described in this document. The evaluation of significant and unreasonable conditions should identify the geographic area over which the conditions need to be evaluated so the GSA can choose appropriate representative monitoring sites (DWR, 2017).

The following discussion of the six sustainability indicators is ordered from the least impactful to the most impactful. The order of the discussion has no other significance.

3.1 Significant and Unreasonable Sea Water Intrusion

Sea water intrusion is an ongoing concern for the coastal areas of Ventura County (UWCD, 2016) (Figure 3-1). Sea water intrusion has not historically migrated beyond the coastal plain (e.g., Oxnard Basin) even during severe drought conditions.

The Fillmore and Piru basins are located a substantial distance inland from the coast and therefore, sea water intrusion is not a realistic threat to these basins. The western boundary of the Fillmore basin, closest to the coast, is approximately 15 miles inland and at an elevation of about 270 ft amsl.

This sustainability indicator is not applicable for the Fillmore or Piru basins.

3.1.1 Undesirable Results

Not applicable to these basins.

3.1.2 Metric

Not applicable to these basins.

3.1.3 Minimum Thresholds

Not applicable to these basins.

3.1.4 Measurable Objectives

Not applicable to these basins.

3.2 Significant and Unreasonable Degraded Water Quality

The FPBGSA recognizes the importance of monitoring the quality of water that supports the beneficial uses and users of that resource and has developed a monitoring program, building upon the water quality sampling and analysis programs conducted by the VCWPD, United Water, and various water purveyors in the basins (Figure 3-2; Appendix K).

A recently developed multi-basin (including Fillmore and Piru basins) water quality monitoring and management program is the Lower Santa Clara River Basin Salt and Nutrient Management Plan (SNMP) adopted by the LARWQCB on July 9, 2015 (Chapter 8 of LARWQCB, 2020). The overarching goal of the SNMP is to protect, conserve, and augment water supplies and to improve water supply reliability. This goal is supported by objectives of:

- Protecting Agricultural Supply and Municipal and Domestic Supply Beneficial Uses of groundwater;

- Supporting increased recycled water use in the basin;
- Facilitating long-term planning and balancing use of assimilative capacity and management measures across the basin;
- Encouraging groundwater recharge in the Santa Clara River valley; and
- Collecting, treating, and infiltrating stormwater runoff in new development and redevelopment projects.

The SNMP and Agency have similar objectives to protect beneficial uses of agricultural supply and municipal and domestic supply, and to encourage groundwater recharge in the Santa Clara River (i.e., through existing recharge management operations lead by United Water).

3.2.1 Undesirable Results

The Agency has an established water quality monitoring program (Figure 3-2), based on the programs implemented by VCWPD and UWCD, that will identify conditions that impair the beneficial use or users of the water.

Examples of undesirable results associated with high levels of:

- Boron can preclude agricultural use (especially for citrus crops);
- Chloride can preclude agricultural use (especially for avocadoes);
- Nitrate can preclude domestic use (especially for infants (i.e., blue-baby syndrome [Infant Methemoglobinemia]);
- Taste and odor that are an aesthetic nuisance;
- Sulfate and TDS (other inorganic minerals) can make water hard and require water softeners, which are often banned to prevent elevated levels in wastewater discharges; and
- Constituents with a maximum contaminant level (MCL) listed in Title 22 of the CCR.

Because the Agency does not have authority to regulate water quality, the most pertinent actions the Agency can take to help ensure sustainable basin conditions is to monitor groundwater quality and understand how changes to groundwater conditions (e.g., groundwater levels) can affect concentrations of various constituents of concern to agencies with regulatory authority over water quality.

3.2.2 Metric

The proposed metrics are the water quality analyte values and units included in existing and future regulations including, but not limited to, for example, Basin Plan Objectives (included in Attachment A as an example) and maximum contaminant levels (MCLs) listed in Title 22 of the CCR. Select historical COCs MCLs in the basins are shown in GSP table 2.2-1 in the GSP (2.2.2.5.1)

3.2.3 Minimum Thresholds

There are many regulatory agencies in the State of California with authorities over water quality, however, the FPBGSA is not among that group. Per SGMA regulations, GSAs do not have regulatory authority over water quality. The Agency has elected to use the water quality concentrations (e.g., MCLs) established by those entities with authority over water quality as the minimum thresholds for both basins.

3.2.4 Measurable Objectives

FPBGSA is not a water purveyor and lacks regulatory authority for water quality compliance, but is committed to working cooperatively with the appropriately empowered entities. Lacking regulatory authority over water quality compliance limits the Agency's control in achieving water quality measurable objectives if the Agency were to establish MOs for specific monitoring points in the basins. Consequently, the FPBGSA will cooperate with entities such as Ventura County Watershed Protection District and the Los Angeles Regional Water Quality Control Board (LARWQCB) as they enforce regulations designed to prevent the degradation of water quality to the extent it impairs the beneficial use of and use by stakeholders.

3.3 Chronic Lowering of Groundwater Levels

This sustainable management indicator addresses changes in groundwater levels in the Fillmore and Piru basins due to groundwater extractions and the potential impacts of those groundwater level changes on the beneficial use and users. As stated previously in Section 2.4, there is no evidence of chronic lowering of groundwater levels in either basin. Water levels do fluctuate in response to natural precipitation cycles with water levels declining during periods of severe droughts and recovering when normal or wet precipitation periods prevail.

The beneficial uses and users of groundwater throughout the basins include, but are not necessarily limited to:

- Pumping for agricultural, domestic, municipal, industrial and even aquaculture (for the CDFW owned and operated fish hatchery lands located near the eastern boundary of the Fillmore basin) (Figure 3-3; LARWQCB, 2020; Attachment A)
- Groundwater dependent ecosystems – vegetation element (GDEs; Figure 3-3). These beneficial users depend on sustainable groundwater supplies, most simply represented by groundwater levels.

As discussed in Section 2, historical data and projected model scenarios indicate that groundwater levels do not (and are not anticipated to) exhibit chronic declines over periods of wet and drought conditions. Given the absence of evidence for chronic lowering of groundwater levels, the Agency considers the most significant potential effect of groundwater levels on beneficial users to be how long groundwater levels remain depressed during droughts and what proportion of the water level decline is attributable to groundwater extractions v. drought.

The groundwater flow model constructed by United Water was used to help discern what portion of the water level declines during droughts, normal, and wet periods were attributable to groundwater extractions. The model included projections of water levels under future climate conditions (i.e., 2070CF), groundwater extractions, and land use changes. The model was used to simulate how groundwater levels changed when extractions from wells within about 1 mile of the Santa Clara River were eliminated (Figure 3-4).

Figures 3-5, 3-6, and 3-7 show the effect groundwater extractions have on water levels at a few example wells. In general, the effect of groundwater pumping on water levels is more pronounced during drought periods and where water levels are estimated to be lowered by 5 to 40 feet.

3.3.1 Undesirable Results

The undesirable results to be avoided for this sustainability indicator have two segments: the loss of the ability to pump groundwater from the existing well network (Table 3-1; Figure 3-3) and significant and unreasonable GDE vegetation die-off due to implementation of the GSP.

3.3.1.1 Water Levels Declining below Bottom of Well Screen

The loss of ability to pump groundwater from the existing wells in each basin was established by the FPBGSA, in consultation with stakeholders, as the decline of water levels below the base of the well screen in a well. The MT for this sustainability indicator is when 25% of the representative monitoring wells (Section 3 of GSP) show water levels below the bottom of the well screen. The United water groundwater flow was used to simulate how future groundwater levels might react as future pumping rates increase (but only slightly) and the impacts of climate change are factored into the scenario.

Groundwater levels are actively monitored at a subset of wells (Figure 3-8) in the Fillmore and Piru basins. The United Water groundwater flow model was used to compare modelled groundwater levels with the bottom of screen (perforation) intervals of wells (where this information is available from United Water and VCWPD databases) to provide a more robust evaluation of additional wells that do have groundwater level measurement records. Wells with groundwater level data were used to evaluate model biases to help interpret the likeliness that any wells would actually have groundwater levels drop below the bottom of screen. No anecdotal evidence of dry water wells has been reported historically (based on Board member and stakeholder engagement during the November 19, 2020 Board Meeting), although one well (04N18W29M02S Vic Warren) went dry in the recent drought (Appendix K)

The modelled future water levels were also compared to the bottom of the well screen for all active wells in the database where that information is known. The modelled future water level data indicated that as many as 9 production wells (Figure 3-9) would be expected to have their water levels decline below the bottom of the well screen for a period of time greater than 1 month. Correcting for model bias in the future scenario, it was determined that none of the wells originally suspected of going dry are likely to do so (Figure 3-10).

3.3.1.2 GDE Die-Off due to Declining Water Levels from Implementation of the GSP

Concerns about the effect of groundwater level declines during droughts on GDEs in the rising groundwater areas were recognized by the FPBGSA Directors and additional analyses were performed to quantify the impact groundwater extractions had on water levels in the vicinity of the major GDE areas (Cienega/Fish Hatchery area near Fillmore-Piru basin boundary and East End/Willard Road area of the Fillmore basin near the Fillmore-Santa Paula boundary) along the Santa Clara River. The shallow groundwater, as well as the surface water, in both of these GDE areas is fed by rising groundwater. A third area of GDEs fed by shallow groundwater and/or surface water is the Del Valle area in eastern Piru basin. This area has relatively stable surface water flows and shallow groundwater levels due to the waste water treatment plant effluent from the Valencia treatment plant being discharged to the Santa Clara River. In the absence of declining water levels and a relatively stable supply of effluent, this GDE area will not be considered further in this section.

Shallow groundwater levels are known to vary in the areas with the GDEs in accordance with the major precipitation trends – lower water levels during periods of drought with higher levels associated with wet to normal precipitation patterns. It is also recognized that the ongoing groundwater extraction activity also impacts water levels. A GSA is not responsible for mitigating the impacts of a drought on water levels, but it is important for the FPBGSA to understand the degree to which groundwater extractions contribute to lower groundwater levels reported during major droughts.

The impact of groundwater extractions on water levels near the Santa Clara River were evaluated by comparing simulated water levels from two model scenarios:

- Current pumping practices (i.e., extraction quantities, spatial distribution of wells); and
- A hypothetical 50% reduction in pumping achieved by eliminating groundwater extractions from wells within about 1 mile of the Santa Clara River (Figure 3-4).

3.3.1.2.1 Cienega / Fish Hatchery

Near the Cienega / Fish Hatchery GDE area rising groundwater serves to limit water level fluctuations during normal to wet periods and is the source of the surface water commonly found in this area. Rising groundwater conditions are the normal for the majority of the simulated time period (Figure 3-11). However, during prolonged drought periods, the impact of groundwater extractions on the water levels is exacerbated (Figure 3-11).

Figure 3-11 illustrates how the shallow groundwater levels are impacted by extractions and by climate change. During future normal to wet precipitation periods simulated groundwater extraction results in water levels that are about 20 ft lower than without groundwater extractions (but including the impacts of climate change) near the Fish Hatchery facility. By contrast, the shallow water levels during drought periods are typically 50-75 feet lower when compared to non-drought periods. Approximately, 30-50 feet of the water level decline during major droughts is attributable to groundwater extractions with another 20-25 feet a function of the drought and the influences of climate change.

Drought impacts on the shallow groundwater level simulated for the key well (04N18W31D04S) located a short distance upstream from the Fillmore-Piru basin boundary have much smaller groundwater extraction impacts on the water levels (typically 10 ft or less).

Critical Water Levels (CWLs) for GDE vegetation are defined using the system suggested by Kibler (2021a,b) where they concluded that vegetative stress due to lower groundwater levels occurs when the water levels in the Cienega/Fish Hatchery area decline 10 feet below the 2011 water level. This condition is modelled to occur during multiyear droughts (Figure 3-12). The modeling results also indicate that the drought impact is not mitigated by the reduction of groundwater extractions within about 1 mile of the Santa Clara River. The shallow water levels tend to fluctuate slightly above or below the CWL during the drought periods, but do not remain above the CWL as is the common condition during normal or wet precipitation periods.

3.3.1.2.2 East End/Willard Road GDE Area

The second area of GDEs deemed of importance to the design and implementation of a GSP is the East End / Willard Road area located at the west end of the Fillmore basin. This is another of the unique areas in the Fillmore and Piru basins where rising groundwater supplies the surface water that supports the GDEs during periods without surface water runoff. The rising groundwater quantities are impacted by groundwater extractions; however, the simulated rising groundwater quantities are not totally depleted during droughts (Figure 3-13), in contrast to the Cienega / Fish Hatchery GDE area. The prevalence of rising groundwater even with groundwater extractions and climatic change effects suggests that this area is not experiencing chronic groundwater level declines and is maintaining the shallow groundwater levels to support GDE vegetation.

Even under this hypothetical significant pumping reduction, groundwater levels were projected to still drop below the CWL (10 feet below 2011 basin groundwater levels), and therefore, GDEs were considered to not be a significant beneficial user of groundwater by which to base the MT for groundwater levels. Although GDEs were considered not a significant factor in establishing groundwater level SMC, the Board recognizes the importance of the ability for GDEs to recover following drought periods and plans to support habitat restoration and preservation projects (i.e., the Cienega site) (See GSP Section 4).

3.3.2 Metric

Groundwater elevation (level) measurements relative to the North American Vertical Datum of 1988 (NAVD88).

3.3.3 Minimum Thresholds

The MT set at each representative monitoring site (well) is equivalent to the bottom of screen (perforation) elevation, which represents the groundwater elevation at which lower water levels result in a "dry" well (loss of ability to pump groundwater for beneficial uses). The MT is considered "exceeded" if groundwater levels drop below the bottom of the screen of 25% of the total number of representative monitoring points (wells) shown on Figure 3-14.

A MT for GDEs (vegetation) has been defined as the CWL (i.e., 10 feet below the 2011 water level). The FPBGSA Board of Directors have elected to mitigate the effects groundwater extraction has upon shallow water levels during droughts by providing supplemental groundwater from an existing or potentially new water well to augment the Cienega Springs restoration program water supplies during a prolonged drought. How and where the supplemental water would be utilized at the restoration program site would be decided by the CDFW personnel managing that facility. Those environmental professionals would determine how to maximize the benefit of the supplemental water. The supplemental water triggering events are:

- If the shallow water levels in the representative wells at the Cienega Springs restoration site decline below the CWL, the water levels will be more closely monitored through the next winter season (when most rainfall occurs) and if the water levels remain below the CWL on May 1st after the winter season, then supplemental water deliveries will be available for the Cienega Springs restoration project management to draw upon;
- The supplemental water deliveries will continue until the shallow water levels in the representative wells at the Cienega Springs restoration site remain at or above the CWL for a period of three consecutive months; and
- The quantity of supplemental water to be supplied will be determined in consultation with the Cienega Springs restoration management team, FPBGSA ecosystem consultants,

and stakeholders. The details of the mitigation program will be memorialized in a *Mitigation Plan* (GSP Section 4)

3.3.4 Measurable Objectives

Water level at the 2011 high which approximately represents basin-full conditions. This maximizes operational range between MT and MO. Groundwater conditions are considered sustainable so long as water levels recover to similar "basin full" conditions following droughts.

3.3.5 Discussion / Evaluation / Implication

The evaluation of long-term hydrographs of measured groundwater elevations throughout the basins (Figures 3-5, 3-6, and 3-7; Appendix K; Attachment C) indicate groundwater level trends have been sustainable (i.e., no long-term declining trends were observed) and are expected to remain stable over multi-decadal time frames. The same conclusion is made for groundwater levels that are projected 70 years into the future (Attachment C), using the United Water groundwater flow model (with projected pumping increases of about 10% and using climate change factors from DWR). Based on these evaluations of historical and projected groundwater level trends, the primary concern of this sustainability indicator is considered insignificant (i.e., sustainable).

Another evaluation was made using the United Water groundwater flow model to evaluate how many wells would be expected to go dry during droughts in the future (Attachment C). This evaluation was made to consider all wells with known well construction (i.e., screen depth intervals) and identify risks to sensitive receptors (i.e., shallow domestic wells). The evaluation revealed that some wells were technically considered to go dry at times (or all the time) per the simulated groundwater levels; however, further evaluation of simulated versus measured groundwater levels at nearby wells indicated that the model tends to bias groundwater levels lower than actual, and in our professional judgement, indicates little to no risk of shallow production wells going dry during future droughts (assuming similar climate conditions as modelled).

3.4 Significant and Unreasonable Reduction of Groundwater Storage

Groundwater storage is directly correlated with groundwater levels and estimates of storage properties of the various aquifer zones (from the calibrated United Water groundwater flow model) in each of the Fillmore and Piru basins. As previously noted, there is no evidence of long-term, chronic decline in water levels in either basin. Consequently, since the estimates of groundwater in storage are linked to those water levels, there is no evidence of long-term decline in groundwater storage (Figure 3-15).

Cyclic variations in the amount of groundwater in storage are evident as water levels decline during periods of prolonged drought, the groundwater storage amount also declines. However, the hydrology of these basins shows that water levels recover (and therefore storage quantities) when normal to wet periods return to the basins.

3.4.1 Undesirable Results

Undesirable results associated with groundwater storage would be considered an amount of groundwater storage reduction (i.e., MT) from the MO (i.e., 2011 basin conditions) that does not permit continued groundwater production (extraction) through a multi-year drought. This is equivalent to the amount of groundwater level decline that would result in water levels below the bottom of screened intervals (i.e., dry well conditions).

3.4.2 Metric

Groundwater elevation (level) relative to the North American Vertical Datum of 1988 (NAVD88). The DWR BMP Guidance Document (2017) confirms that surrogate metrics can be used to quantify a sustainability indicator if there is a clear relationship between the proposed surrogate and the indicator. For this indicator, there is a clear relationship between groundwater elevation and groundwater storage quantities.

3.4.3 Minimum Thresholds

The MT for groundwater storage reduction is the same as that for groundwater level declines (Section 3.3.3)(i.e., water levels in 25% of the representative wells decline to below the bottom of the well screen). The MT for this sustainability indicator does not consider GDEs as those are dealt with by other sustainability indicators.

3.4.4 Measurable Objectives

The MT for groundwater storage reduction is the same as that for groundwater level declines (Section 3.3.4).

3.5 Significant and Unreasonable Land Subsidence

Historical and projected land subsidence estimates are described in detail in the Subsidence Tech Memo (Appendix F). Evaluation of historical subsidence, focused on land elevation changes measured with InSAR during the 2012-2016 drought and recovery period thereafter, revealed insignificant declines (i.e., less than 0.1 feet) throughout the basins. The most significant land surface changes were observed in the western Piru basin and correlated with the decline and recovery of groundwater levels, which indicates any land subsidence in this area was elastic. This sustainability indicator is only concerned with inelastic land subsidence (i.e., land elevation declines that do not recover). Inelastic land subsidence would be considered undesirable because it implies a non-recoverable loss of groundwater storage capacity (due to compaction of pore spaces in the subsurface) and at high enough magnitudes, could damage critical infrastructure.

3.5.1 Undesirable Results

Undesirable results associated with land subsidence would be considered an annual rate or cumulative amount of inelastic subsidence that occurs over a period of years that interfere with infrastructure (e.g., gravity drained systems for wastewater in urban areas, roads/bridges, pipelines).

3.5.2 Metric

Land subsidence will be monitored by changes in land surface elevation (in feet relative to NAVD88) from InSAR datasets provided by DWR. The accuracy of InSAR land elevation change values is considered +/- 0.07 feet.

3.5.3 Minimum Thresholds

The MT for land subsidence at any location in either basin is set at an annual rate of 1 foot/year or 1 foot of cumulative [net] subsidence over a period of five years.

3.5.4 Measurable Objectives

The MO for land subsidence has been set as inelastic subsidence rates within +/- 0.1 feet/year (i.e., within the error range of InSAR land surface elevation change values).

3.6 Depletions of Interconnected Surface Water

The areas of interconnected surface water and groundwater are primarily at the basin boundaries where rising groundwater conditions (i.e., gaining stream conditions) occur along the Santa Clara River (Figure 3-3). These major areas of interconnected surface water support GDE communities and are identified as the Del Valle, Fish Hatchery/Cienega, and Willard Road/East Basin area (Figure 3-3; Appendix D)).

3.6.1 Areas of Interconnected Surface Water and Groundwater

The major areas of interconnected surface water are found in the eastern portion of the Piru basin (Del Valle), straddling the Fillmore-Piru basin boundary (Fish Hatchery/Cienega), and the western end of the Fillmore basin Willard Road/East Basin areas (Figure 3-3; Appendix D).

3.6.1.1 Del Valle area

The Del Valle area is located in the extreme eastern portion of the Piru Basin. Surface and groundwater flow in this reach of the Santa Clara River are supported by the waste water effluent releases from the upstream treatment plants (primarily the Valencia plant) serving the greater Santa Clarita area. These effluent releases to the Santa Clara River serve to dampen the effects of the limited groundwater extractions in the area, as well as the effects of drought. The depth to bedrock in this reach of the river is typically very shallow (e.g., less than 50 ft), so maintaining surface water flows are easier than in downstream reaches where the alluvial thickness can be greater than 1,000 ft.

This unique hydrogeologic setting coupled with limited groundwater extractions, and continuous source of WWTP effluent creates the conditions where surface water depletion due to groundwater extraction has very little impact on the surface water flows in this reach of the Santa Clara River. Based on these conditions, the Del Valle area will not be considered further and minimum thresholds and measurable objectives are not deemed appropriate for this reach of the river.

3.6.1.2 Fish Hatchery / Cienega Area

This is an area where rising groundwater is the primary source of surface water during many months of the year. For the majority of the months in a typical year, the area of rising groundwater are isolated from upstream and downstream reaches. During these periods, the source of the water in these isolated pools of water is rising groundwater, as there is no contributory surface water flow from the upstream reach.

During the wettest years with abundant runoff or during times when releases from Santa Felicia Dam or possibly Castaic Lake can temporarily connect the areas of rising groundwater. This connection is intermittent as the runoff abates and the reaches up- and down gradient of the rising groundwater intervals return to their natural losing reach conditions.

Figure 3-16 shows the rising water rates with and without groundwater extractions in the nearby area (i.e., within about 1 mile of the Santa Clara River). Rising groundwater occurs during normal and wet precipitation periods, although it can become nonexistent during periods of prolonged drought. The amount of rising groundwater/surface water is highly variable with the higher quantities of surface water flow augmented by precipitation runoff during wet periods.

3.6.1.3 Willard Road / East Basin

Rising groundwater is the predominant source of surface water in this reach of the Santa Clara River and has a less flashy hydrologic response to wet and dry cycles (Figure 3-16) than the Cienega/Fish Hatchery area of rising groundwater. The rising groundwater rates (after removing groundwater extractions within ~1 mile of the Santa Clara River) are estimated to be typically in the range of about 10-25 cfs with the lower rates associated with dry periods.

3.6.2 Impact of Groundwater Extractions on Surface Water Flow

Stream flow measurements are recorded at only a few locations in the basins (Appendix K). The impact of groundwater extractions on surface water flows was estimated using the groundwater flow model (Appendix E) developed by UWCD for these basins. The change in rising groundwater rates was estimated by eliminating groundwater extractions within about 1 mile of the Santa Clara River and calculating the rate difference with and without those extractions.

3.6.2.1 Fish Hatchery / Cienega Area

Figure 3-16 shows the rising water rates with normal groundwater extractions and without groundwater extractions in the nearby area (i.e., within about 1 mile of the Santa Clara River). The most apparent observation is that the impact of groundwater extractions is most pronounced during periods of prolonged droughts. During non-drought periods the impact of groundwater extraction on rising groundwater rates is in the range of 3-10 cfs.

Figure 3-17 shows how the groundwater extractions impact on the rising groundwater quantities varied across the historical time period, as well as the simulated future period (including the effects of climate change, future land use changes, and expansion of future pumping quantities). Comparing the mean and median differences due to groundwater extraction over the historical period with the mean and median differences from future model scenarios covering 2020-2096 reveals that the differences between the historical and future impacts of groundwater extraction were very similar (i.e., mean of 3.7 cfs vs. 5.1 cfs with median of 3.8 vs. 4.8 cfs).

The future projection of precipitation used in the groundwater flow model was a replication of the historical precipitation record (Appendices E and I). If the comparative analysis is confined to analogous time periods (those with the same precipitation trends) in the historical and future timelines Figure , the surface water (rising groundwater) depletion due to groundwater extraction is very similar in the historical time period (mean = 3.8 cfs, median = 3.8 cfs) and future time period (mean = 5.1 cfs, median = 4.6 cfs)(Figure 3-18). The slightly greater surface water depletions in the future scenario are reflective of the influences climate change has on the hydrology of the basins.

3.6.2.2 Willard Road / East Basin

Rising groundwater rates in this portion of the Fillmore basin are depicted in Figure 3-16. Groundwater extractions have an impact on the rate of rising groundwater. That impact is estimated to be about 5 cfs during normal and wet periods, but could increase to about 10 cfs during prolonged dry periods. However, groundwater extractions (including the impacts of climate change) are not expected to totally eliminate the rising groundwater even during prolonged dry periods.

3.6.3 Undesirable Results

The FPBGSA Board of Directors have defined the undesirable results associated with this sustainability indicator as "Surface water flow declines due to groundwater extractions that interfere with the beneficial use and users" (Table 3-1).

3.6.4 Metric

Rising groundwater rates at the Fillmore-Piru basin boundary near the Cienega/Fish Hatchery area.

3.6.5 Minimum Thresholds

Future rising groundwater conditions are not expected to be materially different from historical conditions even with consideration of the effects of climate change. The GSPs for the Fillmore and Piru basins do not propose projects or management actions that would change the operational regime of the basins. Therefore, implementation of the GSPs does not cause significant and unreasonable effects. Consequently, a MT has not been developed for this sustainability indicator.

3.6.6 Measurable Objectives

The MT for groundwater storage reduction is the same as that for groundwater level declines (Section 3.3.4).

4. Monitoring Network

The monitoring network associated with these sustainable management criteria are presented in Section 3 of the GSPs for the Fillmore and Piru basins and will not be further detailed in this document. Background information on the current monitoring programs in these basins is contained in Appendix K.

5. Discussion/Conclusion

The Board has approved SMC for the sustainability indicators based on the best available data and science. Sea water intrusion is not an applicable sustainability indicator to these basins due to the large horizontal and vertical distance that separates these basins from the Pacific Ocean, and therefore, SMC are not established. For the water quality sustainability indicator, the Agency does not have authority to regulate surface water or groundwater quality, but recognizes the importance of established thresholds (e.g., SNMP water quality objectives and Title 22 regulations) and will continue to monitor and evaluate how water quality metrics relate to groundwater conditions

The groundwater level sustainability indicator (metric) controls other sustainability indicators, such as groundwater storage reduction and inelastic land subsidence. Although the groundwater level sustainability indicator concerned with preventing chronic declines in water levels (per SGMA), evaluation of measured (historical) and projected (modelled) groundwater levels indicate these basins are resilient and recover from droughts each time, so long as occasional wet periods occur. The basin is considered sustainable in regards to groundwater levels because no chronic (long-term) trends are observed or projected. The same conclusion is made for the groundwater storage and land subsidence sustainability indicators, because storage and water levels are directly correlated and our evaluation of historical land subsidence (based on InSAR datasets) indicate insignificant (less than 0.1 feet/year) land surface elevation changes that rebound with recovery of groundwater levels (i.e., elastic subsidence).

SMC are established to maximize the operational flexibility of the basins by setting the MO and MT at each representative monitoring site (wells) at basin full conditions (2011 groundwater levels) and MT at the bottom of screen of representative monitoring sites (wells), respectively. The basins are considered sustainable in regards to these three sustainability indicators, and therefore, no management actions or projects are considered necessary to prevent undesirable results from groundwater level fluctuations. Although GDEs were considered not a significant factor in establishing groundwater level SMC, the Board recognizes the importance of the ability for GDEs to recover following drought periods and plans to support habitat restoration and preservation projects (i.e., the Cienega site).

Regarding the last sustainability indicator - depletions of surface waters that are interconnected with groundwater - the Board has determined that the anticipated future and historical reductions in the rising groundwater rates are not materially different (even with climate change) and after consultation with DWR, has elected to not establish a MT for this sustainability indicator.

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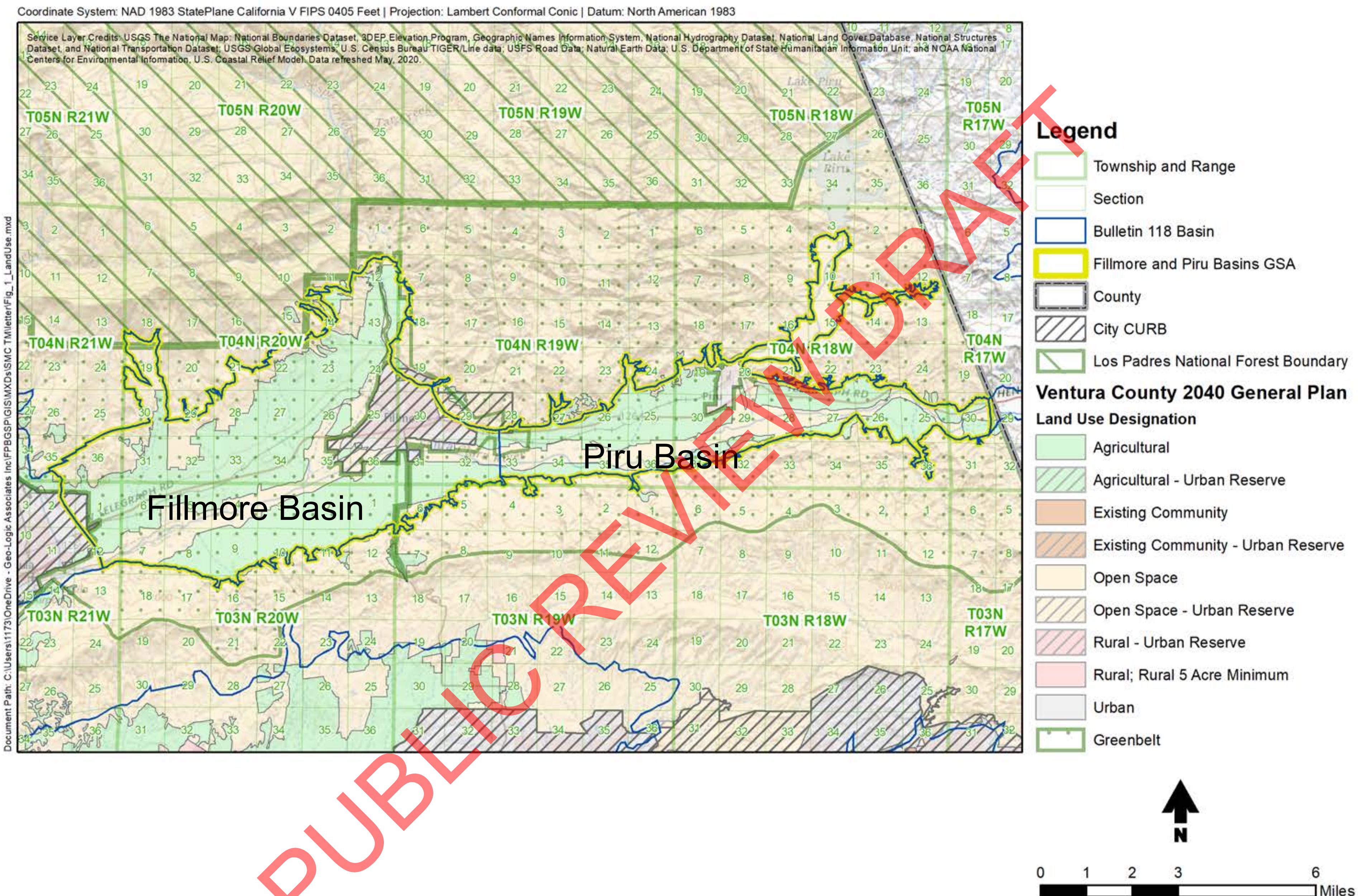
7. Figures



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Land Use Designations Map

Figure 1-1

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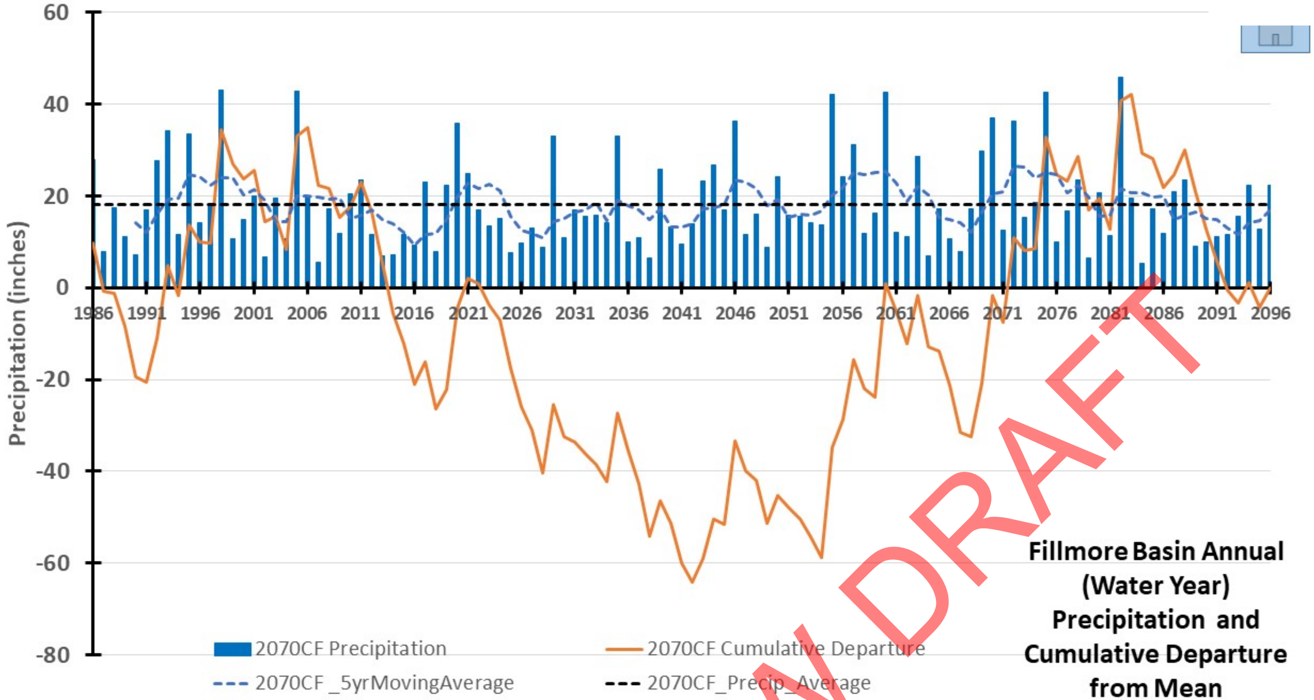

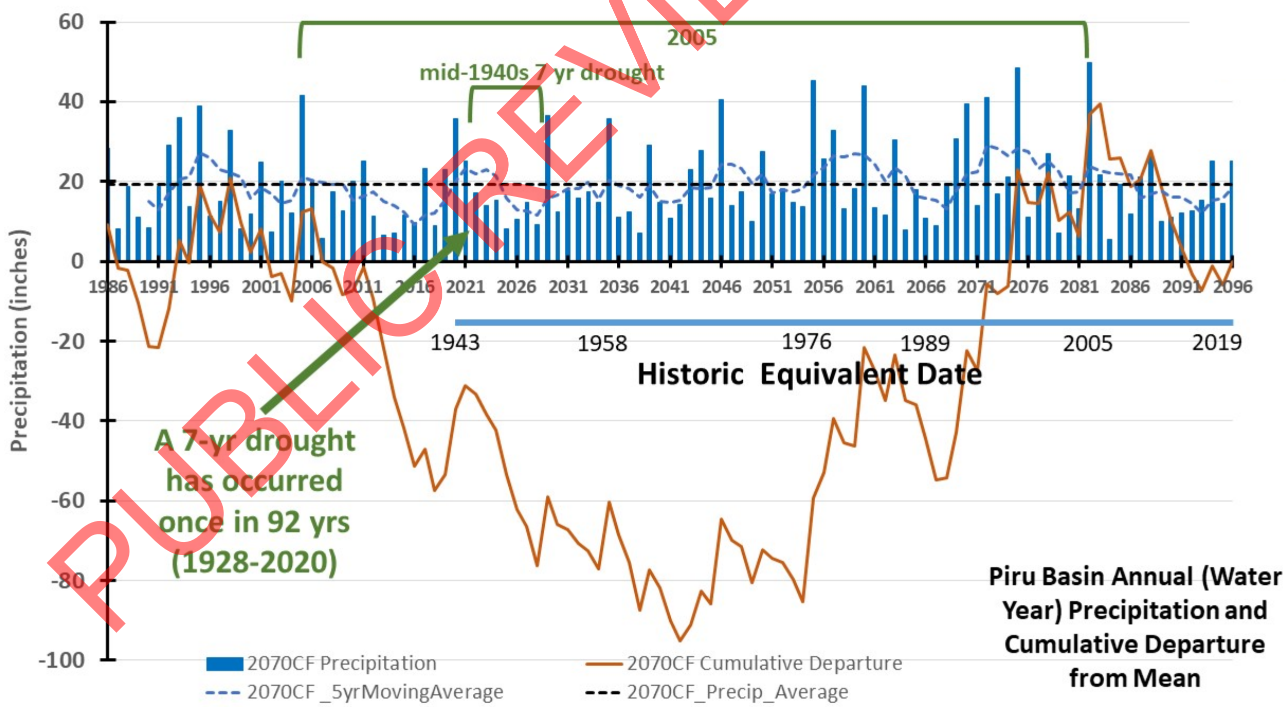

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Precipitation – Historical and Future Projections

Figure 2-1

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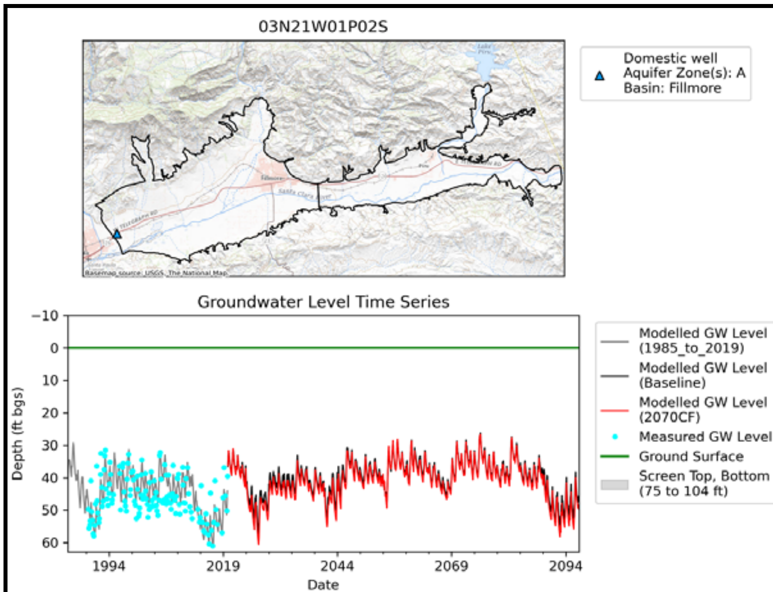

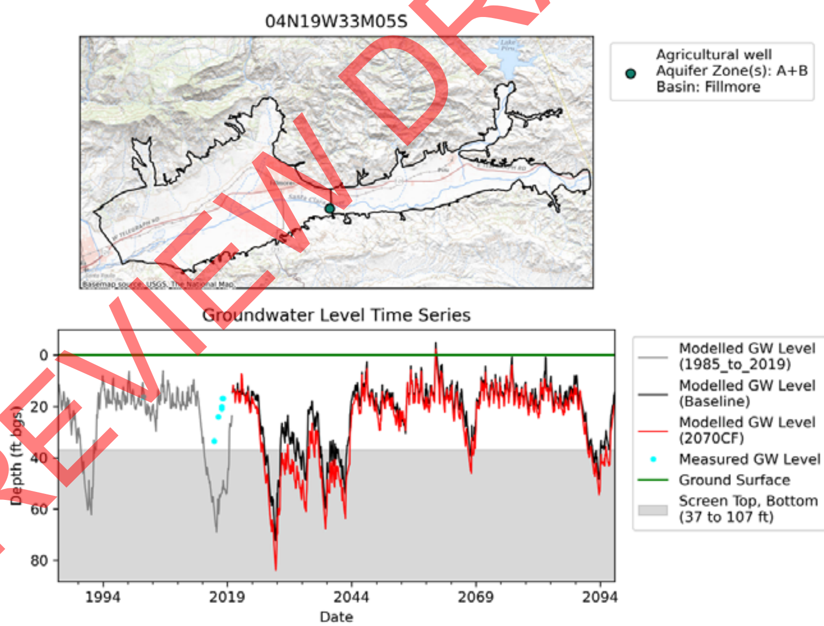

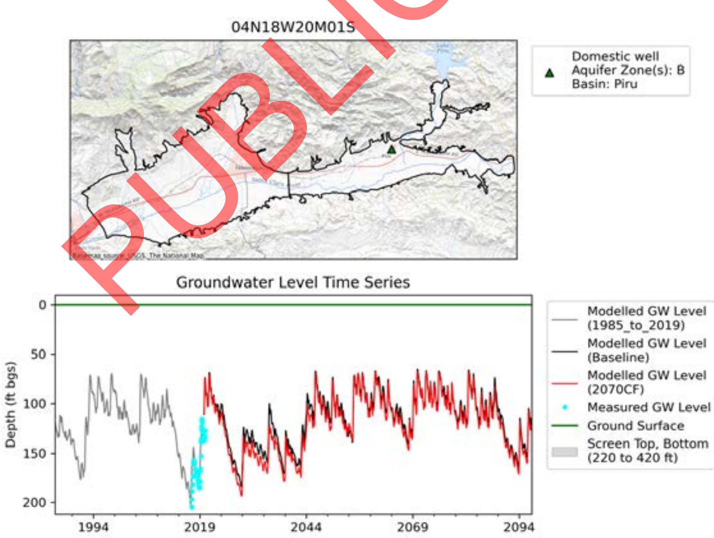

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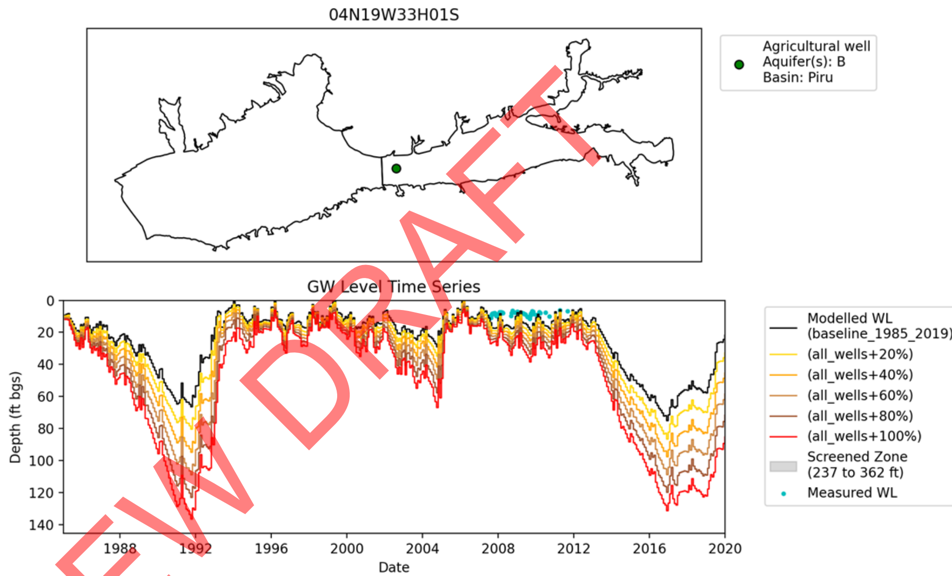
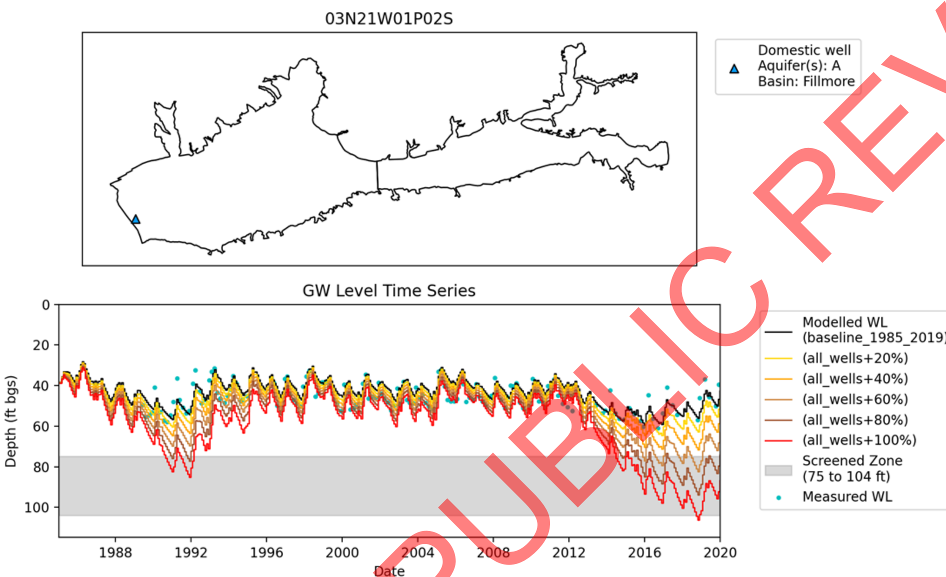
Representative Hydrographs

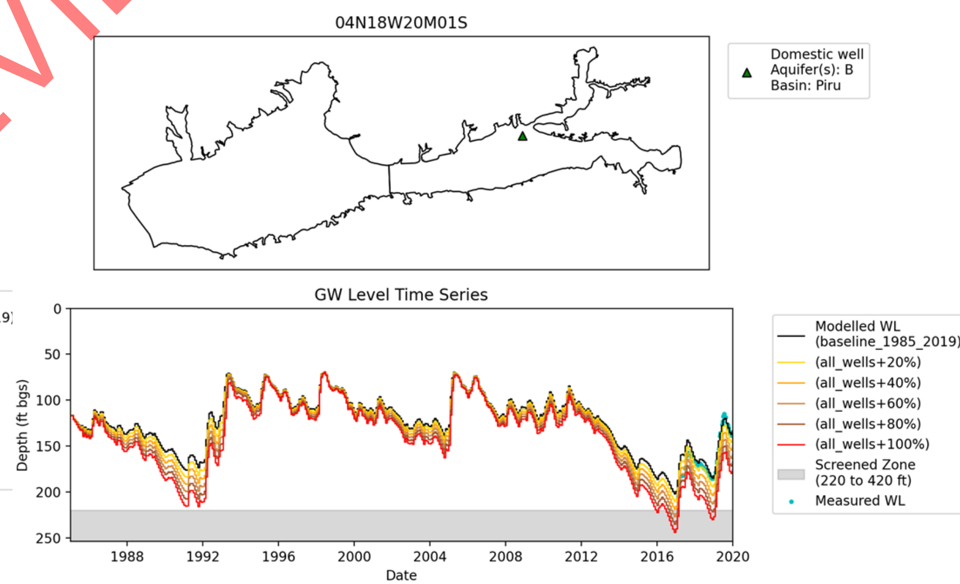
Figure 2-2

Pumping , AFY	Fillmore basin	Piru basin	Total for both basins
Baseline	46,760	11,390	58,150
Baseline + 20%	56,120	13,670	69,780
Baseline + 40%	65,470	15,950	81,420
Baseline + 60%	74,820	18,220	93,050
Baseline + 80%	84,180	20,500	104,680
Baseline + 100%	93,530	22,780	116,310

(Values rounded to nearest 10 AFY)







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Basin Pumping Stress Tests

Figure 2-3

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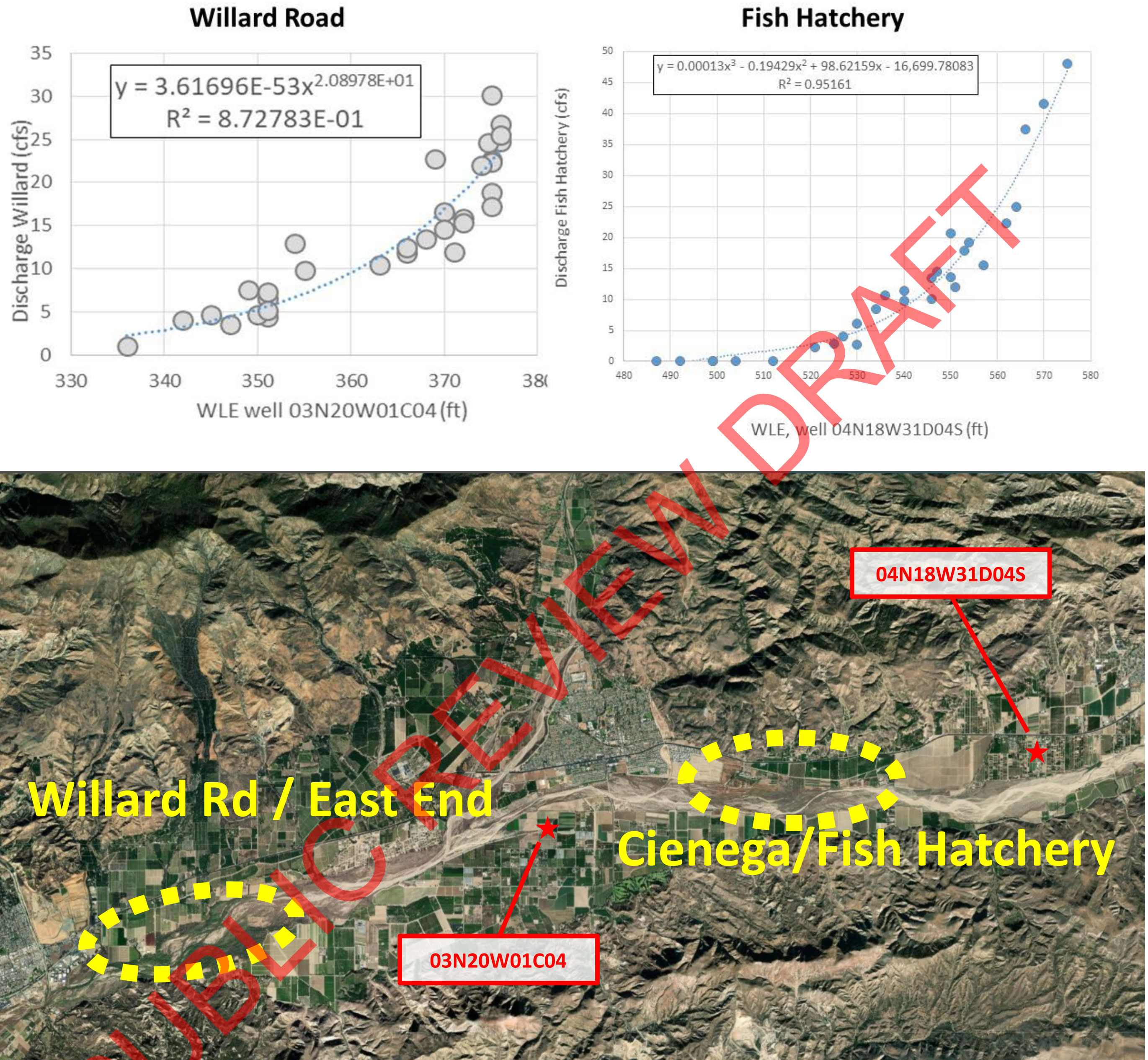
Water Level - Stream Flow Cross Over Analyses



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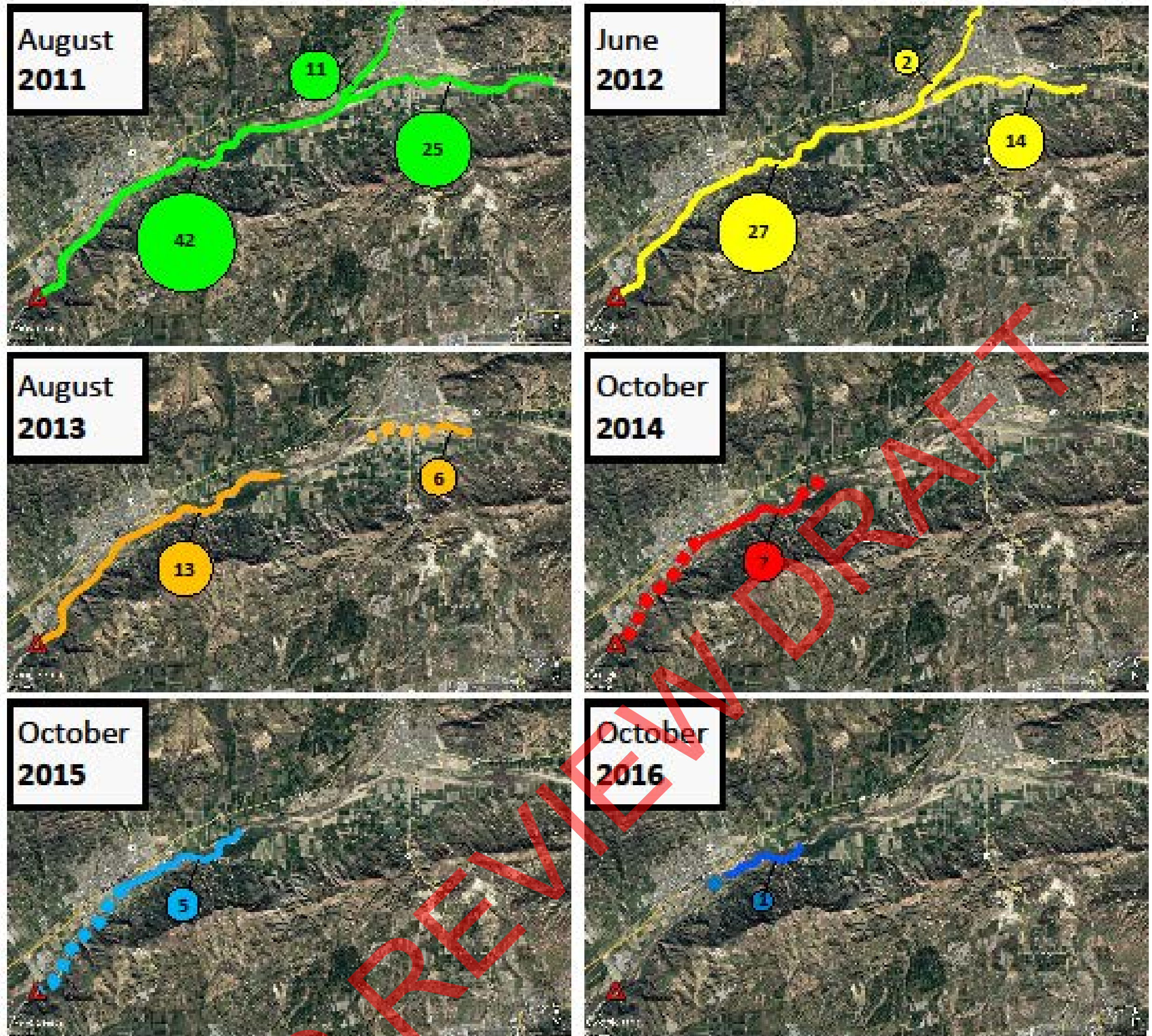
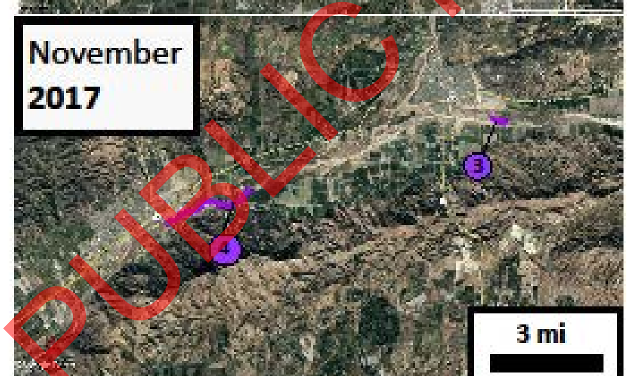
Surface Water-Groundwater Empirical Relationships

Figure 2-4





- **Wetted reaches of Santa Clara River begin to shrink shortly after start of drought**
- **Willard Road/East End are remains wetted through the six year time period**

Surface water flow in cfs shown in circles

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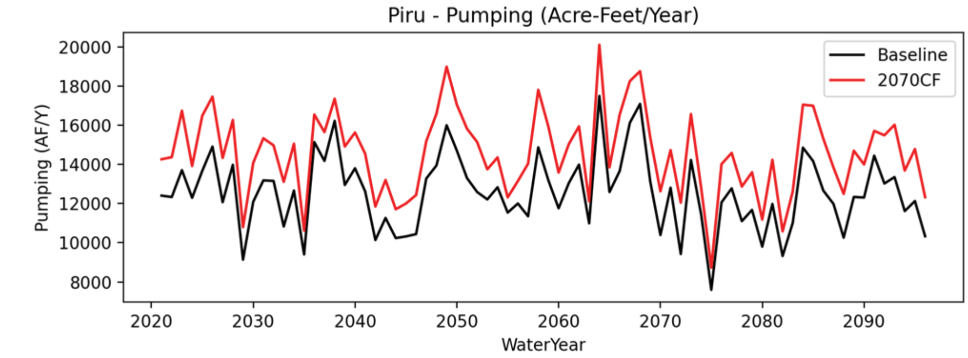
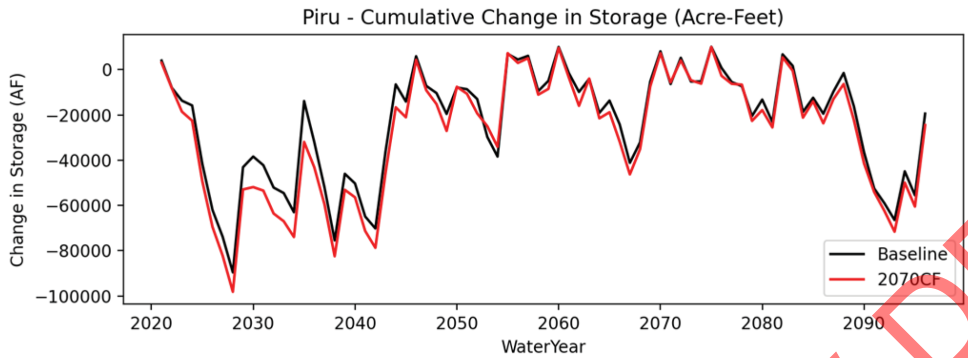
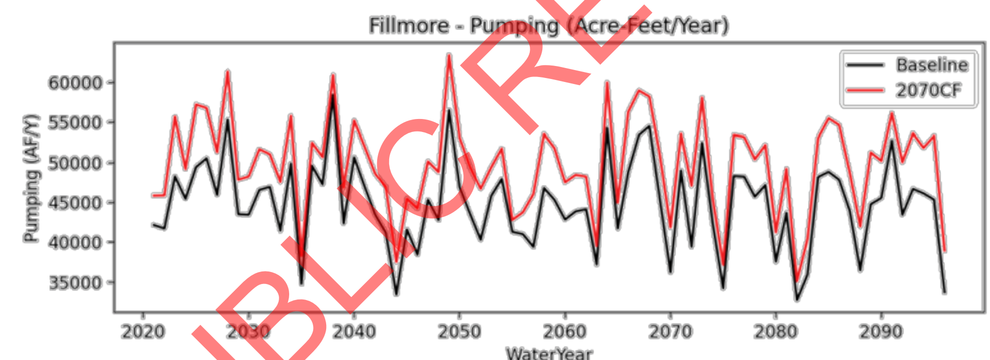
Example Surface Water Flow in Extended Drought – 2011-2017

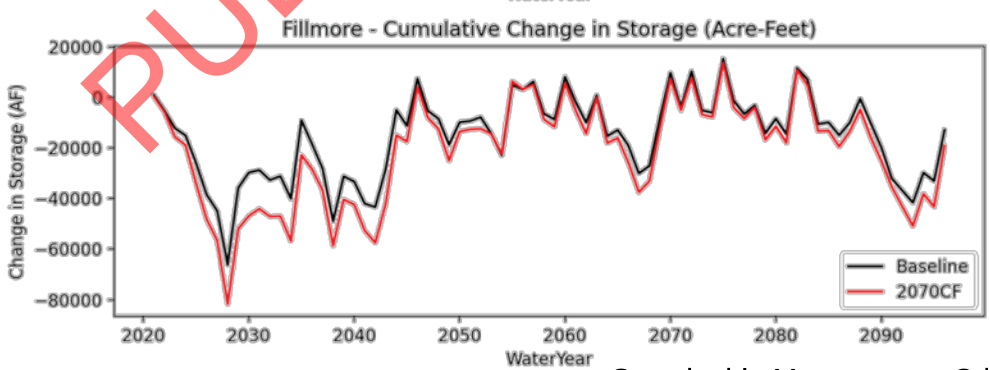
Figure 2-5





	Average Pumping (Acre-Feet/Year)	
Scenario	**Fillmore**	**Piru**
Historical	**46,800**	**11,400**
Baseline	**44,800**	**12,600**
2070CF	**49,800**	**14,600**





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Future Groundwater Extractions And Change in Storage

Figure 2-6

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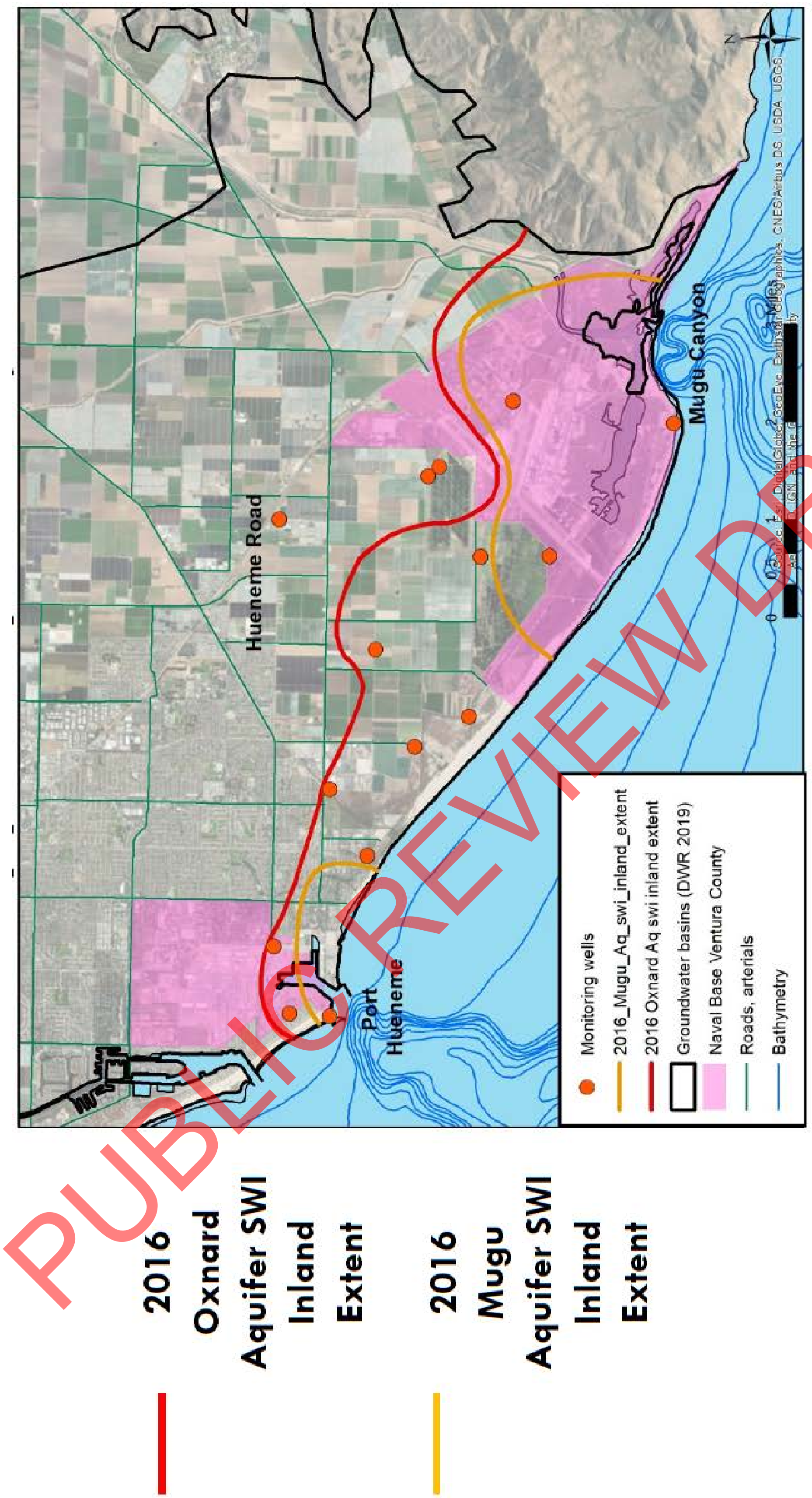

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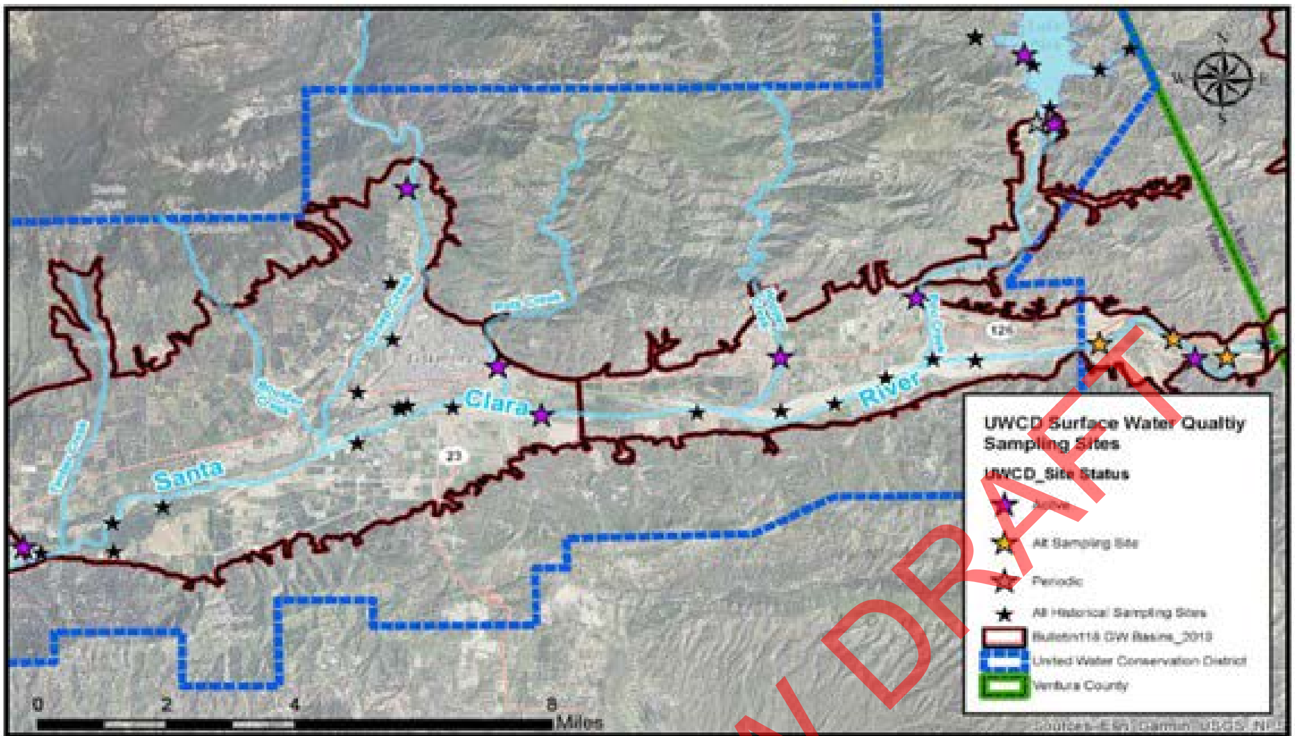
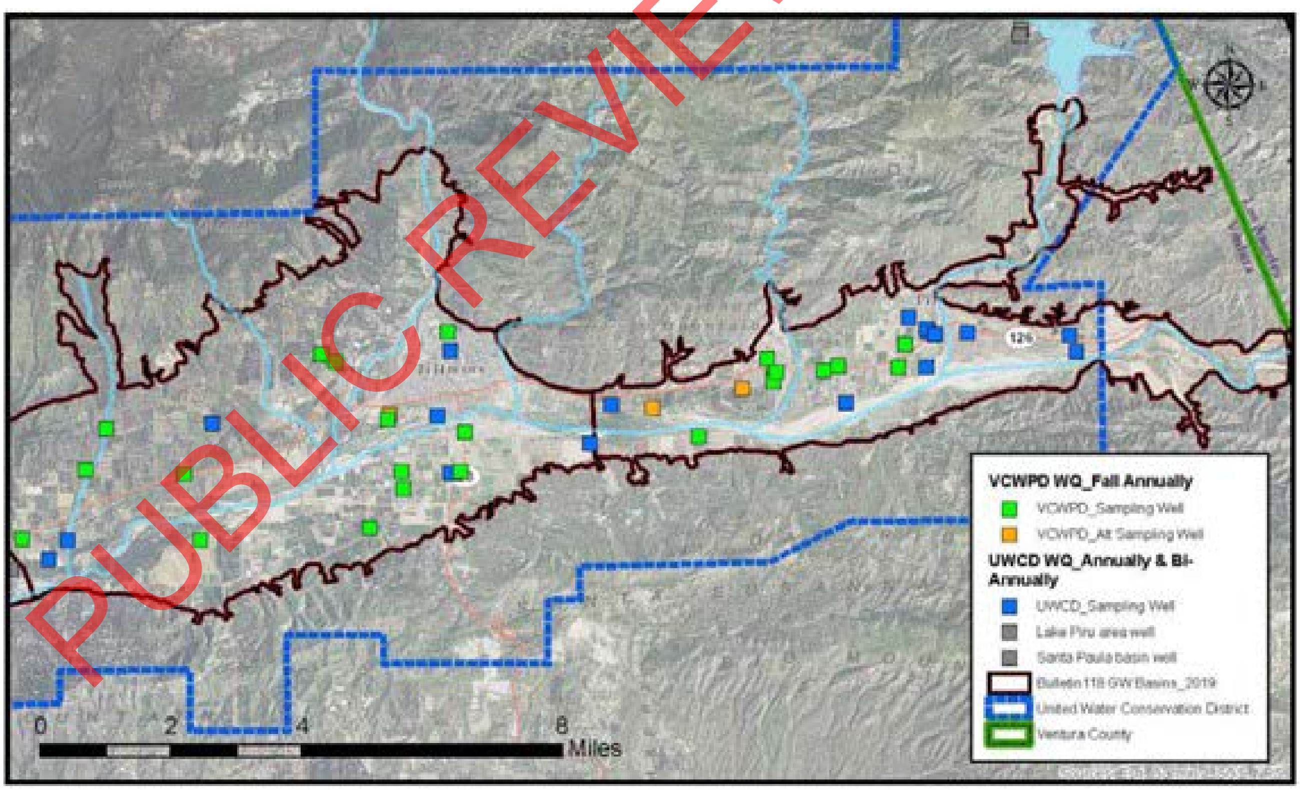
Seawater Intrusion – Upper Aquifer System

Figure 3-1





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Water Quality Sampling Sites

Figures 3-2a & b

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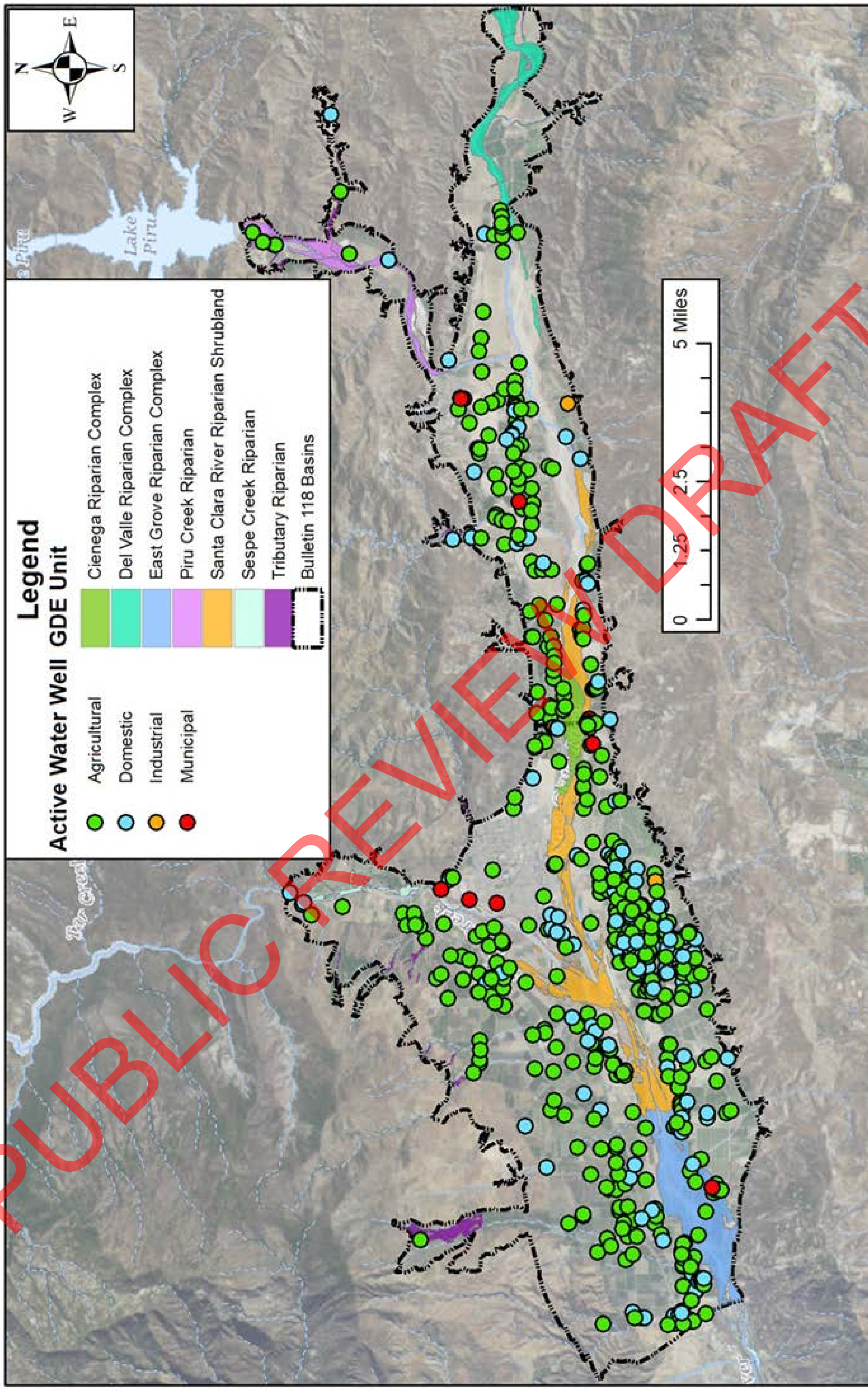

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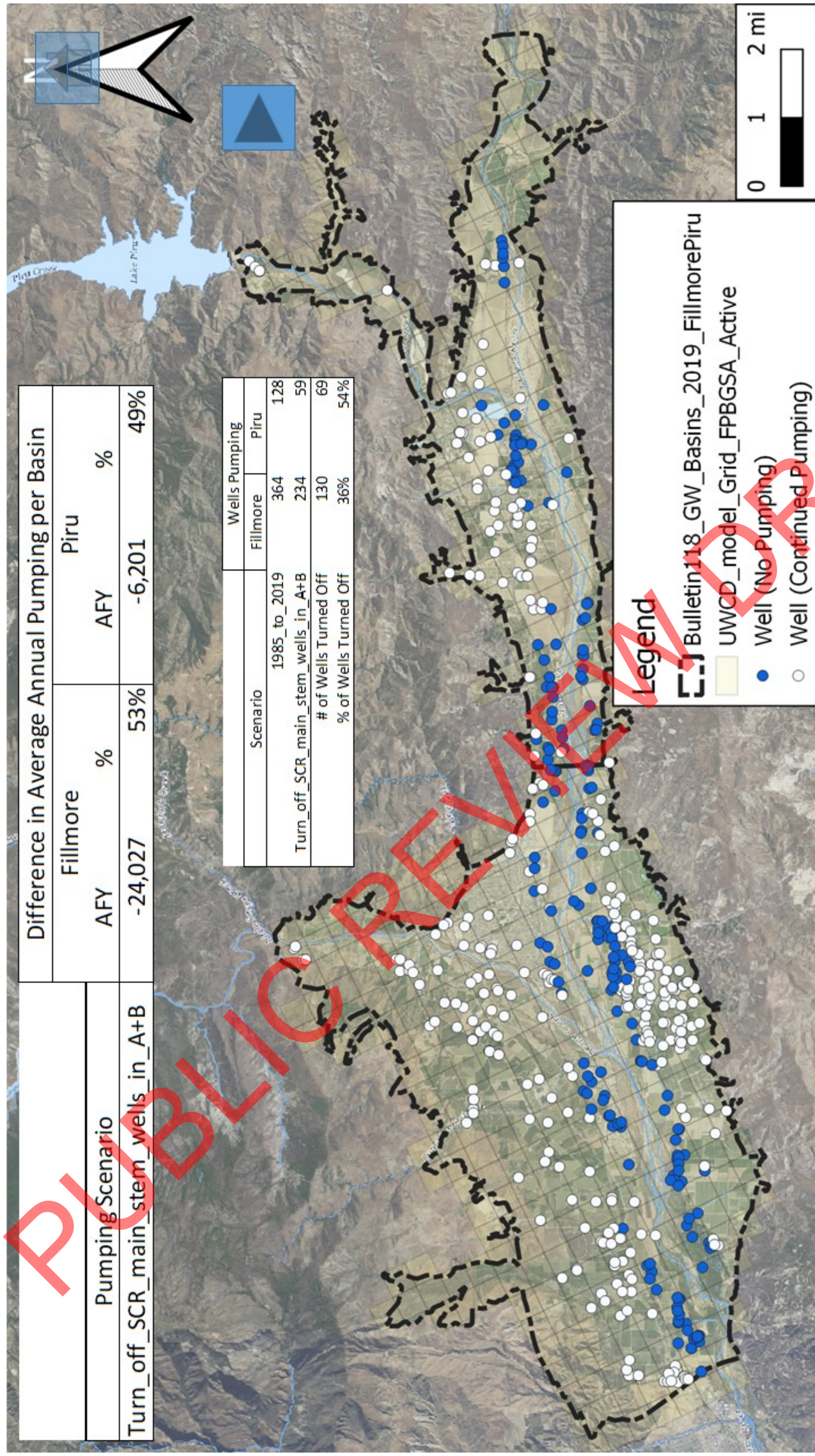
Active Water Wells & GDE Units

Figure 3-3



Difference in Average Annual Pumping per Basin

Pumping Scenario	Fillmore AFY	Fillmore %	Piru AFY	Piru %
Turn_off_SCR_main_stem_wells_in_A+B	-24,027	53%	-6,201	49%

Scenario	Wells Pumping Fillmore	Wells Pumping Piru
1985_to_2019	364	128
Turn_off_SCR_main_stem_wells_in_A+B	234	59
# of Wells Turned Off	130	69
% of Wells Turned Off	36%	54%

Blue Wells – Pumping eliminated

White Well – Continued pumping

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Simulated Groundwater Extraction Reductions

Figure 3-4

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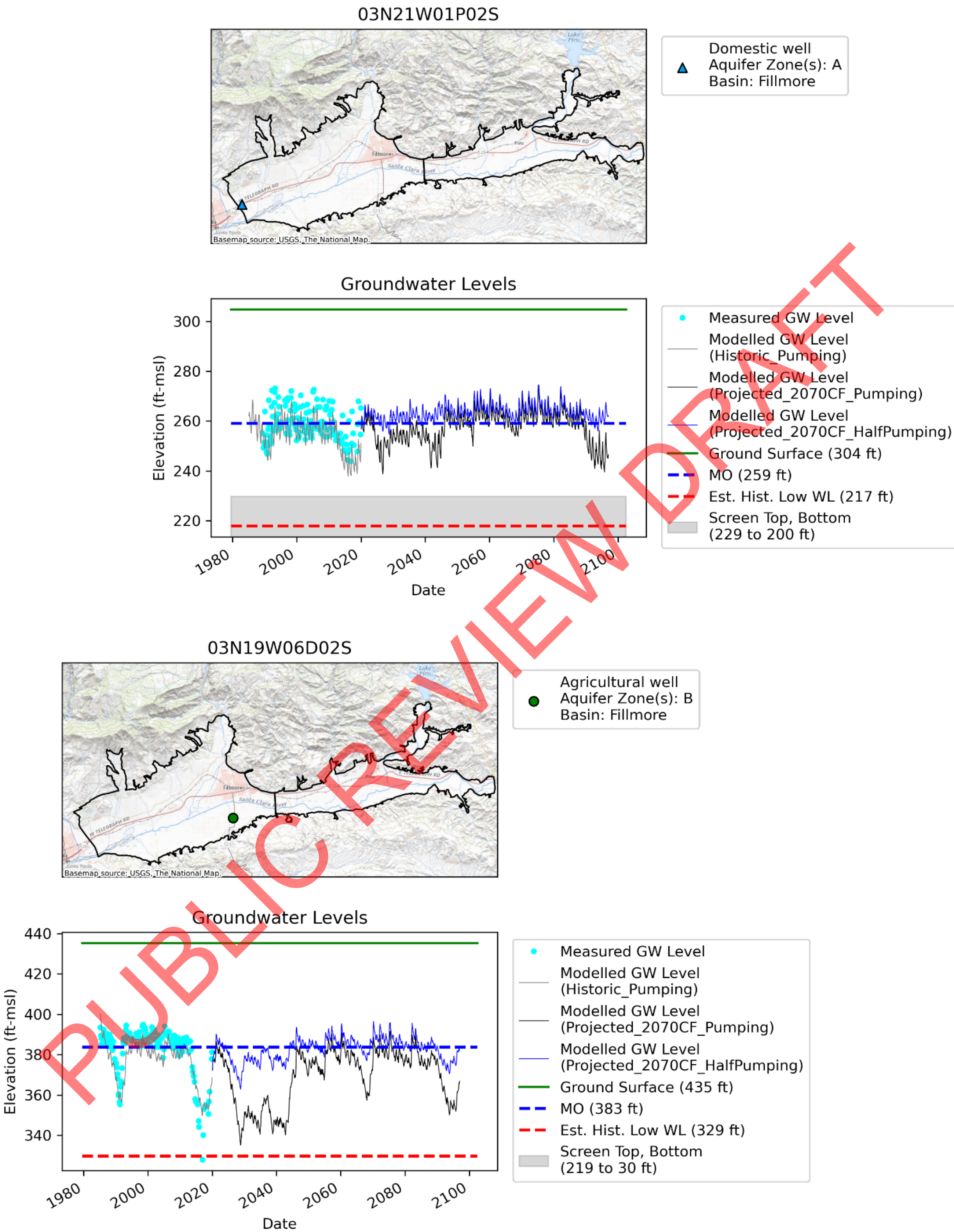

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Simulated Groundwater Hyrographs with Extraction Reductions

Figure 3-5

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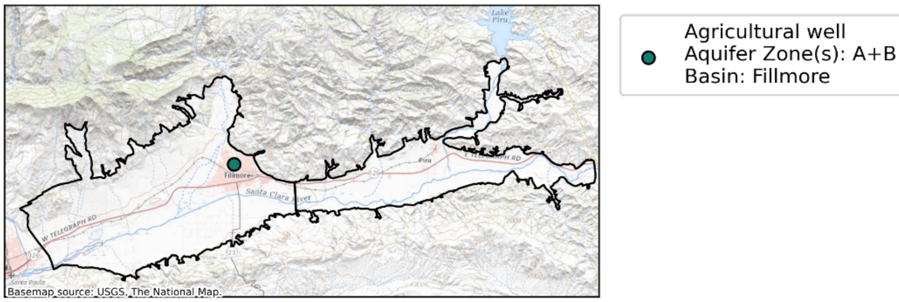

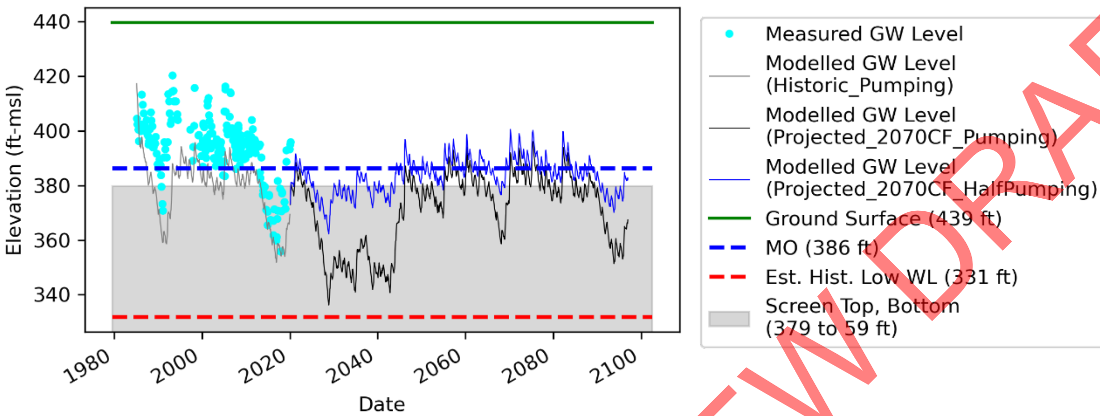

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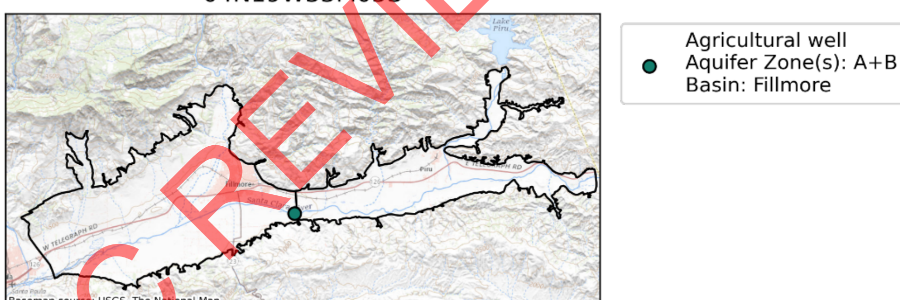

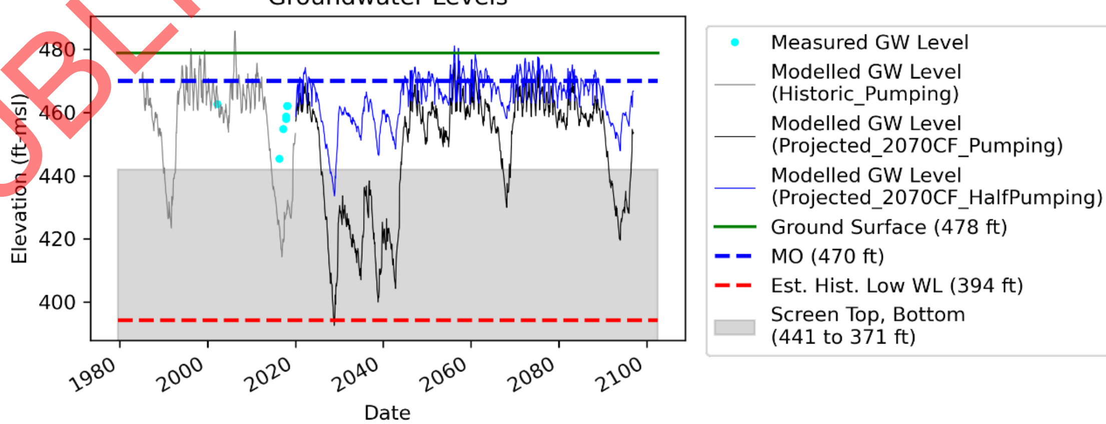

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Simulated Groundwater Hyrographs with Extraction Reductions

Figure 3-6

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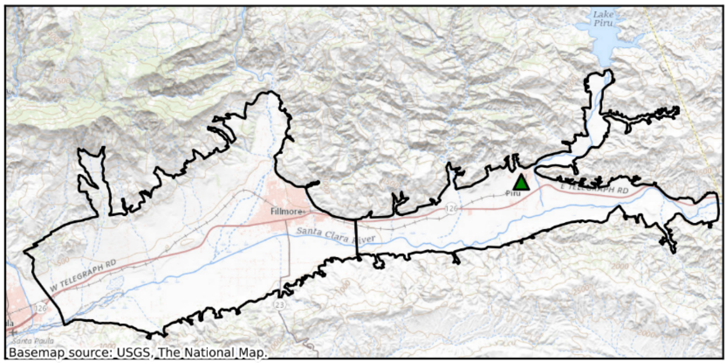
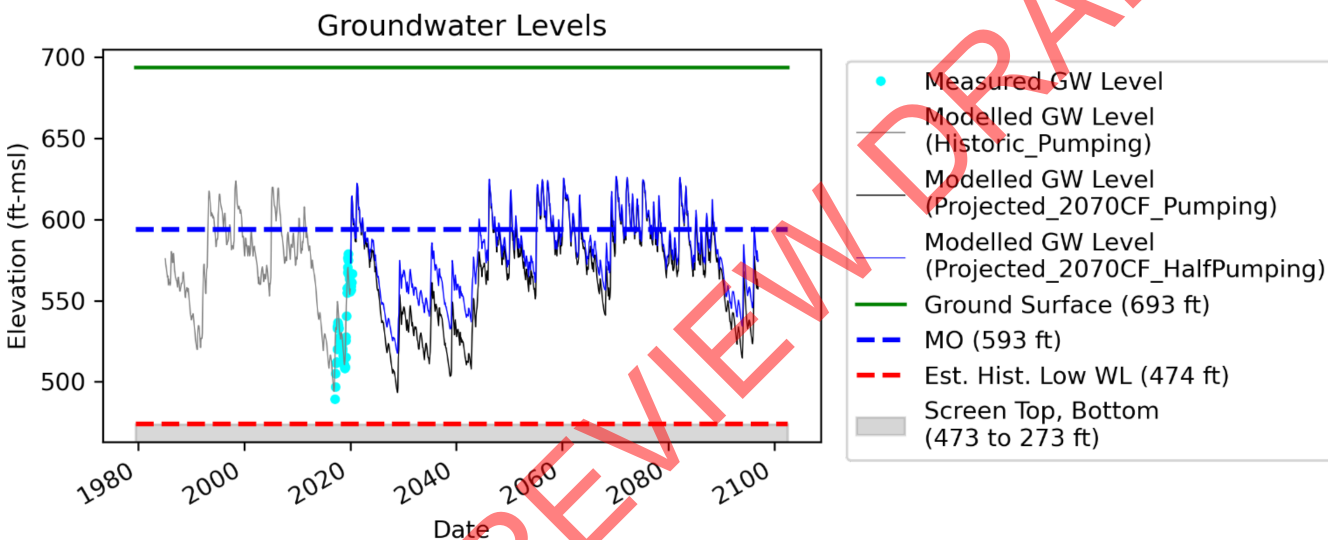


Domestic well
Aquifer Zone(s): B
Basin: Piru



Sustainable Management Criteria Technical Memorandum

Simulated Groundwater Hyrographs with Extraction Reductions

Figure 3-7

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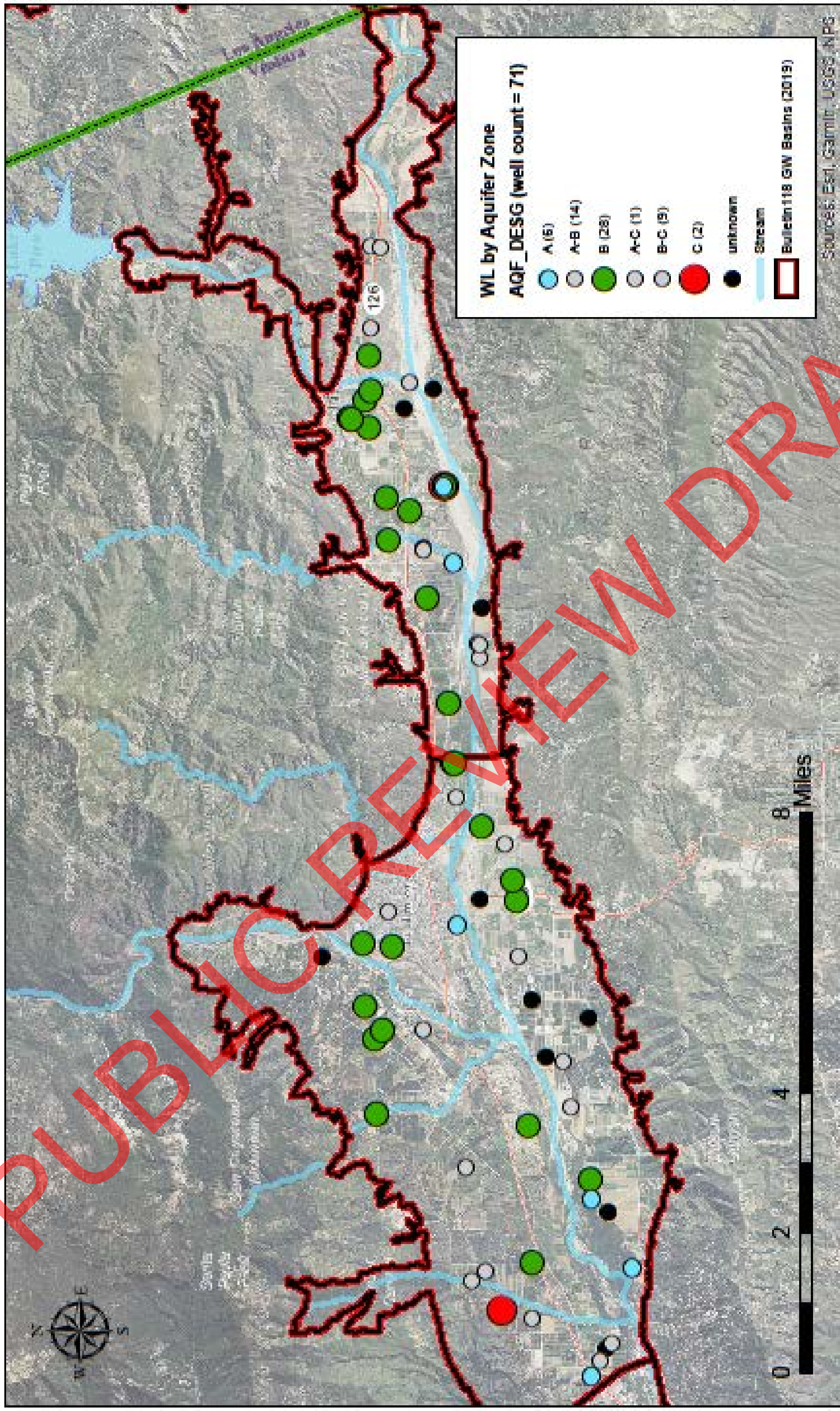
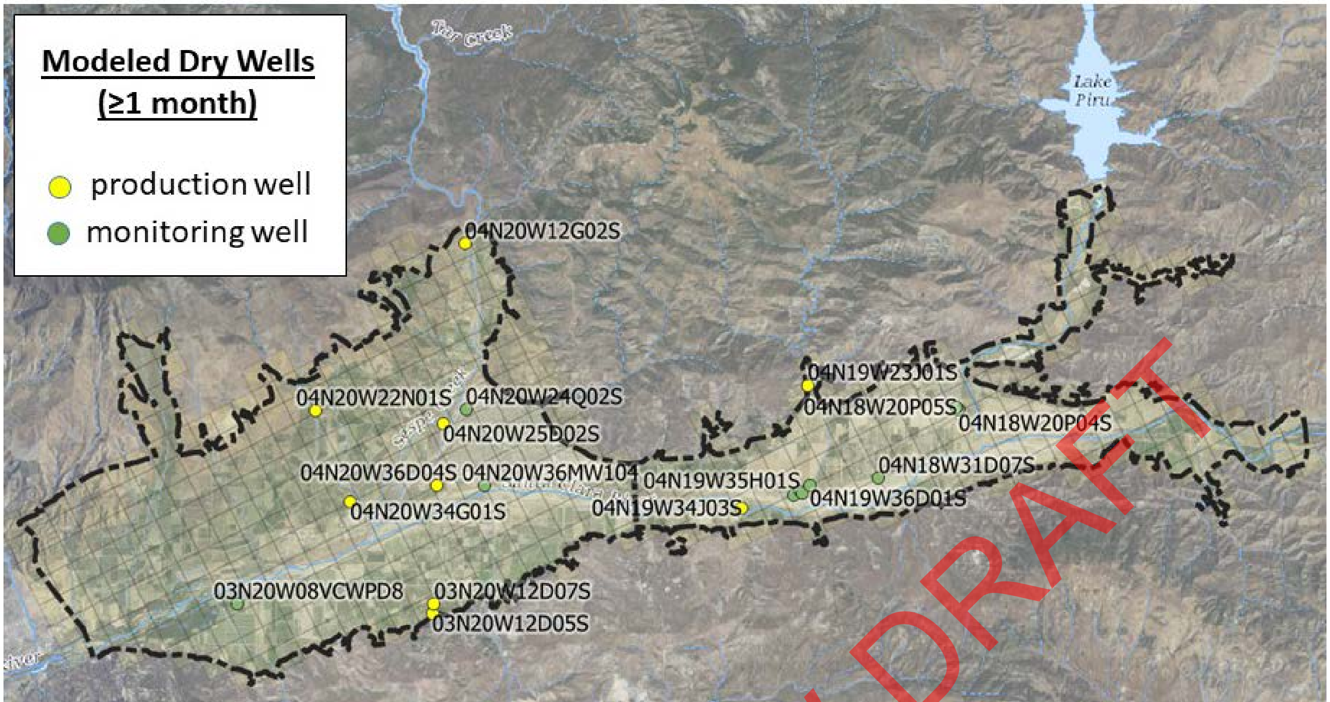
Document1



Sustainable Management Criteria Technical Memorandum

Water Level Monitoring Network

Figure 3-8



"Dry" Well Evaluation
No Production Wells are expected to go "Dry" in the future.

- Nine (9) shallow production well were identified as going "dry" at various months according to the model. The hydrographs for these wells were reviewed for model bias and it was determined that are not expected to go "dry"
- Wells most susceptible to getting close to "dry" conditions are <100 feet deep, on average
- Shallow monitoring wells are expected to go dry (and have gone dry) periodically
- Based on UWCD groundwater flow model results (Projected 2070CF)

Sustainable Management Criteria Technical Memorandum

Dry Well Evaluation

Figure 3-9

Document1

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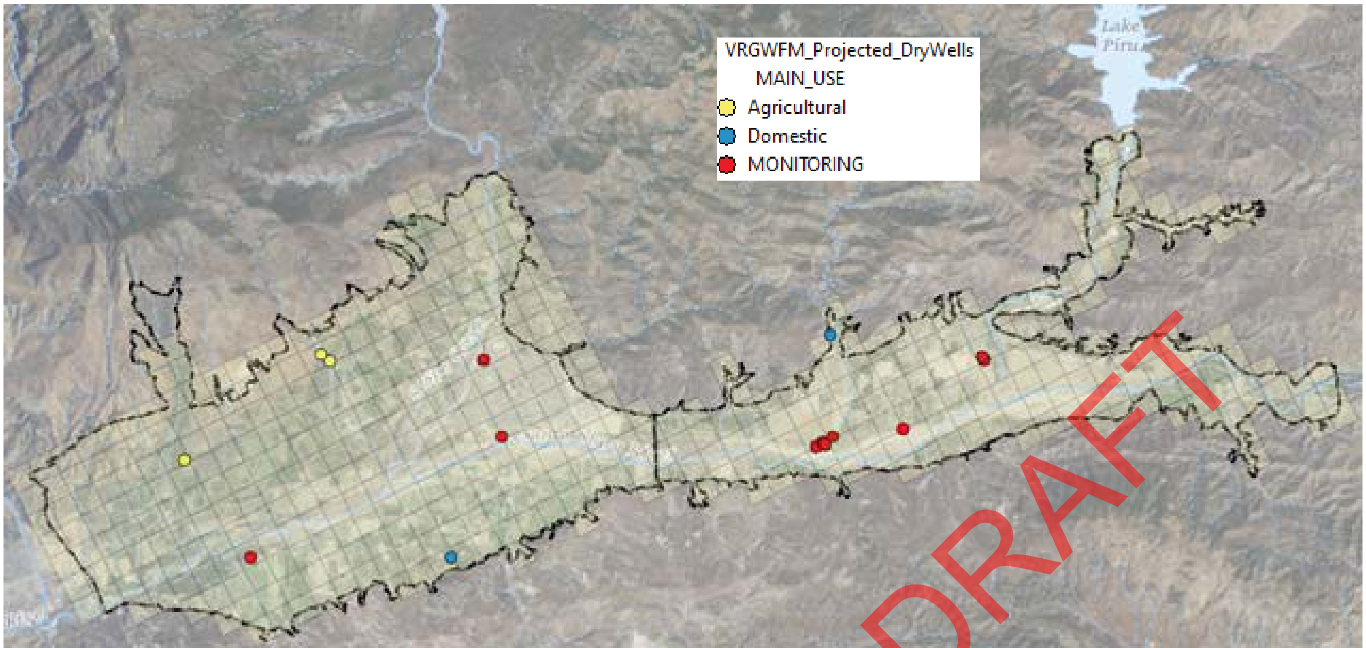


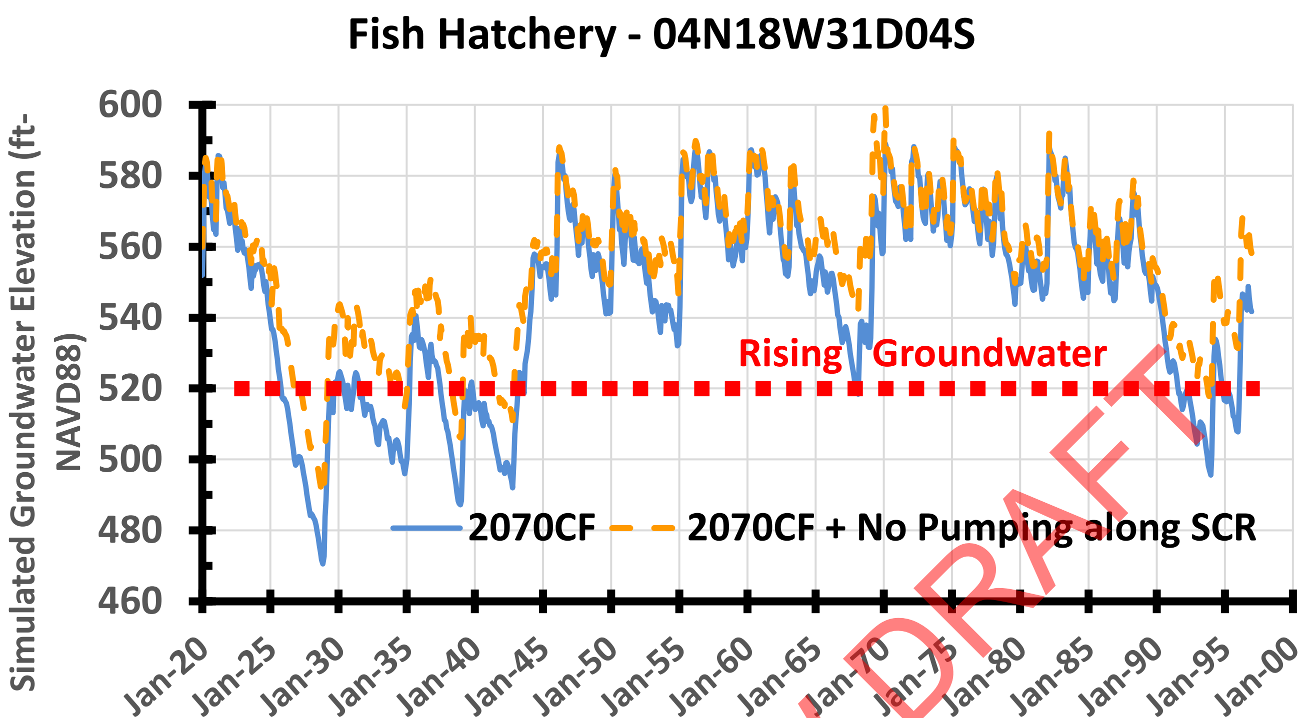
"Dry" Well Evaluation
No Potable Production Wells or Agricultural Irrigation wells are expected to go "Dry" in the future.

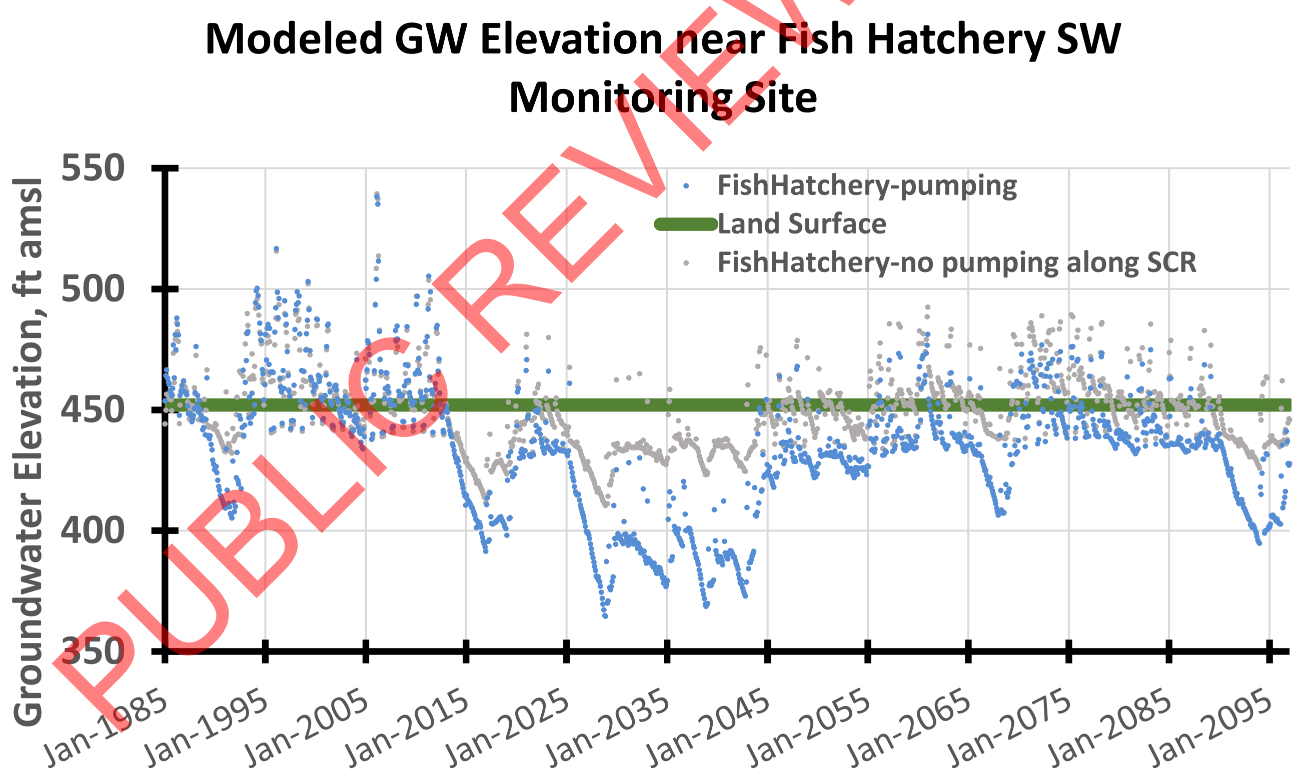
- Based on comparison of groundwater levels v. bottom of well screen
- Nine (9) shallow production well were identified as going "dry" at various months according to the model. The hydrographs for these wells were reviewed for model bias and it was determined that are not expected to go "dry"
- Manually inspected model results at 3 agricultural irrigation wells (yellow) and 2 domestic wells (blue) and when adjusted for model bias, these wells are not expected to go dry
- Wells most susceptible to getting close to "dry" conditions are <100 feet deep, on average
- Shallow monitoring wells are expected to go dry (and have gone dry) periodically
- Based on UWCD groundwater flow model results (Projected 2070CF)

Sustainable Management Criteria Technical Memorandum

Dry Well Evaluation-Model Bias Adjustment

Figure 3-10





Sustainable Management Criteria Technical Memorandum

Groundwater Extraction Impacts on Water Levels

Cienega / Fish Hatchery

Figure 3-11

Document1

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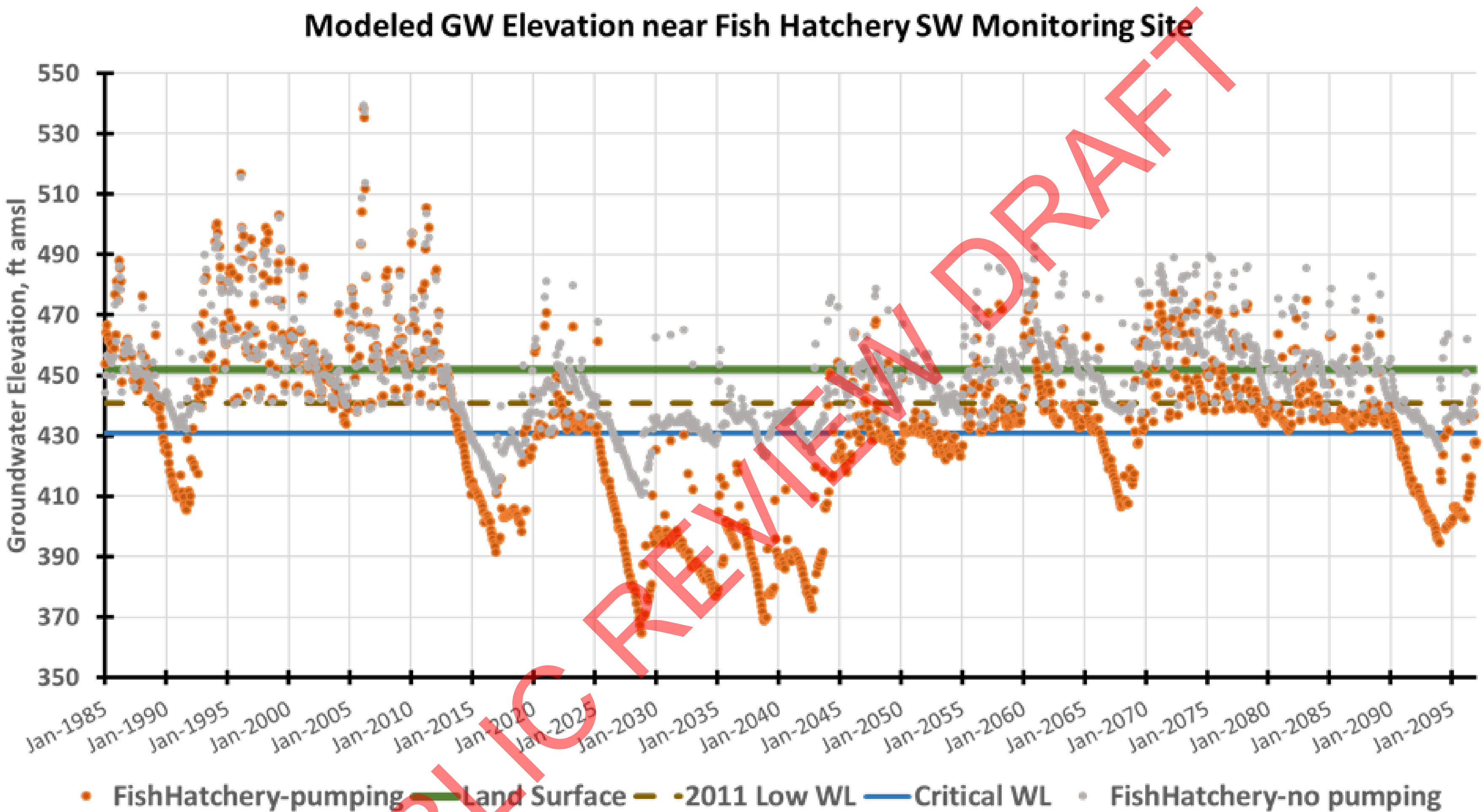

Fillmore and Piru Basins Groundwater Sustainability Agency

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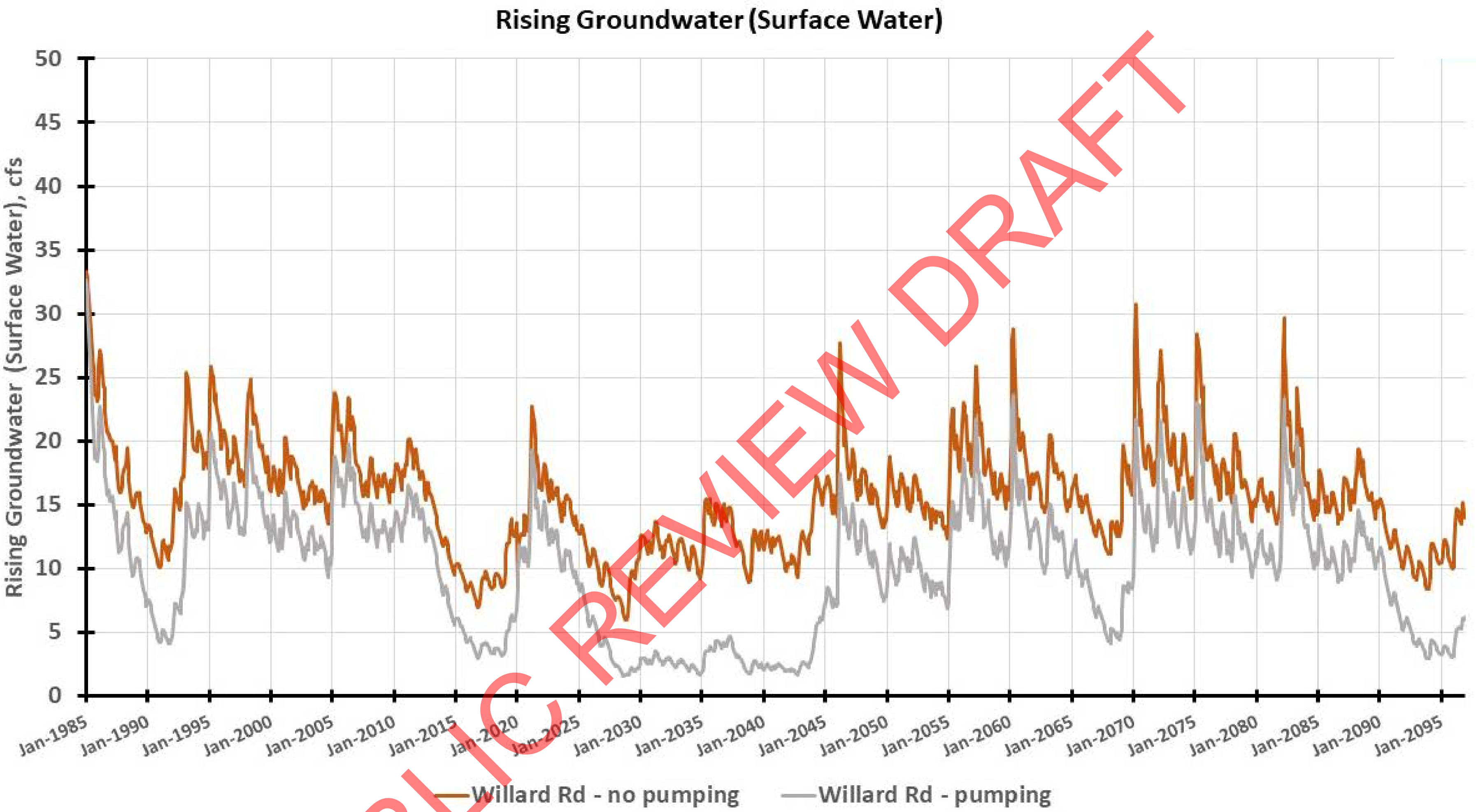
FILLMORE BASIN GROUNDWATER SUSTAINABILITY PLAN

Critical Water Level for Vegetation
Cienega / Fish Hatchery Area

Figure 3-12



Fillmore and Piru Basins Groundwater Sustainability Agency

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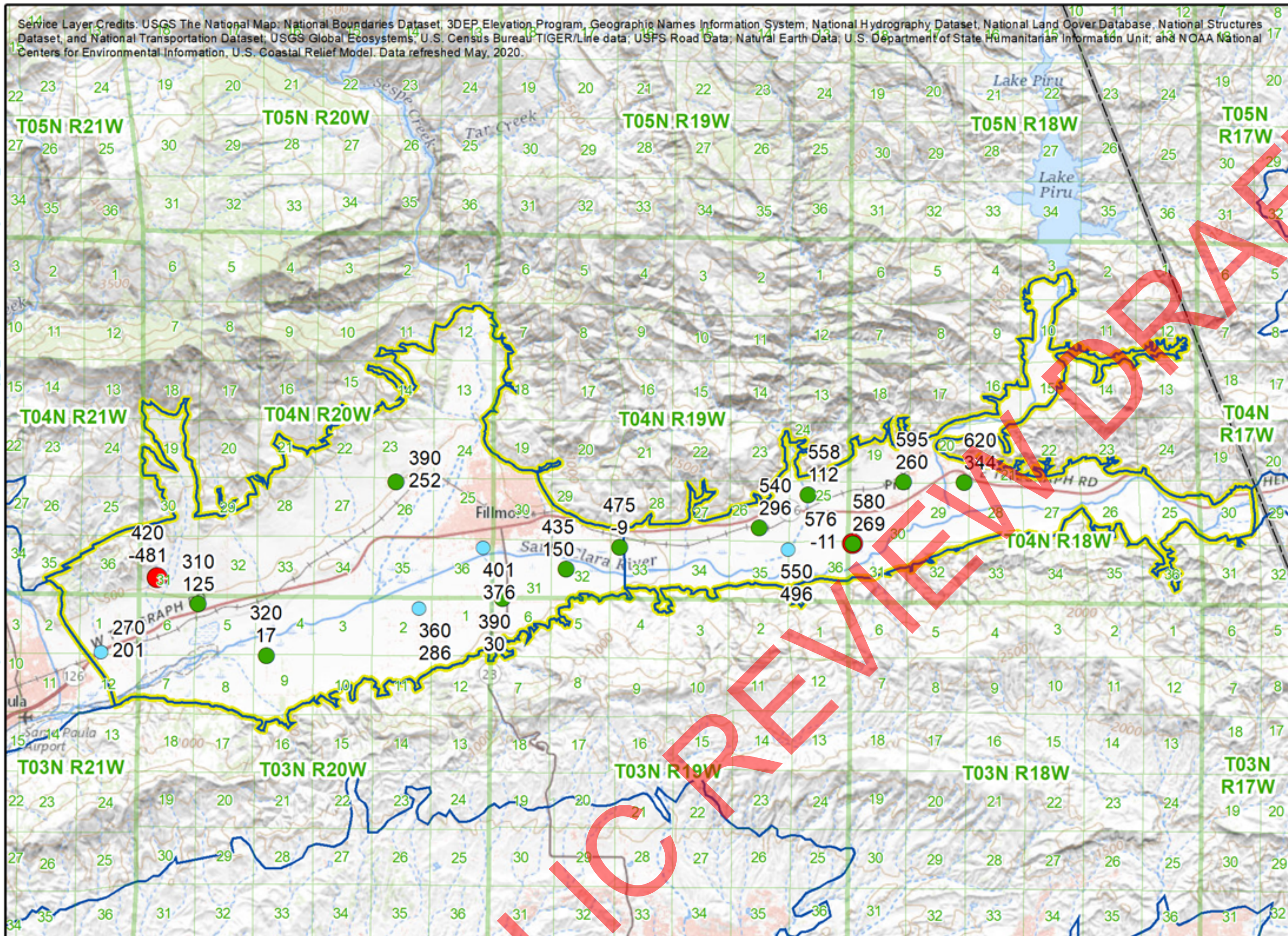
SUSTAINABLE MANAGEMENT CRITERIA TECHNICAL MEMORANDUM

Surface Water Flow - East End/Willard Road

Figure 3-13

Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet | Projection: Lambert Conformal Conic | Datum: North American 1983



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Notes:
- MO: Measurable Objective
- MT: Minimum Threshold

Legend

Representative Monitoring Site (Well)

Aquifer Zone

- A (4)
- B (11)
- C (2)

Label:
MO: (2011 High Water Elev.)
MT: (Bottom of Screen Elev.)

- Township and Range
- Section
- Bulletin 118 Basin
- Fillmore and Piru Basins GSA
- County

N

0 1 2 3 6 Miles

PUBLIC REVIEW DRAFT

Fillmore and Piru Basins Groundwater Sustainability Agency

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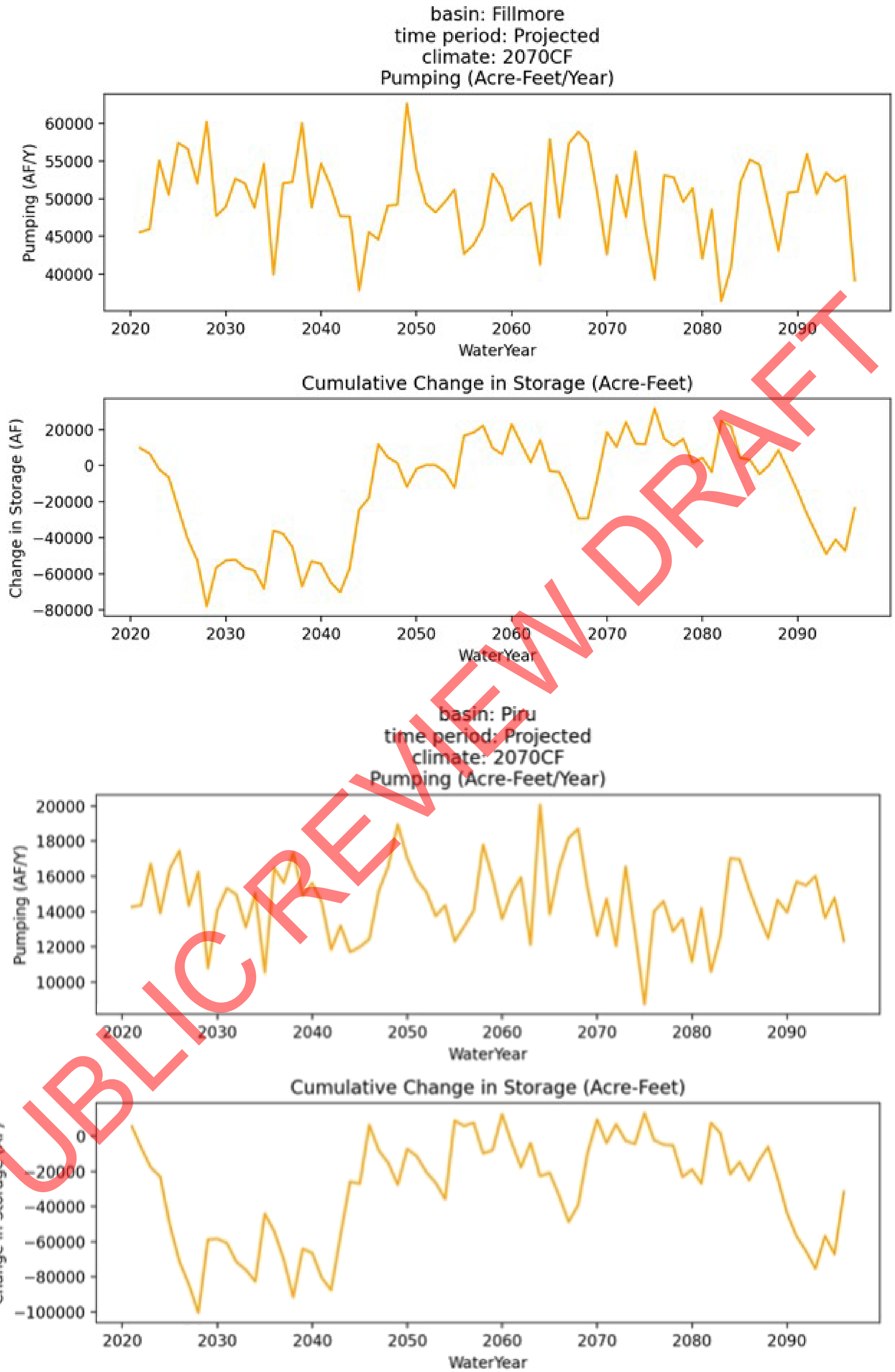
FILLMORE BASIN GROUNDWATER SUSTAINABILITY PLAN

Representative Groundwater Level Monitoring Sites - Aquifer Zones A, B and C

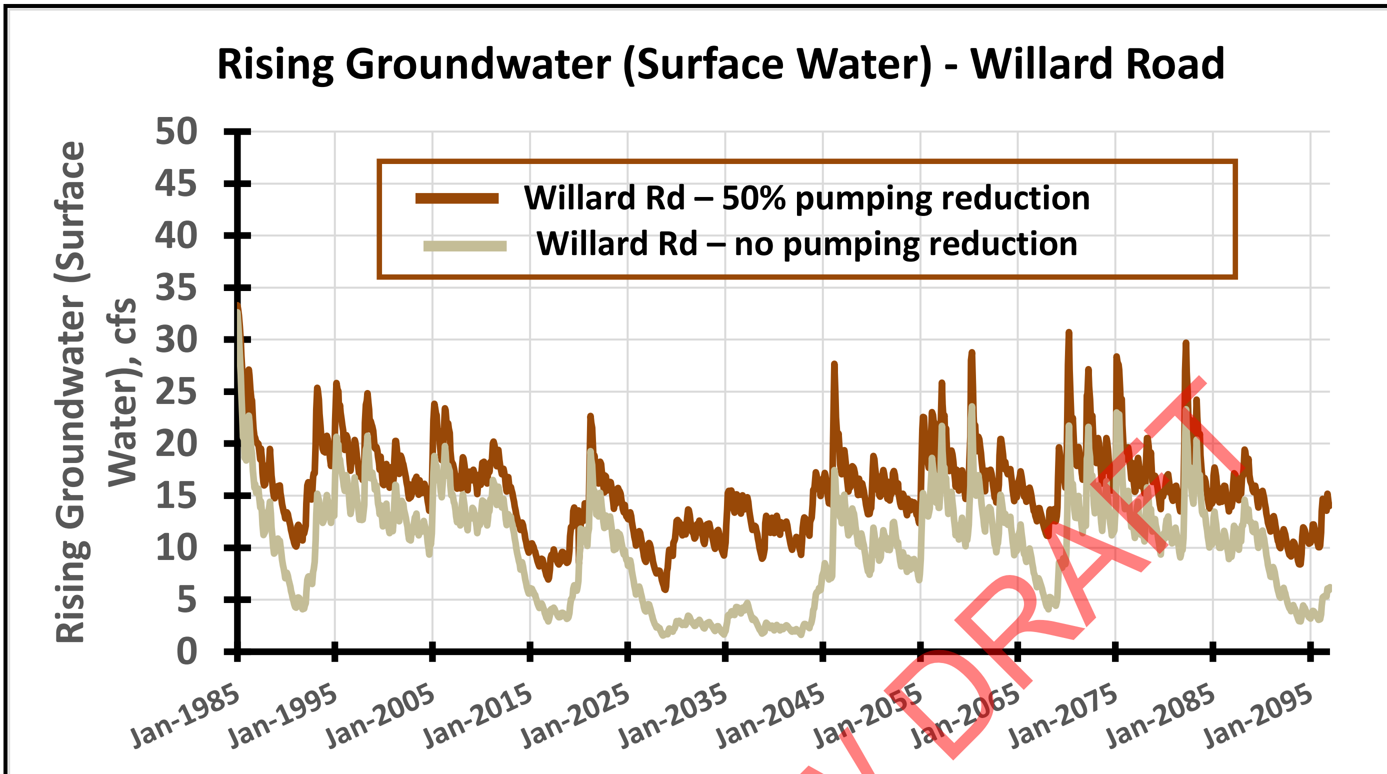
Figure 3-14

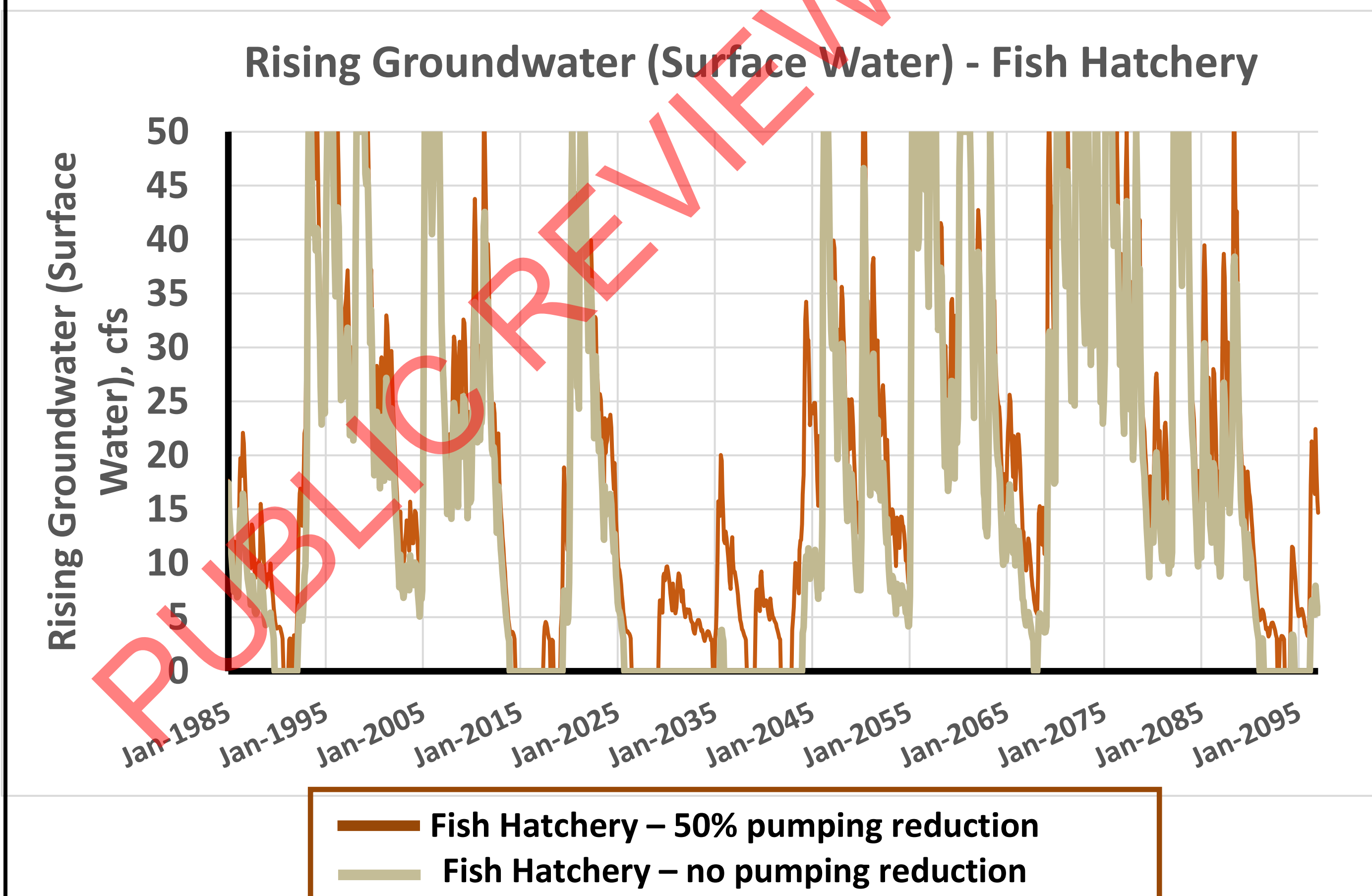


Sustainable Management Criteria Technical Memorandum

Forecasted Annual Pumping & Cumulative Changes in Storage

Figure 3-15

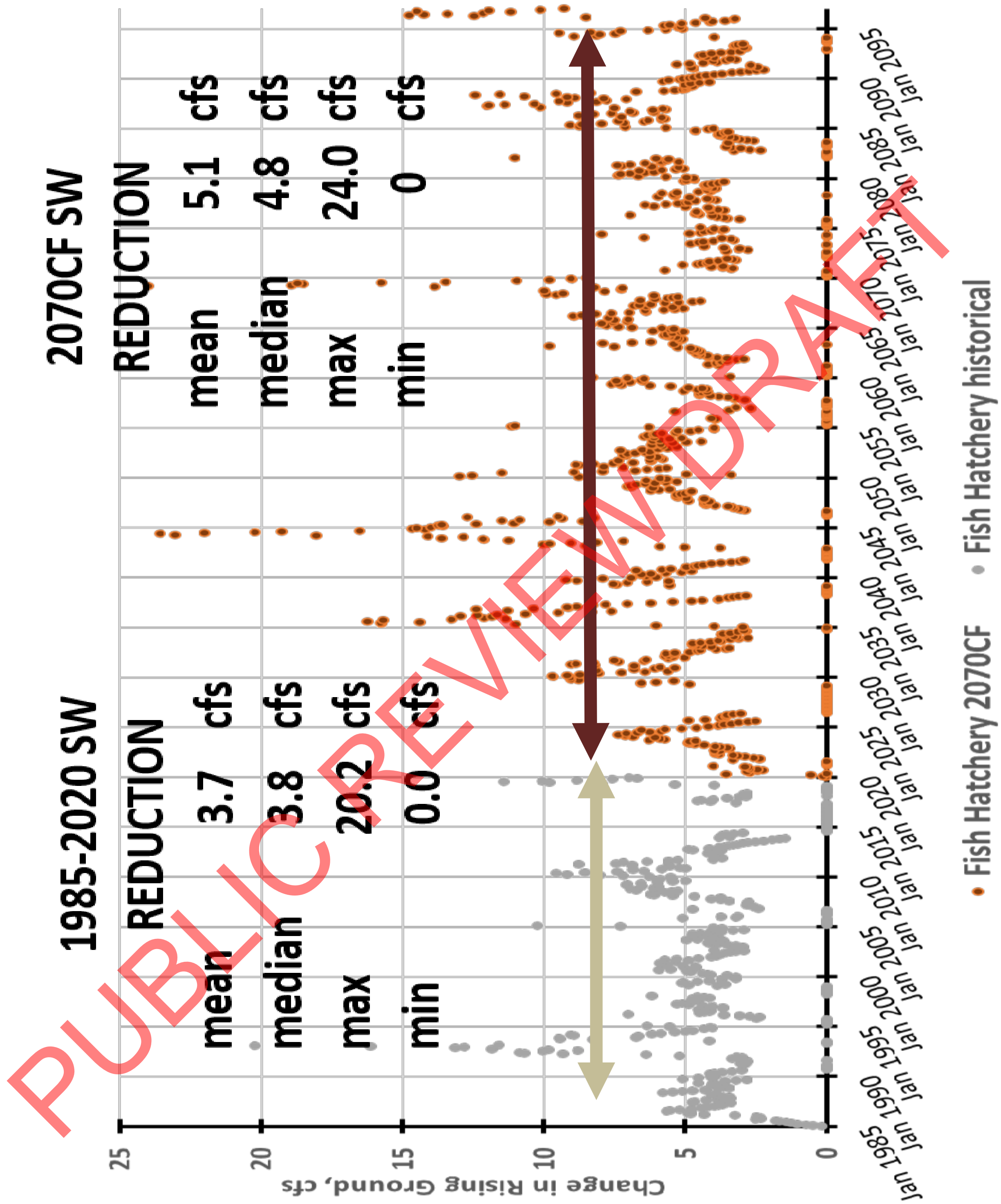




Sustainable Management Criteria Technical Memorandum

Surface Water Depletion Impacts Due to Groundwater Extraction

Figure 3-16



Sustainable Management Criteria Technical Memorandum

Change in Rising Groundwater due to Groundwater Extractions
Historical v. Future with Climate Change
Cienega / Fish Hatchery Area

Figure 3-17

Document1

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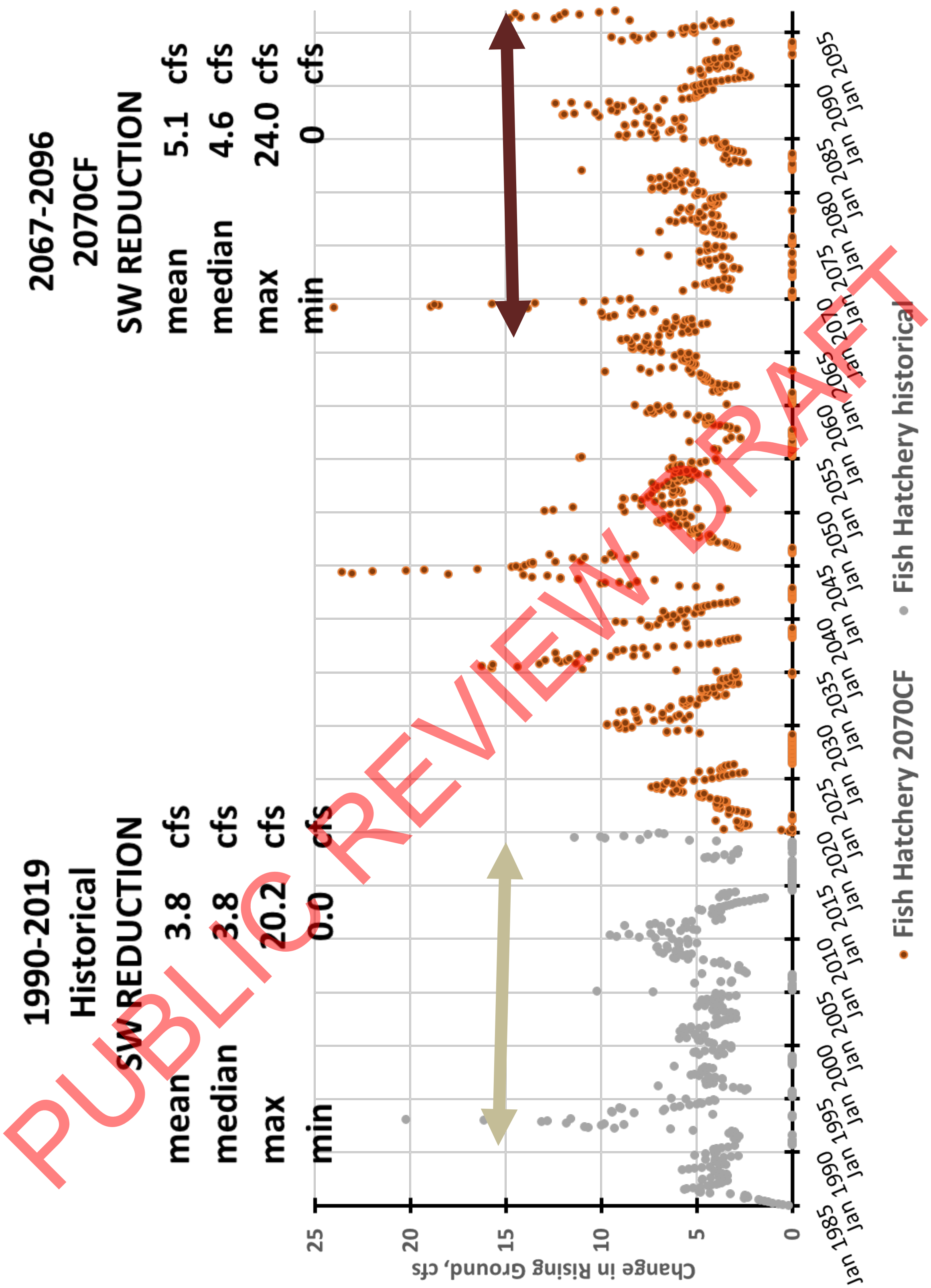

Sustainable Management Criteria Technical Memorandum
Change in Rising Groundwater due to Groundwater Extractions
Analogous Time Periods
Cienega / Fish Hatchery Area
Figure 3-18

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Attachments

ATTACHMENT A
LARWQCB Basin Plan

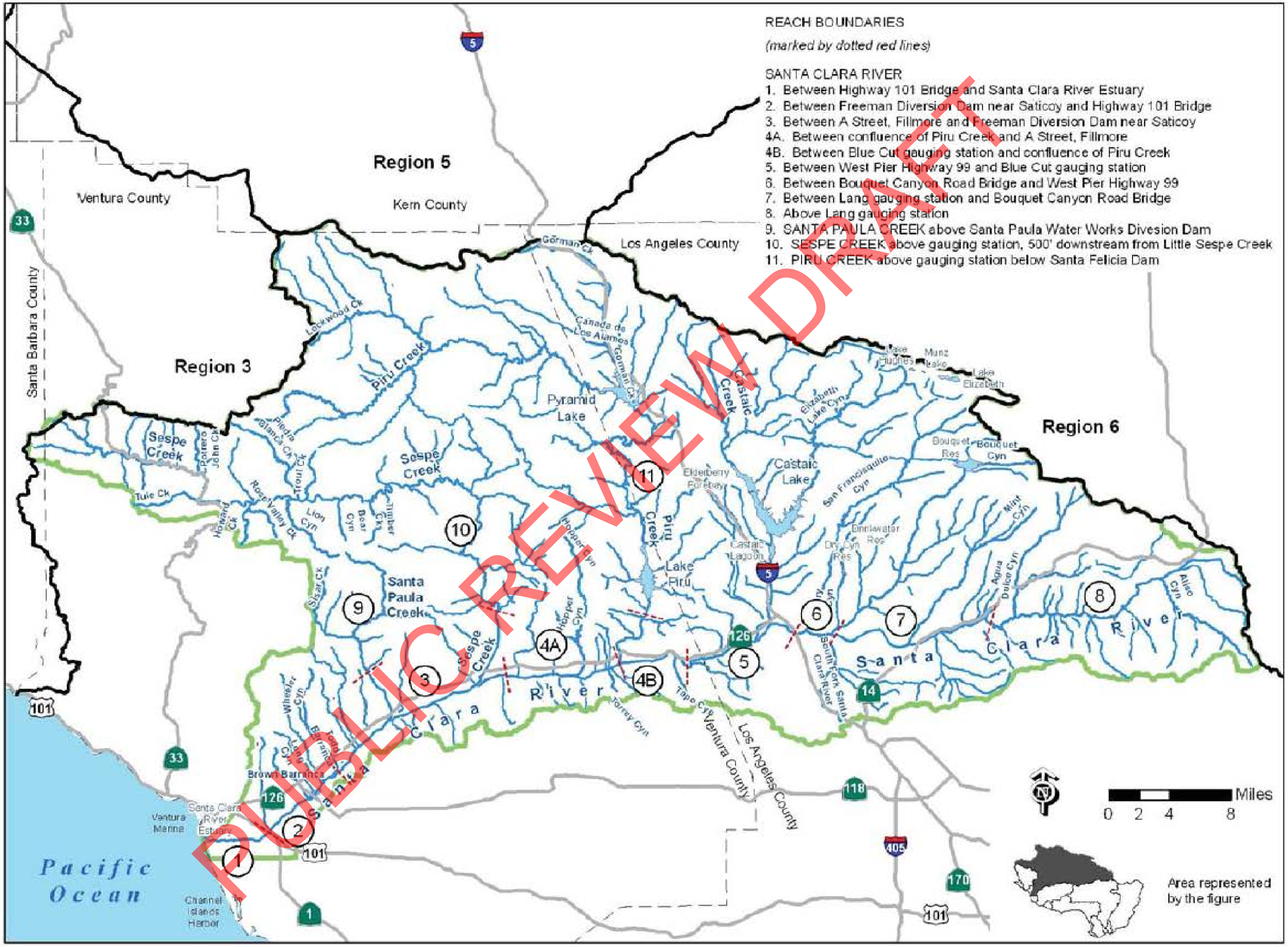


Figure 2-3. Major surface waters of the Santa Clara River watershed.

Beneficial Users - Surface Water

Los Angeles Regional Water Quality Control Board

Table 2-1. Beneficial Uses of Inland Surface Waters.

WATERSHED[a]	WBD No.	MUN	IND	PROC	AGR	GWR	FRSH	NAV	POW	COMM	AQUA	WARM	COLD	SAL	EST	MAR	WILD	BIOL	RARE	MIGR	SPWN	SHELL	WET[b]	REC1	LREC-1	REC2	High Flow Suspension
SANTA CLARA RIVER WATERSHED																											
Santa Clara River Reach 3																											
Santa Clara River (Santa Paula Creek to Sespe Creek)	180701020902	P*	E	E	E	E	E					E					E		E	E			E	Ed		E	
Santa Clara River (Sespe Creek to A Street, Fillmore)	180701020802	P*	E	E	E	E	E					E					E		E	E			E	Ed		E	
Santa Clara River Reach 4A																											
Santa Clara River (A Street, Fillmore to Piru Creek)	180701020802	P*	E	E	E	E	E					E					E		E	E			E	E		E	
Santa Clara River Reach 4B																											
Santa Clara River (Piru Creek to Blue Cut gaging station)	180701020403	P*	E	E	E	E	E					E					E		E	E			E	E		E	

Footnotes are consistent for all beneficial use tables.

E: Existing beneficial use.
P: Potential beneficial use.
I: Intermittent beneficial use.
E, P, and I shall be protected as required.

* Asterisked MUN designations are designated under SB 88-63 and RB 89-03. Some designations may be considered for exemption at a later date (See pages 2-3, 4 for more details).

a: Waterbodies are listed multiple times if they cross hydrologic area or subarea boundaries. Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.
b: Waterbodies designated as WET may have wetlands habitat associated with only a portion of the waterbody. Any regulatory section would require a detailed analysis of the area.
e: One or more rare species utilize all ocean, bays, estuaries, and coastal wetlands for foraging and/or nesting.
f: Aquatic organisms utilize all bays, estuaries, lagoons and coastal wetlands, to a certain extent, for spawning and early development. This may include migration into areas which are heavily influenced by freshwater inputs.
g: Condor refuge.
i: Soledad Canyon is the habitat of the Unarmored Three-Spine Stickleback.

a: Waterbodies are listed multiple times if they cross
to the indicated waterbody, if not listed separately.
b: Waterbodies designated as WET may have wetla
require a detailed analysis of the area.
d: Limited public access precludes full utilization.

Beneficial Users - Ground Water

Los Angeles Regional Water Quality Control Board

Table 2-2. Beneficial Uses of Ground Water.

DWR[ad] Basin No.	BASIN	MUN	IND	PROC	AGR	AQUA
4-4	SANTA CLARA RIVER VALLEY[af]					
4-4.05	Fillmore					
4-4.05	Pole Creek Fan area	E	E	E	E	
4-4.05	South side of Santa Clara River	E	E	E	E	
4-4.05	Remaining Fillmore area	E	E	E	E	E
4-4.05	Topa Topa (upper Sespe) area	P	E	P	E	
4-4.06	Piru					
4-4.06	Upper area (above Lake Piru)	P	E	E	E	
4-4.06	Lower area east of Piru Creek	E	E	E	E	
4-4.06	Lower area west of Piru Creek	E	E	E	E	

Footnotes are consistent for all beneficial use tables.

E: Existing beneficial use.
P: Potential beneficial use.

ac: Beneficial uses for ground waters outside of the major basins listed on this table and outlined in Fig 1-9 have not been specifically listed. However, ground waters outside of the major basins are, in many cases, significant sources of water. Further existing sources of water for downgradient basins, and such, beneficial uses in the downgradient basins shall apply to these areas.
ad: Basins are numbered according to DWR Bulletin No. 118-Update 2003 (DWR, 2003).
ae: Ground waters in the Pitas Point area (between the lower Ventura River and Rincon Point) are not considered to comprise a major basin and, accordingly, have not been designated a basin number by the DWR or outlined on Fig. 1-9.
af: Santa Clara River Valley Basin was formerly Ventura Central Basin and Acton Valley Basin was formerly Upper Santa Clara Basin (DWR, 1980).
ag: Pleasant Valley, Arroyo Santa Rosa Valley, and Las Posas Valley Basins were formerly subbasins of Ventura Central (DWR, 1980).
ah: Nitrite pollution in the groundwater of the Sunland-Tujunga area currently precludes direct MUN uses. Since the ground water in this area can be treated or blended (or both), it retains the MUN designation.
ai: Raymond Basin was formerly a subbasin of San Gabriel Valley and Monk Hill subbasin is now part of San Fernando Valley Basin (DWR, 2003). The Main San Gabriel Basin was formerly separated into Eastern and Western areas. Since these areas had the same beneficial uses as Puente Basin all three areas have been combined into San Gabriel Valley. Any ground water upgradient of these areas is subject to downgradient beneficial uses and objectives, as explained in Footnote ac.
aj: These areas were formerly part of the Russell Valley Basin (DWR, 1980).
ak: Ground water in the Conejo-Tierra Rejada Volcanic Area occurs primarily in fractured volcanic rocks in the western Santa Monica Mountains and Conejo Mountain areas. These areas have not been delineated on Fig. 1-9.
al: With the exception of ground water in Malibu Valley (DWR Basin No. 4-22) ground waters along the southern slopes of the Santa Monica Mountains are not considered to comprise a major basin and accordingly have not been designated a basin number by DWR.
am: DWR has not designated basins for ground waters on the San Pedro Channel Islands.

BENEFICIAL USE DEFINITIONS

The following definitions for beneficial uses are applicable statewide (in alphabetical order by abbreviation). If a Regional Water Board has a region-specific variation on a statewide beneficial use, the region-specific definition is also defined. Additional beneficial use definitions adopted by individual Regional Water Boards, for which there is no equivalent statewide beneficial use, are listed on page 5.

Agricultural Supply (AGR) - Uses of water for farming, horticulture or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Variation:

R5: **Agricultural Supply (AGR)** - Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing.

Aquaculture (AQUA) - Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.

Preservation of Biological Habitats of Special Significance (BIOL) - Uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

Variations:

R1: **Preservation of Areas of Special Biological Significance (ASBS)** - Includes marine life refuges, ecological reserves and designated areas of special biological significance, such as areas where kelp propagation and maintenance are features of the marine environment requiring special protection.

R2: **Areas of Special Biological Significance (ASBS)** - Areas designated by the State Water Board. These include marine life refuges, ecological reserves, and designated areas where the preservation and enhancement of natural resources requires special protection. In these areas, alteration of natural water quality is undesirable. The areas that have been designated as ASBS in this Region are Bird Rock, Point Reyes Headland Reserve and Extension, Double Point, Duxbury Reef Reserve and Extension, Farallon Islands, and James V. Fitzgerald Marine Reserve, depicted in Figure 2-1. The California Ocean Plan prohibits waste discharges into, and requires wastes to be discharged at a sufficient distance from, these areas to assure maintenance of natural water quality conditions. These areas have been designated as a subset of State Water Quality Protection Areas as per the Public Resources Code.

R3: **Areas of Biological Significance (ASBS)** – Are those areas designated by the State Water Resources Control Board as requiring protection of species or biological communities to the extent that alteration of natural water quality is undesirable.

Cold Freshwater Habitat (COLD) - Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Commercial and Sport Fishing (COMM) - Uses of water for commercial or recreational collection of fish and shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Variation:

R6: **Commercial and Sport Fishing (COMM)** - Beneficial uses of waters used for commercial or recreational collection of fish or other organisms including, but not limited to, uses involving organisms intended for human consumption.

Estuarine Habitat (EST) - Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).

Variation:

R2: **Estuarine Habitat (EST)** - Uses of water that support estuarine ecosystems, including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds), and the propagation, sustenance, and migration of estuarine organisms.

Freshwater Replenishment (FRSH) - Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).

Variation:

R3: **Freshwater Replenishment (FRSH)** - Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity) which includes a water body that supplies water to a different type of water body, such as, streams that supply reservoirs and lakes, or estuaries; or reservoirs and lakes that supply streams. This includes only immediate upstream water bodies and not their tributaries.

Ground Water Recharge (GWR) - Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting saltwater intrusion into freshwater aquifers.

Variation:

R3: **Ground Water Recharge (GWR)** – Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers. Ground water recharge includes recharge of surface water underflow.

Industrial Service Supply (IND) - Uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Variation:

R6: **Industrial Service Supply (IND)** - Beneficial uses of waters used for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, geothermal energy production, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

Marine Habitat (MAR) - Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

Migration of Aquatic Organisms (MIGR) - Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Variations:

R2: **Fish Migration (MIGR)** - Uses of water that support habitats necessary for migration, acclimatization between fresh water and salt water, and protection of aquatic organisms that are temporary inhabitants of waters within the region.

R4 & R6: **Migration of Aquatic Organisms (MIGR)** - Uses of water that support habitats necessary for migration, acclimatization between fresh and salt water, or other temporary activities by aquatic organisms, such as anadromous fish.

Municipal and Domestic Supply (MUN) - Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water.

Navigation (NAV) - Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

Hydropower Generation (POW) - Uses of water for hydropower generation.

Industrial Process Supply (PRO) - Uses of water for industrial activities that depend primarily on water quality.

Variations:

R2, R3, R4, R9: **Industrial Service Supply (PROC)** - Uses of water for industrial activities that depend primarily on water quality.

R8: **Industrial Process Supply (PROC)** - waters are used for industrial activities that depend primarily on water quality. These uses may include, but are not limited to, process water supply and all uses of water related to product manufacture or food preparation

Rare, Threatened, or Endangered Species (RARE) - Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.

Water Contact Recreation (REC-1) - Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation (REC-2) - Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Inland Saline Water Habitat (SAL) - Uses of water that support inland saline water ecosystems including, but not limited to, preservation or enhancement of aquatic saline habitats, vegetation, fish, or wildlife, including invertebrates.

Shellfish Harvesting (SHELL) - Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters and mussels) for human consumption, commercial or sport purposes.

Spawning, Reproduction, and/or Early Development (SPWN) - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Variation:

R5: **Spawning, Reproduction, and/or Early Development (SPWN)** - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish. SPWN shall be limited to cold water fisheries.

Warm Freshwater Habitat (WARM) - Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Variation:

R5: **Warm Freshwater Habitat (WARM)** - Uses of water that support warm water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates. WARM includes support for reproduction and early development of warm water fish.

Wildlife Habitat (WILD) - Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Variations:

R5: **Wildlife Habitat (WILD)** - Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

R6: **Wildlife Habitat (WILD)** - Beneficial uses of waters that support wildlife habitats including, but not limited to, the preservation and enhancement of vegetation and prey species used by wildlife, such as waterfowl.

Additional Beneficial Use Definitions Adopted By Individual Regional Water Boards and Approved By the State Water Board

Native American Culture (CUL) Uses of water that support the cultural and/or traditional rights of indigenous people such as subsistence fishing and shellfish gathering, basket weaving and jewelry material collection, navigation to traditional ceremonial locations, and ceremonial uses. North Coast Regional Board (Region 1)

Subsistence Fishing (FISH) Uses of water that support subsistence fishing. North Coast Regional Board (Region 1)

Flood Peak Attenuation/Flood Water Storage (FLD) - Beneficial uses of riparian wetlands in flood plain areas and other wetlands that receive natural surface drainage and buffer its passage to receiving waters. Lahontan Regional Board & North Coast Regional Board (Regions 6 & 1):

Limited Water Contact Recreation (LREC-1): Uses of water for recreational activities involving body contact with water, where full REC-1 use is limited by physical conditions such as very shallow water depth and restricted access and, as a result, ingestion of water is incidental and infrequent. Los Angeles Regional Board (Region 4):

Limited Warm Freshwater Habitat (LWRM) - Waters support warm water ecosystems which are severely limited in diversity and abundance as the result of concrete-lined watercourses and low, shallow dry weather flows which result in extreme temperature, pH, and/or dissolved oxygen conditions. Naturally reproducing finfish populations are not expected to occur in LWRM waters. Santa Ana Regional Board (Region 8):

Shellfish Harvesting (SHELL) - Uses of water that support habitats suitable for the collection of filter feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries. Central Coast Regional Board (Region 3)

Wetland Habitat (WET) Uses of water that support natural and man-made wetland ecosystems, including, but not limited to, preservation or enhancement of unique wetland functions, vegetation, fish, shellfish, invertebrates, insects, and wildlife habitat. North Coast Regional Board (Region 1)

Wetland Habitat (WET) - Uses of water that support wetland ecosystems, including, but not limited to, preservation or enhancement of wetland habitats, vegetation, fish, shellfish, or wildlife, and other unique wetland functions which enhance water quality, such as providing flood and erosion control, stream bank stabilization, and filtration and purification of naturally occurring contaminants. Los Angeles Regional Board (Region 4)

Water Quality Enhancement (WQE) Uses of waters, including wetlands and other waterbodies, that support natural enhancement or improvement of water quality in or downstream of a waterbody including, but not limited to, erosion control, filtration and purification of naturally occurring water pollutants, stream bank stabilization, maintenance of channel integrity, and siltation control. North Coast Regional Board (Region 1)

Water Quality Enhancement (WQE) - Beneficial uses of waters that support natural enhancement or improvement of water quality in or downstream of a water body including, but not limited to, erosion control, filtration and purification of naturally occurring water pollutants, stream bank stabilization, maintenance of channel integrity, and siltation control. Lahontan Regional Board (Regions 6)

ATTACHMENT B
Basin Stress Tests

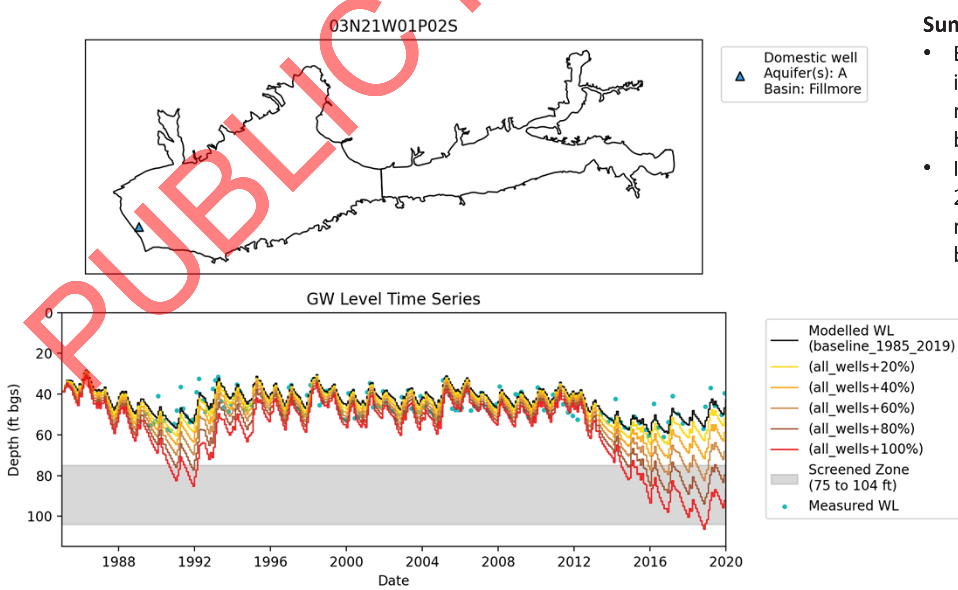
Basin “Stress Test”

- GW pumping increased for all well categories by 20%, 40%, 60%, 80%, & 100%

Pumping , AFY	Fillmore basin	Piru basin	Total for both basins
Baseline	46,760	11,390	58,150
Baseline + 20%	56,120	13,670	69,780
Baseline + 40%	65,470	15,950	81,420
Baseline + 60%	74,820	18,220	93,050
Baseline + 80%	84,180	20,500	104,680
Baseline + 100%	93,530	22,780	116,310

(Values rounded to nearest 10 AFY)

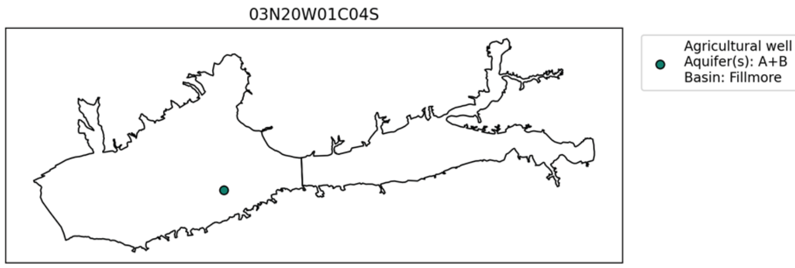
Basin “Stress Test”

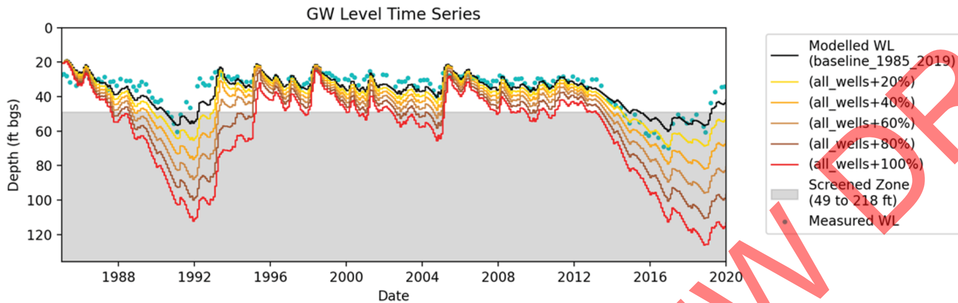


Summary

- Even with pumping increased by 100%, WLs recover to within ~10 ft of baseline in wet periods
- Increasing pumping by 20% or 40% allows WLs to recover within ~5ft of baseline in wet periods

Basin "Stress Test"

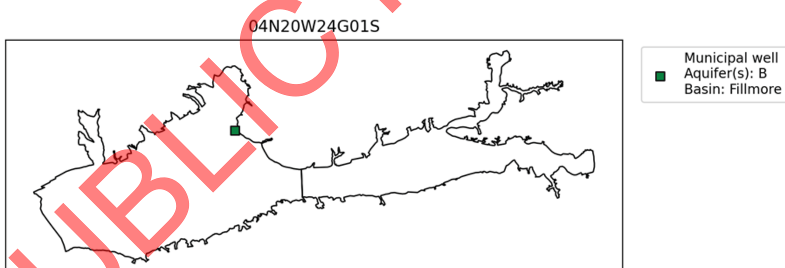


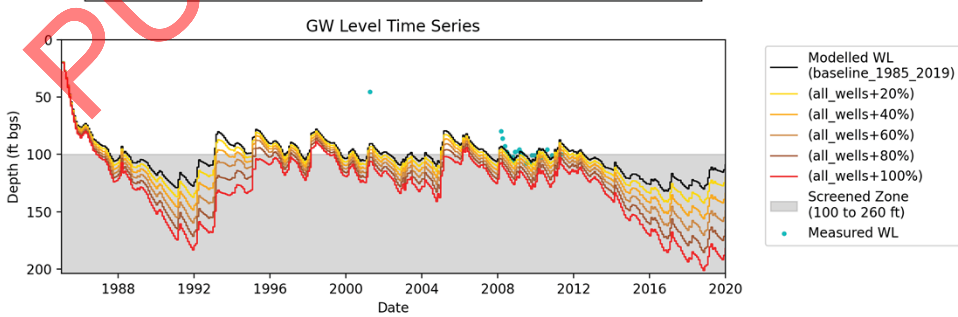


Summary

- Even with pumping increased by 100%, WLs recover to within ~20 ft of baseline in wet periods
- Increasing pumping by 20% or 40% allows WLs to recover within ~10ft of baseline in wet periods

Basin "Stress Test"





Summary

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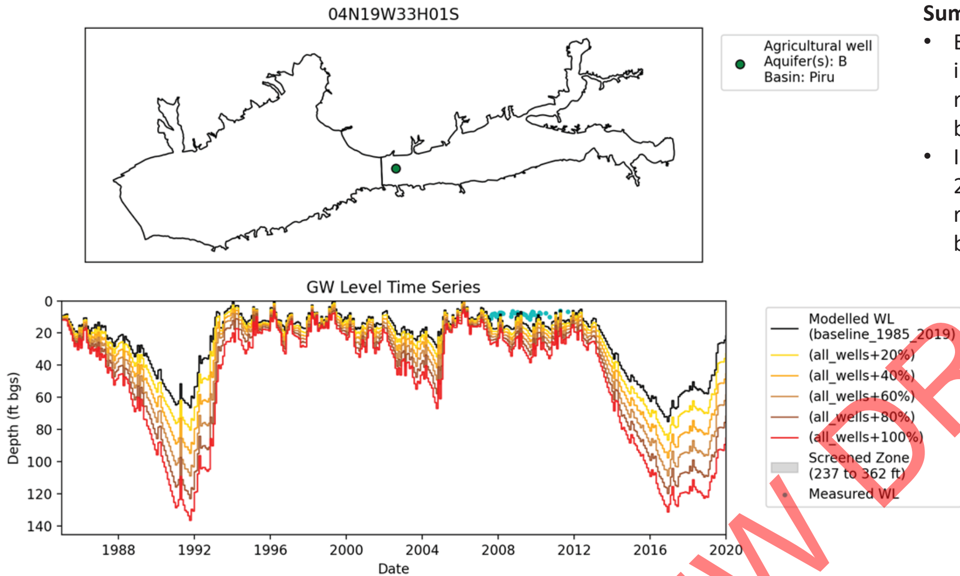
- Increasing pumping by 20% or 40% allows WLs to recover within ~10ft of baseline in wet periods

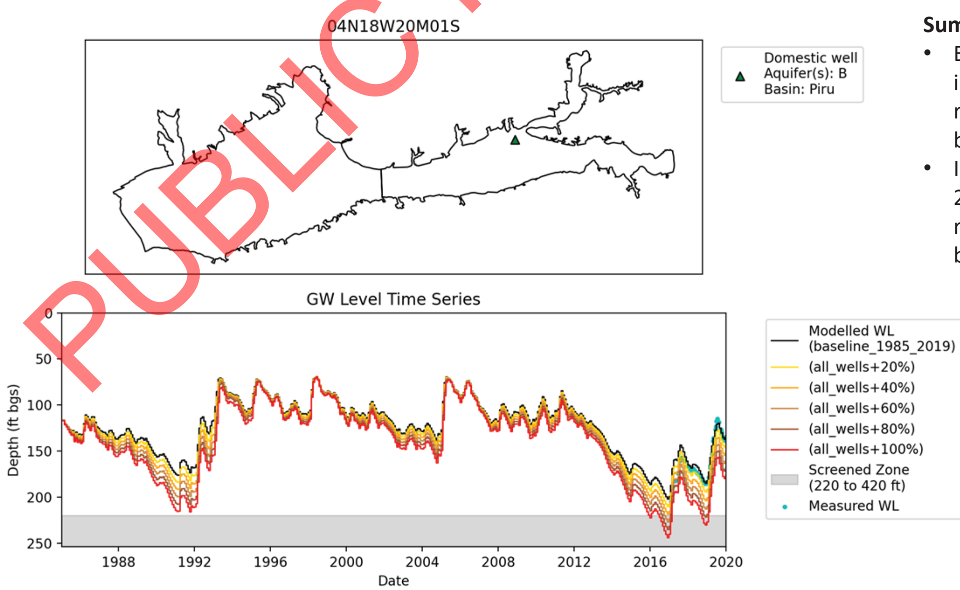
Basin “Stress Test”



Summary

- Even with pumping increased by 100%, WLs recover to within ~15 ft of baseline in wet periods
- Increasing pumping by 20% or 40% allows WLs to recover within ~5ft of baseline in wet periods

Basin “Stress Test”



Summary

- Even with pumping increased by 100%, WLs recover to within ~10 ft of baseline in wet periods
- Increasing pumping by 20% or 40% allows WLs to recover within ~5ft of baseline in wet periods

Basin "Stress Test" - Summary (based on limited # of wells)

No. (%) of Wells Evaluated in Model (330 Total)

Pumping Scenario	WL < Top of Screen	WL < Bottom of Screen
Baseline	55 (18%)	0 (0.0%)
Baseline + 20%	75 (25%)	1 (0.3%)
Baseline + 40%	99 (33%)	8 (2.4%)
Baseline + 60%	125 (42%)	14 (4.2%)
Baseline + 80%	150 (50%)	23 (7.0%)
Baseline + 100%	170 (56%)	23 (7.0%)

Basin "Stress Test" - Summary *(based on limited # of wells)*

In general...

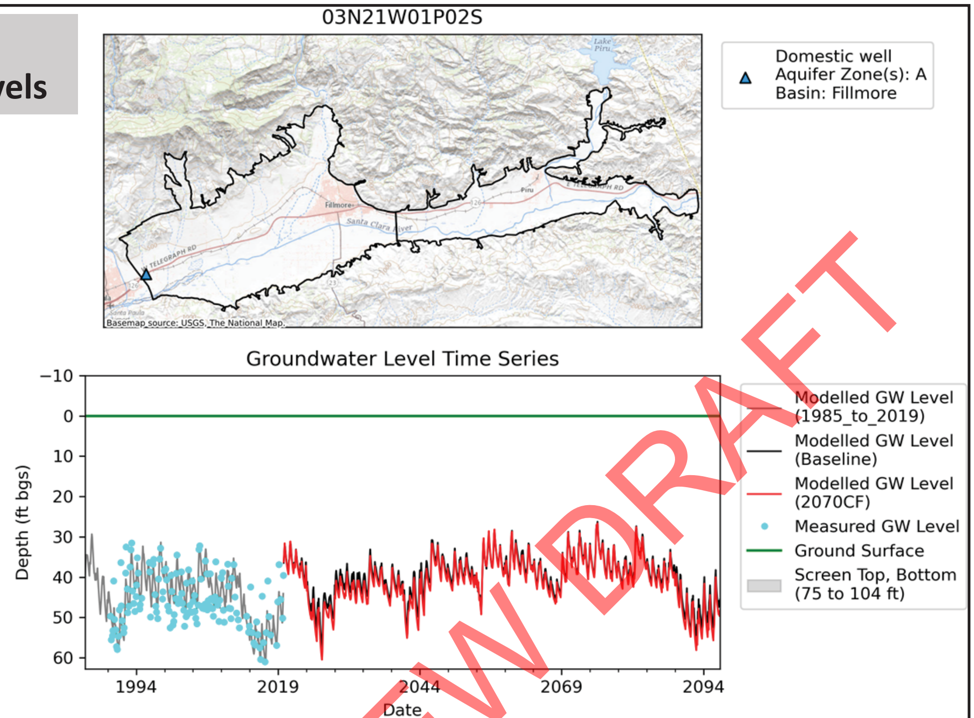
	Recovery	Droughts
Baseline + 20%	WLs recover to within 1 to 10 ft of baseline	Low WLs during droughts are 2 to 10 ft lower than baseline
Baseline + 40%	WLs recover to within 2 to 20 ft of baseline	Low WLs during droughts are 14 to 26 ft lower than baseline
Baseline + 60%	WLs recover to within 3 to 30 ft of baseline	Low WLs during droughts are 26 to 43 ft lower than baseline
Baseline + 80%	WLs recover to within 4 to 40 ft of baseline	Low WLs during droughts are 38 to 59 ft lower than baseline
Baseline + 100%	WLs recover to within 5 to 50 ft of baseline	Low WLs during droughts are 50 to 75 ft lower than baseline

ATTACHMENT C
Example Long-Term Hydrographs

Lowering of Groundwater Levels

Conclusions

- **No evidence of chronic decline in GW levels.**
- GW level ranges are similar to the historic period.
- Difference in 2070CF scenario GW levels vs. Baseline scenario:
    - Wet periods: <5 ft
    - Droughts: <10 ft



Lowering of Groundwater Levels

Conclusions

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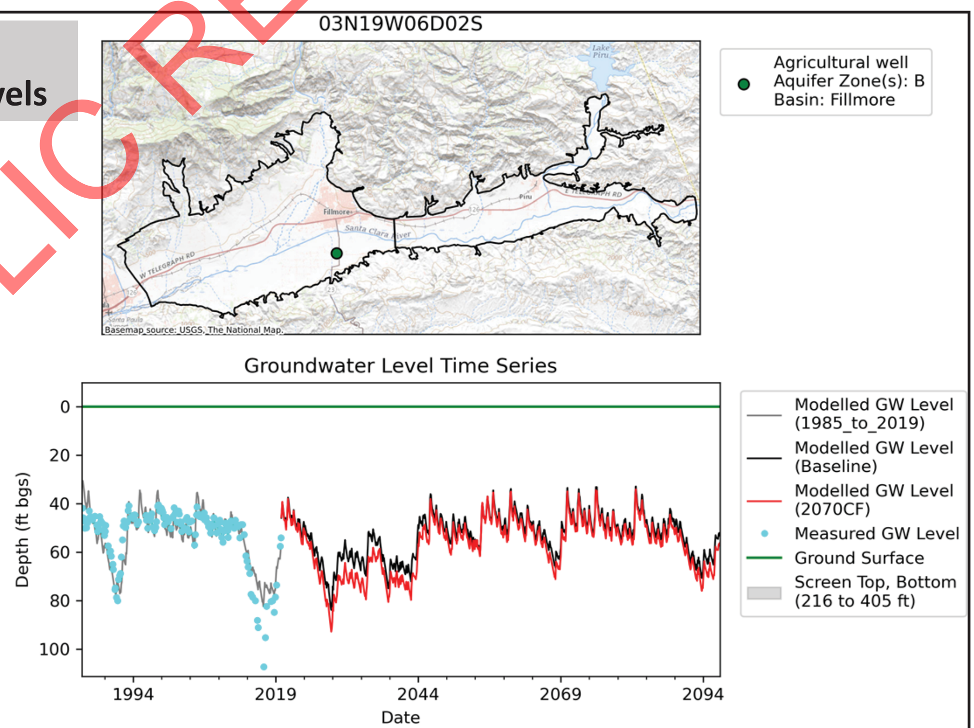
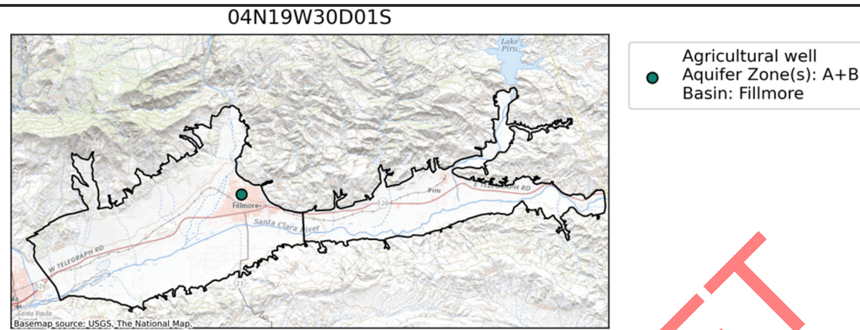
    - Droughts: <20 ft



Lowering of Groundwater Levels



Conclusions

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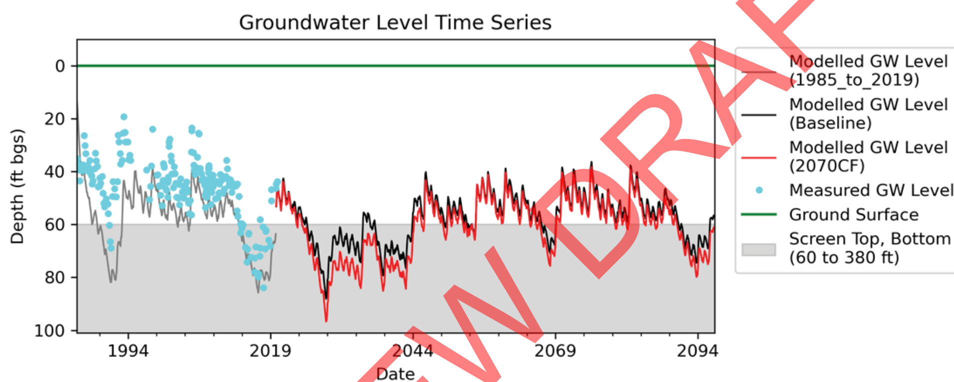
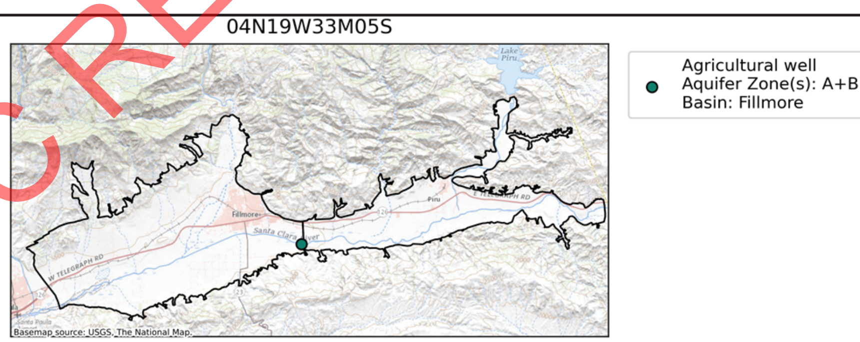
- Difference in 2070CF scenario GW levels vs. Baseline scenario:
  - Wet periods: <5 ft
  - Droughts: <20 ft



Lowering of Groundwater Levels



Conclusions

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- GW level ranges are similar to the historic period.
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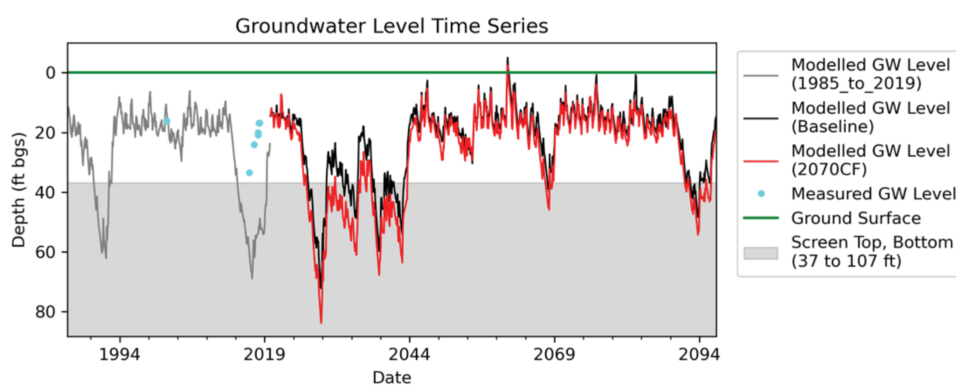
  - Droughts: <20 ft



Lowering of Groundwater Levels

Conclusions

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- GW level ranges are similar to the historic period.
- Difference in 2070CF scenario GW levels vs. Baseline scenario:
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  - Droughts: <20 ft

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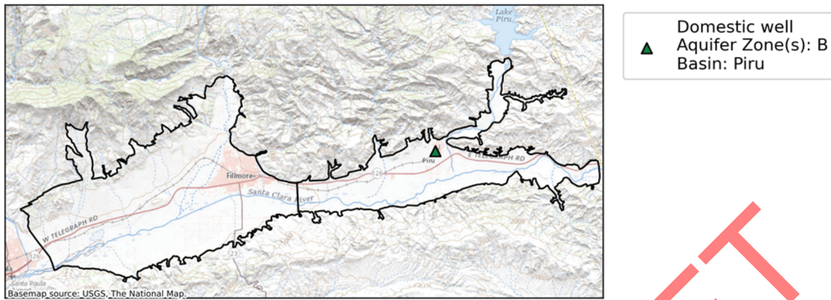

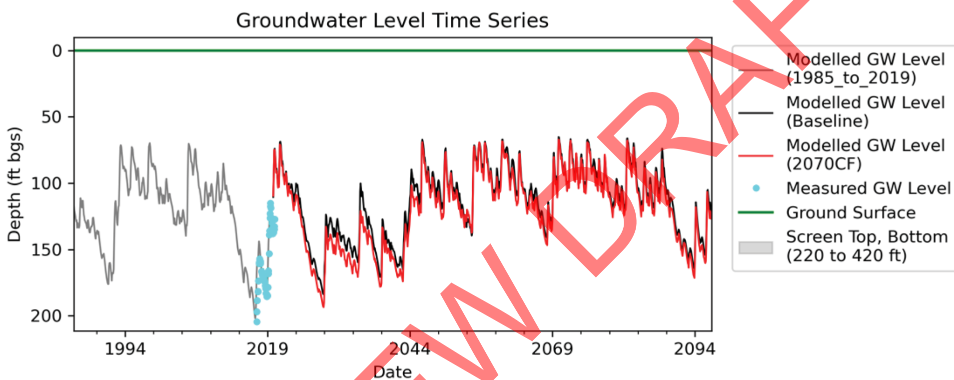

ATTACHMENT D
Water Quality Objectives

Table 3-10. Water Quality Objectives for Selected Constituents in Inland Surface Waters[a].

Reaches are in upstream to downstream order.

WATERSHED/STREAM REACH[b]	TDS (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Boron[c] (mg/L)	Nitrogen[d] (mg/L)	SAR[e] (mg/L)
Between Blue Cut gaging station and Piru Creek	1300	600	100 [m]	1.5	5	5
Between Piru Creek and A Street, Fillmore	1300	600	100	1.5	5	5
Between A Street, Fillmore and Freeman Diversion "Dam" near Saticoy	1300	650	100[l]	1.5	5	5

Notes:

- Modified from the Los Angeles Regional Water Quality Control Board (LARWQCB Basin Plan, May 6, 2019)
- a. As part of the State's continuing planning process, data will continue to be collected to support the development of numerical water quality objectives for waterbodies and constituents where sufficient information is presently unavailable. Any new recommendations for water quality objectives will be brought before the Regional Board in the future.
- b. All references to watersheds, streams and reaches include all tributaries. Water quality objectives are applied to all waters tributary to those specifically listed in the table. See Figures 2-1 to 2-10 for locations.
- c. Where naturally occurring boron results in concentrations higher than the stated objective, a site-specific objective may be determined on a case-by-case basis.
- d. Nitrate-nitrogen plus nitrite-nitrogen (NO3-N + NO2-N). The lack of adequate nitrogen data for all streams precluded the establishment of numerical objectives for all streams.
- e. Sodium adsorption ratio (SAR) predicts the degree to which irrigation water tends to enter into cation-exchange reactions in soil. SAR = Na+/((Ca++ + Mg++)/2)1/2
- l. This objective was updated though a Basin Plan amendment adopted by the Regional Board on November 6, 2003 (Resolution No. R03-015) and went into effect on August 4, 2004.
- m. These objectives apply as a 3-month rolling average. The 3-month averaging period for these objectives was established though a Basin Plan amendment adopted by the Regional Board on October 9, 2014 (Resolution No. R14-010) and went into effect on April 28, 2015.

Table 3-13. Water Quality Objectives for Selected Constituents in Regional Ground Waters[a].

BASINS				Objectives (mg/l)[m]			
Basin	Basin No[b]	1994 Basin Name	1994 Basin No	TDS	Sulfate	Chloride	Boron
Santa Clara River Valley[d]	**4-4**	**Ventura Central**	**4-4**				
Piru	4-4.06	Santa Clara-Piru Creek Area	4-4				
Piru	4-4.06	Lower Area East of Piru Creek	4-4	2500	1200	200	1.5
Piru	4-4.06	Lower Area West of Piru Creek	4-4	1200	600	100	1.5
Fillmore	4-4.05	Fillmore Area	4-4				
Fillmore	4-4.05	Pole Creek Fan Area	4-4	2000	800	100	1.0
Fillmore	4-4.05	South Side of Santa Clara River	4-4	1500	800	100	1.1
Fillmore	4-4.05	Remaining Fillmore Area	4-4	1000	400	50	0.7

Notes:

- Modified from the Los Angeles Regional Water Quality Control Board (LARWQCB Basin Plan, May 6, 2019)
- b. Basins are numbered according to Bulletin 118-Update 2003 (Department of Water Resources, 2003).
- d. The Santa Clara River Valley (4-4) was formerly Ventura Central Basin