

State of California
Department of Water Resources
Sustainable Groundwater Management Program
Alternative Assessment Staff Report

Groundwater Basin Name: Sacramento Valley – Sutter (Basin No. 5-021.62)
Submitting Agency: Sutter County
Recommendation: Do Not Approve
Date Issued: July 17, 2019

I. Summary

Sutter County (Sutter County *or* County) submitted an alternative (Sutter Subbasin Alternative *or* Alternative) to the Department of Water Resources (Department) for evaluation and assessment as provided by the Sustainable Groundwater Management Act (SGMA).¹ The Sutter Subbasin Alternative is based on an analysis of basin² conditions that demonstrates the Sutter Subbasin (Sutter Subbasin *or* Subbasin) has operated within its sustainable yield over a period of at least 10 years,³ and was submitted by Sutter County on behalf of the County, Butte Water District, Feather Water District, Garden Highway Mutual Water Company, Oswald Water District, Meridian Farms Water Company, Sutter Community Services District, Sutter Extension Water District, Sutter Mutual Water Company, Tudor Mutual Water Company, Yuba City, and Reclamation Districts 70, 777, 783, 1001, 1500, 1660, 2054, and 2056.⁴ Based on evaluation of the Sutter Subbasin Alternative and consideration of public comments, Department staff find the Alternative has not satisfied the objectives of SGMA and recommend that the Alternative not be approved.

An alternative based on an analysis of basin conditions requires that the basin has operated within its sustainable yield, which SGMA defines with reference to the absence of undesirable results.⁵ The County seeks to define historic water use as sustainable, but did not provide evidence that groundwater use in the Sutter Subbasin has historically

¹ Water Code § 10720 *et seq.*

² As defined in Water Code § 10721(b) a “basin” means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Chapter 3 (commencing with Section 10722).

³ Water Code § 10733.6(b)(3)

⁴ List of agencies is based on information submitted for question A2 on the Alternative Portal (<https://sgma.water.ca.gov/portal/alternative/print/17>) and the list on the cover of the document titled *Alternative Submittal to a Groundwater Sustainability Plan for Sutter Subbasin*; in some cases, an agency is listed in one location but not the other.

⁵ Water Code § 10721(w)

been managed to quantitative criteria or standards that would demonstrate operation within the sustainable yield of the Subbasin. Department staff do not agree with the County's assumption that if groundwater levels are stable over the base period, significant and unreasonable effects cannot have occurred throughout the Subbasin, and thus the Subbasin cannot have experienced undesirable results. Stable groundwater elevations would provide logical support for an argument that chronic lowering of groundwater levels and significant and unreasonable reduction of groundwater storage had not occurred, and the Department might accept such an inference even if the County failed to explain its reasoning in detail. However, the same cannot be said of all undesirable results. In particular, because the quantification of depletions of interconnected surface water due to groundwater use was not discussed in the Alternative, the County's claim that no undesirable results of this category occurred cannot be evaluated.

The Department cannot assume undesirable results have not occurred in the absence of a compelling argument based on sufficient and credible information and based on adequate supporting data. The Sutter Subbasin Alternative does not sufficiently demonstrate that undesirable results have been absent for 10 years and, therefore, Department staff recommend that it not be approved.

The Alternative documents the development of quantitative criteria in mid- to late-2016 that appear to be based on plans of the County and the stakeholders developing the Alternative to conjunctively manage the Subbasin, which includes a substantial increase in future groundwater use. Although not dispositive to the evaluation and assessment because it involves prospective groundwater management, Department staff note that several aspects of the proposed sustainable management criteria were not supported by sufficient explanations for how they were determined or sufficient analysis of potential impacts to beneficial uses and users of groundwater and interconnected surface water.

The remainder of this assessment is organized as follows:

- **Section II. Review Principles** describes legal and other considerations regarding the Department's assessment and evaluation of alternatives.
- **Section III. Alternative Materials** describes materials (i.e., plans, reports, data, and other information) submitted by the County that, collectively, the Department staff considered as the Alternative.
- **Section IV. Required Conditions** describes whether the Alternative satisfies each of the four conditions required for the Department to review an alternative.
- **Section V. Alternative Contents** briefly describes the contents of the Alternative submittal.
- **Section VI. Assessment** describes the findings of the Department's review of the Alternative, whether it satisfies the objectives of SGMA, and, if applicable, describes corrective actions required for the first five-year update.

II. Review Principles

The County submitted an alternative based on an analysis of basin conditions to the Department for evaluation and assessment to determine whether it satisfies the objectives of SGMA for the Sutter Subbasin. To satisfy the objectives of SGMA, an alternative based on an analysis of basin conditions must demonstrate that the basin has been operated within its sustainable yield for a period of at least 10 years.⁶ The SGMA definition of sustainable yield requires the avoidance of undesirable results.⁷ As a result, an alternative based on an analysis of basin conditions must demonstrate that the submitting agency has an understanding of groundwater conditions that would cause undesirable results, as well as analysis in the alternative demonstrating the absence of undesirable results over a 10-year period.

An alternative, to be evaluated by the Department, must be submitted by the statutory deadline and be within a basin that complies with Part 2.11 of Division 6 of the Water Code.⁸ The submitted alternative must also be complete and must cover the entire basin.⁹ The Department's Groundwater Sustainability Plan (GSP) Regulations¹⁰ require the Department to evaluate an Alternative "in accordance with Sections 355.2, 355.4(b), and Section 355.6, *as applicable*, to determine whether the Alternative complies with the objectives of the Act".¹¹ The elements of the cited sections are not all applicable to alternatives. Some provisions apply to GSPs and alternatives alike, to alternatives only prospectively, or do not apply to alternatives at all.¹² Ultimately, the purpose of the evaluation is to determine whether the elements of the alternative are sufficient to demonstrate its ability to achieve the objectives of SGMA.¹³ The agency must explain how the elements of the alternative are functionally equivalent to the elements of a GSP

⁶ Water Code § 10733.6(b)(3)

⁷ Water Code § 10721(w)

⁸ Water Code § 10733.6(c)-(d)

⁹ 23 CCR § 358.4(a)

¹⁰ 23 CCR § 350 *et seq.*

¹¹ 23 CCR § 358.4(b) (emphasis added)

¹² Procedural requirements, including submissions by the agency, posting by the Department, and the public comment period, apply equally to plans and alternatives (23 CCR § 355.2(a)-(c)). The periodic review of Plans (23 CCR § 355.6(a)) applies to alternatives prospectively but does not apply to initial submissions. Other regulatory provisions are inapplicable to alternatives, including the two-year review period (23 CCR § 355.2(e)), which is based on the statutory time-frame that applies to Plans but not alternatives (Water Code § 10733.4(d)); the "incomplete" status that allows the agency to address "one or more deficiencies that preclude approval, but which may be capable of being corrected by the Agency in a timely manner" (23 CCR § 355.2(e)(2)), which applies to Plans undergoing development, but not alternatives that purportedly satisfy the objectives of SGMA at the time of their submission (Water Code § 10733.6(a)); and, for the same reason, corrective actions to address deficiencies in plans (23 CCR § 355.4(a)(4)), which applies to plans developed after the adoption of SGMA, but is inapplicable to Alternatives that predate SGMA.

¹³ 23 CCR § 358.2(d), based on the statutory threshold of "whether the alternative satisfies the objectives of [SGMA] for the basin" (Water Code § 10733.6(a)).

required by Articles 5 and 7 of the GSP Regulations and are sufficient to demonstrate the ability of the alternative to achieve the objectives of SGMA as required by statute.¹⁴ The explanation by the agency that elements of an alternative are functionally equivalent to elements of a GSP furthers the objective of demonstrating that the alternative satisfies the objectives of SGMA. Alternatives that predate the passage of SGMA or adoption of GSP Regulations are not expected to conform to the precise format and content of a GSP. The Department's assessment is thus focused on the ability of the alternative to achieve the objectives of SGMA as demonstrated by information provided by the agency; it is not a determination of the degree to which the alternative matched the specific requirements of the GSP Regulations.

When evaluating whether an alternative satisfies the objectives of SGMA and thus is likely to achieve the sustainability goal for the basin, staff consider, among other things, whether the information provided by and relied upon by the agency is sufficient, credible, and consistent with scientific and engineering professional standards of practice,¹⁵ and whether there is a reasonable relationship between the information provided and the assumptions and conclusions made by the agency, whether sustainable management criteria and projects and management actions described in the alternative are commensurate with the level of understanding of the basin setting, and whether those projects and management actions are feasible and likely to prevent undesirable results.¹⁶ Staff will recommend that an alternative be approved if staff find, in light of these factors, that the alternative has achieved the sustainability goal for the basin.¹⁷

III. Alternative Materials

Sutter County submitted an alternative based on an analysis demonstrating the Sutter Subbasin has operated within its sustainable yield over a period of at least 10 years pursuant to Water Code Section 10733.6(b)(3). The Sutter Subbasin Alternative includes the following documents:

- *Alternative Submittal to a Groundwater Sustainability Plan for Sutter Subbasin, 2016 (Alternative Report or Report)*

The County also submitted an Alternative Elements Guide, a description of how the Alternative covers the entire Subbasin, and has submitted Annual Reports.¹⁸ Other material submitted by the County, public comments, other documents submitted by third

¹⁴ 23 CCR § 358.2(d)

¹⁵ 23 CCR § 351(h)

¹⁶ 23 CCR § 355.4(b)(1), (3), and (5).

¹⁷ 23 CCR § 355.4(b)

¹⁸ The Annual Report is not part of the Alternative and was not reviewed by the Department for the purpose of approving the Alternative.

parties, correspondence, and other information provided to or relied upon by the Department have been posted on the Department's web site.¹⁹

IV. Required Conditions

An alternative, to be evaluated by the Department, must be submitted by a statutory deadline and be within a basin that complies with Part 2.11 of Division 6 of the Water Code.²⁰ The submitted alternative must also be complete and must cover the entire basin.²¹

A. Submission Deadline

SGMA requires that an alternative for a basin categorized as high- or medium-priority as of January 31, 2015, be submitted no later than January 1, 2017.²²

Sutter County submitted the Alternative on December 27, 2016, which complies with the submission deadline.

B. Part 2.11 (CASGEM) Compliance

SGMA requires that the Department assess whether an alternative is within a basin that is in compliance with Part 2.11 of Division 6 of the Water Code,²³ which requires that groundwater elevations in all groundwater basins be regularly and systematically monitored and that groundwater elevation reports be submitted to the Department.²⁴ To manage its obligations under this law, the Department established the California Statewide Groundwater Elevation Monitoring (CASGEM) Program. The acronym CASGEM is used in this document to denote both the program and the groundwater monitoring law.²⁵

SGMA specifies that an alternative does not satisfy the objectives of SGMA if the basin is not in compliance with the requirements of CASGEM.²⁶ The Department confirmed that the Sutter Subbasin was in compliance with the requirements of CASGEM prior to evaluating this Alternative and confirmed that the Subbasin remained in compliance with CASGEM through the last reporting deadline, prior to issuing this assessment.

¹⁹ <https://sgma.water.ca.gov/portal/#alt>

²⁰ Water Code § 10733.6(c)-(d)

²¹ 23 CCR § 358.4(a)

²² Water Code § 10733.6(c). Pursuant to Water Code § 10722.4(d), a different deadline applies to a basin that has been elevated from low- or very low-priority to high- or medium-priority after January 31, 2015.

²³ Water Code § 10733.6(d)

²⁴ Water Code § 10920 *et seq.*

²⁵ Stats.2009-2010, 7th Ex.Sess., c. 1 (S.B.6), § 1

²⁶ Water Code § 10733.6(d)

C. Completeness

GSP Regulations specify that the Department shall evaluate an alternative if that alternative is complete and includes the information required by SGMA and the GSP Regulations.²⁷ An alternative submitted pursuant to Water Code Section 10733.6(b)(3) must include an analysis demonstrating the basin has operated within its sustainable yield over a period of at least 10 years. That analysis must include a report prepared by a registered professional engineer or geologist who is licensed by the state, and that report must be submitted under that engineer's or geologist's seal. The alternative must include an explanation of how the elements of the alternative are functionally equivalent to the elements of a Plan required by Articles 5 and 7 of the GSP Regulations and are sufficient to demonstrate the ability of the alternative to achieve the objectives of SGMA.²⁸

Sutter County submitted an analysis under the seal of a licensed Professional Geologist along with an Alternative Elements Guide. The submission was deemed complete and was evaluated by the Department.

D. Basin Coverage

An alternative must cover the entire basin.²⁹ An alternative is presumed to cover the entire basin if the basin is contained within the jurisdictional boundaries of the submitting agency. The Sutter Subbasin is entirely within Sutter County and, therefore, the requirement for basin coverage was met.

Note that the Sutter Subbasin, as defined for the Sutter Subbasin Alternative and for this assessment, was the area defined by the Department's 2016 Bulletin 118 basin boundary dataset (i.e., the area shaded in green in Figure 1, below). In addition to information related to the Sutter Subbasin, the Alternative included information related to the portion of the East Butte Subbasin (as that subbasin was defined by the same 2016 Bulletin 118 dataset) in Sutter County (i.e., the area included in the dashed red line in Figure 1, below). The Alternative notes that the intention of the County for including that area was to allow for a future basin boundary modification to incorporate that portion of the East Butte Subbasin into the Sutter Subbasin and for that new area to be covered by the Alternative. While that basin boundary modification was completed in 2018 (i.e., the Sutter County portion of the East Butte Subbasin is now included in the Sutter Subbasin), the Alternative has not been approved and, therefore, this assessment does not address information provided for that former portion of the East Butte Subbasin.

²⁷ 23 CCR § 358.4(a)(3)

²⁸ 23 CCR § 358.2(c)-(d)

²⁹ 23 CCR § 358.4(a)(4)

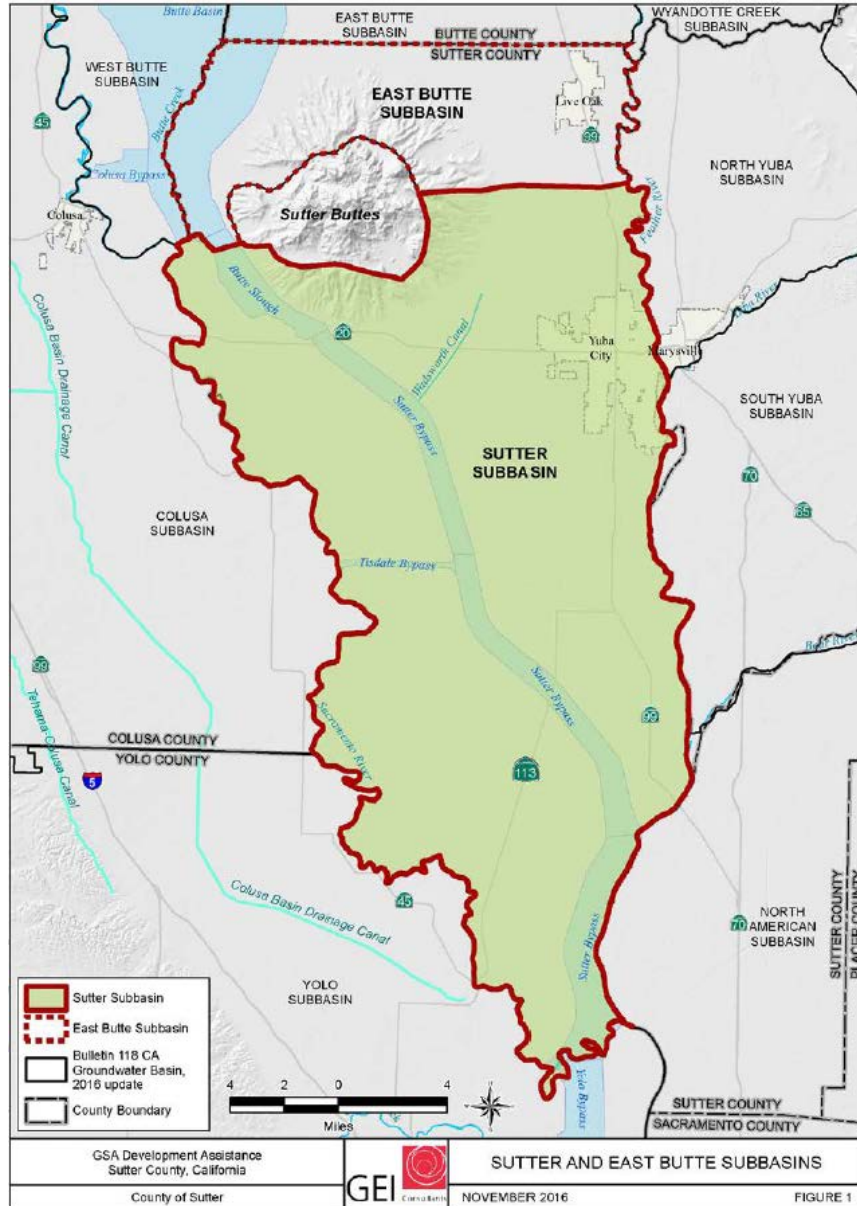


Figure 1 – Boundaries of the Sutter Subbasin

V. Alternative Contents

GSP Regulations require the submitting agency to explain how the elements of an alternative are functionally equivalent to the elements of a GSP as required by Article 5

of the GSP regulations³⁰ and are sufficient to demonstrate the ability of an alternative to achieve the objectives of SGMA.³¹

As stated previously, alternatives based on historical basin management practices that predate the passage of SGMA or adoption of GSP Regulations, although required to satisfy the objectives of SGMA, are not necessarily expected to conform to the precise format and content of a GSP, and the criteria for adequacy of an alternative is whether the Department is able to determine that an alternative satisfies the objectives of SGMA. Department staff rely on the submitting agency's determination of functional equivalence of alternative elements to facilitate its evaluation and assessment of an alternative (see Assessment, below). Although the exact components of a GSP are not required for an alternative, for organizational purposes the discussion of information contained in the Sutter Subbasin Alternative and related documents provided by the County generally follows the elements of a GSP provided in Article 5 of the GSP Regulations. The reference to requirements of the GSP Regulations at the beginning of each section is to provide context regarding the nature of the element discussed but is not meant to define a strict standard applicable to alternatives.

A. Administrative Information

GSP Regulations require information identifying the submitting agency, describing the Plan area, and demonstrating the legal authority and ability of the submitting agency to develop and implement a Plan for that area.³²

The Alternative Report includes an executive summary of the report, a general description of the Sutter Subbasin as well as of adjacent basins, and identification of the organization and management structure with authority to make groundwater management decisions for the Subbasin. The Report identifies the Director of Development Services as being authorized to act as manager for the groundwater management efforts described in the Alternative.

The Alternative Report states that the Sutter Subbasin is managed by 16 different entities, which the Report refers to as "stakeholder agencies".³³ Land use planning within the Subbasin is the responsibility of the City of Live Oak and Yuba City for their respective areas, and the County for all remaining areas. Tables in the Report indicate that countywide land use is predominantly agricultural (e.g., in 2014 approximately 335,000

³⁰ 23 CCR § 354-354.44

³¹ 23 CCR § 358.2(d). The requirements pertaining to Article 7 of the GSP Regulations (23 CCR § 356-356.4) relate to annual reports and periodic evaluation and are not applicable to review of the initial alternative.

³² 23 CCR § 354.2 et seq.

³³ Alternative Report, Section 3.4, p. 8

acres were classified as agricultural out of the 389,000 acres in the County).³⁴ The Report describes that most of the stakeholder agencies in the Sutter Subbasin receive surface water deliveries from either the Feather or Sacramento rivers, while areas outside the service areas of the stakeholder agencies (the Alternative Report refers to these areas as “white areas”) use groundwater. The Report does not quantify surface water use in the Subbasin, noting in the discussion of data gaps that the water districts had data related to imported water volumes but that it had not yet been compiled.³⁵ The Alternative Report also notes that users in those stakeholder areas receiving surface water may, at times, use groundwater to augment their surface water supply or for other operational purposes. The Report indicates that agricultural areas countywide are supplied by approximately 60 percent surface water only, 20 percent by groundwater only, and 20 percent by a mix of groundwater and surface water.³⁶ The annual amount of pumping in the basin was determined through use of a numerical groundwater model (see Water Budget, below).

The Alternative Report describes prior groundwater management planning efforts, including development of a countywide Groundwater Management Plan in 2012 and other groundwater management plans that have been developed by local agencies. The Alternative Report notes that groundwater quality in the agricultural lands is managed under the Irrigated Lands Regulatory Program, and that monitoring for that program is incorporated in the Alternative. Sutter County is the designated CASGEM monitoring entity and information from the CASGEM Program is incorporated in the Alternative.

The Report notes that several agencies in the Subbasin have participated in groundwater substitution transfers beginning in 2009, pumping up to a maximum of 13,440 acre-feet in 2014.³⁷

The Alternative Report lists existing land use planning documents relevant to the Subbasin, specifically the 2011 Sutter County General Plan, the 2015 Yuba City Urban Water Management Plan Update, and the 2030 General Plan for the City of Live Oak. The Report states that approximately eight percent of unincorporated lands have been identified as future urban growth areas, although the Report does not indicate whether that statistic applies to the entire County or just the portion of the County within the Sutter Subbasin. The Report states that implementation of proposed groundwater management actions described in the Alternative are unlikely to affect water supply in the Subbasin.

The Alternative Report describes designated beneficial uses of surface water in rivers at the boundary of the Subbasin (i.e., the Sacramento and Feather rivers) and groundwater, and describes consultation with landowners representing agriculture and rural

³⁴ Alternative Report, Table 2, p. 10

³⁵ Alternative Report, Section 4.14, p. 75

³⁶ Alternative Report, Section 3.10.3, p. 26

³⁷ Alternative Report, Section 3.9, p. 22 and Table 6, p. 24

communities.³⁸ The Report lists meetings in 2016 at which SGMA activities generally, or the Alternative specifically, were discussed with “white area” property owners, representatives from the stakeholder agencies, and the County Board of Supervisors.

B. Basin Setting

GSP Regulations require information about the physical setting and characteristics of the basin and current conditions of the basin, including a hydrogeologic conceptual model, a description of historical and current groundwater conditions, and an assessment of the water budget.³⁹

1. Hydrogeologic Conceptual Model

The GSP Regulations require a descriptive hydrogeologic conceptual model of the basin that includes a written description supported by cross sections and maps.⁴⁰

The Alternative Report describes the hydrogeologic conceptual model for the Sutter Subbasin,⁴¹ which was developed for the Report and builds on prior work documented in the Sutter County Groundwater Management Plan, included as an appendix to the Alternative Report. The hydrogeologic conceptual model includes discussion of the horizontal and vertical boundaries of the Sutter Subbasin, the regional geologic setting, and water bearing formations within the Subbasin. The Alternative Report notes the presence of three distinct aquifer units that are termed the shallow, intermediate, and deep aquifers.⁴² The shallow aquifer is described as unconfined to semi-confined and extending to a depth of between 50 and 150 feet below ground surface. The intermediate aquifer is described as semiconfined to confined and extending from about 150 feet below ground surface to about 400 feet below ground surface. The deep aquifer is described as confined, extending from about 400 feet below ground surface to 700 feet, or more, below ground surface. Information on hydraulic properties based on testing was only available for the deep aquifer.⁴³ The Alternative Report includes information on hydraulic properties in the Department’s C2VSim hydrologic model⁴⁴, which also includes three aquifer layers; however, the Report notes that the three layers in C2VSim do not match the three principal aquifers identified for the Alternative Report in terms of thickness and depth. The County’s C2VSim model in the Alternative Report is described further below (see Groundwater Conditions *and* Water Budget).

³⁸ Alternative Report, Section 9, p. 158 and Appendix Q

³⁹ 23 CCR § 354.12 et seq.

⁴⁰ 23 CCR § 354.14(a)

⁴¹ Alternative Report, Section 4

⁴² Alternative Report, Section 4.4, p. 44

⁴³ Alternative Report, Section 4.6, pp. 44-47

⁴⁴ <https://water.ca.gov/Library/Modeling-and-Analysis/Central-Valley-models-and-tools/C2VSim>

The hydrogeologic conceptual model describes the general water quality of the aquifer system using data from a variety of existing water quality monitoring programs.⁴⁵ The discussion is based on work completed for the Sutter County Groundwater Management Plan, which was included as an appendix to the Alternative Report. The Alternative Report notes that several constituents have historically been detected above maximum contaminant levels identified for drinking water, including arsenic, boron, total dissolved solids, nitrate, iron, and manganese. However, the Report states that all those constituents, except for nitrate, are naturally occurring in groundwater in the Sutter Subbasin.

The hydrogeologic conceptual model describes recharge areas, including recharge from subsurface inflows from adjacent basins, infiltration of applied water, recharge from rivers and bypasses, and recharge from the Sutter Buttes.⁴⁶ The Alternative Report states that an agricultural water management plan⁴⁷ prepared for the region includes a general estimate of recharge from infiltration of precipitation and applied water.⁴⁸ The Report uses the regional recharge estimate from the agricultural water management plan to attempt to quantify recharge in the Sutter Subbasin by multiplying recharge by the ratio of the area in the Subbasin (approximately 366 square-miles) to the total area covered by the agricultural water management plan (approximately 740 square-miles). The Report asserts that simply scaling the regional recharge to the Sutter Subbasin area is reasonable because of similarities between land uses and water management practices in the region and the Subbasin. The Alternative Report states that the combined infiltration from applied water and precipitation is 373,500 acre-feet per year and compares that value with recharge simulated for the Sutter Subbasin by the Department's C2VSim hydrologic model (94,000 acre-feet per year).

The Alternative Report notes that data gaps in the hydrogeologic conceptual model include a quantification of surface water imports into the Sutter Subbasin, lack of well construction information for some wells, lack of routine sampling for water quality to understand trends in salinity and nitrate, uncertainty in the amount of recharge (as noted above), and uncertainty as to the source of elevated salinity observed in the shallow aquifer at some locations in the Subbasin.⁴⁹

⁴⁵ Alternative Report, Section 4.7.1, pp. 48-50

⁴⁶ Alternative Report, Section 4.9.2, p. 70-72

⁴⁷ Davids Engineering, Inc., 2014. Feather River Regional Agricultural Water Management Plan, Volume 1: Regional Plan Components.

https://water.ca.gov/LegacyFiles/wateruseefficiency/sb7/docs/2014/SBX%207-7%20Plans/Feather_River/FRRAWMP_Volume_I_August_2014.pdf

⁴⁸ Alternative Report, Section 4.9.2, p. 71

⁴⁹ Alternative Report, Section 4.14, p. 75

2. Groundwater Conditions

The GSP Regulations require a description of historical and current groundwater conditions in the basin that includes information related to groundwater elevations, groundwater storage, seawater intrusion, groundwater quality, subsidence, and interconnected surface water, as applicable. The GSP Regulations also require an identification of groundwater dependent ecosystems.⁵⁰

The Alternative Report includes numerous groundwater level hydrographs and groundwater elevation contour maps by principal aquifer for spring 1998, fall 2009, and fall 2015. These maps and figures are accompanied by descriptions of groundwater elevation conditions, including an analysis of vertical gradients between the principal aquifers. The Report describes groundwater levels in the Sutter Subbasin as having been relatively stable for more than 70 years.⁵¹

The Alternative Report states that groundwater storage was determined based on differences between the groundwater elevation contour surfaces for the period between spring 1998 and fall 2009 for the shallow and intermediate aquifers.⁵² The Report does not describe why the deep aquifer was excluded. The analysis indicated storage declined in the shallow aquifer by approximately 131,000 acre-feet and declined in the intermediate aquifer by about 163,000 acre-feet.⁵³ The report notes that C2VSim simulated a decline in storage of 138,000 acre-feet, but the Report does not explain the reliability of those numbers or how they should be utilized given the discrepancy between the primary aquifers and the layers of the model as noted in the Report (see, Hydrogeologic Conceptual Model, above).

The Alternative Report states that no subsidence monitoring has occurred within the basin but estimates approximately two inches of subsidence based on NASA satellite data from 2006 to 2010.⁵⁴ The Report suggests that the observed changes may be due to factors unrelated to groundwater extraction. The Report does not provide any evidence for alternate explanations but does note that the Sutter Subbasin has been ranked as having a low potential for subsidence by the Department.

As noted previously, the Alternative Report included extensive description and mapping of existing water quality conditions in the Sutter Subbasin (see Hydrogeologic Conceptual Model, above). The Alternative Report includes maps and tables of sites with potential groundwater contamination issues (e.g., sites with leaking underground storage tanks). The Report notes that several constituents in the Subbasin have historically had

⁵⁰ 23 CCR § 354.16

⁵¹ Alternative Report, Section 5.1.1, p. 76

⁵² Alternative Report, Section 5.2, p. 94

⁵³ Alternative Report, Section 5.2, p. 94

⁵⁴ Alternative Report, Section 5.5, p. 97

concentrations exceeding maximum contaminant levels (MCLs) for drinking water, including arsenic, boron, total dissolved solids, and nitrate. However, the Report identifies that all those constituents are naturally occurring except for nitrate.⁵⁵

The Alternative Report describes that coarse-grained sediments along the Sacramento and Feather rivers connect those surface water bodies to the shallow aquifer system. The Report notes the presence of surface water monitoring gages in the Sutter Subbasin and elsewhere in the County, although data from these gages is not used in the Report. Sutter County used the Department's C2VSim model to quantify the combined simulated gains and losses from the Sacramento and Feather rivers to the Sutter Subbasin. Those modeling results indicate the net flux of water between the rivers and groundwater ranged from a streamflow loss of 267,098 acre-feet in 1995 to a streamflow gain of 23,863 acre-feet in 1999, with an average net streamflow loss of approximately 73,000 acre-feet per year during the water budget base period (1989 to 2009). The Alternative Report discusses the trends in simulated gains and losses using the phrase "long-term projects" though they are, in fact, not projections of future conditions but rather simulations of historical conditions. The Report also discusses these gains and losses using the term "depletions", although it should be noted that they are not depletions of streamflow due to groundwater use (i.e., due to groundwater pumping from wells). The Report notes that streamflow losses are generally greater during the winter months, regardless of year type (i.e., across wet and dry years) but states that "... as seen in the below normal years and in critical years, surface flow is depleted during the summer months when surface flow is needed to support habitat."⁵⁶

The Alternative Report includes a map of wetlands in the Subbasin that are noted as being groundwater dependent ecosystems. The Report provides general descriptions of what groundwater dependent ecosystems are (e.g., citing various definitions), but does not specifically discuss those ecosystems in the Sutter Subbasin.

3. Water Budget

GSP Regulations require a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored, as applicable.⁵⁷

The Alternative Report includes an evaluation of the water budget from 1989 through 2009 using the Department's C2VSim hydrologic model. The Alternative Report also notes that a relationship was developed between the historical simulated water budget

⁵⁵ Alternative Report, Section 4.8, p. 50

⁵⁶ Alternative Report, Section 5.7, p. 108

⁵⁷ 23 CCR § 354.18

components in C2VSim and the Sacramento River Index. That relationship was then used to project certain components of the water budget forward for years 2010 through 2015 using the published Sacramento River Index values for those years.

The Report describes that Sutter County used the Department's coarse-grid version of C2VSim because it was the only publicly-released version available at the time the Alternative was being developed. Tabulations of the water budget simulated by C2VSim over the water budget base period indicate that inflows from streams and rivers is, by far, the largest inflow to the Subbasin (approximately 328,000 acre-feet per year on average) and that groundwater pumping and flows from groundwater to streams are the largest components of outflow (approximately 170,000 and 253,000 acre-feet per year on average, respectively). Charts of various components of the water budget through time indicate that there is significant variability in components of the water budget, particularly the total stream gains and losses, and that the variability may be correlated to the year type (e.g., critical, dry, wet).⁵⁸

The Alternative Report notes that the average quantity of water extracted during the base period (1989 to 2009) was 169,000 acre-feet per year.⁵⁹ The Report states that the annual sustainable yield would be "slightly greater" than that quantity because the Report claims that no undesirable results were present during that period and average groundwater levels in the Subbasin increased by 0.5 feet over that period.⁶⁰ Because Sutter County chose a historical average, annual pumping exceeded the 169,000 acre-feet per year value in eight years during the base period.⁶¹ The sustainable yield is noted elsewhere in the Alternative Report to be "about 162,000 [acre-feet per year]."⁶²

The Alternative Report does not assess the adequacy of the coarse grid version of C2VSim, a model developed for regional groundwater analysis in California's Central Valley, for development of subbasin-level water budgets suitable for SGMA. The Report does note that there are some uncertainties in the water budget, including: (1) a discussion that appears to address the County's opinion that there was a dearth of data used to calibrate C2VSim in the Sutter Subbasin, (2) a note that a more recent study indicates percolation of precipitation and applied water may be roughly three times greater than values simulated by the C2VSim model, which the authors conclude means the C2VSim estimate of recharge to the Subbasin from rivers and streams must be correspondingly too high, (3) a note that appears to indicate the County may have selected an inappropriate base period, and (4) a note that addresses the use of "automatic

⁵⁸ Alternative Report, Figures 64 and 65, pp.117-118; note that the bars representing the Sacramento River Index water year type on those charts appear to be incorrectly offset and do not line up with the correct year of the water budget, particularly for later years shown.

⁵⁹ Alternative Report, Section 6.4, p. 125

⁶⁰ Alternative Report, Section 6.4, p. 125

⁶¹ Alternative Report, Table 15, p. 116

⁶² Alternative Report, Section 7.4.1, p. 131

groundwater contouring software” and potential issues with that software creating maps that have “...large cones of depression which are not necessarily present.”⁶³

4. Management Areas

GSP Regulations authorizes but does not require an agency to define one or more management areas within a basin if the agency has determined that creation of management areas will facilitate implementation of the GSP.⁶⁴

Sutter County has not identified management areas or defined management strategies that are functionally equivalent to management areas within the Sutter Subbasin.

C. Sustainable Management Criteria

GSP Regulations require a sustainability goal that defines conditions that constitute sustainable groundwater management for the basin, characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator, as appropriate.⁶⁵

1. Sustainability Goal

GSP Regulations require that sustainable management criteria include a sustainability goal that culminates in the absence of undesirable results within the appropriate timeframe, and includes a description of the sustainability goal, describes information used to establish the goal for the basin, describes measures that will be implemented to ensure the basin operates within its sustainable yield, and contains an explanation of how the sustainability goal will be met.⁶⁶ The sustainability goal for an alternative based on an analysis of basin conditions represents the criteria that allowed the basin to be operated within its sustainable yield for a period of at least 10 years, which includes the avoidance of undesirable results.⁶⁷

The County states that “[t]he goal of the stakeholders is to maintain groundwater sustainability within the Subbasin, allow some reduction in groundwater levels in the shallow aquifer for agriculture, and maintain groundwater flows to the rivers.” The Alternative Report states that since groundwater levels and storage have generally been

⁶³ Alternative Report, Section 6.3, pp. 123-124

⁶⁴ 23 CCR § 354.20

⁶⁵ 23 CCR § 354.22

⁶⁶ 23 CCR § 354.24. For an alternative based on a demonstration of 10 years of sustainable management, the sustainability goal, or its functional equivalent, would have been developed at some previous time during basin management, and its goals met by the time the Alternative was submitted to the Department.

⁶⁷ Water Code § 10721(w)

stable in the Sutter Subbasin, that “...the Subbasin is essentially in balance” and concludes that the Subbasin is being sustainably managed.⁶⁸

2 Sustainability Indicators

GSP Regulations specify that an agency define conditions that constitute sustainable groundwater management for a basin, including the characterization of undesirable results and the establishment of minimum thresholds and measurable objectives for each applicable sustainability indicator.⁶⁹

Sustainability indicators are defined as any of the effects caused by groundwater conditions occurring throughout the basin that, *when significant and unreasonable*, cause undesirable results.⁷⁰ Sustainability indicators thus correspond with the six undesirable results – chronic lowering of groundwater levels indicating a depletion of supply if continued over the planning and implementation horizon, reduction of groundwater storage, seawater intrusion, degraded water quality, including the migration of contaminant plumes that impair water supplies, land subsidence that substantially interferes with surface land uses, and depletions of interconnected surface water that have adverse impacts on beneficial uses of the surface water⁷¹ – but refer to groundwater conditions that are not, in and of themselves, significant and unreasonable. Rather, sustainability indicators refer to the effects caused by changing groundwater conditions that are monitored, and for which criteria in the form of minimum thresholds are established by the agency to define when the effect becomes significant and unreasonable, producing an undesirable result.

This section thus consolidates three facets of sustainable management criteria: undesirable results, minimum thresholds, and measurable objectives. Information pertaining to the processes and criteria relied upon to define undesirable results applicable to the basin, as quantified through the establishment of minimum thresholds, are addressed for each sustainability indicator. However, a submitting agency is not required to establish criteria for undesirable results that the agency can demonstrate are not present and are not likely to occur in a basin.⁷²

The Alternative Report states that “stakeholders” developing the Sutter Subbasin Alternative in 2016 participated in a forum to determine whether any undesirable results were present in the Subbasin.⁷³ The Report states the stakeholders presented “the

⁶⁸ Alternative Report, Section 7.1, p. 127

⁶⁹ 23 CCR § 354.22

⁷⁰ 23 CCR § 351(ah)

⁷¹ Water Code § 10721(x)

⁷² 23 CCR § 354.26(d)

⁷³ Alternative Report, Section 7.2, p. 128. The “stakeholders” mentioned here and elsewhere are not specifically identified; the Department assumes this to refer to the entities identified on Figure 2 of the Alternative Report, p. 9.

information” to their governing boards, that public comments were documented in their meeting minutes, and that pertinent comments were included in the Alternative.⁷⁴

The following subsections discuss sustainable management criteria developed by the County in late 2016 as documented in the Alternative Report.

a. Chronic Lowering of Groundwater Levels

GSP Regulations specify that the minimum threshold for chronic lowering of groundwater levels be based on groundwater elevations indicating a depletion of supply that may lead to undesirable results.⁷⁵

The Alternative Report does not indicate that groundwater use in the Subbasin was managed to any quantitative or objective standard related to groundwater levels prior to 2016. The County defined undesirable results for chronic lowering of groundwater levels through a post hoc process in 2016 during development of the Alternative Report, describing them as either “[g]roundwater levels dropping to a level at which domestic or irrigation wells go dry or lose functional pumping capacity” or “[s]ignificant and unreasonable effort to maintain or deepen production wells.”⁷⁶ Groundwater-level minimum thresholds developed for the Report in 2016 are stated to serve as a proxy for reduction of groundwater storage (see Reduction of Groundwater Storage, below). The Alternative Report states that the selected minimum thresholds “... may be exceeded for short periods during dry and critically dry years.”⁷⁷ However, the Report does not define what is considered a short period. The Report also states that “[p]otential affects would be to surface water discharges and on adjacent subbasins by increasing subsurface inflows but these would be short-term and should not affect beneficial uses of surface water or groundwater or land use.”⁷⁸ The Report indicates that a future undesirable result would occur if minimum thresholds were exceeded at 5 of the 25 wells with defined minimum thresholds.⁷⁹

b. Reduction of Groundwater Storage

GSP Regulations specify that the minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results.⁸⁰

⁷⁴ Alternative Report, Section 7.2, p. 128. The Report does not include meeting minutes or public comments.

⁷⁵ 23 CCR § 354.28(c)(1)

⁷⁶ Alternative Report, Section 7.5.2, p. 136

⁷⁷ Alternative Report, Section 7.5.1, p. 134

⁷⁸ Alternative Report, Section 7.5.1, p. 134

⁷⁹ Alternative Report, Section 7.5.1, pp. 134-136

⁸⁰ 23 CCR § 354.28(c)(2)

The Alternative Report does not indicate that groundwater use in the Sutter Subbasin was managed to any quantitative or objective standard related to groundwater storage prior to 2016. Undesirable results for reduction of groundwater storage defined in 2016 during development of the Alternative Report are either a “depletion of the aquifer to the extent that other components of the water budget are unreasonably affected which could affect adjacent subbasins and rivers” or the same two undesirable results listed for chronic lowering of groundwater levels (see Chronic Lowering of Groundwater Levels, above).

The Alternative Report, in its discussion of sustainable management criteria development for groundwater storage, notes that storage levels in the Sutter Subbasin have “remained stable” with “little to no reduction in storage.”⁸¹ The Report states that “[t]o expand conjunctive use to benefit the environment and the State, it is reasonable to exercise the Subbasin to use up to 10 percent of the groundwater in storage...”⁸²; the Report notes that the 10 percent reduction equates to a reduction in storage of 310,000 acre-feet.⁸³ For comparison, the Report notes that the greatest annual reduction in storage during the base period, as simulated by C2VSim, was 127,000 acre-feet, which represents approximately four percent of the total estimated groundwater in storage.⁸⁴ The County’s assertion that a 10 percent reduction in storage is reasonable is the basis for their minimum thresholds for storage, as discussed below. The Report does not describe why that assumption was reasonable or what information that reasonableness was based on. The Report notes that some “short-term impacts” may occur due to the increased groundwater use, but that no “long-term undesirable results” would occur if the Subbasin remained within its “long-term sustainable yield”; the Report does not describe what those “short-term impacts” would be.⁸⁵

The Report describes that increasing groundwater use (i.e., to exercise the Subbasin in such a way as to reduce storage by 310,000 acre-feet) would lead to an 11- to 18-foot reduction in groundwater levels below the historic low level observed in 1988. The Report notes that the County chose the larger end of the range in groundwater reduction (i.e., 18 feet) and set minimum threshold groundwater levels, serving as a proxy for reduction in storage, at 18 feet below measured fall 1988 levels and that those thresholds were set at 25 monitoring wells in the Subbasin. The minimum thresholds are stated to be the lowest point groundwater levels can drop before undesirable results occur in the Subbasin, although the Report does not describe the relationship of those groundwater-level thresholds to the qualitative descriptions of the undesirable results noted above (e.g., how

⁸¹ Alternative Report, Section 7.4, p. 129

⁸² Alternative Report, Section 7.4.1, p. 131

⁸³ Alternative Report, Section 7.4.1, p. 131

⁸⁴ Alternative Report, Section 7.4.1, p. 131

⁸⁵ Alternative Report, Section 7.4.1, p. 131

those minimum thresholds relate to the undesirable result of domestic or irrigation wells going dry or losing functional pumping capacity, as noted above).

The Report also discusses the storage reduction value of 310,000, itself, as a minimum threshold but it is not clear if that threshold is based on a cumulative or annual reduction in storage. Figures in the Report show minimum thresholds for storage that conflict with values in the written descriptions, and those values conflict with one another – one figure indicates the minimum threshold is approximately 275,000 acre-feet of *cumulative* storage loss⁸⁶ while another shows the minimum threshold is approximately 275,000 acre-feet of *annual* storage loss.⁸⁷

c. Seawater Intrusion

GSP Regulations specify that the minimum threshold for seawater intrusion be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results.⁸⁸

The Alternative Report notes that the Sutter Subbasin is not connected to the Pacific Ocean or other bodies of saline water and, therefore, seawater intrusion is not expected to occur, and sustainable management criteria were not developed.⁸⁹

d. Degraded Water Quality

GSP Regulations specify that the minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the agency that may lead to undesirable results.⁹⁰

The Alternative Report does not indicate that groundwater use in the Subbasin was managed to any quantitative or objective standard related to groundwater quality degradation prior to 2016. The undesirable result for degraded water quality defined in 2016 during development of the Report is “[i]f the groundwater quality monitoring indicates that the minimum threshold has been exceeded for salinity or nitrate, the beneficial use for drinking water could be impacted.”⁹¹ The Report states that salinity and nitrate are the only constituents within the control of stakeholders in the Subbasin and that other potential constituents, such as naturally occurring boron, manganese, iron, and arsenic, were not considered for sustainable management criteria development.⁹²

⁸⁶ Alternative Report, Figures 69, p. 132; see the horizontal red dashed line

⁸⁷ Alternative Report, Figures 70, p. 133; see the horizontal red dashed line

⁸⁸ 23 CCR § 354.28(c)(3)

⁸⁹ Alternative Report, Section 7.6, p. 136

⁹⁰ 23 CCR § 354.28(c)(4)

⁹¹ Alternative Report, Section 7.7.2, p. 139

⁹² Alternative Report, Section 7.7, p. 137

Minimum thresholds for salinity and nitrate were established during development of the Report at a network of monitoring sites in the Subbasin. In some cases, individual monitoring sites have minimum thresholds for both constituents and in other cases a threshold for only one constituent is established.⁹³ The Alternative Report indicates that minimum thresholds were not established to improve water quality; for example, the Report states that "...[t]he goal is to maintain the nitrate level below state primary drinking water standard except where they currently are exceeding those standards."⁹⁴

The Alternative Report contains conflicting statements regarding the minimum threshold for nitrate. The written description states that minimum thresholds for nitrate were set at either the drinking water maximum contaminant level (MCL) of 45 milligrams per liter (mg/L) for wells where historical concentrations were below the MCL, or 10 mg/L above the MCL (i.e., 55 mg/L) at wells where historical concentrations were above the MCL.⁹⁵ However, a table of sustainable management criteria in the Alternative Report⁹⁶ lists minimum thresholds for nitrate as either 45 or 110 mg/L and charts in an appendix also indicate that the minimum thresholds are either 45 or 110 mg/L; those same appendix charts also appear to show that the higher value was used for wells where concentrations had never exceeded the MCL.⁹⁷

Measurements of electrical conductivity (EC) were selected as the metric to track salinity. The Report contains conflicting information regarding the EC minimum thresholds, similar to the issue with nitrate discussed above. The written description states that minimum thresholds were set at the secondary MCL for EC of 1,600 micro-Siemens per centimeter ($\mu\text{S}/\text{cm}$)⁹⁸ or, for wells with "...maximum historic concentrations exceeding the MCL, the concentrations were increased by about 10 percent or conservatively 100 $\mu\text{S}/\text{cm}$."⁹⁹ However, a table of sustainable management criteria in the Alternative Report¹⁰⁰ lists minimum thresholds for EC as either 2,200 or 3,750 $\mu\text{S}/\text{cm}$, and charts in an appendix also indicate that the minimum thresholds are either 2,200 or 3,750 $\mu\text{S}/\text{cm}$. Those same appendix charts also appear to show that the higher value was used for wells where concentrations had never exceeded the cited MCL value and that sampling for EC since

⁹³ Alternative Report, Table 17, p. 130; Note that some sites listed for water quality have no minimum threshold or measurable objectives values set (e.g., RICE-01 or RICE-20)

⁹⁴ Alternative Report, Section 7.7.1, p. 139

⁹⁵ Alternative Report, Section 7.7.1, p. 139

⁹⁶ Alternative Report, Table 17, p. 130

⁹⁷ Alternative Report, Appendix O, Figures O-4 through O-6; see e.g., monitoring well 5101013-001 on Figure O-6 where historical concentrations do not appear to have been above the MCL

⁹⁸ The recommended secondary MCL for EC is 900 $\mu\text{S}/\text{cm}$ while the value of 1,600 $\mu\text{S}/\text{cm}$ is an upper secondary MCL; the value of 2,200 $\mu\text{S}/\text{cm}$ shown in tables and figures is a short-term upper secondary MCL generally allowable for only a short period of time pending development of new water sources; see https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/recentlyadoptedregulations/R-21-03-finalregtext.pdf

⁹⁹ Alternative Report, Section 7.7.1, p. 139

¹⁰⁰ Alternative Report, Table 17, p. 130

2005 has been limited (i.e., only one of the wells selected has more than one measurement in that time).¹⁰¹

The Alternative Report contains similarly conflicting statements about the measurable objectives for nitrate and salinity. The written description states that measurable objectives for nitrate and salinity were set at two-thirds of the MCL (i.e., either at 30 mg/L for nitrate or an EC value of approximately 1,056 $\mu\text{S}/\text{cm}$ for salinity, assuming use of the upper secondary MCL for salinity of 1,600 $\mu\text{S}/\text{cm}$) regardless of whether historical concentrations had been above the MCL.¹⁰² However, measurable objectives for nitrate listed in tables and figures indicate that the MCL (45 mg/L) was used as the measurable objective for wells where the minimum threshold was set above the MCL. Similarly, measurable objectives for salinity in tables and figures are shown as EC values of either 900 or 1,600 $\mu\text{S}/\text{cm}$.

e. Land Subsidence

GSP Regulations specify that the minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.¹⁰³

The Alternative Report does not indicate that groundwater use in the Subbasin was managed to any quantitative or objective standard related to subsidence prior to 2016. The undesirable result for subsidence defined in 2016 during development of the Report is "...damage to local infrastructure creating the need for costly repairs."¹⁰⁴ The Report does not describe which infrastructure the undesirable result pertains to or what is considered a "costly" repair.

The report states that the "goal of the minimum threshold is to keep inelastic subsidence due to groundwater extraction from exceeding six inches" and then states that the actual minimum thresholds will be the same groundwater-level thresholds used for the groundwater level and storage sustainability indicators (i.e., 18-feet below fall 1998 levels).¹⁰⁵ The Report does not contain an analysis relating the 18-foot groundwater level reduction to the goal of preventing subsidence in excess of six inches.

¹⁰¹ Alternative Report, Appendix O, Figures O-2 through O-3; see e.g., monitoring well 389605N1218102W003 shown on Figure O-3 where the single sample result shown appears to have been below the cited MCL value

¹⁰² Alternative Report, Section 7.7.3, p. 139

¹⁰³ 23 CCR § 354.28(c)(5)

¹⁰⁴ Alternative Report, Section 7.8.2, p. 140

¹⁰⁵ Alternative Report, Section 7.8.1, p. 140

f. Depletion of Interconnected Surface Water

GSP Regulations specify that the minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results.¹⁰⁶

The Alternative Report does not indicate that the Subbasin was managed to any quantitative or objective standard related to depletion of interconnected surface water prior to 2016. Undesirable results for depletion of interconnected surface water defined in 2016 during development of the Report are either an increase in depletion exceeding the historical maximum of 555,000 acre-feet per year or degradation of groundwater dependent ecosystems. The quantity of 550,000 acre-feet per year is discussed in the Report as the maximum annual streamflow *loss* from the Sacramento and Feather rivers to the aquifers of the Sutter Subbasin, as simulated by C2VSim from 1989 to 2009.¹⁰⁷ However, another table earlier in the Alternative Report cites that value as the maximum stream *gain* (i.e., flow from groundwater to the river; the table refers to “losses from groundwater”) during the same period; the table indicates the range of simulated stream *loss* is approximately 113,000 to 784,000 acre-feet per year.¹⁰⁸

Regardless of the intended value for streamflow loss, the Report describes that groundwater-level proxies were selected as the tracking metric for depletions of interconnected surface water.¹⁰⁹ Eleven total groundwater monitoring sites (nine in the Sutter Subbasin and two in the County portion of the East Butte Subbasin) were selected based on their known construction details, proximity to rivers or wetlands, and location within “the same aquifer” (presumably the shallow aquifer that is penetrated by the river). For those monitoring sites where groundwater levels had historically been above the river invert (i.e., the top of the streambed), the minimum threshold was set at 1 foot above the invert.¹¹⁰ The Report states that those minimum threshold levels would “...continue groundwater discharge to the rivers, even during droughts.” Conversely, at those sites where groundwater levels had historically been below the invert, the minimum threshold was set at five feet below the historical range of measured groundwater levels to limit recharge of surface water to groundwater.¹¹¹ The Report states that, “[w]ith the minimal allowable change, these threshold values should continue to maintain [the historical] range of inflows and outflows from the rivers but the range may increase by about 12,000 [acre-feet].”¹¹² The Report did not discuss how the 12,000 acre-feet value was determined

¹⁰⁶ 23 CCR § 354.28(c)(6)

¹⁰⁷ Alternative Report, Section 7.9, p. 140

¹⁰⁸ Alternative Report, Table 13, p. 103

¹⁰⁹ Alternative Report, Section 7.9.1, p. 141

¹¹⁰ Alternative Report, Section 7.9.1, p. 141

¹¹¹ Alternative Report, Section 7.9.1, p. 141

¹¹² Alternative Report, Section 7.9.1, p. 141

or how that value was consistent with increasing groundwater use in manner that would result in greater than 300,000 acre-feet of groundwater storage reduction (see Reduction of Groundwater Storage, above).

A table in the Report indicates that an undesirable result would occur if groundwater levels dropped below the minimum threshold at two or more representative monitoring wells.¹¹³ However, the Report did not discuss how that combination of minimum threshold exceedances relates to the qualitative description of the undesirable results described above.

D. Monitoring Networks

GSP Regulations require that each basin be monitored, and that a monitoring network include monitoring objectives, monitoring protocols, and data reporting requirements be developed that shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions.¹¹⁴

The Alternative Report describes a monitoring network for groundwater levels that includes existing wells monitored by the County for CASGEM. The Report states that water levels will be measured twice yearly in the spring (April) and fall (October). The Report indicates that the same wells used to monitor groundwater levels will be used to assess changes in storage in the Subbasin.

The groundwater quality monitoring network is composed of sites located both within, and in areas upgradient and cross-gradient from, areas of elevated nitrate and/or electrical conductivity. The Alternative Report notes that the water quality monitoring sites will be sampled once per year in October for at least the first five years of implementing the Alternative.

The Alternative Report notes that the analysis "...has demonstrated that land subsidence has not occurred in the subbasins but because groundwater is pumped from the basin a potential exists [for future subsidence]."¹¹⁵ The Report states that groundwater levels will be used as a surrogate to evaluate subsidence and that 25 wells will be used for that purpose. The Report also states that the County will track regional studies of subsidence that may be relevant to the Sutter Subbasin.

The Alternative Report states that the set of wells used to develop groundwater-level proxies for depletion of interconnected surface water will comprise the monitoring network for depletion of interconnected surface water. Additional wells will be added "to develop

¹¹³ Alternative Report, Table 17, p. 130

¹¹⁴ 23 CCR § 354.32

¹¹⁵ Alternative Report, Section 8.2.5, p. 152

historic groundwater gradients and flow directions.”¹¹⁶ These wells will be measured twice per year at the same times as the groundwater level monitoring network described above.

While not identified specifically as data gaps, the Alternative Report indicates that improvements needed to improve the monitoring network include: (1) identifying well construction details for 53 wells to assess which principal aquifer(s) they are screened in and (2) to install a well in the shallow aquifer near wetlands near the Sutter Bypass; the Report indicates that no current monitoring takes place near those wetlands.¹¹⁷

E. Projects and Management Actions

GSP Regulations require a description of the projects and management actions the submitting agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.¹¹⁸

The Alternative Report does not address projects and management actions, except for the indication that stakeholders preparing the Alternative desire to participate in conjunctive use projects in the future. The County, in its Alternative Elements Guide, states that no projects are identified because of the demonstration that the Sutter Subbasin is sustainable.

VI. Assessment

The following describes the evaluation and assessment of the Alternative for the Sutter Subbasin as determined by Department staff. In undertaking this assessment, Department staff did not conduct geologic or engineering studies, although Department staff may have relied on publicly available geologic or engineering or other technical information to verify claims or assumptions presented in the Alternative.¹¹⁹ As discussed above, Department staff have determined that the Sutter Subbasin Alternative satisfied the conditions for submission of an alternative.¹²⁰ The Alternative was submitted within the statutory period, the Subbasin was found to be in compliance with the reporting requirements of CASGEM, and staff find the Alternative to be complete and to cover the entire Subbasin (see Required Conditions, above). However, based on its evaluation and assessment of the Sutter Subbasin Alternative, Department staff do not believe that the

¹¹⁶ Alternative Report, Section 8.2.6, p. 152

¹¹⁷ Alternative Report, Section 8.4, p. 154

¹¹⁸ 23 CCR § 354.44

¹¹⁹ Instances where the Department review relied upon publicly available data that was not part of the Alternative are specifically noted in the assessment.

¹²⁰ 23 CCR § 358.4(a)

Alternative is able to satisfy the objectives of SGMA and recommend that the Alternative not be approved.¹²¹

A. Evaluation of Alternative Contents

The Alternative Report description of the County's responsibilities, along with the other stakeholders in the Sutter Subbasin, were adequate to demonstrate the County's authority to submit and implement the Alternative.

The County's description of the hydrogeologic conceptual model appears to be reasonable and based on best available information and science. The conceptual model described in the Alternative Report is generally consistent with Department staff's understanding of the Sutter Subbasin. The Report leverages existing datasets for groundwater levels and groundwater quality to describe conditions related to those sustainability indicators, and the interpretations of those datasets appear reasonable (see Groundwater Conditions, above). Although the Report discusses the simulated flux of water between groundwater and surface water systems, there is no discussion of the depletions of interconnected surface water due to groundwater use.

The Report makes use of the Department's coarse-grid version of the C2VSim model to generate information on the water budget, including to determine groundwater pumping, changes in storage, and fluxes between groundwater and surface water. The Report acknowledges some of the assumptions used for C2VSim (e.g., the representation of aquifer layers¹²²) are not consistent with the conceptual model developed by the County and identifies uncertainties regarding the simulated water budget (see Water Budget, above). One uncertainty identified is that groundwater recharge simulated by C2VSim is roughly three times less than recharge estimates derived by the County from a regional agricultural water management plan. The County concludes that this discrepancy indicates C2VSim overestimates recharge from rivers¹²³ but, other than noting that the agricultural water management plan was developed more recently than C2VSim, does not describe how, and based on what evidence, this conclusion was reached.

Given the County's reliance on C2VSim for development of the water budget, including to estimate historical pumping in the Subbasin in support of the sustainable yield determination, Department staff believe it would be appropriate and consistent with standard practices to discuss why the model is appropriate for that use. It was not clear to Department staff how the County determined that the coarse-grid C2VSim model, a Central Valley-wide model, was appropriate for development of subbasin-scale water budgets in support of the Alternative. While acknowledging that the GSP Regulations

¹²¹ Water Code § 10733.6(a); 23 CCR § 358.4(b)

¹²² Alternative Report, Section 4.6, p. 47

¹²³ Alternative Report, Section 6.3, p. 124

state the Department will make C2VSim available, it is nevertheless imperative that agencies using the model in support of groundwater management efforts evaluate whether it is a sufficient and credible tool for that use.

Based on information contained in the Alternative, it does not appear that groundwater use in the Sutter Subbasin was managed to any quantitative or objective standards prior to development of the Alternative Report in late 2016, or that any type of functionally-equivalent undesirable result standard had been identified. The SGMA definition of sustainable yield requires an avoidance of undesirable results, and the lack of functionally-equivalent standards for undesirable results in the Sutter Subbasin is a significant deficiency for an alternative submitted pursuant to Water Code Section 10733.6(b)(3) which, to satisfy the objectives of SGMA, is required to demonstrate operation within the sustainable yield over a period of at least 10 years.

The Alternative Report calculates average annual pumping during the base period (1989 to 2009), as simulated by C2VSim, and claims that value to be equivalent to the sustainable yield because none of the undesirable results defined in SGMA were present in the Subbasin. However, the Alternative Report does not provide an explanation or justification for how the absence of undesirable results for the Subbasin was determined. The Report states that “stakeholders” involved with preparation of the Alternative met in mid- to late-2016 to decide whether undesirable results were present (see Sustainability Indicators, above), but the Report does not describe what guidance that group may have provided, or how it was utilized to conclude that undesirable results were not present.

Because groundwater levels are likely to have remained stable over the base period, Department staff find that the quantity of water in storage is likely to have remained relatively stable over that period as well, and that it is unlikely significant subsidence has occurred. However, the Alternative Report shows that limited groundwater quality monitoring has been performed, particularly over the last 10 years at the monitoring sites identified in the Report, to demonstrate whether undesirable results have occurred. The Alternative Report also does not analyze the depletion of interconnected surface water due to groundwater use in the Subbasin, and it is not clear what basis or standard the County used to determine that undesirable results related to those depletions have not occurred.

The Alternative Report sets quantitative sustainable management criteria related to future planned operation of the Subbasin, which apparently includes an increase in conjunctive management of groundwater and surface water. The rationale for the selection of the future operating criteria in the Sutter Subbasin, however, lacks thorough and reasonable analysis. The Alternative Report states, without supporting evidence, that it is reasonable to withdraw 10 percent of the overall groundwater storage in the Subbasin, and then uses that as the rationale for setting its minimum thresholds for groundwater levels and

storage. The Alternative Report states that the County will use those same groundwater-level thresholds, representing an 18-foot reduction in groundwater levels relative to a historical low, as a proxy for subsidence but does not explain how it was determined that those groundwater-level reductions would prevent the stated, locally-defined goal of preventing inelastic subsidence in excess of six inches.

Water quality minimum thresholds are described as maintaining water quality below regulatory MCLs, except in locations where those levels had historically been exceeded. It is not clear why those existing MCL exceedances do not represent an undesirable result when the goal for the rest of the Subbasin is to remain below those levels. It is also not clear, when comparing written descriptions, figures, and tables, the rationale used to set minimum thresholds and measurable objectives at sites with historical exceedances of the MCL; those discrepancies are noted above (see Degraded Water Quality, above).

The Alternative Report's description of sustainable management criteria for depletion of interconnected surface water appear to be in conflict. One of the locally-defined undesirable results is an increase in stream depletion above a historical value. However, the minimum thresholds for depletion of interconnected surface water are based, with few exceptions, on groundwater levels that are lower than historical conditions. Those lower groundwater levels represent the stated intent to increase groundwater use in the Subbasin, which could result in increased stream depletion. The Alternative Report contains numerous technical discrepancies and errors related to the discussion of depletion of interconnected surface water, as listed below:

- Discussion in the Alternative Report repeatedly refers to the maximum of the range in historical streamflow losses as approximately 555,000 acre-feet per year, when information elsewhere in the Alternative Report indicates that value represents the maximum annual *gain* in streamflow.
- The Alternative Report appears to equate streamflow depletions with streamflow losses (i.e., total flows from streams to groundwater) simulated by C2VSim. The County estimates its groundwater pumping during the base period ranged between approximately 121,000 and 235,000 acre-feet per year. The volume of depletion due to groundwater use should, therefore, generally be within a similar range. The quantity of streamflow loss cited (550,000 acre-feet per year) does not appear to be depletion due to groundwater use.
- The Alternative Report lists two locally-defined undesirable results - exceeding historical streamflow losses and degradation of groundwater dependent ecosystems. It is not clear how the minimum thresholds identified in the Report, which are generally set lower than historically observed groundwater levels, are consistent with avoiding those undesirable results.

- The Alternative Report does not provide evidence or explanation to support that there is significant correlation between the quantity of depletion of interconnected surface water due to groundwater use and the groundwater-level proxies selected.
- Minimum thresholds were established at one-foot above the river invert elevation for those monitoring sites where groundwater levels were historically above the invert. The Alternative Report states that those thresholds would “continue groundwater discharge to rivers, even during droughts.” In fact, the flow would be proportional to the hydraulic gradient between groundwater elevation and the river stage, not the invert elevation. On highly managed rivers such as the Feather and Sacramento, it is extremely unlikely that river stage would drop to less than 1 foot above the invert. Therefore, if groundwater levels decline to one foot above the invert elevation, water will most likely discharge from the stream to the aquifer and would not “continue discharge to rivers”.

Generally, the Alternative Report lacks sufficient justification that groundwater was managed in such a way as to avoid undesirable results prior to 2015, both because of the absence of clearly defined criteria for undesirable results consistent with the requirements of SGMA and also because, even assuming the validity of the undesirable result criteria selected in the Alternative Report, it is not clear that the Subbasin has been successfully managed to achieve those criteria for the 10-year base period required. As such, Department staff recommend that the Alternative to not be approved.

The County appears to have utilized the Alternative, required by SGMA to be a demonstration that the Sutter Subbasin had been operated within its sustainable yield for at least 10 years, to describe sustainable management criteria developed in mid- to late-2016 for future operation of the Subbasin. Department staff find, consistent with the intent of SGMA, that when setting criteria for future operations, particularly when those operations include significantly more groundwater use than in the past, the County should develop a GSP following the process described in the GSP Regulations.