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CALIFORNIA DEPARTMENT OF WATER RESOURCES
SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE
715 P Street, 8th Floor | Sacramento, CA 95814 | P.O. Box 942836 | Sacramento, CA 94236-0001

August 4, 2023

Ronnie Samuelian
Kings Subbasin Point of Contact
1800 30th Street, Suite 280
Bakersfield, CA 93301
rsamuelian@ppeng.com

RE: Approved Determination of the Revised Groundwater Sustainability Plans Submitted for the San Joaquin Valley – Kings Subbasin

Dear Ronnie Samuelian,

The Department of Water Resources (Department) has evaluated the seven groundwater sustainability plans (GSPs) submitted for the San Joaquin Valley – Kings Subbasin (Subbasin), as well as the materials considered to be part of the required coordination agreement. Collectively, the seven GSPs and the coordination agreement are referred to as the Plan for the Subbasin. The Department has evaluated the resubmitted Plan for the Kings Subbasin in response to the Department's incomplete determination on January 28, 2022 and has determined the GSP is approved. The approval is based on recommendations from the Staff Report, included as an exhibit to the attached Statement of Findings, which describes that the Plan has taken sufficient action to correct deficiencies identified by the department and satisfies the objectives of the Sustainable Groundwater Management Act (SGMA) and substantially complies with the GSP Regulations. The Staff Report also proposes recommended corrective actions that the Department believes will enhance the GSP and facilitate future evaluation by the Department. The Department strongly encourages the recommended corrective actions be given due consideration and suggests incorporating all resulting changes to the GSP in future updates.

Recognizing SGMA sets a long-term horizon for groundwater sustainability agencies (GSAs) to achieve their basin sustainability goals, monitoring progress is fundamental for successful implementation. GSAs are required to evaluate their GSPs at least every five years and whenever the Plan is amended, and to provide a written assessment to the Department. Accordingly, the Department will evaluate approved GSPs and issue an assessment at least every five years. The Department will initiate the first five-year review of the Plan no later than January 31, 2025.

Please contact Sustainable Groundwater Management staff by emailing sgmps@water.ca.gov if you have any questions related to the Department's assessment or implementation of your GSP.

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Thank You,

Paul Gosselin

Paul Gosselin
Deputy Director
Sustainable Groundwater Management

Attachment:

1. Statement of Findings Regarding the Determination of Approval of the San Joaquin Valley – Kings Subbasin Groundwater Sustainability Plans (August 4, 2023)

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STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE APPROVAL OF THE SAN JOAQUIN VALLEY – KINGS SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

The Department of Water Resources (Department) is required to evaluate whether a submitted groundwater sustainability plan (GSP or Plan) conforms to specific requirements of the Sustainable Groundwater Management Act (SGMA or Act), is likely to achieve the sustainability goal for the basin covered by the Plan, and whether the Plan adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) The Department is directed to issue an assessment of the Plan within two years of its submission. (Water Code § 10733.4.) If a Plan is determined to be Incomplete, the Department identifies deficiencies that preclude approval of the Plan and identifies corrective actions required to make the Plan compliant with SGMA and the GSP Regulations. The Groundwater Sustainability Agency (GSA) has up to 180 days from the date the Department issues its assessment to make the necessary corrections and submit a revised Plan. (23 CCR § 355.2(e)(2)). In the San Joaquin Valley – Kings Subbasin (No. 5-022.08) (Subbasin), seven separate revised GSPs were prepared by seven GSAs pursuant to the required coordination agreement. This Statement of Findings explains the Department's decision regarding these revised Plans covering the Subbasin. Collectively, the seven GSPs and the coordination agreement are referred to as the Plan for the Subbasin.

Department management has discussed the Plan with staff and has reviewed the Department Staff Report, entitled Sustainable Groundwater Management Program Groundwater Sustainability Plan Assessment Staff Report, attached as Exhibit A, which recommends approval of the Plan. Department management is satisfied that staff have conducted a thorough evaluation and assessment of the Plan and concurs with staff's recommendation and all the recommended corrective actions. The Department therefore **APPROVES** the Plan and makes the following findings:

A. The initial Plan for the basin submitted by the GSA for the Department's evaluation satisfied the required conditions as outlined in § 355.4(a) of the GSP Regulations (23 CCR § 350 et seq.), and Department Staff therefore evaluated the initial Plan.

B. On January 28, 2022, the Department issued a Staff Report and Findings determining the initial Plan submitted by the Agencies for the basin to be incomplete because the Plan did not satisfy the requirements of SGMA, nor did

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it substantially comply with the GSP Regulations. At that time, the Department provided corrective actions in the Staff Report that were intended to address the deficiencies that precluded approval. Consistent with the GSP Regulations, the Department provided the Agencies with up to 180 days to address the deficiencies detailed in the Staff Report. On July 27, 2022, within the 180 days provided to remedy the deficiencies identified in the Staff Report related to the Department's initial incomplete determination, the Agencies resubmitted a revised GSP to the Department for evaluation. When evaluating a revised Plan that was initially determined to be incomplete, the Department reviews the materials (e.g., revised or amended GSP) that were submitted within the 180-day deadline and does not review or rely on materials that were submitted to the Department by the GSA after the resubmission deadline. Part of the Department's review focuses on how the Agency has addressed the previously identified deficiencies that precluded approval of the initially submitted Plan. The Department shall find a Plan previously determined to be incomplete to be inadequate if, after consultation with the State Water Resources Control Board, the Agency has not taken sufficient actions to correct the deficiencies previously identified by the Department. (23 CCR § 355.2(e)(3)(C).) If the Department determines the Agency has sufficiently addressed those deficiencies, the Department may evaluate other components of the Plan, particularly to assess whether and, if so, how revisions to address deficiencies may have affected other components of a Plan or its likelihood of achieving sustainable groundwater management.

C. The Department's initial Staff Report identified the following deficiencies that precluded approval of the initially submitted Plan. After staff's thorough evaluation of the revised Plan, the Department makes the following findings regarding the sufficiency of the actions taken by the Agency to correct those deficiencies:

1. Deficiency 1: The corrective action advised the Agencies to address several aspects of the Plan's disclosure, discussion, and analyses of groundwater level sustainable management criteria and potential impacts to groundwater users and uses. The Department found that the initial GSP did not define significant and unreasonable effects as the result of chronic lowering of groundwater levels. The Department also found that the GSP lacked sufficient explanation for the established minimum thresholds and undesirable results for groundwater levels.

   The 2023 Staff Report associated with the revised Plan indicates that the Agencies have taken sufficient actions to correct this deficiency such that, at this time, although the Staff Report includes recommended corrective actions to further align this aspect of the Plan with the GSP Regulations, the Department no longer finds the deficiency to preclude approval, and

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further finds that the Agencies have the ability to achieve the sustainability goal for the basin on SGMA timelines, and that the Department will be able to periodically monitor and evaluate the likelihood of Plan implementation to achieve sustainability.

2. Deficiency 2: The corrective action advised the Agencies to address several aspects of the Plan's disclosure, discussion, and analyses of inelastic land subsidence sustainable management criteria and potential impacts to beneficial users and uses. The initial GSP did not include a coordinated approach to identify the land uses and property interests that have been affected or are likely to be affected by land subsidence nor did the GSAs identify the amount of subsidence these land uses and property interests can tolerate throughout GSP implementation.

   The 2023 Staff Report associated with the revised Plan indicates that the Agencies have taken sufficient actions to correct this deficiency such that, at this time, although the Staff Report includes recommended corrective actions to further align this aspect of the Plan with the GSP Regulations, the Department no longer finds the deficiency to preclude approval, and further finds that the Agencies have the ability to achieve the sustainability goal for the basin on SGMA timelines, and that the Department will be able to periodically monitor and evaluate the likelihood of Plan implementation to achieve sustainability.

3. Deficiency 3: The corrective action advised the Agencies to address several aspects of the Plan's disclosure, discussion, and analyses of interconnected surface water sustainable management criteria. The initial Plan did not establish sustainable management criteria for the depletions interconnected surface water sustainability indicator.

   The 2023 Staff Report associated with the revised Plan indicates that the Agencies have taken sufficient actions to correct this deficiency such that, at this time, although the Staff Report includes recommended corrective actions to further align this aspect of the Plan with the GSP Regulations, the Department no longer finds the deficiency to preclude approval, and further finds that the Agencies have the ability to achieve the sustainability goal for the basin on SGMA timelines, and that the Department will be able to periodically monitor and evaluate the likelihood of Plan implementation to achieve sustainability.

4. Deficiency 4: The corrective action advised the Agencies to address several aspects of the Plan's disclosure, discussion, and analyses of water quality sustainable management criteria and potential impacts to groundwater users and uses. The initial GSP did not establish sustainable

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management criteria nor include the necessary detail required to establish sustainable management criteria at each monitoring location.

The 2023 Staff Report associated with the revised Plan indicates that the Agencies have taken sufficient actions to correct this deficiency such that, at this time, although the Staff Report includes recommended corrective actions to further align this aspect of the Plan with the GSP Regulations, the Department no longer finds the deficiency to preclude approval, and further finds that the Agencies have the ability to achieve the sustainability goal for the basin on SGMA timelines, and that the Department will be able to periodically monitor and evaluate the likelihood of Plan implementation to achieve sustainability.

D. The Plan satisfies the required conditions as outlined in § 355.4(a) of the GSP Regulations (23 CCR § 350 et seq.):

1. The Plan was complete, meaning it generally appeared to include the information required by the Act and the GSP Regulations sufficient to warrant a thorough evaluation and issuance of an assessment by the Department. (23 CCR § 355.4(a)(2).)

2. The Plan, either on its own or in coordination with other Plans, appears to cover the entire Basin sufficient to warrant a thorough evaluation. (23 CCR § 355.4(a)(3).)

E. The general standards the Department applied in its evaluation and assessment of the Plan are: (1) “conformance” with the specified statutory requirements, (2) “substantial compliance” with the GSP Regulations, (3) whether the Plan is likely to achieve the sustainability goal for the Subbasin within 20 years of the implementation of the Plan, and (4) whether the Plan adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) Application of these standards requires exercise of the Department’s expertise, judgment, and discretion when making its determination of whether a Plan should be deemed “approved,” “incomplete,” or “inadequate.”

The statutes and GSP Regulations require Plans to include and address a multitude and wide range of informational and technical components. The Department has observed a diverse array of approaches to addressing these technical and informational components being used by GSAs in different basins throughout the state. The Department does not apply a set formula or criterion that would require a particular outcome based on how a Plan addresses any one of SGMA’s numerous informational and technical components. The Department finds that affording flexibility and discretion to local GSAs is consistent with the standards identified above; the state policy that sustainable groundwater

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management is best achieved locally through the development, implementation, and updating of local plans and programs (Water Code § 113); and the Legislature's express intent under SGMA that groundwater basins be managed through the actions of local governmental agencies to the greatest extent feasible, while minimizing state intervention to only when necessary to ensure that local agencies manage groundwater in a sustainable manner. (Water Code § 10720.1(h)) The Department's final determination is made based on the entirety of the Plan's contents on a case-by-case basis, considering and weighing factors relevant to the particular Plan and Subbasin under review.

F. In making these findings and Plan determination, the Department also recognized that: (1) The Department maintains continuing oversight and jurisdiction to ensure the Plan is adequately implemented; (2) the Legislature intended SGMA to be implemented over many years; (3) SGMA provides Plans 20 years of implementation to achieve the sustainability goal in a Subbasin (with the possibility that the Department may grant GSAs an additional five years upon request if the GSA has made satisfactory progress toward sustainability); and, (4) local agencies acting as GSAs are authorized, but not required, to address undesirable results that occurred prior to enactment of SGMA. (Water Code §§ 10721(r); 10727.2(b); 10733(a); 10733.8.)

G. The Plan conforms with Water Code §§ 10727.2 and 10727.4, substantially complies with 23 CCR § 355.4, and appears likely to achieve the sustainability goal for the Subbasin.

1. The sustainable management criteria and the Plan's goal to ensure that the Subbasin maintains a reliable water supply for current and future beneficial users are sufficiently justified and explained. The Plan relies on credible information and science to quantify the groundwater conditions that the Plan seeks to avoid and provides an objective way to determine whether the Subbasin is being managed sustainably in accordance with SGMA. (23 CCR § 355.4(b)(1).)

2. The Plan demonstrates an understanding of where data gaps exist (i.e., land subsidence and interconnected surface water) and demonstrates a commitment to eliminate those data gaps. The Plan intends to eliminate land subsidence data gaps through the Data Gap Project, which includes investigating and evaluating groundwater conditions in the confined aquifer. The GSP plans to address interconnected surface water data gaps through the Surface Water-Groundwater Interconnection Data Gap Analysis project. This project will determine interconnected water bodies, allow the GSAs to coordinate with water rights holders and river management programs, and evaluate impacts of groundwater pumping on surface water. Filling these known data gaps, and others described in the

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Plan, should lead to the refinement of the GSAs' monitoring networks, the Subbasin's water model, and sustainable management criteria to better inform and guide future adaptive management strategies. (23 CCR § 355.4(b)(2).)

3. The sustainable management criteria and projects and management actions are reasonable and commensurate with the level of understanding of the Subbasin setting. The projects and management actions described in the Plan provide a feasible approach to achieving the Subbasin's sustainability goal and should provide the GSAs with greater versatility to adapt and respond to changing conditions and future challenges during GSP implementation. (23 CCR § 355.4(b)(3).)

4. The Plan provides a detailed explanation of how the various interests of groundwater uses and users in the Subbasin were considered in developing the sustainable management criteria and how those interests would be impacted by the chosen minimum thresholds. (23 CCR § 355.4(b)(4).)

5. The Plan's projects and management actions appear feasible at this time and appear likely to prevent undesirable results and ensure that the Subbasin is operated within its sustainable yield within 20 years. The Department will continue to monitor Plan implementation and reserves the right to change its determination if projects and management actions are not implemented or appear unlikely to prevent undesirable results or achieve sustainability within SGMA timeframes. (23 CCR § 355.4(b)(5).)

6. The Plan includes a reasonable assessment of overdraft conditions and includes reasonable means to mitigate overdraft, if present. (23 CCR § 355.4(b)(6).)

7. At this time, the Department has insufficient evidence to conclude the Plan will adversely affect the ability of the adjacent basins to implement their GSPs or impede achievement of their sustainability goals. The Department will continue to monitor these conditions as Plan implementation proceeds. While the Plan does provide a general discussion regarding the impacts that its sustainable management criteria may have on adjacent basins, the Department encourages the GSAs to collaborate with these basins (i.e., enter into voluntary interbasin agreements) to address cross-basin groundwater concerns, such that Department intervention is not required. (23 CCR § 355.4(b)(7).)

8. A satisfactory coordination agreement has been adopted by all relevant parties. (23 CCR § 355.4(b)(8).)

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9. Given the legal authority and financial resources of the GSAs' member agencies and the additional authorities granted the GSAs' under SGMA, the Department concludes the GSAs' likely have the legal authority and financial resources necessary to implement the Plan. (23 CCR § 355.4(b)(9).)

10. Through review of the Plan and consideration of public comments, the Department determines that the GSAs adequately responded to comments that raised credible technical or policy issues with the Plan, sufficient to warrant approval of the Plan at this time. The Department also notes that the recommended corrective actions included in the Staff Report are important to addressing certain technical or policy issues that were raised and, if not addressed before future, subsequent plan evaluations, may preclude approval of the Plan in those future evaluations. (23 CCR § 355.4(b)(10).)

H. In addition to the grounds listed above, DWR also finds that:

1. The Plan conducted a well impact analysis to better understand the potential impacts of groundwater level minimum thresholds on domestic well users. The analysis concluded that approximately 1,150 domestic wells would go dry if minimum thresholds were reached. The Department provided a recommended corrective action in the 2023 Staff Report related to the Plan's analysis of well impacts, recommending the GSAs conduct further analyses to demonstrate that less than 15% of shallow wells will not be impacted. The GSAs, however, propose a Domestic Well Mitigation Program as a means to develop policies and procedures for mitigating dry domestic wells. The Department developed its GSP Regulations consistent with and intending to further the policy through implementation of SGMA and the Regulations, primarily by achieving sustainable groundwater management in a basin. By ensuring substantial compliance with the GSP Regulations, the Department has considered the state policy regarding the human right to water in its evaluation of the Plan. (23 CCR § 350.4(g).)

2. The Plan acknowledges and identifies interconnected surface waters within the Subbasin. The GSAs propose to use groundwater levels as proxy for the depletions of interconnected surface water sustainability indicator, however, sustainable management criteria have not been established. The Plan includes a data gap analysis for interconnected surface water which is sectioned into three phases: determining interconnection status; coordinating with water rights holders and river management programs; and evaluating impacts of groundwater

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pumping on surface water. While the Plan has made progress in correcting deficiencies related to interconnected surface water, the Department recognizes that additional data gaps exist within the Subbasin. The GSAs should fill data gaps, evaluate additional modeling data, and coordinate with agencies and interested parties to understand beneficial uses and users that may be impacted by depletions of interconnected surface water caused by groundwater pumping. Future updates to the Plan should aim to improve the sustainable management criteria as more information and improved methodologies become available.

3. The California Environmental Quality Act (Public Resources Code § 21000 *et seq*.) does not apply to the Department's evaluation and assessment of the Plan.

Accordingly, the revised GSP submitted by the Agencies for the Kings Subbasin is hereby **APPROVED**. The recommended corrective actions identified in the Staff Report will assist the Department's future review of the Plan's implementation for consistency with SGMA and the Department therefore recommends the Agencies address them by the time of the Department's periodic review, which is set to begin on January 28, 2025, as required by Water Code § 10733.8. Failure to address the Department's Recommended Corrective Actions before future, subsequent plan evaluations, may lead to a Plan being determined incomplete or inadequate.

Signed:

Karla Nemeth

Karla Nemeth, Director
Date: August 4, 2023

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – San Joaquin Valley – Kings Subbasin (August 4, 2023)

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

Groundwater Basin Name:	San Joaquin Valley Basin – Kings Subbasin (No. 5-022.08)
Number of GSPs:	7 (see list below)
Number of GSAs:	7 (see list below)
Submittal Type:	Revised Plan in Response to Incomplete Determination of the 2020 Groundwater Sustainability Plan
Submittal Date:	July 27, 2022
Recommendation:	Approve
Date:	August 4, 2023

On July 27, 2022, multiple groundwater sustainability agencies (GSAs) submitted multiple groundwater sustainability plans (GSPs) for the entire Kings Subbasin (Subbasin), which are coordinated pursuant to a required coordination agreement, to the Department of Water Resources (Department) in response to the Department's incomplete determination on January 28, 2022[1] for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA)[2] and GSP Regulations.[3] In total, seven GSPs have been revised, adopted, and implemented by seven GSAs. Collectively, all 2022 GSPs and the coordination agreement are, for evaluation and assessment purposes, treated and referred to as the Plan for the Subbasin. Individually, the GSPs include the following:

- *Central Kings GSP – Revised and Adopted July 13, 2022* (CKGSP) – prepared by the Central Kings GSA (CKGSA)
- *James GSP – Revised and Adopted June 29, 2022* (JGSP) – prepared by the James GSA (JGSA)
- *Kings River East GSP – Revised and Adopted July 5, 2022* (KREGSP) – prepared by the Kings River East GSA (KREGSA)
- *McMullin Area GSP – Revised and Adopted July 7, 2022* (MAGSP) – prepared by the McMullin Area GSA (MAGSA)
- *North Fork Kings GSP – Revised and Adopted July 14, 2022* (NFKGSP) – prepared by the North Fork Kings GSA (NFKGSA)

[1] Water Code § 10733.4(b); 23 CCR § 355.4(a)(4); https://sgma.water.ca.gov/portal/service/gspdocument/download/7781.
[2] Water Code § 10720 *et seq*.
[3] 23 CCR § 350 *et seq*.

- *North Kings GSP – Revised and Adopted June 13, 2022* (NKGSP) – prepared by the North Kings GSA (NKGSA)
- *South Kings GSP – Revised and Adopted July 13, 2023* (SKGSP) – prepared by the South Kings GSA (SKGSA)

After evaluation and assessment, Department staff conclude that the GSAs have taken sufficient actions to correct the deficiencies identified in the Department's incomplete determination and that the Plan contains the required components of a GSP. The Plan demonstrates a thorough understanding of the Subbasin; is based on what appears to be the best available science and information; sets reasonable and supported sustainable management criteria to prevent the defined undesirable results; has an adequate monitoring network; and proposes a set of projects and management actions that, if successfully implemented, are likely to achieve the sustainability goal defined for the Subbasin.

While Department staff are recommending Plan approval at this time, this report identifies and describes numerous recommended corrective actions that staff believe must be promptly addressed during Plan implementation. However, most of these recommended corrective actions are related to updating multiple Plan sections to include data and information related to the Subbasin's confined aquifer and several others are related to further justifying and clarifying the sustainable management criteria of multiple sustainability indicators. However, staff note that the Plan includes several projects demonstrating the preemptive actions being taken by the GSAs to better understand the Subbasin prior to the release of this assessment. The data and information obtained by these projects should allow the GSAs to adequately respond to the Department's recommended corrective actions by the Plan's next periodic evaluation.[4]

Additionally, Department staff understand that most GSPs will need to be updated prior to reaching its sustainability goal. The Department also encourages GSAs to embrace adaptive management concepts to enhance GSP implementation by adjusting those sections affected by changing basin conditions, incorrect initial assumptions, and/or reduced uncertainty due to the collection of previously unavailable data. Furthermore, the Department believes that if a basin has made substantial GSP improvements, and if the GSAs have identified and begun implementing projects to further improve the GSP, then the GSAs should be provided the opportunity to complete these improvements on their own. Department staff believe the Kings Subbasin has demonstrated that they are able to improve their GSP and respond to the Department's recommended corrective actions in a timely manner. Department staff will continue to monitor and evaluate Plan implementation and the Subbasin's progress toward achieving the sustainability goal through annual reporting and future periodic evaluations of the GSP and its implementation.

[4] 23 CCR § 356.4.

This assessment includes six sections:

a) **Section 1 – Summary:** Provides an overview of the Department's assessment and recommendations.

b) **Section 2 – Evaluation Criteria:** Describes the legislative requirements and the Department's evaluation criteria.

c) **Section 3 – Required Conditions:** Describes the submission requirements of a response to an incomplete determination to be evaluated by the Department.

d) **Section 4 – Deficiency Evaluation:** Provides an assessment of whether and how the contents included in the GSP resubmittal addressed the deficiencies identified by the Department in the initial incomplete determination.

e) **Section 5 – Plan Evaluation:** Provides a detailed assessment of the contents included in the GSP organized by each Subarticle outlined in the GSP Regulations.

f) **Section 6 – Staff Recommendation:** Includes the staff recommendation for the Plan and recommended corrective actions.

1 SUMMARY

Department staff conclude that the GSAs took sufficient action to correct the deficiencies previously identified. Accordingly, Department staff recommend **approval** of the Plan for the Kings Subbasin, along with implementation of recommended corrective actions described in this Staff Report, which should be addressed by the Plan's next periodic evaluation to further improve Plan implementation and achievement of basin sustainability in accordance with SGMA timelines.

The GSAs have identified areas for improvement of their Plans (e.g., addressing the confined aquifer data gap and updating the associated Plan sections; addressing the interconnected surface water data gap and establishing initial sustainable management criteria; initiating implementation of the Domestic Well Mitigation Program; and filling various other identified data gaps). Department staff concur that those items are important and recommend that the GSAs address them as soon as possible. Department staff have also identified additional recommended corrective actions designed to address shortcomings of the Plan, as described in this Staff Report, that the GSAs should address by the next periodic evaluation (see Section 6). The recommended corrective actions generally focus on the following:

1) Providing additional justification for, and further clarification of, multiple sustainability indicators' sustainable management criteria.
2) Updating the Subbasin's well impact analysis and demonstrating implementation of the Domestic Well Mitigation Program.
3) Incorporating the data and information, obtained from filling the confined aquifer data gap, into the relevant Plan sections.
4) Describing the basin-wide methodology used to identify each plan area's chemicals of concern.
5) Updating the Subbasin's historical water budget.
6) Identifying and filling water budget related data gaps.
7) Clarifying the volume of overdraft being mitigated during Plan implementation.
8) Updating various aspects of each sustainability indicators' monitoring network.
9) Further describing the implementation timeline and expected benefits of projects and management actions.
10) Providing additional details concerning the land subsidence capacity analysis and the degraded water quality site-specific investigation projects.

Addressing the recommended corrective actions identified in Section 6 of this Staff Report will be important to demonstrate, on an ongoing basis, that implementation of the Plan is likely to achieve the Subbasin's sustainability goal.

2 EVALUATION CRITERIA

The Department evaluates whether a Plan conforms to the statutory requirements of SGMA[5] and is likely to achieve the basin's sustainability goal,[6] whether evaluating a basin's first Plan,[7] a Plan previously determined incomplete,[8] an amended Plan,[9] or a GSA's periodic evaluation to an approved Plan.[10] To achieve the sustainability goal, each version of the Plan must demonstrate that implementation will lead to sustainable groundwater management, which means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.[11] The Department is also required to evaluate, on an ongoing basis, whether the Plan will adversely affect the ability of an adjacent basin to implement its groundwater sustainability program or achieve its sustainability goal.[12]

The Plan evaluated in this Staff Report is a revision of the 2020 Plan, which was evaluated by the Department and found to be incomplete. An incomplete Plan is one which Department staff identify as containing one or more deficiencies that preclude its initial approval. Deficiencies may result from supporting information that is insufficiently detailed or analyses that are insufficiently thorough or unreasonable, or where Department staff determine it is unlikely the GSA(s) in the basin/subbasin could achieve the sustainability goal under the proposed Plan. After GSAs have been afforded up to 180 days to address the deficiencies and based on the GSAs' efforts, the Department can either approve[13] the Plan or determine the Plan inadequate.[14]

The Department's evaluation and assessment of a revised or amended Plan, subsequent to the initial Plan being found to be incomplete, as presented in this Staff Report, continues to follow Article 6 of the GSP Regulations[15] to determine whether the Plan, with revisions or additions prepared by the GSA, complies with SGMA and substantially complies with the GSP Regulations.[16] As stated in the GSP Regulations, "substantial compliance means that the supporting information is sufficiently detailed and the analyses sufficiently thorough and reasonable, in the judgment of the Department, to evaluate the Plan, and the Department determines that any discrepancy would not materially affect the

[5] Water Code §§ 10727.2, 10727.4, 10727.6.
[6] Water Code § 10733; 23 CCR § 354.24.
[7] Water Code § 10720.7.
[8] 23 CCR § 355.2(e)(2).
[9] 23 CCR § 355.10.
[10] 23 CCR § 355.6.
[11] Water Code § 10721(v).
[12] Water Code § 10733(c).
[13] 23 CCR §§ 355.2(e)(1).
[14] 23 CCR §§ 355.2(e)(3).
[15] 23 CCR § 355 *et seq*.
[16] 23 CCR § 350 *et seq*.

ability of the Agency to achieve the sustainability goal for the basin, or the ability of the Department to evaluate the likelihood of the Plan to attain that goal."[17]

When reviewing a revised or amended Plan that had previously been determined to be incomplete, Department staff primarily assess whether the GSA(s) have taken sufficient actions to correct any deficiencies identified by the Department.[18] A Plan approval does not signify that Department staff, were they to exercise the professional judgment required to develop a Plan for the basin, would make the same assumptions and interpretations as those contained in the revised Plan, but simply that Department staff have determined that the modified assumptions and interpretations relied upon by the submitting GSA(s) are supported by adequate, credible evidence, and are scientifically reasonable. Assessment of a revised or amended Plan previously determined to be incomplete may involve the review of new information presented by the GSA(s), including models and assumptions, and a reevaluation of that information based on scientific reasonableness. In conducting its assessment, Department staff does not recalculate or reevaluate technical information or perform its own geologic or engineering analysis of that information.

The recommendation to approve a Plan previously determined to be incomplete is based on a determination that the GSA(s) have taken sufficient actions (e.g., amended or revised the Plan) to correct the deficiencies previously identified by the Department that precluded earlier approval.

3 REQUIRED CONDITIONS

For a Plan that the Department determines to be incomplete, the Department identifies corrective actions to address those deficiencies that preclude approval of the Plan as initially submitted. The GSAs in a basin, whether developing a single GSP covering the basin or multiple GSPs, must attempt to sufficiently address those corrective actions within the time provided, not to exceed 180 days, for the Plan to be evaluated by the Department.

3.1 INCOMPLETE RESUBMITTAL

The GSP Regulations specify that the Department shall evaluate a revised GSP if the GSA has taken corrective actions to address deficiencies within 180 days from the date the Department issued an incomplete determination.[19]

The Department issued the incomplete determination on January 28, 2022. The GSAs submitted their individual GSPs and the coordination agreement on July 27, 2022, in compliance with the 180-day deadline.

[17] 23 CCR § 355.4(b).
[18] 23 CCR § 355.2(e)(3)(C).
[19] 23 CCR § 355.4(a)(4).

4 DEFICIENCY EVALUATION

As stated in Section 355.4 of the GSP Regulations, a basin "shall be sustainably managed within 20 years of the applicable statutory deadline consistent with the objectives of the Act." The Department's assessment is based on a number of related factors including whether the elements of a GSP were developed in the manner required by the GSP Regulations, whether the GSP was developed using appropriate data and methodologies and whether its conclusions are scientifically reasonable, and whether the GSP, through the implementation of clearly defined and technically feasible projects and management actions, is likely to achieve a tenable sustainability goal for the basin.

In its initial incomplete determination, the Department identified deficiencies in the Plan which precluded the Plan's approval in January 2022.[20] In January 2022 the GSAs were given 180 days to take corrective actions to remedy the identified deficiencies. Consistent with the GSP Regulations, Department staff have evaluated the revised 2022 Plan to determine if the GSAs have taken sufficient actions to correct the deficiencies.

4.1 DEFICIENCY 1. THE GSPS DO NOT SET THEIR SUSTAINABLE MANAGEMENT CRITERIA FOR CHRONIC LOWERING OF GROUNDWATER LEVELS IN A MANNER CONSISTENT WITH THE REQUIREMENTS OF SGMA AND THE GSP REGULATIONS

4.1.1 Corrective Action 1

As described in the Department's GSP Assessment Staff Report released in January 2022, Department staff determined that the Subbasin's definition of an undesirable result for the chronic lowering of groundwater levels was not consistent with the requirements of SGMA. As a result, the Department provided the following corrective actions for the Subbasin to consider and address:

> *The GSAs must revise the Plan to define sustainable management criteria for the chronic lowering of groundwater levels by utilizing information specific to the Subbasin. The GSAs should first characterize undesirable results by describing the significant and unreasonable effects that could be, or are being caused by, lowering groundwater levels that the GSAs are seeking to avoid. The GSAs will need to define the criteria used to determine when and where the effects of the groundwater conditions will cause undesirable results and describe the potential effects on the beneficial uses and users of groundwater that may occur or are occurring from undesirable results, which analysis could include both physical and economic impacts.*
>
> *Next, the GSAs should revise minimum thresholds to quantify groundwater conditions which represent a point in the Subbasin that, if exceeded, may cause*

[20] https://sgma.water.ca.gov/portal/service/gspdocument/download/7781.

undesirable results. The Plan's description of minimum thresholds should include (1) information and criteria relied upon to establish and justify the minimum thresholds supported by the basin setting and qualified by uncertainty in the understanding of the basin setting; (2) the relationship between these minimum thresholds and each sustainability indicator to show how these basin conditions would avoid undesirable results for each sustainability indicator; (3) a technical description explaining how operating the Subbasin to the proposed minimum thresholds would not be expected to cause undesirable results in adjacent basins or affect the ability of adjacent basins to achieve their sustainability goals; and (4) how the minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.

Addressing this deficiency may require the GSAs to not only reconsider their undesirable results, minimum thresholds, and measurable objectives, so that they are consistent with SGMA and the GSP Regulations as discussed above, but also may require changes to other aspects of the GSPs, such as the projects and management actions that the GSAs would implement to achieve sustainable groundwater management.

4.1.2 Evaluation

To address the identified deficiencies, the Plan includes updated sustainable management criteria sections related to the chronic lowering of groundwater levels. Additionally, the Plan includes a new project which aims to mitigate the potential effects that the chronic lowering of groundwater levels may have on the Subbasin's beneficial uses and users of groundwater.

The Plan redefines the Subbasin's undesirable result definition as "*the chronic lowering of groundwater levels which would cause a significant and unreasonable reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses over the GSP's planning and implementation period.*"[21] The Plan states that the primary concern related to undesirable results are groundwater levels declining in dry periods to the point that they will not likely recover during normal/wet periods or a significant and unreasonable number of shallow domestic wells going dry.[22] The Plan defines 15% of domestic wells going dry as significant and unreasonable.[23]

The Plan was updated to have a consistent criterion to define the presence of an undesirable result; this criterion is 15% of a GSP's representative monitoring sites exceeding their minimum threshold during a single monitoring event.[24] The Plan does not include updated processes for establishing interim milestones, measurable objectives, or minimum thresholds; therefore, the Plan does not include updated sustainable management criteria values for any existing representative monitoring wells. However,

[21] 2022 Redlined Kings River East GSA GSP, Section 4.2.1.1, p. 254.
[22] 2022 Redlined McMullin Area GSA GSP, Section 4.2.1.1, p. 267.
[23] 2022 Redlined McMullin Area GSA GSP, Section 4.2.1.1, p. 267.
[24] 2022 Redlined McMullin Area GSA GSP, Section 4.2.1.2, p. 272.

the Plan was updated to have a consistent criterion to define the presence of an undesirable result as required by the corrective action.

The Plan established interim milestones, measurable objectives, and minimum thresholds based on each well's historical groundwater levels and the Plan's incremental overdraft mitigation timeline.[25] The Plan developed a groundwater level decline trendline for each well based on data collected from 1997 to 2012. This trendline was projected to 2020 to get a baseline groundwater elevation. The Plan projected the trendline to 2040 while reducing the rate of decline at the same rate as the Plan's incremental mitigation timeline (10% by 2025, 30% by 2030, 60% by 2035, and 100% by 2040).[26] Using this method, each well's interim milestones and measurable objective are equal to the quantified groundwater elevation in 2025, 2030, 2035, 2040.[27]

The Plan established minimum thresholds at each well by determining the groundwater level decline experienced during the 2012 to 2016 drought, increasing the value by 20%, and then deducting the quantified value from the measurable objective.[28] If there was incomplete or inconsistent groundwater level data for a representative monitoring site during 2012 to 2016, the Plan deducted the greater of the average rate of groundwater level decline multiplied by 15 (three times the standard rate of decline for five years) or the measured decline from the measurable objective.[29] The Plan used three times the standard rate of decline for five years as the groundwater decline experienced during the 2012 to 2016 drought was observed to be roughly three times the Subbasin's average rate of decline.[30]

The Plan explains the relationship between the chronic lowering of groundwater level minimum thresholds and other sustainability indicators. Groundwater level minimum thresholds are used to calculate the reduction in groundwater storage minimum thresholds. The Plan has processes in place to determine if declining groundwater levels cause any future groundwater quality degradation, however, the Plan established separate groundwater quality sustainable management criteria and will monitoring water quality as groundwater levels decline during Plan implementation.[31] The Plan has identified interconnected surface waters as a data gap and will be investigating the relationship between the chronic lowering of groundwater levels and the depletions of interconnected surface water over the next few years.[32]

Each of the individual GSPs, except the NFKGSP, states that the plan area has not experienced significant subsidence and that most of the groundwater extractions in the plan area are outside the confined aquifer. Additionally, the chronic lowering of

[25] 2022 Redlined McMullin Area GSA GSP, Section 4.2.3.1, p. 280.
[26] 2022 Redlined McMullin Area GSA GSP, Section 4.2.3.1, p. 281.
[27] 2022 Redlined McMullin Area GSA GSP, Section 4.2.3.4, p. 282.
[28] 2022 Redlined North Fork Kings GSA GSP, Section 4.2.2.1, p. 274.
[29] 2022 Redlined North Fork Kings GSA GSP, Section 4.2.2.1, p. 280.
[30] 2022 Redlined North Fork Kings GSA GSP. Section 4.2.2.1, p. 280.
[31] 2022 Redlined North Fork Kings GSA GSP, Section 4.2.2.2, p. 282.
[32] 2022 Redlined North Fork Kings GSA GSP, Section 4.2.2.2, p. 282.

groundwater level minimum thresholds has been established based on historical rates of decline that have not caused land subsidence. As a result, these GSPs determined that the minimum threshold will avoid undesirable results for land subsidence.

The NFKGSP states that the lowering of groundwater levels directly impacts land subsidence when it is caused by groundwater extractions below a confining layer. The NFKGSP is unaware of significant pumping occurring in the plan area's confined aquifers; however, the NFKGSA recognizes this as a data gap.[33] The NFKGSP does acknowledge that there is a potential for chronic lowering of groundwater level minimum thresholds causing some subsidence. However, the NFKGSP states that each of the sustainability indicators will be monitored and whichever is most sensitive to chronic lowering of groundwater levels will be the controlling factor for the surrounding area.

Department staff believe that the Plan provided insufficient information and data to thoroughly demonstrate the relationship between the chronic lowering of groundwater levels minimum thresholds and other sustainability indicators. The MAGSA and JGSA state that their plan areas have not experienced significant subsidence even though both have experienced over 150-inches of historical subsidence.[34] The NFKGSP highlights the existence of historical land subsidence in their plan area; however, the GSP does not acknowledge the significant groundwater level declines their confined aquifer wells are projected to experience nor do they analyze how these declines might affect future land subsidence rates or amounts. The remaining GSP areas have experienced comparatively little land subsidence, and their chronic lowering of groundwater level minimum thresholds are unlikely to cause land subsidence undesirable results. However, Department staff conclude that the MAGSA, NFKGSA, and JGSA should update their GSPs to provide additional justification for how they have determined that their chronic lowering of groundwater level minimum thresholds will not result in a land subsidence undesirable result (See Recommended Corrective Action 1a).

The Plan recognizes that the established minimum threshold will result in some wells going dry and reiterates that it is not a significant and unreasonable impact if less than 15% of the shallow wells in the Subbasin go dry.[35] However, the Plan does not clearly define what is considered a "shallow well." The Plan states that shallowest wells tend to be domestic wells; however, there is room for improvement, and Department staff believe the Plan should explicitly state what is included in the definition of "shallow wells."

The Plan discusses how agriculture is the Subbasin's most significant groundwater use and user and that agricultural production is the primary economic driver for the region.[36] The GSAs argue that setting minimum thresholds to maintain water levels to the shallowest wells in the Subbasin would cause a significant and unreasonable economic

[33] 2022 Redlined North Fork Kings GSA GSP, Section 4.2.2.2, p. 281.
[34] 2022 Redlined McMullin Area GSA GSP, Section 4.6.2.1, p. 310.
[35] 2022 Redlined McMullin Area GSA GSP, Section 4.2.1.2, p. 268.
[36] 2022 Redlined McMullin Area GSA GSP, Section 4.2.1.2, p. 269.

impact on the Subbasin's varied groundwater users.[37] As a result, the GSAs established sustainable management criteria with the understanding that groundwater levels would continue to decline until sustainability is reached within the Plan's planning period.

The Plan includes a domestic well impact analysis (Analysis) to understand the impacts to beneficial uses and users of groundwater. This analysis estimated the number of potentially impacted domestic wells within each GSP area based on the established minimum thresholds.[38] Department staff are encouraged by the steps the GSAs have taken to conduct this Analysis. However, the Plan provides the Analysis results in map format rather than providing the sum, or a percentage of the total, of potentially impacted wells. Department staff estimated the sum of potentially impacted wells, based on the Plan's map figure, for each GSP area; Table 1 summarizes these results. To further analyze impacts to beneficial uses and users and to demonstrate that less than 15% of shallow wells are not impacted, Department staff recommend that the GSAs collectively review the values in Table 1, but also expand the analysis to include all beneficial uses and users and explicitly define what is considered shallow wells in the Subbasin by the periodic evaluation. (See Recommended Corrective Action 1b)

Table 1 – Domestic Well Analysis Results

GSA	Total Dry Wells
North Kings GSA[39]	306
James GSA[40]	3
North Fork GSA[41]	258
McMullin Area GSA[42]	37
Central Kings GSA[43]	221
South Kings GSA[44]	7
Kings River East GSA[45]	325
Total	**1,157**

To address the impacted domestic wells, the GSAs propose to implement a Domestic Well Mitigation Program (Program). The Plan outlines the processes to develop policies and procedures for mitigating domestic wells that go dry or are in imminent threat of going dry. The Plan states that the potentially impacted wells are generally limited to shallow domestic wells since most irrigation wells and agency-owned wells are deeper; however, the Program will also consider mitigating small water supply systems and certain

[37] 2022 Redlined McMullin Area GSA GSP, Section 4.2.1.2, p. 269.
[38] 2022 Redlined McMullin Area GSA GSP, Section 4.2.2.4, p. 277.
[39] 2022 Redlined North Kings GSA GSP, Figure 4-3, p. 232.
[40] 2022 Redlined James GSA GSP, Figure 4-2, p. 220.
[41] 2022 Redlined North Fork Kings GSA GSP, Figure 4-2, p. 287.
[42] 2022 Redlined McMullin Area GSA GSP, Figure 4-2, p. 279.
[43] 2022 Redlined Central Kings GSA GSP, Figure 4-17, p. 271.
[44] 2022 Redlined South Kings GSA GSP, Figure 4-9, p. 191.
[45] 2022 Redlined Kings River East GSA GSP, Figure 4-3, p. 273.

agricultural wells that may be impacted. The GSAs will develop an application form for landowners to request well mitigation. The Program will consider the following well mitigation methods: 1) installing a new well, 2) deepening the well if it has an open bottom, 3) modifying pumping equipment, or 4) modifying current pumping practices. The Program will also consider including short-term solutions, such as providing bottled water and water tanks while implementing longer-term well mitigation methods. The Program is estimated to cost approximately $40 million; this assumes an average per-well cost of $40,000 and an estimated 1,000 wells requiring mitigation before groundwater levels stabilize. The GSAs expect to have the policies and procedures for the Program completed by the end of 2024; however, it is unclear if they expect to have a funding mechanism in place by this time.[46] Although specific funding mechanisms remain to be addressed and implemented, at this time, Department staff believe the Program is feasible. For example, the GSAs have authority under SGMA to impose fees on the extraction of groundwater. If the GSAs elected to fund the Program this way, based on the Plan's estimate that an average of over 1 million acre-feet of groundwater is extracted annually from the Subbasin, an extraction fee of only two dollars ($2.00) per acre-foot imposed for only the next ten years of Plan implementation could fully fund the Program. Department staff encourages the GSAs to consider this and other funding options and sources to support and implement the Program.

Although the Program is in the initial stages of development, the GSAs state that they are committed to the implementation of this high-priority project as it is necessary to mitigate the impacts of declining groundwater levels and to provide a water supply to meet the essential health and safety needs of the Subbasin's beneficial users of groundwater.[47] Department staff believe that including the Analysis and the Program in the Plan demonstrates the GSAs' progress toward understanding the Plan's effect on domestic well users and illustrates their commitment to mitigating some of these impacts. Additionally, Department staff consider the implementation of the Program critical to concluding that the GSAs have taken sufficient action to address deficiency one. As a result, by the Plan's next periodic evaluation, the GSAs must demonstrate the Program's successful development and initial implementation (See Recommended Corrective Action 1c). Department staff also encourage the GSAs to review the Department's April 2023 guidance document titled *Considerations for Identifying and Addressing Drinking Water Well Impacts* guidance to assist its Program implementation.[48]

4.1.3 Conclusion

While Department staff have provided the GSAs with recommended corrective actions to improve upon the Plan, Department staff believe the issues identified and addressed by the recommended corrective actions do not preclude approval of the Plan at this time. Department staff concludes that the Subbasin's updated undesirable result definition and assigned criteria to determine the presence of an undesirable result are now more

[46] 2022 Redlined McMullin Area GSA GSP, Section 6.2.15, pp. 485-489.
[47] 2022 Redlined McMullin Area GSA GSP, Section 6.2.15, pp. 485-489.
[48] https://water.ca.gov/Programs/Groundwater-Management/Drinking-Water-Well

consistent with the GSP Regulations and SGMA. However, this determination is based heavily on the successful implementation of the Plan's Program. The GSAs should be prepared to demonstrate the successful development and initial implementation of the Program by the next periodic evaluation.

4.2 Deficiency 2. The GSPs do not set minimum thresholds and measurable objectives for land subsidence in a manner consistent with their undesirable result definition and the requirements of SGMA and the GSP Regulations.

4.2.1 Corrective Action 2

The January 2022 Staff Report concluded that the GSAs did not use a coordinated approach to identify the land uses and property interests that have been affected or are likely to be affected by land subsidence nor did the GSAs identify the amount of subsidence these land uses, and property interests can tolerate throughout GSP implementation. As a result, the Department provided the following corrective actions:

a) *The SKGSA should define an undesirable result for land subsidence and either establish sustainable management criteria, with consideration [given] to Corrective Action 2b and 2c, or provide additional information and data to adequately demonstrate that an undesirable result related to land subsidence is not present and is not likely to occur.*

b) *The Subbasin's GSAs should develop a coordinated basin-wide approach to identify the land uses and property interests that have been affected or are likely to be affected by land subsidence, including an explanation of how the GSAs have determined and considered those uses and interests.*[99] *Additionally, the GSAs should identify the amount of subsidence the identified land uses and property interests (commonly referred to as structures, infrastructure, and major roads within the GSPs) can tolerate throughout GSP implementation. The GSAs should revise their minimum thresholds for land subsidence to reflect the intent of SGMA and incorporate the information gained following the identification of land uses and property interests and the amount of subsidence that may be tolerated.*

c) *The Subbasin's GSAs should revise their measurable objectives for land subsidence to reflect the intent of SGMA that land subsidence be avoided or minimized once sustainability is achieved.*

d) *The Subbasin's GSAs should provide an explanation for how the implementation of projects and management actions is: 1) consistent with the reestablished minimum thresholds and measurable objectives; 2) achieving the long-term avoidance or minimization of land subsidence; and 3) ensuring that the Subbasin will not exceed the cumulative amount of land*

subsidence the identified land uses, and property interests can tolerate.

4.2.2 Evaluation

To address the identified deficiencies, the Plan includes updated land subsidence sustainable management criteria sections. Additionally, the Plan includes a new project to better understand the impact groundwater extractions from the confined aquifer have on land subsidence within the Subbasin.

In response to components 2a and 2b of the corrective action, the Plan states that the primary concern related to land subsidence's interference with surface land uses is reducing the capacity of gravity flow water conveyance facilities, such as canals or river channels, which could increase the risk of flooding adjacent land or restrict/prevent the delivery of irrigation water to agricultural land.[49] As a result, the GSAs updated the Subbasin's land subsidence undesirable result. The revised definition is the significant and unreasonable loss of conveyance capacity (where historic water deliveries cannot be met) of the Kings River or existing irrigation canals due to land subsidence.[50] The Subbasin's updated land subsidence undesirable result specifically highlights the loss of conveyance capacity of the Kings River; however, the MAGSP discusses the conveyance capacity of the San Joaquin River channel and canals because the Kings River does not run through this GSP area. The GSAs have taken a good stride to unify the definition of significant and unreasonable; however, to account for the infrastructure of concern identified by each GSP, Department staff recommend that the GSAs update the Subbasin's undesirable result definition to include the San Joaquin River's conveyance facilities (See Recommended Corrective Action 2a).

The Plan's criteria to define the presence of an undesirable result is the exceedance of the minimum threshold within a 36 square-mile area.[51] Based on the explanation provided surrounding the definition of an undesirable result, Department staff interpret this criterion as the exceedance of the minimum threshold at any point within a 36 square-mile area or at any point within the Subbasin. Assuming this is the GSAs' intent, that no more than 3 feet (the identified minimum threshold) of subsidence occurs at any point within the Subbasin, Department staff believe sufficient action has been taken to address this deficiency. If this is not the GSAs' intent, Department staff recommend that the GSAs clarify how this criterion should be interpreted (See Recommended Corrective Action 2b).

The Plan includes updated minimum thresholds, measurable objectives, and interim milestones based on the updated undesirable result definition. The reestablished minimum threshold is 3 feet of cumulative land subsidence.[52] The Plan's rationale for setting minimum thresholds at 3 feet is that irrigation canals within the Subbasin generally have about 3 feet of freeboard.[53] This indicates that land subsidence can cause up to a

[49] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.1, p. 312.
[50] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.1, p. 313.
[51] 2022 Redlined McMullin Area GSA GSP, Section 4.6.1.2, p. 308.
[52] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.2, p. 316.
[53] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.2, p. 316.

3-feet difference between the head of a canal and the canal terminus before there is a loss of operational capacity.[54] The Plan states that the spatial distribution of subsidence could result in less than 3 feet of subsidence impacting the freeboard and that uniform subsidence along a canal reach would not necessarily cause any capacity or freeboard losses.[55] The Plan used a consistent and sound approach in reestablishing minimum thresholds; however, the Plan does not thoroughly provide the information and criteria required by the GSP Regulations when justifying the reestablished minimum thresholds. Specifically, it is unclear whether all irrigation canals within the Subbasin have 3 feet of remaining freeboard or whether the 3 feet justification is based on assumed initial design. Statements such as "from discussions with stakeholders, local agencies and landowners, there have been reports of irrigation canals and portions of the river requiring fill material to raise the bank to maintain needed conveyance capacity and freeboard" appear to indicate that not all existing irrigation canals within the Subbasin currently contain 3 feet of remaining freeboard.[56] Although the Plan provides some additional statements related to the distribution of subsidence and the subsequent impacts on land use, the overall discussion does not thoroughly meet the GSP Regulations expectations.

Department staff understand the inclusion of freeboard to be standard practice required in the proper design, operation, and at times required for certification and permitting of canals and levees and, therefore, should not be eliminated or reduced. Freeboard is incorporated within project design to ensure optimal intended operations amidst and despite uncertainties or variations in project construction and other physical or operational factors. The GSAs have not provided justification for reducing the freeboard, nor correspondence from infrastructure owners that encroaching upon the freeboard is acceptable. Thus, Department staff conclude the GSAs have not provided sufficient justification that the criteria of 3 feet would avoid substantial interference with land use. While the lack of information does not preclude the Department staff's recommendation to approve the Plan at this time, Department staff recommend that the GSAs provide additional information to justify the reestablished minimum thresholds in the Subbasin's next periodic evaluation (See Recommended Corrective Action 2c).

In response to the Department's Corrective Action 2c, the GSAs updated their measurable objective for land subsidence. The revised measurable objective is set at 1 inch per year over 36 square miles to allow for the error of the InSAR data.[57] Although Department staff find the updated measurable objective acceptable, as mentioned above, the Department recommends that the GSAs provide additional details concerning the 36 square mile criteria (See Recommended Corrective Action 2b).

While the Plan does not directly articulate how it addresses component 2d of the corrective action, Department staff consider the trigger point actions and land subsidence

[54] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.2, p. 316.
[55] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.2.1, p. 318.
[56] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.1.1, p. 313.
[57] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.3.1, p. 322.

data gap project discussions sufficient to address this component. As mentioned above, the Plan does not thoroughly justify the established minimum thresholds, but the Plan does include actions to identify and mitigate land uses and property interests affected by land subsidence prior to the exceedance of minimum thresholds. These actions are triggered when one foot of subsidence within a 36-square mile area occurs.[58] These actions include the GSAs conducting a capacity analysis on critical infrastructure to evaluate whether an undesirable result occurred. If it is determined that there are capacity issues, then the GSAs will: 1) mitigate the facility through modifications and retrofits, 2) investigate what is causing land subsidence, and 3) if the facility cannot be restored to its original functions, then the GSAs may take significant actions such as reducing groundwater extractions or importing additional surface water supplies.[59] Department staff believe that the GSAs conducting a capacity analysis for every one foot of land subsidence offsets the immediate concern caused by the GSA's lack of information and criteria to justify the Plan's minimum thresholds. However, Department staff recommend that the GSAs provide additional details concerning these investigations in the Subbasin's next periodic evaluation (See Recommended Corrective Action 2d).

The Plan includes a new land subsidence data gap analysis project (Data Gap Project) to perform the necessary research and data gathering to fill the Subbasin's land subsidence data gaps. The Data Gap Project will:

1) Estimate the quantity of groundwater pumping from the confined aquifer.
2) Identify and monitor wells perforated within the confined aquifer.
3) If necessary, install new monitoring wells.
4) Evaluate the potential influence of neighboring basins.[60]

The Data Gap Project's preliminary timeline aims to estimate groundwater pumping from the confined aquifer by December 2023; however, the aspects of the Data Gap Project necessary to fill the data gap will not be completed until December 2025.[61] Department staff have identified that the Plan lacks sufficient information and data related to the confined aquifer, which, as discussed more thoroughly in Section 5, affects not only the GSAs' ability to manage land subsidence sustainably, but also affects the quality of the Plan's hydrologic conceptual model, water budget, and other aspects. This Data Gap Project will fix one of the Subbasin's primary data gaps, greatly improving upon the Plan, and it will provide the GSAs with the data and information necessary to adequately update their Plan in its subsequent periodic evaluation. Department staff believe filling this data gap is crucial to improvement of the Plan and the GSAs' reaching their sustainability goal because of the extent of which pumping from the confined aquifer may impact aspects of the Plan and the entire Subbasin. Several of the recommended corrective actions provided by Department staff rely on this information. As a result, Department staff

[58] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.2.1, p. 319.
[59] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.2.1, p. 319.
[60] 2022 Redlined McMullin Area GSA GSP, Section 6.2.13, pp. 479-482.
[61] 2022 Redlined McMullin Area GSA GSP, Section 6.2.13, pp. 479-482.

strongly recommend that the GSAs fill the confined aquifer data gap by the Subbasin's next periodic evaluation (See Recommended Corrective Action 2e).

4.2.3 Conclusion

While the Department staff have provided the GSAs with recommended corrective actions to improve upon the Plan, Department staff believe the remaining issues identified and addressed by the recommended corrective actions do not preclude approval of the Plan at this time given that historical subsidence over the past few years has been relatively small[62] and is not expected to significantly increase by the next periodic evaluation. Department staff conclude that the GSAs have taken sufficient action to address deficiency related to subsidence because the Subbasin's updated undesirable result definition, minimum thresholds, criteria to determine the presence of an undesirable result, and measurable objectives better align with the intent of SGMA. Department staff consider the capacity analyses pertinent to the GSAs' ability to justify and verify that an undesirable result is not present prior to a minimum threshold exceedance occurring. Additionally, the Data Gap Project will allow GSAs to better understand how existing groundwater extractions from the confined aquifer affect land subsidence and whether or how these extractions need to be modified during the Plan's planning and implementation horizon. Department staff have provided recommended corrective actions for the GSAs to consider in the Subbasin's next periodic evaluation to further improve upon the groundwater management as it relates to subsidence. (See Recommended Corrective Action 2a through 2e). Staff advise the GSAs also provide a progress update in the next annual report submitted to the Department.

4.3 Deficiency 3. The GSPs do not consistently identify interconnected surface water systems, or provide the location, quantity, and timing of depletions of those systems due to groundwater use. The GSPs do not define sustainable management criteria for the depletions of interconnected surface water in the manner required by the GSP Regulations.

4.3.1 Corrective Action 3

The January 2022 Staff Report concluded that the Subbasin's GSAs did not establish sustainable management criteria for the interconnected surface waters located within the Subbasin. As a result, the Department provided the following corrective action:

> *Having identified that interconnected surface waters are present in the Subbasin, and absent a demonstration that undesirable results for depletion of interconnected surface water are not present and not likely to occur, Department staff recommended that the GSAs should properly identify depletion of interconnected*

[62] TRE ALTAMIRA InSAR Subsidence Data, January 2020 – April 2023, https://data.cnra.ca.gov/dataset/tre-altamira-insar-subsidence.

surface water as a data gap and should provide a plan within 180 days that describes how the GSAs will address the data gap as soon as practical, with updated sustainable management criteria by the first required periodic evaluation. The plan to address the data gap should specifically outline how and when the GSAs will:

a) *Acquire or develop data and tools to identify the location, quantity, and timing of the depletion of interconnected surface water due to groundwater use for interconnected surface water systems identified in the Subbasin's GSPs,[119] and*

b) *Develop sustainable management criteria based on the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses and users of the surface water in the Subbasin.*

4.3.2 Evaluation

To address Deficiency 3, the corrective action required the GSAs to properly identify the depletion of interconnected surface water as a data gap and provide a plan to fill the data gap and establish sustainable management criteria in the Subbasin's next periodic evaluation. To address the deficiency, the GSAs revised the Plan to include: 1) new statements concerning when an undesirable result would occur; 2) interim sustainable management criteria using groundwater levels as a proxy; and 3) a new data gap analysis project.

Although the Plan does not define the criteria of an undesirable result, it does state that an undesirable result would occur if groundwater pumping caused significant and unreasonable depletions of interconnected surface water.[63] The Plan states the following would need to be present for an undesirable result to occur:

1) Surface water and groundwater are hydraulically connected.
2) Groundwater pumping is causing a significant reduction in surface water flows.
3) The surface water depletion is not being mitigated by the GSA or other agencies/river management programs.
4) Third parties are being adversely impacted by the surface water depletion.[64]

These are similar to the statements included in the Subbasin's 2020 GSPs. In the Incomplete Determination Staff Report, Department staff have already discussed that evidence for interconnected surface waters was provided in the 2020 GSPs and that the statements concerning continued surface water releases under existing river management programs to meet minimum flow requirements was not solely an acceptable form of mitigation. Department staff continue to remind the GSAs that surface water

[63] 2022 Redlined North Kings GSA GSP, Section 4.7, p. 280.
[64] 2022 Redlined Kings River East GSA GSP, Section 4.7, p. 321.

releases under existing river management programs to meet minimum flow requirements is not solely an acceptable form of mitigation.

The Plan highlights that Corrective Action 3 states the GSAs should *'identify depletion of interconnected surface water as a data gap'* and '*provide a plan within 180-days that describes how the GSAs will address the data gap'*. In response, the GSAs established interim milestones for interconnected surface waters using groundwater levels as a proxy. The Plan does not provide details concerning how using groundwater levels as a proxy is reasonable; however, it is mentioned that there is some uncertainty that they will fully protect against undesirable results due to the limited available data.[65] Department staff does not consider the Plan's existing use of groundwater levels as a proxy meets the intent of SGMA and/or the GSP Regulations. However, Department staff believe that the GSAs established these interim milestones due to a misinterpretation of the Incomplete Determination Staff Report, which intended that the revised Plan provide a plan to fill the interconnected surface water data gap and establish sustainable management criteria by the next periodic evaluation.

The Plan includes a new Surface Water-Groundwater Interconnection Data Gap Analysis (Project), which aims to collect additional data and information to determine to what extent groundwater pumping is depletion surface water. The Project includes three general phases:

1) Determine interconnection status.
2) Coordinate with water rights holders and river management programs.
3) Evaluate impacts of groundwater pumping on surface water.[66]

Phase 1 includes reviewing existing studies, evaluating water level data from existing riverside wells, existing piezometers, and regional groundwater elevation contour maps, and, if necessary, constructing new piezometers to collect additional groundwater level data.[67] While this phase could provide a better understanding of the location of interconnected surface waters within the Subbasin, the GSAs have already discussed and confirmed the existence, in both their 2020 and 2022 Plan, the location of interconnected surface waters that must be managed per SGMA and the GSP Regulations.

Phase 2 includes working with surface water rights holders to understand the quantity and timing of direct surface water use and to work with existing river management programs. The Plan states that the existing river management programs account for river losses, which the Plan claims essentially mitigates existing surface water depletion.[68] However, the Department's Incomplete Determination Staff Report already stated that the additional release of surface water from reservoirs to meet in-stream flow requirements

[65] 2022 Redlined North Kings GSA GSP, Section 4.7, p. 284.
[66] 2022 Redlined McMullin Area GSA GSP, Section 6.2.14, pp.482-485.
[67] 2022 Redlined McMullin Area GSA GSP, Section 6.2.14, pp.482-485.
[68] 2022 Redlined McMullin Area GSA GSP, Section 6.2.14, pp.482-485.

is unlikely to be found to be an acceptable form of mitigation without specific incorporation of better understanding and particular actions directed at stream depletions caused by current and future groundwater extractions. Accordingly, the GSAs should focus on determining the location, quantity, and timing of the depletion of interconnected surface water and establish sustainable management criteria for all sustainability indicators in a manner that protects the Subbasin's interconnected surface water reaches.

Phase 3 includes how the GSAs will fill the interconnected surface water data gap. This phase aims to estimate the impact of groundwater pumping on surface water depletions by establishing a study area around the Subbasin's rivers' borders and then selecting a model, analytical tool, or calculation method for estimating groundwater pumping impacts on the rivers. Additionally, the Plan states that this phase does not include the development of sustainable management criteria since development will depend on the results of Phase 1 and Phase 2.[69]

The Incomplete Determination Staff Report provided GSAs the opportunity to develop a plan to fill their interconnected surface waters data gap and then subsequently establish sustainable management criteria in the Subbasin's next periodic evaluation. While the GSAs have been responsive to the corrective action and developed the Project to fill data gaps, Department staff believe that the Project includes several unnecessary steps, such as, determining whether there are any interconnected surface waters, since the Plan already identifies their presence and determining whether existing river management programs mitigate any increased interconnected surface water losses. Additionally, the Project's current preliminary schedule for Phase 3 ends in December 2025 and does not include the establishment of sustainable management criteria.

Department staff understands that quantifying depletions of interconnected surface water from groundwater extractions is a complex task that likely requires developing new, specialized tools, numerical and surface water models, and methods to understand local hydrogeologic conditions, interactions, and responses. If the GSAs decide not to use a numerical groundwater and surface water model, then the GSAs should ensure that the method used is equally effective. The concerns that the GSAs raise in the Plan, such as differentiating between surface water losses caused by groundwater pumping and riparian water users, are issues that the GSAs should consider when determining whether any non-model method is equally effective. Department staff believes the Subbasin's GSAs have established an adequate Plan to fill the depletion of interconnected surface water data gaps. However, Department staff further advise these data to be used to inform and establish sustainable management criteria based on timing, volume, and depletions, as required by the GSP Regulations, by the Subbasin's next periodic evaluation (See Recommended Corrective Action 3a).

The Department will continue to support GSAs in this regard by providing, as appropriate, financial, and technical assistance to GSAs, including the development of guidance

[69] 2022 Redlined McMullin Area GSA GSP, Section 6.2.14, pp. 482-485.

describing appropriate methods and approaches to evaluate the rate, timing, and volume of depletions of interconnected surface water caused by groundwater extractions. Once the Department's guidance related to depletions of interconnected surface water is publicly available, GSAs, where applicable, should consider incorporating appropriate guidance approaches into their future periodic evaluations to the GSP (see Recommended Corrective Action 3a). GSAs should consider availing themselves of the Department's financial or technical assistance, but in any event must continue to fill data gaps, collect additional monitoring data, and implement strategies to better understand and manage depletions of interconnected surface water caused by groundwater extractions and define segments of interconnectivity and timing within their jurisdictional area (See Recommended Corrective Action 3b). Furthermore, GSAs should coordinate with local, state, and federal resources agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion (See Recommended Corrective Action 3c).

4.3.3 Conclusion

While the Department staff have provided the GSAs with recommended corrective actions to improve upon the Plan, Department staff believe the issues identified and addressed by the recommended corrective actions do not preclude approval of the Plan at this time. Department staff conclude that the GSAs have taken sufficient action to address the deficiencies identified. While the GSAs were not required to establish sustainable management criteria until the periodic evaluation, Department staff have provided recommended corrective actions for the GSAs to continue improvement of the Plan as it relates to interconnected surface water along the Kings and San Joaquin Rivers.

4.4 Deficiency 4. The GSPs do not provide adequate information to support the selection of degraded water quality sustainable management criteria.

4.4.1 Corrective Action 4

The January 2022 Staff Report concluded that Subbasin's GSAs did not establish sustainable management criteria in a manner consistent with SGMA and the GSP Regulations. Specifically, the CKGSA did not establish sustainable management criteria for degraded water quality, and the remaining GSAs' sustainable management criteria lacked the necessary detail for all monitoring sites. As a result, the staff report included the following corrective actions:

a) *The CKGSA should further discuss and disclose the data and information that is available in their GSP's plan area and, understanding that data gaps exist, further describe how the GSA intends to obtain the data necessary to develop baseline groundwater quality conditions for each beneficial use. The CKGSA must also establish sustainable management criteria for the degraded water quality, which can be based on existing water quality*

standards, similar to the other GSAs in the Subbasin. Additionally, the CKGSA should consider Corrective Action 4b and Corrective Action 4c when developing the sustainable management criteria.

b) *Each GSA should describe how the statistically significant increase is quantified and provide the numerical values established for the sustainable management criteria for degraded water quality at each well in their monitoring network. The GSAs should discuss the specific method used to establish the sustainable management criteria for each monitoring well.*

c) *The GSAs should provide additional information related to how they intend to evaluate whether or not GSA actions are attributing to the degradation of groundwater quality and how the monitoring network and monitoring frequency contribute to understanding the potential causes of groundwater quality degradation.*

4.4.2 Evaluation

The Deficiency 4 corrective action required the CKGSA to establish sustainable management criteria for degraded water quality in a manner consistent with the Subbasin's other GSAs, required each GSA to provide additional information concerning minimum threshold concentrations, and required each GSA provide additional information related to their process to determine whether groundwater extractions or GSA projects or management actions are attributing to the degradation of groundwater quality.

To address component 4a of the corrective action, the CKGSA updated its GSP's degraded water quality sustainable management criteria to be consistent with the other GSPs in the Subbasin (further discussed in Section 5.3.2.4 below). This includes outlining their GSP's chemicals of concern (COC), summarizing the existing groundwater quality monitoring programs and agencies, and establishing sustainable management criteria. Department staff conclude that CKGSA has taken sufficient steps to address component 4a of the corrective action. A full assessment of the Plan's degraded water quality sustainable management criteria is provided in Section 5.3.2.4 below.

In response to corrective action 4b, the Plan updated its method for quantifying minimum thresholds and no longer uses "a statistically significant increase in groundwater degradation where concentrations of chemicals of concern were historically above MCLs."[70]The Plan uses California's maximum contaminant level (MCL) for each identified COC as the baseline to establish minimum threshold concentrations.[71] Using MCLs, the Plan's methods for establishing minimum thresholds at individual representative monitoring sites are:

1) If historical concentrations are below the MCL then minimum thresholds are equal to the MCL.

[70] 2020 McMullin Area GSA GSP, Section 4.5.1.2, p. 277.
[71] 2022 Redlined Central Kings GSA GSP, Section 4.5.1.1, p. 296.

2) If historical concentrations are above the MCL then minimum thresholds are equal to 20% greater than the well's recent historically high concentration.

The GSAs justify using 20% in the second method as a reasonable balance between natural fluctuations and uncertainty in the data while still maintaining their desire to minimize further degradation.[72] However, the Plan does not define "recent historically high concentration," nor does it discuss why 20% is representative of natural fluctuations and uncertainty with the Subbasin's groundwater quality, or why that same percentage is equally applicable and appropriate for every COC. While the Plan has taken sufficient action to address component b of the corrective action, Department staff recommend that the GSAs define "recent historically high concentration" (See Recommended Corrective Action 4a). Additionally, Department staff recommend the GSAs provide a robust explanation and justification for setting some minimum thresholds 20% greater than historical concentrations that already exceed California's MCL (See Recommended Correction Action 4b).

In response to corrective action 4c, the Plan now contains site-specific investigation methods to assess whether the groundwater quality degradation is associated with groundwater pumping or recharge activities when a minimum threshold is exceeded.[73] These investigations will be conducted for the area surrounding the representative monitoring site and include, but are not limited to, the following:

- Verify the groundwater gradient and flow direction.
- Compare changes in historic cropping records versus historic groundwater quality data.
- Compare groundwater quality data versus changes in groundwater levels.
- Review and compare available groundwater pumping records versus groundwater quality trends.
- Review and compare available groundwater recharge records versus groundwater quality data.
- Potentially perform a Phase I Environmental Site Assessment to assess whether degradation is the result of third-party activities.[74]

The Plan's discussion concerning the investigations to assess whether groundwater quality degradation is associated with groundwater pumping or recharge activities is a significant improvement from the 2020 Plan. However, it is unclear how the GSAs will use data gained from these investigations to determine whether a minimum threshold exceedance is caused by groundwater extractions or other activities associated with Plan implementation. Department staff recommends that the GSAs provide additional details concerning how the results of these investigations will be incorporated into Subbasin management (See Recommended Corrective Action 4c).

[72] 2022 Redlined McMullin Area GSA GSP, Section 4.5.2, p. 295.
[73] 2022 Redlined Kings River East GSA GSP, Section 4.5.3.4, p. 298.
[74] 2022 Redlined McMullin Area GSA GSP, Section 4.5.3.4, p. 303.

The Plan states that if the investigations confirm that groundwater extractions or other activities contributed to groundwater quality degradation, then the Plan's management actions will be implemented in the area where the groundwater quality has changed. However, the following GSPs have no management actions associated with degraded water quality: CKGSP, JGSP, and KREGSP. Also, the GSPs with management actions associated with degraded water quality, do not specify which management actions will be implemented to mitigate the degraded groundwater. Department staff recommend that by the Subbasin's next periodic evaluation, the GSAs update the Plan's management actions section to include a discussion related to what management actions will be implemented if their investigations confirm that GSA actions contributed to groundwater quality degradation (See Recommended Corrective Action 4d).

4.4.3 Conclusion

While Department staff have provided the GSAs with recommended corrective actions to improve upon the Plan, Department staff believe the issues identified do not preclude approval of the Plan. The Plan's individual GSPs now establish sustainable management criteria using consistent methodology. Additionally, the Plan quantified minimum threshold concentrations for all representative monitoring wells and provides the investigative methods which will be used following a minimum threshold exceedance. Department staff conclude that the GSAs have taken sufficient action to address the identified deficiencies. However, Department staff recommend that the corrective actions be considered by the next periodic evaluation to further improve upon the groundwater management as it relates to degraded water quality.

5 PLAN EVALUATION

As stated in Section 355.4 of the GSP Regulations, a basin "shall be sustainably managed within 20 years of the applicable statutory deadline consistent with the objectives of the Act." The Department's assessment is based on a number of related factors including whether the elements of a GSP were developed in the manner required by the GSP Regulations, whether the GSP was developed using appropriate data and methodologies and whether its conclusions are scientifically reasonable, and whether the GSP, through the implementation of clearly defined and technically feasible projects and management actions, is likely to achieve a tenable sustainability goal for the basin.

The Department staff's evaluation of the likelihood of the Plan to attain the sustainability goal for the Basin is provided below. Department staff consider the information presented in the Plan to satisfy the general requirements of the GSP Regulations.

5.1 ADMINISTRATIVE INFORMATION

The GSP Regulations require each Plan to include administrative 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.[75]

As mentioned at the start of this staff report, seven GSAs within the Subbasin have each prepared seven GSPs and a Coordination Agreement for future coordination efforts related to GSP content, data, and methodologies.[76] The GSAs developed a Memorandum of Understanding for GSP development and for acquiring grant funding.[77] Table 2 describes each GSA's decision-making process.

[75] 23 CCR § 354.2 *et seq*.
[76] 2022 Redlined James GSA GSP, Section 1.3, p. 33.
[77] 2022 Redlined James GSA GSP, Section 1.3, p. 33.

Table 2: GSA Governance Structure

GSA (GSP)	Decision Making Body	Seats	Voting Thresholds
CKGSA (Central Kings GSP[78])	Board of Directors	Consolidated Irrigation District Board of Directors	Not outlined in GSP
JGSA (James GSP[79])	Board of Directors	Five-member board	Majority vote
KREGSA (Kings River East GSP[80])	Board of Directors	Seven-member board	GSA decisions require majority vote. Bylaw amendments require 2/3 vote.
MAGSA (McMullin Area GSP[81])	Board of Directors	Five-member board	Vary, presented in Table 2-10 of GSP
NKGSA (North Kings GSP[82])	Board of Directors	Seven-member board	Vary, presented in Table 2-4 of GSP
NFKGSA (North Fork Kings GSP[83])	Board of Directors	Seven-member board	Majority vote. 2/3 vote for specified tasks.
SKGSA (South Kings GSP[84])	Board of Directors	Five-member board	Vary, presented in Table 2-4

The Subbasin is approximately 981,100-acres (1,530 square miles) located within the southern San Joaquin Valley Groundwater Basin, covers portions of Fresno and Kings Counties, and ranges from approximately 160 to 700 feet above mean sea level.[85]. The Kings and San Joaquin Rivers are the Subbasin's primary surface water bodies. The Subbasin is bounded by the Madera, Kaweah, Tulare Lake, Westside, and Delta-Mendota Subbasins. Figure 1 is a map of the Subbasin and depicts the location and coverage area of each GSP. Land use varies by GSP area, Table 3 provides a summary of each GSPs land use.

The Subbasin's water sources include groundwater, surface water (Kings River, San Joaquin River, Central Valley Project), and recycled water; however, these water sources vary by GSP. Table 4 summarizes each GSP's available water sources.

[78] 2022 Redlined Central Kings GSA GSP, Section 2.5.2, p. 85.
[79] 2022 Redlined James GSA GSP, Section 2.5.2, pp.71-72.
[80] 2022 Redlined Kings River East GSA GSP, Section 2.5.2, p. 106.
[81] 2022 Redlined McMullin Area GSA GSP, Section 2.5.2, pp. 95-96; and Table 2-10, p.98.
[82] 2022 Redlined North Kings GSA GSP, Section 2.5.2, pp. 77-78; and Table 2-4, p. 78.
[83] 2022 Redlined North Fork Kings GSA GSP, Section 2.5.2, pp. 98-99.
[84] 2022 Redlined South Kings GSA GSP, Section 2.6.2, p. 69; and Table 2-4, p. 69.
[85] 2022 Redlined James GSA GSP, Section 3.1.4, p. 83.

Figure 1: Kings Subbasin GSP Coverage Map[86]

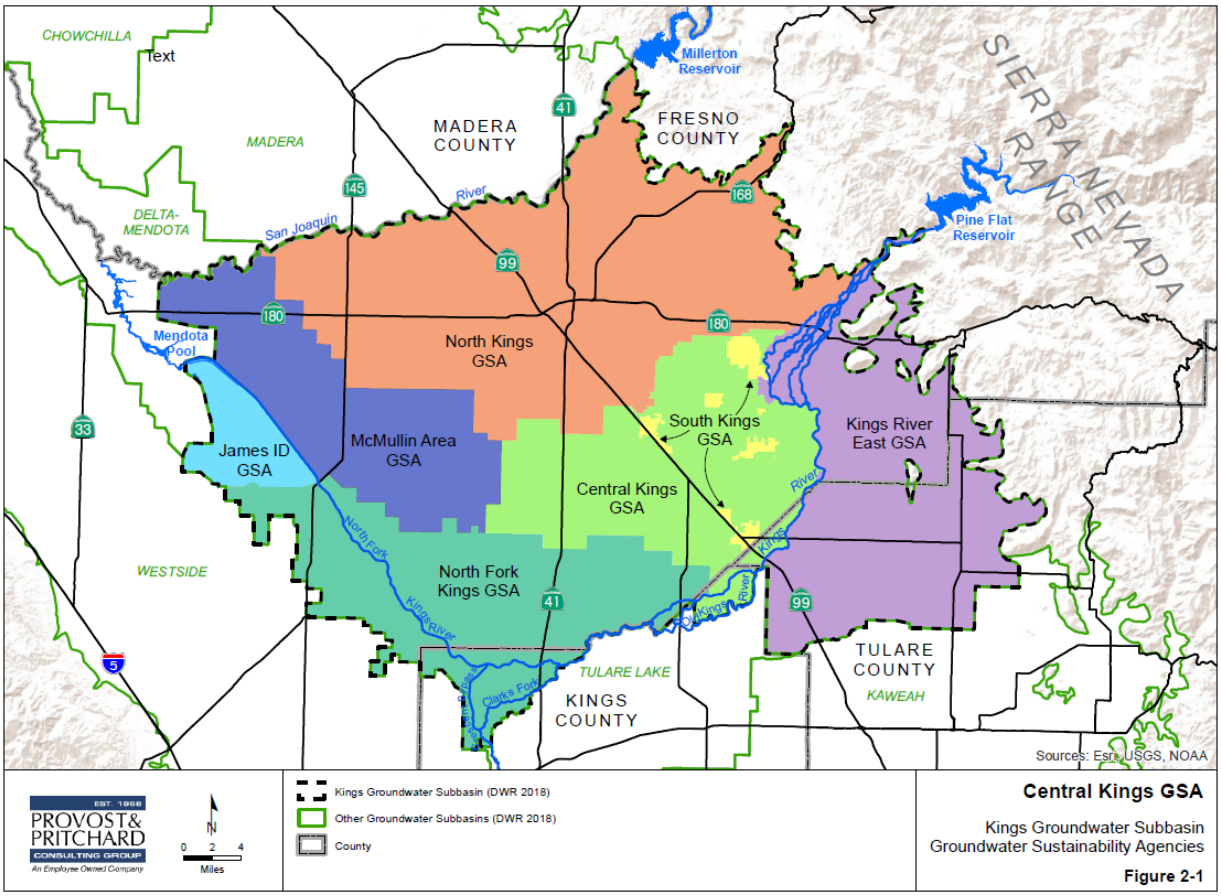

Table 3: Land Use by GSP in the Kings Subbasin

GSP	Total GSP Acreage[87]	% Agriculture	% Other (Vegetation, Urban, Commercial, Industrial, Water Features)
CKGSP	150,900	~90%	~10%
JGSP	29,000	~90%	~10%
KREGSP	191,300	~95%	~5%
MAGSP	120,600	~92%	~8%
NKGSP	310,700	~50%	~50%
NFKGSP	168,700	~90%	~10%
SKGSP	9,900	~15%	~85%
Total	**981,100**	**~78%**	**~22%**

[86] 2022 Redlined Central Kings GSA GSP, Figure 2-1, p. 56.
[87] 2022 Redlined Kings River East GSA GSP, Table 1-1, p. 48.

Table 4: Water Sources by GSP in the Kings Subbasin

GSP	Groundwater	Surface Water	Recycled Water
CKGSP[88]	x	x	
JGSP[89]	x	x	
KREGSP[90]	x	x	
MAGSP[91]	x	x	
NKGSP[92]	x	x	x
NFKGSP[93]	x	x	
SKGSP[94]	x		

Apart from the CKGSP, each GSP includes individualized Communication and Engagement Plans which detail the GSA's efforts to involve diverse social, cultural, and economic elements of the Subbasin's population and the methods the GSA shall follow to inform the public about Plan implementation.[95] The CKGSP identifies how agricultural users and domestic well users will receive GSP-related information; however, it is unclear if these notifications include all members of the public within the GSP area.[96]

Overall, Department staff conclude that the Plan's discussion of administrative information substantially complies with GSP Regulations.

5.2 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 a water budget accounting for total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions.[97]

5.2.1 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.[98] The hydrogeologic conceptual model is a non-numerical model of the physical setting, characteristics, and processes that govern groundwater occurrence within a basin, and represents a GSA's understanding of the geology and hydrology of the basin that support

[88] 2022 Redlined Central Kings GSA GSP, Section 2, p. 54.
[89] 2022 Redlined James GSA GSP, Table 2-2, p. 44.
[90] 2022 Redlined Kings River East GSA GSP, Table 2-2, p. 74.
[91] 2022 Redlined McMullin Area GSA GSP, Table 2-2, p. 58.
[92] 2022 Redlined North Kings GSA GSP, Table 2-2, p. 43.
[93] 2022 Redlined North Fork Kings GSA GSP, Table 2-2, p. 67.
[94] 2022 Redlined South Kings GSA GSP, Table 2-2, p. 49.
[95] 2022 Redlined James GSA GSP, Section 2.5.3-2.5.5, pp. 72-76.
[96] 2022 Redlined Central Kings GSA GSP, Section 2.5.3-2.5.4, p. 85.
[97] 23 CCR § 354.12 *et seq*.
[98] 23 CCR § 354.12 *et seq*.

the geologic assumptions used in developing mathematical models, such as those that allow for quantification of the water budget.[99]

The geologic structure of the Subbasin is a valley trough composed of the Sierra Nevada basement complex bedrock, overlying sedimentary rocks, and alluvium deposits.[100] Sedimentary rocks and alluvium deposits primarily have a regional dip to the west from the Sierra Nevada toward the valley trough axis; however, sedimentary rocks and alluvium in western portions of the Subbasin have a regional dip to the east from the Coast Ranges toward the valley trough axis.[101] The Sierra Nevada basement complex outcrops along the Subbasin's eastern margin.[102] For a majority of the Subbasin, the base of fresh groundwater is shallower than the depth to bedrock.[103] The Plan defines the Subbasin's base of fresh groundwater as either bedrock (east of bedrock-connate water interface[104]), or the depth to connate water (west of the bedrock-connate water interface).[105] Department staff note that the depth of connate water is the same as the base of groundwater, where present, in the Subbasin.

The Plan describes the aquifer systems, which consist of unconsolidated Tertiary and Quaternary age continental deposits that include the Turlock Lake, Riverbank, Modesto, and Post-Modesto formations.[106] The unconsolidated continental deposits can be categorized as older alluvium, lacustrine, marsh, younger alluvium, and flood-basin deposits. The aquifer system is primarily composed of the younger alluvium and older alluvium deposits, with the latter considered the Subbasin's most important aquifer.[107] Lacustrine and marsh deposits include the E-Clay, or Corcoran Clay, A-clay, and C-clay. The Corcoran Clay is approximately present in the western third of the Subbasin and is the primary aquitard separating the unconfined aquifer system from the confined aquifer system.[108] The A and C-clays are less extensive aquitards found at shallower depths in western areas of the Subbasin. The aquifer system east of the Corcoran Clay consists of a shallow unconfined aquifer and a deep confined aquifer separated by non-continuous confining clay layers.[109] Although the Plan describes the aquifer systems, it does not identify which aquifer systems are managed as principal aquifers, which is essential for the characterization and management of the Subbasin. Department staff recommend that

[99] DWR Best Management Practices for the Sustainable Management of Groundwater: Hydrogeologic Conceptual Model, December 2016: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-3-Hydrogeologic-Conceptual-Model_ay_19.pdf.
[100] 2022 Redlined Kings River East GSA GSP, Section 3.1.3, pp. 114-116.
[101] 2022 Redlined Central Kings GSA GSP, Section 3.1.3, pp. 90-91.
[102] 2022 Redlined James GSA GSP, Section 3.1.3, p. 81.
[103] 2022 Redlined James GSA GSP, Section 3.1.3, p. 81; and Figure 3-3, p. 82.
[104] 2022 Redlined James GSA GSP, Figure 3-3, p. 82.
[105] 2022 Redlined Central Kings GSA GSP, Section 3.1.3, pp. 90-91.
[106] 2022 Redlined James GSA GSP, Section 3.1.5, pp. 83-84.
[107] 2022 Redlined South Kings GSA GSP, Section 3.1.8.1, pp. 90-91.
[108] 2022 Redlined North Fork Kings GSA GSP, Section 3.1.8.1, pp. 135-136.
[109] 2022 Redlined James GSA GSP, Section 3.1.8.1, pp. 98-99.

the GSAs include the principal aquifer designations required by the GSP Regulations[110] in the Subbasin's next periodic evaluation (See Recommended Corrective Action 5).

The Plan identifies the A, C, and E-clays, and the San Joaquin and Kings Rivers as the Subbasin's structural properties which restrict groundwater flow within its aquifers.[111] The A, C, and E-clays are aquitards that generally restrict vertical groundwater flow.[112] Although the Plan does not define its principal aquifers, these clay layers are primarily responsible for the presence of unconfined, semi-confined, and confined conditions throughout the Subbasin. Seepage from the San Joaquin and Kings Rivers primarily affects horizontal groundwater flow.[113]

The Plan provides maps of the Subbasin's geomorphic features[114], topography[115], surficial geologic deposits[116], soil texture and relative saturated hydraulic conductivity[117], and provides several geologic cross-sections.[118] The Subbasin's most significant surface water features are the San Joaquin River and the Kings River, in addition to several smaller canals, bypasses, and sloughs.[119] The primary sources of water into the Subbasin is the Kings River, the San Joaquin River via the Friant-Kern Canal, the Mendota Pool via the Delta-Mendota Canal, and other minor sources.[120]

Overall, the Plan provides a sufficient description of the Subbasin's hydrogeologic conceptual model. Department staff conclude that the Plan substantially complies with the requirements outlined in the GSP Regulations. However, Department staff recommend that the GSAs consider and incorporate the Department's recommended corrective actions by the Subbasin's next periodic evaluation to improve upon the Plan.

5.2.2 Groundwater Conditions

The GSP Regulations require a written description of historical and current groundwater conditions for each of the six sustainability indicators and groundwater dependent ecosystems.[121] The Plan provides the current and historical groundwater conditions for each applicable sustainability indicator.

Unconfined groundwater conditions are present throughout the Subbasin, while confined groundwater conditions are only present where the C-clay and E-clay are located.[122] The Plan provided Spring and Fall 2017 groundwater elevation contour maps to illustrate the

[110] 23 CCR § 354.14(b).
[111] 2022 Redlined James GSA GSP, Section 3.1.8.1, pp. 98-99.
[112] 2022 Redlined James GSA GSP, Section 3.1.8.1, pp. 98-99.
[113] 2022 Redlined Central Kings GSA GSP, Section 3.1.2, pp. 86-87.
[114] 2022 Redlined McMullin Area GSA GSP, Figure 3-5, p. 122.
[115] 2022 Redlined McMullin Area GSA GSP, Figure 3-6, p.123.
[116] 2022 Redlined McMullin Area GSA GSP, Figure 3-7, p. 125.
[117] 2022 Redlined McMullin Area GSA GSP, Figure 3-8, p. 127.
[118] 2022 Redlined McMullin Area GSA GSP, Figures 3-9 to 3-14, pp. 129-134.
[119] 2022 Redlined McMullin Area GSA GSP, Section 3.1.10, pp. 149-151.
[120] 2022 Redlined North Fork Kings GSA GSP, Section 3.1.11, p. 148.
[121] 23 CCR § 354.16(a-f).
[122] 2022 Redlined North Fork Kings GSA GSP, Section 3.2, p. 158.

unconfined aquifer's current seasonal high and low groundwater elevations.[123] However, due to 2016/2017 being an extremely wet year these specific maps illustrate minimal change in seasonal elevations.[124] The Plan does not include the most recent available data to demonstrate the unconfined aquifer's normal seasonal high and low groundwater elevations. As a result, Department staff suggest the GSAs use data more representative of normal seasonal high and seasonal low groundwater elevations.

The Plan adequately discusses the unconfined aquifer's groundwater flow directions, lateral and vertical gradients, and regional pumping patterns. Additionally, the Plan provides hydrographs depicting a well's historical high and low groundwater elevations.[125] Collectively, these hydrographs illustrate the Subbasin's general long-term groundwater elevation trends. However, due to the Plan not identifying principal aquifers, the Plan does not include an equivalent discussion for the Subbasin's confined aquifer(s). As mentioned above, the lack of information related to the confined principal aquifer(s) has led to several staff recommendations for various parts of the Plan. Department staff recommends that the GSAs discuss the confined aquifer's groundwater conditions in the Plan's subsequent periodic evaluation (See Recommended Correction Action 6a).

The GSAs developed a coordinated approach for estimating the change in storage for the Subbasin's unconfined aquifer. This approach split the Subbasin into subareas, which were generally a single township, and then completed the following to quantify the storage capacity of each subarea:

1) Determined the base of the unconfined aquifer.
2) Quantified the average depth to groundwater.
3) Multiplied the thickness of saturated alluvium by the designated specific yield for a given depth zone and by the subarea's area.[126]

The Plan summed the storage capacity of each subarea to quantify the estimated total available groundwater in storage for a given year.[127] Annual storage estimates are compared to determine the change in storage over a given period.[128]This approach estimates the total change in storage over the Plan's hydrologic average base period (spring 1997 to spring 2012) as -1.8 million acre-feet or approximately -122,000 acre-feet per year (AFY).[129] The approach provides an adequate estimate of the unconfined aquifer's change in storage. However, the Plan states that it could not estimate the confined aquifer's change in storage due to a lack of available data.[130] This lack of data illustrates the GSAs' incomplete understanding of the Subbasin's change in storage

[123] 2022 Redlined North Fork Kings GSA GSP, Figures 3-27 and 3-28, pp. 160-161.
[124] 2022 Redlined McMullin Area GSA GSP, Section 3.2.1, p. 158.
[125] 2022 Redlined North Kings GSA GSP, Appendix 4A, pp. 916-951.
[126] 2022 Redlined North Fork Kings GSA GSP, Section 3.2.1, p. 172.
[127] 2022 Redlined North Fork Kings GSA GSP, Section 3.2.1, p. 172.
[128] 2022 Redlined North Fork Kings GSA GSP, Section 3.2.1, p. 172.
[129] 2022 Redlined North Fork Kings GSA GSP, Section 3.2.1, p. 172; and Figure 3-34, p. 174.
[130] 2022 Redlined North Fork Kings GSA GSP, Section 3.2.1, p. 172.

conditions. However, the Plan includes a new project to fill the confined aquifer's data gaps. Department staff recommends that the GSAs use the data collected from this project to quantify the change in storage conditions for the confined aquifer(s) in the Plan's next periodic evaluation (See Recommended Corrective Action 6b).

The Plan describes the Subbasin's current and historical groundwater quality conditions. The individual GSPs identify their chemical of concerns and provides a historical and current summary of each listed chemical within the plan area. The Plan does not use a singular methodology to identify the chemicals of concern included in the individual GSPs. In some of the GSPs, the chemicals of concern appear to be based on constituents mentioned in existing plans, such as the Subbasin's IRWM plan,[131] while other GSPs appear to identify those constituents with possible historically elevated concentrations.[132] Table 5 below summarizes the chemicals of concern by GSP area.

Department staff considers it reasonable for each GSA to recognize varying chemicals of concern for their plan area. However, Department staff recommend that the GSAs describe the methodology used to determine the identified chemicals of concern within the Subbasin. This is further described in Section 5.3.2.4 of this Staff Report and a recommended corrective action is provided.

The Plan states that the Subbasin has historically experienced land subsidence caused by overdraft conditions and declining groundwater levels within the confined aquifer.[133] The Plan provided several datasets outlining the cumulative and annual rate of land subsidence for a given period. The Department's 1949 to 2005 dataset and Kings River Conservation District's (KRCD) 2013 to 2016 dataset offer an overview of the Subbasin's historical and recent land subsidence.[134] The Department's dataset illustrates that between 60 and 150-inches of subsidence occurred between 1949 to 2005, while KRCD's dataset illustrates that between 4 and 17-inches of subsidence occurred between 2013 and 2016.[135] These datasets demonstrate the varied amount of land subsidence each GSP area has experienced. The MAGSP, JGSP, and NFKGSP, located within the western third of the Subbasin, are the GSP areas that are most affected by subsidence.

[131] 2022 Redlined South Kings GSA GSP, Section 3.2.5, p. 121.
[132] 2022 Redlined North Fork Kings GSA GSP, Section 3.2.5, pp. 176-195.
[133] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.1.2, p. 314.
[134] 2022 Redlined McMullin Area GSA GSP, Section 4.6.2.1, pp. 310-312.
[135] 2022 Redlined McMullin Area GSA GSP, Section 4.6.2, p. 312.

Table 5: Chemicals of Concern by GSP

Chemical of Concern	MAGSP	NFKGSP	KREGSP	NKGSP	JGSP	SKGSP	CKGSA
1,2,3-Trichloropropane (TCP)	X	X		X	X	X	X
Aluminum		X					
Arsenic	X	X		X	X	X	X
Boron					X		
Chloride	X						
Chromium (Total)		X			X		
Dibromo-Chloropropane	X		X	X		X	X
Fluoride		X			X		
Gross Alpha		X			X		
Hexavalent Chromium						X	X
Iron		X					
Lead		X			X		
Manganese	X	X			X		
Methyl Tert-Butyl Ether						X	X
Nitrates	X	X	X	X	X	X	X
Sodium	X						
Tetrachloroethylene (PCE)							X
Total Dissolved Solids (TDS)	X	X					
Trichloroethylene (TCE)							X
Uranium	X	X		X	X	X	X

The Plan provides varying discussions related to the Subbasin's interconnected surface water conditions. The GSP areas that are adjacent to the upper reaches of the Kings River highlight studies which state that the Kings River is in direct hydraulic communication with groundwater.[136] The GSP areas that are adjacent to the San Joaquin River highlight studies which provide conflicting information and data about whether portions of the San Joaquin River are interconnected.[137] However, the Plan does not provide information concerning the quantity and timing of depletions of the identified interconnected surface water systems. Department staff concludes that this lack of information is equivalent to the data gap highlighted in Corrective Action 3 of the Department's Incomplete Staff Report (pertaining to the depletion of interconnected surface waters). Section 4.3.2 of this Staff Report (above) discusses the GSA's response to Corrective Action 3 in which Department staff provided additional Recommended Corrective Actions related to the interconnected surface water data gap.

Overall, the Plan adequately describes the Subbasin's historical and current groundwater conditions. Department staff concludes that the Plan substantially complies with the

[136] 2022 Redlined North Kings GSA GSP, Section 3.2.7.2, p. 163.
[137] 2022 Redlined McMullin Area GSA GSP, Section 3.2.7, pp. 224-225.

groundwater conditions requirements outlined in the GSP Regulations. However, Department staff recommend that the GSAs consider and incorporate the Department's recommended corrective actions by the Subbasin's next periodic evaluation to improve upon the Plan.

5.2.3 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.

The GSAs developed aggregated water budgets using spreadsheet calculations based on estimates of the Subbasin's inflows and outflows of groundwater for the historical, current, and projected water budgets.[138] A numerical model was not used due to documented deficiencies with currently available models, limited data for model development, and limited time for model refinement, calibration, and validation.[139] However, the Plan states that the data used in the aggregated water budget was often incomplete, had to be estimated, or was based on assumptions that resulted in parameters having confidence intervals of 5% to 50%.[140] The Plan does not identify those parameters with large confidence intervals as existing data gaps, nor do they discuss how water budget-related data gaps will be identified and filled in future Plan updates, this topic is further discussed later in this section.

The historical water budget covers water years 1997 to 2011 (October 1996 to September 2011), which is also defined as the Plan's base or study period.[141] The GSAs chose this period due to the Subbasin's surface water diversions being similar to the Subbasin's long-term average diversions, claiming that due to extreme drought conditions between 2012 to 2016 using a more recent period was impractical.[142] However, the GSP Regulations require historical water budgets to include the best and most recently available information and extend back a minimum of 10 years.[143] One of the purposes for this requirement is to ensure that the historical water budget provides an evaluation of the Subbasin's availability or reliability of historical surface water supplies and while the 2012-2016 drought was extreme, California's hydrological record and forecasts of future hydrology (especially when climate change is factored in) indicate that similar dry periods and scarcity of surface water supplies are likely to occur during the planning and implementation horizon and should therefore be considered and incorporated into Subbasin management. By excluding the periods of drought, the GSAs have developed a historical water budget that does not fully meet the intent of the GSP Regulations.

[138] 2022 Redlined McMullin Area GSA GSP, Section 3.3.1, p. 231.
[139] 2022 Redlined McMullin Area GSA GSP, Section 3.3.1, p. 231.
[140] 2022 Redlined McMullin Area GSA GSP, Section 3.3.2, p. 232.
[141] 2022 Redlined North Fork Kings GSA GSP, Section 3.3.3, p. 215.
[142] 2022 Redlined North Fork Kings GSA GSP, Section 3.3.3, pp. 215-216.
[143] 23 CCR § 354.18(c)(2)(B).

The Plan includes two methods for determining the historical water budget's annual change in groundwater storage, which this assessment's water budget section defines as overdraft. Method 1 is the aggregated water budget discussed above, and Method 2 is based on annual unconfined groundwater levels and estimated groundwater released from land subsidence.[144] Method 1 quantified the average overdraft as -198,200 AFY and Method 2 quantified the average overdraft as -134,000 AFY.[145] The Plan considers Method 2 more accurate than Method 1 due to Method 2 using direct measurements (i.e., groundwater level contour maps).[146] Department staff consider both methods to have several inaccuracies and data gaps associated with their quantified overdraft values and have determined that the Plan provides insufficient evidence to adequately demonstrate that one method is more accurate than the other. Department staff recommend the GSAs consider updating the Subbasin's historical water budget using a single method and the best and most recently available information that considers all aspects of groundwater extractions and that provides a more accurate assessment of the Subbasin's historical water use (See Recommended Corrective Action 7a).

The Plan's current water budget was prepared using data from water years 2016 and 2017.[147] The Plan states that these water years represent a dry year and a wet year, which together was considered the best representation of current hydrology.[148] The Subbasin's current water budget estimated annual overdraft as -119,400 AFY.[149] The Plan attributes the decrease in overdraft between the historical and current water budget to an increase in urban surface water use, water meter installations, and residual effects of conservation measures implemented during the 2012 to 2015 drought, however, the Plan does not provide evidence of this.[150] However, Kings River diversions during water years 2016 and 2017 were approximately 17% greater than the base period diversions used for the historical water budget, leading Department staff to believe this increase was likely a primary factor in the decreased overdraft.[151] Department staff suggest the GSAs use data more representative of normal basin conditions when updating the current water budget for the periodic evaluation.

The Plan's historical and current water budgets provide three overdraft values: -198,200 AFY, -134,000 AFY, and -119,400 AFY. The Plan's approach to reaching sustainability is based on the incremental mitigation of the Subbasin's historical overdraft by 2040. However, the Plan's coordination agreement states that the total volume of overdraft that the GSAs must mitigate is -122,000 AFY.[152] This volume of overdraft was quantified in the Plan's groundwater conditions section and did not consider the confined aquifer's

[144] 2022 Redlined North Fork Kings GSA GSP, Section 3.3.8, p. 234.
[145] 2022 Redlined Kings River East GSA GSP, Section 3.3.8, p. 217.
[146] 2022 Redlined McMullin Area GSA GSP, Section 3.3.8, p. 245.
[147] 2022 Redlined North Fork Kings GSA GSP, Section 3.3.9, p. 240.
[148] 2022 Redlined North Fork Kings GSA GSP, Section 3.3.9, p. 241.
[149] 2022 Redlined Kings River East GSA GSP, Section 3.3.9, p. 221.
[150] 2022 Redlined Kings River East GSA GSP, Section 3.3.9, p. 221.
[151] 2022 Redlined North Fork Kings GSA GSP, Section 3.3.3, p. 219.
[152] 2022 Kings Subbasin Coordination Agreement, Exhibit B, p. 29.

storage change. The Plan does not thoroughly discuss why the GSAs used the -122,000 AFY overdraft volume. However, the Plan states that the volume of overdraft each GSA is responsible for mitigating will be adjusted in the future as additional data becomes available. The GSAs provide no discussion or explanation regarding why the Plan used an overdraft value lower than the overdraft value quantified using either of the Plan's historical water budget methods. Department staff recommends that the GSAs eliminate this inconsistency and provide a thorough explanation for the inconsistencies between the volume of overdraft quantified from the Subbasin's water budgets and the cumulative volume of overdraft the GSAs indicate their management will mitigate (See Recommended Correct Action 7b).

The Plan includes projected water budgets for 2040 and 2070.[153] The Subbasin's projected water budgets were developed using DWR's projected inflows to Pine Flat, projected precipitation, and projected evapotranspiration datasets.[154] The 2040 projected water budget estimates that the Subbasin will experience zero annual overdraft.[155] The Subbasin Plan proposes to eliminate overdraft with 168,494 AFY from water supply augmentation projects, 7,500 AFY from demand reduction associated with project development, and 43,400 AFY from demand reduction associated with management actions.[156] Most of the demand reduction associated with management actions comes from the MAGSP. However, the MAGSP does not define their management actions' benefits or implementation timelines. As a result, it is unclear to Department staff whether this amount of demand management is feasible or achievable by 2040. Department staff have included recommended corrective actions related to the implementation timeline and projected benefits for management actions in Section 5.5.2 of this Staff Report.

The Plan estimates the Subbasin's sustainable yield as 1,170,000 AFY.[157] To quantify sustainable yield, the Plan subtracted total groundwater outflow from total groundwater recharge (from natural and artificial sources).[158] The Plan states that the sustainable yield is approximate and discusses the current inaccuracies with the quantification processes.[159] The GSAs expect that the Subbasin's sustainable yield will change over time as their data becomes more accurate.[160] Department staff determined that the Subbasin's sustainable yield estimate substantially complies with the requirements of the GSP Regulations but suggest that the GSAs articulate any changes in the Subbasin's future periodic evaluations.

The Plan states that the best available data for the water budget was often incomplete, had to be estimated, or was based on assumptions.[161] Additionally, the Plan states that

[153] 2022 Redlined McMullin Area GSA GSP, Section 3.3.10, p. 250.
[154] 2022 Redlined McMullin Area GSA GSP, Section 3.3.10, p. 251.
[155] 2022 Redlined McMullin Area GSA GSP, Section 3.3.10, p. 255.
[156] 2022 Redlined McMullin Area GSA GSP, Section 3.3.10, p. 255.
[157] 2022 Redlined McMullin Area GSA GSP, Section 3.3.10, p. 255.
[158] 2022 Redlined McMullin Area GSA GSP, Section 3.3.13, p. 258.
[159] 2022 Redlined Central Kings GSA GSP, Section 3.3.12, p. 210.
[160] 2022 Redlined Central Kings GSA GSP, Section 3.3.12, p. 210.
[161] 2022 Redlined McMullin Area GSA GSP, Section 3.3.2, p. 232.

the confidence intervals for the individual parameters used to quantify the Subbasin's water budgets vary from 5% to 50% resulting in the Plan's water budget being merely an approximation of the Subbasin's hydrologic system.[162] This approximation theme is repeated throughout the Plan's water budget, quantification of overdraft, and estimate of sustainable yield sections.[163] However, the Plan does not identify any of these parameters as data gaps nor does it discuss how the GSAs will improve these parameters in the future. Department staff believe that the GSAs can improve upon a confidence interval of up to 50%. Therefore Department staff recommend the GSAs identify and fill water budget-related data gaps and update the Subbasin's water budgets, quantification of overdraft, and estimate of sustainable yield by the Subbasin's next periodic evaluation (See Recommended Corrective Action 7c).

Overall, Department staff conclude that the Plan's water budget sections substantially comply with the requirements outlined in the GSP Regulations. While Department staff have provided recommended corrective actions, the shortcomings of the Plan do not preclude approval of the Plan at this time. The Plan provides the required historical, current, and future account and assessment of the volume of groundwater and surface water entering and leaving the Subbasin. Additionally, the Plan includes a sufficient estimate of the Subbasin's sustainable yield and future water demands. Department staff considers these initial water budgets an adequate plan implementation starting point. However, Department staff encourage the GSAs to consider and incorporate Recommended Corrective Actions 7a through 7c and update the Plan's water budgets by the Subbasin's next periodic evaluation.

5.2.4 Management Areas

The GSP Regulations provide the option for one or more management areas to be defined within a basin if the GSA has determined that the creation of the management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives, provided that undesirable results are defined consistently throughout the basin.[164] None of the GSPs utilize management areas for the Subbasin.

5.3 Sustainable Management Criteria

The GSP Regulations require each Plan to include a sustainability goal for the basin and to characterize and establish undesirable results, minimum thresholds, and measurable objectives for each applicable sustainability indicator, as appropriate. The GSP Regulations require each Plan to define conditions that constitute sustainable groundwater management for the basin including the process by which the GSA

[162] 2022 Redlined McMullin Area GSA GSP, Section 3.3.2, p. 232.
[163] 2022 Redlined McMullin Area GSA GSP, Section 3.3.2, p. 232; Section 3.3.11, p. 257; and Section 3.3.13, pp. 257-258.
[164] 23 CCR § 345.20.

characterizes undesirable results and establishes minimum thresholds and measurable objectives for each applicable sustainability indicator.[165]

5.3.1 Sustainability Goal

The Subbasin's sustainability goal is *"to ensure that by 2040 the basin is being managed to maintain a reliable water supply for current and future beneficial uses without experiencing undesirable results."*[166] The Subbasin will be considered sustainable when:

1) The Subbasin is managed within its sustainable yield.

2) The current rate of groundwater level decline has been corrected, and the multi-year trend of groundwater elevations has stabilized.

3) Groundwater management activities prevent undesirable results for all applicable sustainability indicators.[167]

The Plan discusses the volume of overdraft that each GSA has agreed to mitigate to ensure that the Subbasin reaches sustainability.[168] Each GSA is responsible for implementing the projects and management actions necessary to meet the Plan's phased approach for overdraft mitigation and to ultimately reach sustainability.[169] Department staff determined that the Plan's Sustainability Goal substantially complies with the GSP Regulations.

5.3.2 Sustainability Indicators

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.[170] Sustainability indicators thus correspond with the six undesirable results – chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon, significant and unreasonable reduction of groundwater storage, significant and unreasonable seawater intrusion, significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies, land subsidence that substantially interferes with surface land uses, and depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water[171] – 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.

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[165] 23 CCR § 354.22 *et seq*.
[166] 2022 Redlined McMullin Area GSA GSP, Section 4.1, p. 266.
[167] 2022 Redlined McMullin Area GSA GSP, Section 4.1, p. 266.
[168] 2022 Redlined Central Kings GSA GSP, Section 4.1, p. 219.
[169] 2022 Redlined McMullin Area GSA GSP, Section 4.1, p. 266.
[170] 23 CCR § 351(ah).
[171] Water Code § 10721(x).

The following subsections consolidate three facets of sustainable management criteria: undesirable results, minimum thresholds, and measurable objectives. Information, as presented in the Plan, 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 GSA is not required to establish criteria for undesirable results that the GSA can demonstrate are not present and are not likely to occur in a basin.[172]

5.3.2.1 Chronic Lowering of Groundwater Levels

In the January 2022 Incomplete Determination for the 2020 Plan, the Department identified a deficiency related to the sustainable management criteria of chronic lowering of groundwater levels. The GSAs revised this portion of the Plan, and Department staff provided the evaluation for this sustainability indicator in Section 4.1 of this Staff Report, and Recommended Corrective Action 1.

5.3.2.2 Reduction of Groundwater Storage

The GSP Regulations require the minimum threshold for the reduction of groundwater storage to be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for the reduction of groundwater storage shall be supported by the basin's sustainable yield, calculated based on the basin's historical trends, water year type, and projected water use.[173]

The Plan did not use groundwater levels as a proxy; however, the Plan did use the Subbasin's chronic lowering of groundwater levels minimum thresholds and measurable objectives as the basis for quantifying sustainable management criteria for the reduction of groundwater storage.[174] The Plan quantified annual change in storage using the methods discussed in the Section 5.2.2 above. The Plan quantified interim milestones, measurable objectives, and minimum thresholds for the reduction of groundwater storage by comparing current and projected groundwater elevation maps.[175] The projected maps were based on the Plan's chronic lowering of groundwater levels interim milestones, measurable objectives, and minimum thresholds.[176] Department staff conclude that the Plan's process to establish sustainable management criteria are generally sound for the Subbasin's unconfined aquifer. However, as mentioned in previous sections of this Staff Report, the Plan's reduction of groundwater storage sustainable management criteria section does not provide a robust discussion of the confined aquifer.

The Plan does not include the Subbasin's confined aquifer in its establishment of sustainable management criteria. The Plan states that if the confined aquifer remains fully saturated then changes in the potentiometric surface would only impact the

[172] 23 CCR § 354.26(d).
[173] 23 CCR § 354.28(c)(2).
[174] 2022 Redlined McMullin Area GSA GSP, Section 4.3.2, p. 285.
[175] 2022 Redlined McMullin Area GSA GSP, Section 4.3.2, pp. 285-286.
[176] 2022 Redlined McMullin Area GSA GSP, Section 4.3.2, pp. 285-286.

compressibility of the mineral skeleton and pore water, which would have a minimal impact on the total volume of storage change.[177] The Plan does not provide the change of storage that has occurred in the confined aquifer to demonstrate what the small impact is. Additionally, the Plan's monitoring network does not adequately monitor the confined aquifer, which appears to indicate that the GSAs do not currently have the data necessary to demonstrate this statement, this is further discussed in Section 5.4 below.

The GSP Regulations do not require GSPs to manage each principal aquifer separately. However, the GSP Regulations do require that the GSPs quantify the volume of groundwater that can be withdrawn from the Subbasin without causing conditions that may lead to undesirable results.[178] The Plan discusses how the Subbasin's excessive groundwater extractions, specifically within the confined aquifer, have resulted in subsidence and states that future excessive pumping from the confined aquifer could cause an land subsidence undesirable result.[179] By excluding the confined aquifer from the Plan's reduction of groundwater storage sustainable management criteria, the GSAs have not demonstrated the quantity of groundwater that can be withdrawn prior to causing an undesirable result for all sustainability indicators. Department staff recommend the GSAs update the Plan's reduction in groundwater storage sustainable management criteria in a manner that collectively considers all aquifers in the Subbasin by the Subbasin's next periodic evaluation (see Recommended Corrective Action 8).

At this time, the Department staff conclude that the Plan's reduction of groundwater storage sustainable management criteria substantially complies with the requirements outlined in the GSP Regulations. The Plan's reduction of groundwater storage sustainable management criteria is commensurate with its chronic lowering of groundwater levels sustainable management criteria and the GSA's understanding of the basin as there are data gaps associated with the confined aquifers. Because the Plan does not consider the storage losses of all principal aquifers, Department staff encourage the GSAs to consider the Department's recommended corrective action and update the Subbasin's Plan by the next periodic evaluation.

5.3.2.3 Seawater Intrusion

The GSP Regulations require the minimum thresholds for seawater intrusion to be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results.[180]

The Plan states that *"by definition, seawater intrusion occurs when saline water from the ocean infiltrates the groundwater system and begins to flow into areas of freshwater due to pressure differentials, in many cases caused by groundwater pumping".*[181] Additionally, due to the distance between the Subbasin and the Pacific Ocean and the Subbasin's

[177] 2022 Redlined McMullin Area GSA GSP, Section 4.3, p. 284.
[178] 23 CCR § 354.28(c)(2).
[179] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.1.2, p. 314.
[180] 23 CCR § 354.58(c)(3).
[181] 2022 Redlined McMullin Area GSA GSP, Section 4.4, p. 290.

current groundwater elevations the Plan determined that it does not need to account for seawater intrusion.[182] Department staff concur with the rational for not setting sustainable management criteria for seawater intrusion.

5.3.2.4 Degraded Water Quality

The GSP Regulations require the minimum threshold for degraded water quality to 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. The minimum thresholds shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.[183]

The Plan defines a degraded water quality undesirable result as the significant and unreasonable reduction in groundwater quality as it relates to groundwater pumping and recharge projects such that the groundwater is no longer suitable for agricultural, irrigation, and domestic use.[184] Each GSP provides the same undesirable result definition, however, each GSP does not establish minimum thresholds and measurable objectives for the same constituents.

Each GSP's groundwater conditions section lists the chemicals of concern that cause groundwater quality issues within its plan area. Each GSP established Sustainable management criteria for all or a subset of the listed chemicals of concern. However, the Plan does not use a singular methodology to identify each GSP's chemicals of concern. For some GSPs, the chemicals of concern appear to be based on constituents mentioned in existing plans, such as the Subbasin's IRWM plan.[185] In contrast, other GSPs appear to be those constituents with possible historically elevated concentrations.[186] Department staff recognize that each GSA could establish sustainable management criteria for varying constituents and still ensure that groundwater quality in their plan area remains suitable for agricultural irrigation and domestic use, as required by the Subbasin's undesirable result definition. However, Department staff recommend that in the Subbasin's next periodic evaluation, the GSAs describe the methodology used to determine which chemicals of concern are identified in the individual GSPs (See Recommended Corrective Action 9a).

The Plan's minimum thresholds were updated as required by deficiency 4b. An assessment of the Plan's minimum thresholds for degraded water quality is provided in Section 4.4.2 of this Staff Report.

[182] 2022 Redlined McMullin Area GSA GSP, Section 4.4, p. 290.
[183] 23 CCR § 354.28(c)(4).
[184] 2022 Redlined McMullin Area GSA GSP, Section 4.5.1, pp. 291-292.
[185] 2022 Redlined South Kings GSA GSP, Section 3.2.5, p. 121.
[186] 2022 Redlined McMullin Area GSA GSP, Section 3.2.5.2, p. 192.

The KREGSP, NKGSP, SKGSP, and CKGSP's criteria to define the presence of an undesirable result is 15% of their representative monitoring wells exceeding its minimum threshold for two consecutive years. The MAGSP, NFKGSP, and JGSP's criteria is 15% of their representative monitoring wells exceeding its minimum threshold for two consecutive monitoring events. The Plan does not provide sufficient information concerning monitoring frequency to demonstrate whether two consecutive years and two consecutive monitoring events are the same criteria. Department staff recommend that the GSAs clarify that the GSPs use a basin-wide criteria to determine the presence of an undesirable result (See Recommended Corrective Action 9b).

The Plan's water quality monitoring frequency is equal to the requirements of the existing program under which the representative monitoring wells are monitored. This frequency can be anywhere from one month to six years and varies by constituent and by well; however, the specific frequency for each constituent at each representative monitoring well is not provided.[187] Additionally, based on the Plan's statement that monitoring frequency for individual representative monitoring wells may vary from one month to six years it is unclear how the GSAs could determine whether a degraded water quality undesirable result was present. As a result, Department staff recommend that the GSAs demonstrate how minimum thresholds are quantitively measured in a manner consistent with the GSP Regulations monitoring network requirements and that they can determine whether an undesirable result is present (See Recommended Corrective Action 9c).

Additionally, the Plan does not discuss how the GSAs are able to determine whether an undesirable result is present, using either criterion, when each constituent's representative monitoring well is monitored at varied frequencies. Department staff recommend that by the Subbasin's next periodic evaluation, the GSAs develop a new criterion, used by each GSP, to define the presence of an undesirable result that can determine whether an undesirable result is present annually even if each representative monitoring well is not monitored annually (ex. if a representative monitoring well is monitored once every six years then the GSAs could assume that the well's concentration remains the same between monitoring events) (See Recommend Corrective Action 9b).

The Plan established measurable objectives to maintain stable or improve groundwater quality trends for each identified chemical of concern.[188] The Plan established measurable objectives for each chemical of concern at individual representative monitoring sites using two methods:

1) If historical concentrations are below the MCL then the measurable objective equals the MCL.
2) If historical concentrations are above the MCL then the measurable objective is to maintain stable or improving groundwater quality trends.

[187] 2022 Redlined McMullin Area GSA GSP, Section 4.5.1.1, p. 292.
[188] 2022 Redlined McMullin Area GSA GSP, Section 4.5.3.1, p. 302.

The Plan does not explicitly define how measurable objectives meant to "maintain stable or improving groundwater quality trends" are quantified. Department staff recommend that, in the Subbasin's next periodic evaluation, the GSAs provide a table that includes each representative monitoring site's quantified measurable objective concentrations.

Department staff conclude that the Plan's degraded water quality sustainable management criteria substantially complies with the requirements outlined in the GSP Regulations. The Plan includes the underlying discussions and rationale to understand why the GSAs selected the Plan's chemicals of concerns and used a reasonable approach to establish sustainable management criteria. However, Department staff encourage the GSAs to consider the Department's recommended corrective actions and update the Subbasin's Plan by the next periodic evaluation.

5.3.2.5 Land Subsidence

In the January 2022 Incomplete Determination for the 2020 Plan, the Department identified a deficiency related to the sustainable management criteria of land subsidence. The GSAs revised this portion of the Plan and Department staff provided the evaluation for this sustainability indicator in Section 4.2 of this Staff Report, as well as Recommended Corrective Action 2.

5.3.2.6 Depletions of Interconnected Surface Water

In the January 2022 Incomplete Determination for the 2020 Plan, the Department identified a deficiency related to the sustainable management criteria of depletions of interconnected surface water. The GSAs revised this portion of the Plan and Department staff provided the evaluation for this sustainability indicator in Section 4.3 of this Staff Report, as well as Recommended Corrective Action 3.

5.4 MONITORING NETWORK

The GSP Regulations describe the monitoring network that must be developed for each basin including monitoring objectives, monitoring protocols, and data reporting requirements. Collecting monitoring data of a sufficient quality and quantity is necessary for the successful implementation of a groundwater sustainability plan. The GSP Regulations require a monitoring network of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.[189]

The Plan includes between 176 to 182 groundwater level monitoring wells. The range of wells is due to the CKGSP providing inconsistent information about the number of monitoring wells included in its monitoring network. Table 6 provides the number of wells by GSP area based on their GSP and the Department's SGMA Monitoring Network Module (MNM).

[189] 23 CCR § 354.32.

Table 6: Number of Wells in GSP and Monitoring Network Module by GSP

GSP	# of Wells in GSP	# of Wells in MNM
NFKGSP	76	60
MAGSP	23	23
CKGSP	10 to 16	11
JGSP	5	5
KREGSP	23	23
NKGSP	34	34
SKGSP	5	5
Total	**176 to 182**	**161**

The 161 wells in the MNM are the Plan's wells for which the GSAs have been actively submitting the groundwater level readings required by the GSP Regulations. Of these wells, 63 include well depth, 52 include perforations, and 135 include principal aquifer designations; however, most of these designations are labeled as "assumed". As a result, a majority of the Subbasin's chronic lowering of groundwater levels monitoring wells do not meet the GSP Regulations Data and Reporting Standards.[190] The NFKGSP, MAGSP, JGSP, KREGSP, and NKGSP identify the absence of information required by the GSP Regulations data and reporting standards as a data gap.

The CKGSP and SKGSP state that the absence of this information is not a data gap, reasoning that *"the data is from dedicated monitor well information of known construction."*[191] This statement demonstrates that the CKGSA and SKGSA have knowingly excluded data and information from their GSPs which was readily available. Additionally, the GSPs' do not include a plan for providing this data and information in the future. CKGSP includes information related to the groundwater monitoring improvements conducted using the State's Local Groundwater Assistance grant funding, awarded in June 2013 and the project was completed in December 2015.[192] Department staff strongly recommend that each GSP in the Subbasin update their chronic lowering of groundwater levels monitoring network to meet the GSP Regulations data and reporting standards, including all known physical attributes of wells used in the network (See Recommended Corrective Action 10a).

The NFKGSP, JGSP, MAGSP, KREGSP, and NKGSP state that insufficient data is collected for the plan area's confined aquifer(s). These GSPs intend to fill this data gap by increasing groundwater level monitoring within the confined aquifer via new monitoring well construction or recovering well construction information.[193] The SKGSP identifies a confined aquifer across most of the plan area; however, the SKGSP does not identify the confined aquifer as a data gap and does not provide a plan to fill this data gap. As a result,

[190] 23 CCR § 352.4.
[191] 2022 Redlined Central Kings GSA GSP, Section 5.2.8.2, p. 346.
[192] 2022 Redlined Central Kings GSA GSP, Figure 2-6, p. 65.
[193] 2022 Redlined Central Kings GSA GSP, Section 5.2.8.3, pp. 346-347.

Department staff recommend that the Subbasin's next periodic evaluation ensures the monitoring network adequately accounts for each principal aquifer. (See Recommended Corrective Action 10b).

The Plan's groundwater storage monitoring is based on quantifying storage change using the methodology discussed in Section 5.2.2 of this Staff Report. This methodology adequately quantifies storage change in the Subbasin's unconfined aquifer. However, this methodology excludes the Subbasin's confined aquifer. Department staff recommends that the GSAs ensure the monitoring network quantifies storage change from all the Subbasin's principal aquifers by the next periodic evaluation (See Recommended Corrective Action 10c).

The Plan's water quality monitoring network is based on data collected under existing water quality monitoring and management programs.[194] These are primarily programs, such as the Irrigated Lands Regulatory Program (ILRP), which submit data to the State Water Resources Control Board's (SWRCB) Groundwater Ambient Monitoring and Assessment Program (GAMA). Each GSP provides a table that lists the GSP's degraded water quality monitoring wells and the constituents monitored at each well; additionally, each GSP includes a map with each monitoring well's location. However, the Plan does not provide the information required by the GSP Regulation's data and reporting standards nor does the Plan provide each well's monitoring frequency. As a result, Department staff recommend that the GSAs provide well information required by the GSP Regulations data and reporting standards[195] and the monitoring frequency for each constituent at each well (See Recommended Corrective Action 10d).

The Plan's land subsidence monitoring network is primarily based on monitoring conducted under existing programs. The two programs pertinent to the Plan's subsidence monitoring are the Kings River Conservation District's (KRCD) land subsidence surveying program and NASA's InSAR remote sensing dataset.[196] The NASA dataset is equivalent to the Department's TRE Altamira InSAR dataset.

KRCD's monitoring program includes surveying benchmarks located at least every seven miles and began collecting data in 2010.[197] The number of KRCD benchmark sites included as monitoring locations in each GSP, based on the information submitted to the MNM, are provided in Table 7. MAGSP's figure 5-5 provides the location of these monitoring sites[198]. The NFKGSP and MAGSP state that their KRCD benchmark sites will be monitored annually, while the CKGSA, JGSP, KREGSP, NKGSP, and SKGSP do not provide the monitoring frequency. However, site specific monitoring data for these benchmarks have not been provided to the Department via the MNM or the Subbasin's Annual Reports since 2019. As a result, it is unclear to Department staff whether the

[194] 2022 Redlined McMullin Area GSA GSP, Section 5.5.1, p. 360.
[195] 23 CCR § 354.2.
[196] 2022 Kings Subbasin Coordination Agreement, Exhibit B, p. 26.
[197] 2022 Kings Subbasin Coordination Agreement, Exhibit B, p. 26.
[198] 2022 Redlined McMullin Area GSA GSP, Figure 5-5, p. 369.

KRCD benchmarks are monitored consistently enough to provide sufficient land subsidence monitoring for the Subbasin.

Table 7: Number of KRCD Benchmarks in the MNM

GSP	# of KRCD Benchmarks
NFKGSP	21
MAGSP	5
CKGSP	5
JGSP	4
KREGSP	6
NKGSP	18
SKGSP	3
Total	**62**

The Plan will use the Tre Altamira InSAR data to verify any observed subsidence and fill in gaps between the surveyed KRCD benchmarks.[199] The Subbasin's Annual Reports provides figures illustrating the amount of land subsidence, quantified from the InSAR dataset, that the Subbasin experienced during a given Annual Report's water year.[200] Additionally, the Annual Reports include a figure illustrating the cumulative land subsidence that has occurred since 2020.

Section 4.2.2 of this staff report provides the Department assessment of the Plan's land subsidence sustainable management criteria section. This section highlights the Department's interpretation of the Plan's minimum thresholds as no more than 3-feet of land subsidence at any point within the Subbasin. Additionally, the Plan's land subsidence sustainable management criteria section states that land subsidence monitoring will be done by evaluating data released from NASA InSAR and will use the KRCD data as a cross-check.[201] As a result, it is apparent to Department staff that the InSAR dataset is the Plan's primary form of land subsidence monitoring. Additionally, Department staff recommend that the GSAs use the InSAR dataset in a manner that better illustrates the Plan's progress (See Recommended Corrective Action 10e).

The Plan will use the groundwater level monitoring network as a proxy until the GSAs can fill the Subbasin's interconnected surface water data gap.[202] The interim interconnected surface water monitoring network includes 31 monitoring wells located within two miles of the Kings River and San Joaquin River.[203] Proposed monitoring frequencies vary by GSP but are no more frequent than semi-annual.[204] However, the Plan has not demonstrated that the use of groundwater elevations is a suitable proxy for quantifying

[199] 2022 Redlined McMullin Area GSA GSP, Section 5.6.2, p. 375.
[200] Water Year 2022 Kings Subbasin Annual Report, Figure 4-5, p. 28.
[201] 2022 Redlined McMullin Area GSA GSP, Section 4.6.1.3, p. 316.
[202] 2022 Redlined McMullin Area GSA GSP, Section 5.7.1, p. 380.
[203] 2022 Redlined McMullin Area GSA GSP, Table 4-13, p. 325.
[204] 2022 Redlined North Kings GSA GSP, Section 5.2.3, pp. 310-311.

depletions of interconnected surface water due to groundwater extraction. Based on the Department's evaluation of sustainable management criteria for the depletion of interconnected surface water and the recommended corrective actions provided, changes to the monitoring network are inherently expected to fill data gaps and should be commensurate with the improved level of understanding of the basin setting.

Department staff conclude that the Plan's monitoring network sections substantially complies with the requirements outlined in SGMA and the GSP Regulations. The Plan includes an adequate monitoring network for all relevant sustainability indicators or discusses how existing data gaps will be filled. While Department staff have provided recommended corrective actions, the shortcomings of the Plan do not preclude approval of the Plan. However, Department staff encourage the GSAs to consider and incorporate Recommended Corrective Actions 10a through 10d to improve the Subbasin's monitoring network by the first periodic evaluation.

5.5 Projects and Management Actions

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

The Plan includes a suite of projects (completed, in progress, and conceptual) and management actions that appear to be reasonable and feasible, and, if implemented, will likely lead to the Subbasin achieving its sustainability goal.[205] These projects and management actions are primarily related to increasing groundwater recharge, education and outreach, and well head requirements which are directly related to the Plan's sustainable management criteria and present a feasible approach to achieving the sustainability goal of the Basin.

5.5.1 Projects

The Plan includes approximately 171 projects unique to the individual GSPs and three basin-wide projects. These projects are primarily associated with recharge basins, wastewater treatment plants, and water supply projects. Each GSA is responsible for the timing and implementation of their GSP's projects to ensure that their overdraft mitigation obligations are met. Table 8 includes the number of projects specific to each GSP.

[205] 23 CCR §§ 354.44 (a), 354.44 (b), 354.44 (c), 354.44 (d).

Table 8: Number of Projects Included Per GSP

GSP	Number of Projects
MAGSP	12
KREGSP	15
NFKGSP	19
SKGSP	19
JGSP	21
CKGSP	28
NKGSP	57
Total	**171**

The status of the Plan's projects ranges from completed or in progress to conceptual. Many of these projects are in the conceptual phase, and an expected implementation timeline is not provided. Instead, the Plan includes duration estimates for the planning and construction of these projects. These conceptual projects generally have not secured funding, limiting the GSAs' ability to establish accurate implementation timelines. It is apparent to Department staff that the successful implementation of projects and the subsequent accrual of project benefits are pertinent to each GSA's ability to meet their overdraft mitigation obligations. For those projects that are conceptual or in-progress, Department staff recommend that the GSAs provide an updated timeline which includes when the GSAs expect to secure funding, initiate and complete construction, and accrue the project's expected benefits (See Recommended Corrective Action 11).

The Plan includes three new projects pertinent to the Department's approved determination. These projects are the domestic well mitigation program[206], the surface water-groundwater interconnected data gap analysis[207], and the land subsidence data gap analysis[208]. The Department discussed and provided recommended corrective actions for the domestic well mitigation program and the surface water-groundwater interconnected data gap analysis in Sections 4.1.2 and 4.3.2, respectively. The Department discussed the land subsidence data gap analysis in Section 4.2.2. This project will obtain critical information and data related to the Subbasin's confined aquifer, including an estimate of groundwater extractions and the identification of wells perforated within the confined aquifer.[209] The GSAs will use this information to improve the Plan's hydrogeologic conceptual model, groundwater conditions, water budget, sustainable management criteria, and monitoring network sections. As a result, the sections referenced above include recommended corrective actions related to the inclusion of the confined aquifer, which should be possible following the completion of the land subsidence data gap analysis.

[206] 2022 Redlined McMullin Area GSA GSP, Section 6.2.15, pp. 485-489.
[207] 2022 Redlined McMullin Area GSA GSP, Section 6.2.14, pp. 482-485.
[208] 2022 Redlined McMullin Area GSA GSP, Section 6.2.13, pp. 479-482.
[209] 2022 Redlined McMullin Area GSA GSP, Section 6.2.13, pp. 479-482.

Department staff concludes that the Plan's projects section substantially complies with the requirements outlined in the GSP Regulations. The Plan includes a robust suite of projects that are in various stages of completion. Each GSP includes projects that fit the individual GSP's needs to reach the Subbasin's sustainability goal. While Department staff have provided recommended corrective actions, the shortcomings of the Plan do not preclude approval of the Plan. However, Department staff encourage the GSAs to consider and incorporate Recommended Corrective Action 11 to include additional details related to their project implementation timeline, including when the GSAs expect to secure funding, initiate and complete construction, and accrue the project's expected benefits.

5.5.2 Management Actions

The Plan includes 78 management actions related to education and outreach, well head requirements, groundwater allocations, groundwater marketing and trading, fees and incentives, and, among others, groundwater pumping restrictions. However, each GSP did not take the same approach when developing management actions nor did each GSP includes management actions covering each of these categories. Table 9 provides the number of management actions included in each GSP.

Table 9: Number of Management Actions per GSP

GSP	Number of Management Actions
CKGSP	0
KREGSP	4
JGSP	4
SKGSP	9
NKGSP	12
MAGSP	21
NFKGSP	28
Total	**78**

The CKGSP has zero management actions, as they do not plan on using any to meet their sustainability goals.[210] The JGSP's four management actions include three that have already been implemented and one that has been initiated.[211] The initiated management action will benefit water quality in the Mendota Pool.[212] The KREGSA's four management actions include education and communication, well registration, groundwater extraction quantification, and ensuring new developments have a sustainability water supply.[213] These three GSPs do not include any management actions which could rapidly be implemented incase projects are not completed on time or expected project benefits are not achieved resulting in the GSP not achieving interim milestones, exceeding minimum thresholds, or undesirable results.[214] The absence of this type of management action

[210] 2022 Redlined Central Kings GSA GSP, Section 6.3, p.397.
[211] 2022 Redlined James GSA GSP, Section 6.4, pp. 441-473.
[212] 2022 Redlined James GSA GSP, Section 6.4.4.2, p. 357.
[213] 2020 Kings River East GSA GSP, Table 6-16, pp. 394-395.
[214] 23 CCR § 354.44(b)(1).

demonstrates that the GSPs do not take into account the level of uncertainty associated with projects or the increased lowering of groundwater levels and the depletion of groundwater supplies during periods of drought.

The SKGSP, NKGSP, MAGSP, and NFKGSP describe a varying number of management actions that may be implemented; however, each GSP includes a management action related to groundwater pumping restrictions during droughts.[215] The GSAs would implement this management action in circumstances of extreme drought or the exceedance of minimum thresholds and would remain in place until drought conditions end, or minimum thresholds were no longer exceeded.[216] The management action does not discuss what the GSAs consider an extreme drought nor does it include circumstances where interim milestones are not met. Additionally, the GSAs may not implement the management action for 15 years, which does not consider the necessity for demand management in the near term. However, the GSPs do state that if pumping restrictions are implemented, then the GSAs would consider significant penalties for violators, including liens or cease and desist orders for excessive abuse.[217] The inclusion of this management action demonstrates that these GSPs have considered the uncertainty associated with projects and the increased lowering of groundwater levels and the depletion of groundwater supplies during periods of drought.

Several sections of the Plan discuss how the GSAs will implement management actions to respond to an undesirable result or to meet their sustainability goal. As mentioned in Section 4.4.2 of this Staff Report, the Plan's degraded water quality sustainable management criteria section outlines how the GSAs will implement management actions in areas where groundwater quality has changed due to GSA actions. However, none of the GSPs outline what these management actions are. Suppose the GSAs are going to rely on management actions to offset any potential water quality degradation caused by GSP implementation. In that case, the GSAs should provide the specific management actions that will be implemented. Department staff reiterates the recommendation from above that the GSAs provide the specific management actions that will be implemented if their water quality degradation investigations conclude that their actions contributed to the degradation (See Recommended Corrective Action 4d).

The Plan's 2040 projected water budget illustrates that the GSAs will eliminate overdraft in the Subbasin by 2040. The elimination of overdraft is possible due to 43,400 AFY of demand reduction associated with management actions; a majority of this demand management comes from the MAGSP. However, the MAGSP, or any of the other GSPs, define the benefits or implementation timelines for their management actions. Department staff cannot thoroughly verify whether this amount of demand management is achievable by 2040. As a result, Department staff recommend that for those management actions responsible for eliminating overdraft, the GSAs provide an updated timeline which

[215] 2022 Redlined North Fork Kings GSA GSP, Section 6.4.6.1, p. 471.
[216] 2022 Redlined North Fork Kings GSA GSP, Section 6.4.6.1, p. 471.
[217] 2022 Redlined McMullin Area GSA GSP, Section 6.3.6.1, p. 516.

includes when the GSAs expect to implement those management actions and the expected demand management benefits (See Recommended Corrective Action 12).

Based on information submitted to the SGMA Portal's MNM in March 2023, each GSP has at least one chronic lowering of groundwater levels representative monitoring site exceeding its first 5-year interim milestone.[218] Achieving interim milestones is a critical component of demonstrating a Plan's success in reaching sustainability for a basin. Given the Subbasin's approach to reaching sustainability, project and management actions are crucial. Department staff acknowledges that the Subbasin has experienced drought conditions during the first years of GSP implementation and that the most recently available MNM data does not highlight the full benefits of the recent winter. However, this does demonstrate the uncertainty that is expected during the Plan's planning and implementation period which the GSAs do not adequately consider. As a result, Department staff recommend the GSAs articulate how project and management action implementation may change, whether expedited or additional management actions are implemented, for the Subbasin to maintain its progress to sustainability when interim milestones are missed.

Department staff concludes that the Plan's management actions section substantially complies with the requirements outlined in the GSP Regulations. The individual GSPs include a varied number and type of management actions based on the GSPs' needs to reach sustainability. While Department staff have provided a recommended corrective action, the shortcomings of the Plan do not preclude approval of the Plan. However, Department staff encourage the GSAs to consider and incorporate Recommended Corrective Action 4d and 12 to include additional details related to the management actions that will be implemented following water quality degradation and the implementation timeline for those management actions resulting in demand management benefits required to reach sustainability.

5.6 Coordination Agreement

The GSP Regulations require GSAs in a basin managed under multiple GSPs to enter into a coordination agreement to ensure the GSPs are developed and implemented using the same data and methodologies, and that elements of the GSPs necessary to achieve the sustainability goal for the basin are based upon consistent interpretations of the basin setting.[219]

The Plan demonstrates how the individual GSPs are coordinated via the Subbasin's coordination agreement and the format of the GSPs. The coordination agreement discusses how the Subbasin will develop and maintain a coordinated data management system that is capable of storing and reporting the data and information required by SGMA and the GSP Regulations.[220] Additionally, the Coordination Agreement's Exhibit

[218] CNRA DWR GSP Monitoring Data, July 2023, https://data.cnra.ca.gov/dataset/gspmd.
[219] Water Code § 10727.6; 23 CCR § 357.4.
[220] 2022 Kings Subbasin Coordination Agreement, Section 7, p. 9.

B describes the Subbasin's coordinated monitoring networks, data management system, mitigation responsibility, and water budget which covers the data and information required for coordinated GSPs.[221]

The format and outline of the individual GSPs further demonstrate the GSAs' intrabasin coordination. Each GSP was developed using the same format, included the same sections, and, where necessary, used the same Subbasin-wide data and information. However, each GSP also contains the data and information specific to its plan area. The GSP's sustainability goal section displays the Subbasin-wide coordination by discussing Subbasin-wide data and information, which results in each GSPs' sustainability goal section being nearly identical.[222] Additionally, the individualistic nature of the GSPs is displayed in each GSPs' groundwater conditions – groundwater quality issues section which only includes the data and information pertinent to each GSP area.[223] Although the GSAs' wrote these sections using data and information related to their specific GSP area, the similarities in the format and tone of these sections allow the reader to combine the sections to infer the basin-wide groundwater conditions quickly.

Department staff believes that the Subbasin's coordination agreement, combined with the consistent GSP format, allowed the GSAs to demonstrate the presence of the intrabasin coordination required by SGMA and the GSP Regulations. As a result, Department staff believe the coordination agreement substantially complies with the GSP Regulations. However, recommended corrective actions identified in this Staff Report may require the GSAs to reconsider certain aspects of the coordination agreement. Additionally, Department staff remind the GSAs that the GSP Regulations require a coordination agreement to be "reviewed as part of the five-year assessment, revised as necessary, dated, and signed by all parties."[224]

5.7 Consideration of Adjacent Basins/Subbasins

SGMA requires the Department to "…evaluate whether a groundwater sustainability plan adversely affects the ability of an adjacent basin to implement their groundwater sustainability plan or impedes achievement of sustainability goals in an adjacent basin."[225] Furthermore, the GSP Regulations state that minimum thresholds defined in each GSP

[221] 2022 Kings Subbasin Coordination Agreement, Exhibit B, pp. 24-35.
[222] 2022 Redlined North Kings GSA GSP, Section 4.1, pp. 215-216; 2022 Redlined Central Kings GSA GSP, Section 4.1, pp. 219-221; 2022 Redlined James GSA GSP, Section 4.1, pp. 209-210; 2022 Redlined Kings River East GSA GSP, Section 4.1, pp. 251-253; 2022 Redlined North Fork Kings GSA GSP, Section 4.1, pp. 270-272; 2022 Redlined South Kings GSA GSP, Section 4.1, pp. 174-175; and 2022 Redlined McMullin Area GSA GSP, Section 4.1, pp. 266-267.
[223] 2022 Redlined McMullin Area GSA GSP, Section 3.2.5, p. 192; 2022 Redlined North Kings GSA GSP, Section 3.2.5, p. 141; 2022 Redlined Central Kings GSA GSP, Section 3.2.5, p. 161; 2022 Redlined James GSA GSP, Section 3.2.5, p. 138; 2022 Redlined Kings River East GSA GSP, Section 3.2.8, p. 174; 2022 Redlined North Fork Kings GSA GSP, Section 3.2.5, p. 176; and 2022 Redlined South Kings GSA GSP, Section 3.2.5, p. 121.
[224] 23 CCR § 357.4(i).
[225] Water Code § 10733(c).

be designed to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.[226] The Kings Subbasin has five adjacent basins, the Madera Subbasin, Kaweah Subbasin, Tulare Lake Subbasin, Westside Subbasin, and Delta-Mendota Subbasin. All the adjacent subbasins are high priority, critically overdrafted subbasins, which are currently managed under GSPs. Tulare Lake Subbasin, Kaweah Subbasin, and Delta-Mendota Subbasin currently have inadequate plans that the Department has referred to the State Water Resources Control Board under Chapter 11 of SGMA.

The Plan provides generalized comments related to the impact sustainable management criteria will have on adjacent basins. The chronic lowering of groundwater levels discussion states that the Subbasin's GSAs have met with adjacent basins to discuss how minimum threshold were established and the potential impacts of these thresholds. However, at the time of Plan development, minimum thresholds within the Subbasin and adjacent basins were not yet available yet.[227] The Plan states that it is understood that minimum thresholds along basin boundaries will not match exactly as the basins and GSAs have likely taken difference approaches to establishing thresholds.[228] In the Plan's incomplete resubmittal the GSAs state that the Subbasin's representatives have met with representatives from other basins to begin discussions on inter-basin concerns, but additional discussion and determinations are needed.[229] The Plan mentions that once neighboring basin GSPs are complete, the Subbasin will evaluate the potential differences between thresholds and work to coordinate needed resolutions and clarifications, however, when or what these resolutions could include are not discussed.[230]

The Plan provides similar statements concerning the impact the Subbasin's reduction of groundwater storage sustainable management criteria will have on adjacent basins.[231] For degraded water quality the Plan mentions that the Subbasin's sustainable management criteria is protective of water uses and users and will prevent causing undesirable results in adjacent basins and will not affect the affect the ability of adjacent basins to achieve sustainability goals.[232]

The Plan states that land subsidence minimum thresholds have been selected to avoid causing undesirable results in adjacent basins.[233] The individual GSPs provide varying statements that essentially highlight the Department's InSAR data illustrating that historical subsidence has been greater in adjacent basins indicating that it is reasonable

[226] 23 CCR § 354.28(b)(3).
[227] 2022 Redlined McMullin Area GSA GSP, Section 4.2.2.3, p. 276.
[228] 2022 Redlined McMullin Area GSA GSP, Section 4.2.2.3, p. 276.
[229] 2022 Redlined McMullin Area GSA GSP, Section 4.2.2.3, p. 276.
[230] 2022 Redlined McMullin Area GSA GSP, Section 4.2.2.3, p. 276.
[231] 2022 Redlined McMullin Area GSA GSP, Section 4.3.2.2, pp. 286-287.
[232] 2022 Redlined McMullin Area GSA GSP, Section 4.5.2.3, p. 298.
[233] 2022 Redlined Central Kings GSA GSP, Section 4.6.2.3, p. 321.

to assume that the Plan's land subsidence minimum thresholds will not cause detrimental land subsidence in adjacent basins.[234]

Public comments submitted by representatives from adjacent subbasins (Westside and Delta-Mendota) on individual GSPs (North Fork Kings and McMullin) addressed concerns regarding potential impacts to these adjacent basins resulting from the sustainable management criteria established by the Plan for the Subbasin. The comments noted a lack of data and monitoring that would adequately quantify cross-basin impacts, which is consistent with data gaps identified by Department staff in this assessment, as well as those acknowledged by the Plan itself. As a result, evidence demonstrating whether the Plan will adversely affect the ability of adjacent basins to implement their GSPs or impede achievement of their sustainability goals does not yet exist. However, even if adequate data were available, a full assessment of the effect of the Plan on adjacent basins will, in the ordinary case, require monitoring conditions as GSPs are implemented. Department staff will look to the periodic evaluations for more robust monitoring that would provide detailed information about the condition of groundwater across basin boundaries and during the Department periodic review staff will assess whether implementation of the Plan is potentially impacting adjacent basins.

5.8 Consideration of Climate Change and Future Conditions

The GSP Regulations require a GSA to consider future conditions and project how future water use may change due to multiple factors including climate change.[235]

Since the original GSP was adopted and submitted in 2020, climate change conditions have advanced faster and more dramatically. It is anticipated that the hotter, dryer conditions will result in a loss of 10 percent of California's water supply. As California adapts to a hotter, drier climate, GSAs should be preparing for these changing conditions as they work to sustainably manage groundwater within their jurisdictional areas. Specifically, the Department encourages GSAs to explore how the proposed groundwater level thresholds have been established in consideration of groundwater level conditions in the basin based on current and future drought conditions. The Department encourages GSAs to also explore how groundwater level data from the existing monitoring network will be used to make progress towards sustainable management of the basin given increasing aridification and effects of climate change, such as prolonged drought. Lastly, the Department encourages GSAs to continually coordinate with the appropriate groundwater users, including but not limited to domestic well owners and state small water systems, and the appropriate overlying county jurisdictions developing drought plans and establishing local drought task forces[236] to evaluate how the Agency's groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

[234] 2022 Redlined North Fork Kings GSA GSP, Section 4.6.2.3, pp. 320-321.
[235] 23 CCR § 354.18.
[236] Water Code § 10609.50.

6 STAFF RECOMMENDATION

Department staff believe sufficient action has been taken by the GSAs to address the deficiencies identified in the Department's previous incomplete determination and assessment. Department staff recommend **APPROVAL** of the Plan with the recommended corrective actions listed below. The Plan conforms with Water Code Sections 10727.2 and 10727.4 of SGMA and substantially complies with the GSP Regulations. The GSAs have identified several areas for improvement of their Plan, and Department staff concur that those items are important and should be addressed as soon as possible. Department staff have also identified recommended corrective actions related to providing additional details and justification for the Plan's sustainable management criteria, demonstrating the successful implementation of specific projects and/or management actions, updating the relevant Plan sections to include confined aquifer data and information, and other related topics. Department staff note that several of the actions are related to the general issue of the exclusion of the Subbasin's confined aquifer from the Plan which could potentially have been combined into one recommended corrective action. However, Department staff believe that highlighting the affected Plan sections separately and individually is the best way to provide detailed discussion and technical recommendations to improve the Plan. These recommended corrective actions do not preclude Plan approval at this time as they do not appear to prevent the GSAs from implementing important elements of the current Plan, are capable of being concurrently addressed in sufficient time to update or revise the Plan (or management under the Plan) as appropriate with new information before the next periodic evaluation so that the GSA can adjust the Basin management as needed to achieve sustainability within 20 years of Plan implementation. Addressing these recommended corrective actions will be important to demonstrate that implementation of the Plan is and continues to be likely to achieve the sustainability goal. The recommended corrective actions include:

RECOMMENDED CORRECTIVE ACTION 1

Department staff recommend that the GSAs address following chronic lowering of groundwater levels related items by the Subbasin next periodic evaluation:

a) The MAGSA, NFKGSA, and JSA should provide justification for how they have determined that their GSP's chronic lowering of groundwater level minimum thresholds will not result in a land subsidence undesirable result.

b) The Plan should clearly define what is considered a "shallow well" and provide a table identifying the number and percentage of "shallow wells" projected to be impacted by minimum thresholds for each GSP area. If "shallow wells" include more than one well type, then the table should identify the number of wells, by well type, projected to be impacted by minimum thresholds for each GSP area.

c) GSAs should demonstrate successful development and initial implementation of the Domestic Well Mitigation Program (Program) by the next periodic evaluation. This demonstration should, at a minimum, provide the source and amount of funding secured, the well mitigation request and evaluation processes, and a summary of the requests received, approved, and completed.

RECOMMENDED CORRECTIVE ACTION 2

Department staff recommend that the GSAs address the following land subsidence related items by the Subbasin's next periodic evaluation:

a) Identify the loss of conveyance capacity from the San Joaquin River channel and related canals in the Subbasin's undesirable result definition to be inclusive of all the GSPs.

b) Provide clarification on whether the Department's interpretation of the criteria to define an undesirable result, minimum thresholds, and measurable objectives for subsidence is correct. If the Plan intended the criteria to require 3 feet of continuous subsidence over 36 square miles, then the GSAs should provide additional justification for how this criterion meets the Subbasin's undesirable result definition and complies with the requirements of SGMA and the GSP Regulations.

c) Better identify land uses and property interests that are likely to be affected by land subsidence in the Subbasin and provide an explanation of how these land uses, and property interests were adequately considered in the establishment of minimum thresholds. The GSAs should not assume that subsidence caused by groundwater pumping can reduce or eliminate the claimed 3 feet of freeboard of canals and levees unless the GSAs can substantiate that this will not substantially interfere with the functioning and purposes of those structures. This will require, at a minimum, that the GSAs specifically identify the infrastructure involved, demonstrate that 3 feet (or some other amount) of freeboard currently exists, and provide evidence that the owners or operators of that infrastructure would not consider the loss of the existing freeboard, due to additional future land subsidence, to substantially interfere with the uses of that infrastructure.

d) Provide additional information concerning the land subsidence capacity analysis process, specifically:

    a. Like corrective action 2b, if the Department's interpretation is incorrect, justify how 1-feet of subsidence over a 36 square mile area is an adequate trigger considering critical infrastructure is commonly impacted by subsidence occurring over a smaller area.

    b. Describe how the GSAs will determine when and where a capacity analysis investigation is required.

c. Describe is the criteria used to determine whether mitigation is required (ex. percent capacity lost, amount of free board remaining, etc.).

e) Fill the confined aquifer data gap and update the associated Plan sections.

RECOMMENDED CORRECTIVE ACTION 3

Department staff understand that estimating the location, quantity, and timing of stream depletion due to ongoing, Subbasin-wide pumping is a complex task and that developing suitable tools may take additional time; however, it is critical for the Department's ongoing and future evaluations of whether GSP implementation is on track to achieve sustainable groundwater management. The Department plans to provide guidance on methods and approaches to evaluate the rate, timing, and volume of depletions of interconnected surface water and support for establishing specific sustainable management criteria in the near future. This guidance is intended to assist GSAs to sustainably manage depletions of interconnected surface water.

a) Department staff recommend the GSAs revisit the schedule of the Project and establish undesirable results, minimum thresholds, and measurable objectives consistent with the GSP Regulations by the Subbasin's next periodic evaluation. Measurable objectives are to use the same metric used for minimum thresholds, including quantifying the location, quantity, and timing of depletions of interconnected surface water due to groundwater extraction. Consider utilizing the interconnected surface water guidance, as appropriate, when issued by the Department.

b) Continue to fill data gaps, collect additional monitoring data, and implement the current strategy to manage depletions of interconnected surface water and define segments of interconnectivity and timing.

c) Prioritize collaborating and coordinating with local, state, and federal regulatory agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion within the GSA's jurisdictional area.

RECOMMENDED CORRECTIVE ACTION 4

Department staff recommend that the GSAs address the following degraded water quality related items by the Subbasin's next periodic evaluation:

a) Define what is meant by "recent historically high concentration" in the establishment of minimum thresholds.

b) Provide a robust explanation and justification for setting some minimum thresholds 20% greater than historical concentrations that already exceed California's MCLs.

c) Provide additional details concerning how the results of the site-specific investigations will be used to determine if GSA actions have contributed to groundwater quality degradation.

d) Provide the specific management actions that will be implemented if the Plan's groundwater quality degradation investigations conclude that GSA actions contributed to the groundwater quality degradation.

RECOMMENDED CORRECTIVE ACTION 5

Department staff recommend that the GSAs update the Plan's hydrogeologic conceptual model to identify the Subbasin's principal aquifers, and provide the associated data and information required by the GSP Regulations.[237]

RECOMMENDED CORRECTIVE ACTION 6

Department staff recommend that the GSAs address the following groundwater conditions related items by the Subbasin's next periodic evaluation:

a) Provide a description of the Subbasin's confined aquifer(s) current and historical groundwater conditions.[238]

b) Provide an updated change in storage estimate which includes the Subbasin's confined aquifer.

RECOMMENDED CORRECTIVE ACTION 7

Department staff recommend that the GSAs address the following water budget related items by the Subbasin's next periodic evaluation:

a) Update the historical water budget using a singular basin-wide methodology. This water budget should be based on the best and most recently available data which considers all aspects of groundwater extractions (such as the groundwater extractions and/or storage losses from the confined aquifer).

b) Provide a thorough explanation for the inconsistencies between the volume of overdraft quantified from the Subbasin's water budgets and the cumulative volume of overdraft that the GSAs indicate their management will mitigate.

c) Identify and fill water budget related data gaps and update the Subbasin's water budgets, quantification of overdraft, and estimate of sustainable yield by the Subbasin's next periodic evaluation.

RECOMMENDED CORRECTIVE ACTION 8

Department staff recommend the GSAs update the Subbasin's reduction of groundwater storage sustainable management criteria to include the volume of reduced groundwater storage associated with the Subbasin's confined aquifer(s).

[237] 23 CCR § 354.14(b)(4)(A-E).
[238] 23 CCR § 354.16(a)(1), 354.16(a)(2).

RECOMMENDED CORRECTIVE ACTION 9

Department staff recommend that the GSAs address the following degraded water quality related items by the Subbasin's next periodic evaluation:

a) Describe the basin-wide methodology for identifying the Subbasin's chemicals of concern. This description should explain why each GSP established sustainable management criteria for different chemicals of concern.

b) Clarify what the basin-wide criteria to determine the presence of an undesirable result is. This criterion should be used by each GSP.

c) Provide the monitoring frequency for each constituent of concern at each representative monitoring well and justify how this monitoring frequency ensures that minimum thresholds are measured in a manner consistent with the monitoring network requirements of the GSP Regulations. The GSP Regulations requires the Plan's monitoring frequency be capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term water quality trends. If a representative monitoring well is not monitored annually then the GSAs could assume, for the purpose to determining the presence of an undesirable result, that the well's concentration remains the same between monitoring events.

RECOMMENDED CORRECTIVE ACTION 10

Department staff recommend that the GSAs address the following monitoring network related items by the Subbasin's next periodic evaluation:

a) Update the chronic lowering of groundwater levels monitoring network with the information and data required by the GSP Regulation's data and reporting standards, including all known physical attributes of wells used in the network.[239]

b) The GSAs should ensure that the chronic lowering of groundwater levels monitoring network adequately accounts for each principal aquifer.

c) The GSAs should ensure the monitoring network quantifies storage change from each of the Subbasin's principal aquifers.

d) Update the degraded water quality monitoring network with the information and data required by the GSP Regulation's data and reporting standards.[240] Provide the monitoring frequency for each constituent monitored at each monitoring well.

e) Department staff recommend that the GSAs demonstrate how the TRE Altamira InSAR dataset is used to demonstrate progress toward achieving the Plan's measurable objectives or avoiding the Plan's minimum thresholds. Department staff suggest that this could be completed by annually providing the annual

[239] 23 CCR § 352.4
[240] 23 CCR § 352.4

maximum rate and maximum cumulative subsidence since January 2020 for each GSP area.

RECOMMENDED CORRECTIVE ACTION 11

Department staff recommend that for those projects that are conceptual or in-progress, the GSAs should provide an updated timeline which includes when the GSAs expects to secure funding, initiate and complete construction, and accrue the project's expected benefits.

RECOMMENDED CORRECTIVE ACTION 12

Department staff recommend the GSAs update the Plan's management actions section to discuss the implementation timeline for those management actions which will result in the demand management benefits required to reach sustainability.