



CALIFORNIA DEPARTMENT OF WATER RESOURCES

SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE

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December 21, 2023

John Davids
Madera Point of Contact
1772 Picasso Avenue, Suite A
Davis, CA 95618
john@davidsengineering.com

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

Dear John Davids,

The Department of Water Resources (Department) has evaluated the four groundwater sustainability plans (GSPs) submitted for the San Joaquin Valley – Madera Subbasin (Subbasin), as well as the materials considered to be part of the required coordination agreement. Collectively, the four GSPs and the coordination agreement are referred to as the Plan for the Subbasin. The Department has evaluated the resubmitted Plan for the Madera Subbasin in response to the Department's incomplete determination on September 22, 2022, and has determined the Plan 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 periodic 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.

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 – Madera Subbasin Groundwater Sustainability Plans (December 21, 2023)

**STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES**

**STATEMENT OF FINDINGS REGARDING THE
APPROVAL OF THE
SAN JOAQUIN VALLEY – MADERA 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)). This Statement of Findings explains the Department's decision regarding the revised Plan submitted by the City of Madera GSA, Madera County GSA, Madera Irrigation District GSA, Madera Water District GSA, Gravelly Ford Water District GSA, New Stone Water District GSA, and Root Creek Water District GSA (GSAs or Agencies) for the San Joaquin Valley – Madera Subbasin (No. 5-022.06) (Subbasin) on March 21, 2023 (2023 Plan).

Department management has discussed the 2023 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, recommending approval of the 2023 Plan. Department management is satisfied that staff have conducted a thorough evaluation and assessment of the 2023 Plan and concurs with staff's recommendation and all the recommended corrective actions. The Department therefore **APPROVES** the 2023 Plan and makes the following findings:

- A. The initial Plan for the basin submitted by the GSAs for the Department's evaluation on January 31, 2020 (2020 GSP or 2020 Plan) was determined by Department staff to satisfy the preliminary requirements for Plan review 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 September 22, 2022, the Department issued a Staff Report and Findings determining the initial 2020 GSP submitted by the Agencies for the basin to be incomplete because the 2020 Plan did not satisfy the requirements of

SGMA, nor did 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 March 21, 2023, 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 Plan 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 Plan) that were submitted within the 180-day deadline and does not review or rely on materials that were submitted to the Department by the GSAs after the resubmission deadline. Part of the Department's review focuses on how the Agencies have 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 Agencies have 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 Agencies have 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 deficiencies that precluded approval of the initially submitted 2020 Plan. After staff's thorough evaluation of the revised 2023 Plan, the Department makes the following findings regarding the sufficiency of the actions taken by the Agencies to address those deficiencies:
1. Deficiency 1: The corrective action advised the Agencies to modify several aspects of their respective GSPs to substantially comply with the GSP Regulations in a coordinated manner. The Department found that the initial GSPs did not sufficiently coordinate on data and methodologies, including coordination of the sustainability goal, water budget and sustainable yield, and undesirable results as required by SGMA and the GSP Regulations. The Department also determined that the 2020 Plan's definition of an undesirable result for the chronic lowering of groundwater levels was not consistent with the requirements of SGMA.

The 2023 Staff Report indicates that the Agencies have taken sufficient actions to correct this deficiency, and it should no longer materially affect the ability of the Agencies to achieve sustainability and the ability of the Department to evaluate the likelihood of the 2023 Plan to achieve sustainability.

2. Deficiency 2: The corrective action advised the Agencies to address several aspects of the 2020 Plan's disclosure, discussion, and analyses of groundwater level sustainable management criteria and potential impacts to groundwater users and uses. The initial 2020 Plan did not establish undesirable results and minimum thresholds for chronic lowering of groundwater levels in a manner substantially compliant with the GSP Regulations. Additionally, the Department found that the Plan did not present sufficient analysis of the effects of minimum thresholds on beneficial uses and users of groundwater in the Subbasin.

The 2023 Staff Report indicates that the Agencies have taken sufficient actions to correct this deficiency, and it should no longer materially affect the ability of the Agencies to achieve sustainability and the ability of the Department to evaluate the likelihood of the 2023 Plan to achieve sustainability.

3. Deficiency 3: The corrective action advised the Agencies to address several aspects of the 2020 Plan's disclosure, discussion, and analyses of land subsidence sustainable management criteria and potential impacts to groundwater users and uses. The initial Plan did not establish sustainable management criteria for subsidence. The Department determined that the GSAs did not sufficiently demonstrate that undesirable results related to land subsidence are not present and are not likely to occur in the Subbasin.

The 2023 Staff Report indicates that the Agencies have taken sufficient actions to correct this deficiency, and it should no longer materially affect the ability of the Agencies to achieve sustainability and the ability of the Department to evaluate the likelihood of the 2023 Plan to achieve sustainability.

4. Deficiency 4: The corrective action advised the Agencies to address several aspects of the 2020 Plan's disclosure, discussion, and analyses of interconnected surface water sustainable management criteria and potential impacts to groundwater users and uses. The initial 2020 Plan did not establish sustainable management criteria for interconnected surface water. The Department determined that the GSAs do not sufficiently demonstrate that interconnected surface

water or undesirable results related to depletions of interconnected surface water are not present and are not likely to occur in the Subbasin.

The 2023 Staff Report indicates that the Agencies have taken sufficient actions to correct this deficiency, and it should no longer materially affect the ability of the Agencies to achieve sustainability and the ability of the Department to evaluate the likelihood of the 2023 Plan to achieve sustainability.

- D. The 2023 Plan satisfies the required conditions as outlined in § 355.4(a) of the GSP Regulations (23 CCR § 350 et seq.):
1. The 2020 Plan was submitted within the statutory deadline of January 31, 2022 (Water Code § 10720.7(a); 23 CCR § 355.4(a)(1)), and the 2023 Plan was submitted within 180 days of the Department's Incomplete determination (23 CCR § 355.2(e)(2)).
 2. The 2023 Plan is 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).)
 3. The 2023 Plan, either on its own or in coordination with other Plans, covers the entire Subbasin. (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 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 of a Plan 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) it 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 with 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 2023 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. It does not appear at this time that the 2023 Plan will adversely affect the ability of adjacent basins to implement their GSPs or impede achievement of sustainability goals.
1. The sustainable management criteria and the 2023 Plan's goal to implement a package of projects and management actions that will, by 2040, balance long-term groundwater system inflows and outflows based on a 50-year period representative of average historical hydrologic conditions are sufficiently justified and explained. The 2023 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 2023 Plan demonstrates an understanding of where data gaps exist and has identified areas for improvement of its Plan, including addressing data gaps related to land subsidence and interconnected surface water, refining water budgets, incorporating new information

into the numerical model, and expanding monitoring networks. (23 CCR § 355.4(b)(2).)

3. The projects and management actions proposed are designed to meet interim milestones and bring groundwater levels back up to minimum thresholds, mitigate overdraft, and operate the Subbasin sustainably. The 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 2023 Plan provides a detailed explanation of how the varied interests of groundwater uses and users in the Subbasin were considered in developing the sustainable management criteria and how those interests, including domestic wells, would be impacted by the chosen minimum thresholds. (23 CCR § 355.4(b)(4).)
5. The 2023 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 2023 Plan includes a reasonable assessment of overdraft conditions and includes reasonable means to mitigate overdraft. (23 CCR § 355.4(b)(6).)
7. At this time, it does not appear that the 2023 Plan will adversely affect the ability of an adjacent basin to implement its GSP or impede achievement of sustainability goals in an adjacent basin. The Plan states that the Subbasin's GSAs have met with GSAs in adjacent basins to share data and information to ensure that the implementation of the GSPs will not interfere with neighboring basins. The Plan also qualitatively describes how minimum thresholds and measurable objectives may affect an adjacent basin, concluding that the Madera Subbasin Plan will not hinder the ability of an adjacent basin to be sustainable; however, the evaluation is provided without specifics. (23 CCR § 355.4(b)(7).)

8. A satisfactory coordination agreement has been adopted by all relevant parties. (23 CCR § 355.4(b)(8).)
9. The City of Madera GSA, Madera County GSA, Madera Irrigation District GSA, Madera Water District GSA, Gravelly Ford Water District GSA, New Stone Water District GSA, and Root Creek Water District GSA have historically had a role in water planning and management in the Subbasin. The seven GSAs' history of groundwater management provide a reasonable level of confidence that the GSAs have the legal authority and financial resources necessary to implement the 2023 Plan. (23 CCR § 355.4(b)(9).)
10. Through review of the 2023 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 2023 Plan provides an analysis that documents the expected location and quantity of domestic wells that will experience undesirable results during the GSP implementation period based on future modeled groundwater conditions. Additionally, the Plan describes a domestic well mitigation program that the GSAs will implement to provide assistance to domestic and municipal wells adversely impacted by declining groundwater levels that have occurred since 2015. The Plan describes that the cost of mitigating domestic wells due to lowering groundwater levels is shown to be economically preferable to the costs associated with immediately stabilizing groundwater levels and the resulting impact to the local economy. The Plan's compliance with the requirements of SGMA and substantial compliance with the GSP Regulations supports the state policy regarding the human right to water (Water Code § 106.3). 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 2023 Plan acknowledges and identifies interconnected surface waters within the Subbasin. The GSAs propose interim sustainable management criteria to manage this sustainability indicator and measures to improve understanding and management of interconnected surface water. The GSAs acknowledge, and the Department agrees, many data gaps related to interconnected surface water exist. The GSAs should continue filling data gaps, collecting additional monitoring data, and coordinating with resources 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 initial sustainable management criteria as more information and improved methodology becomes 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.

Statement of Findings
San Joaquin Valley – Madera Subbasin (No. 5-022.06)

December 21, 2023

Accordingly, the revised 2023 Plan submitted by the Agencies for the San Joaquin Valley – Madera 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 31, 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: December 21, 2023

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – San Joaquin Valley – Madera Subbasin (December 21, 2023)

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

Groundwater Basin Name: San Joaquin Valley - Madera Subbasin (No. 5-022.06)
Number of GSPs: 4 (see list below)
Number of GSAs: 7 (see list below)
Submittal Type: Revised Plan in response to Incomplete Determination
Submittal Date: March 21, 2023
Recommendation: Approve
Date: December 21, 2023

On March 21, 2023, multiple groundwater sustainability agencies (GSAs) resubmitted multiple groundwater sustainability plans (GSPs) for the entire Madera 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 September 22, 2022¹ for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA)² and GSP Regulations.³ In total, four GSPs have been revised and implemented by seven GSAs. Collectively, all 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:

- *Gravelly Ford Water District Groundwater Sustainability Plan (Gravelly Ford GSP)* – prepared by the Gravelly Ford Water District GSA.
- *Joint Groundwater Sustainability Plan (Joint GSP)* – prepared jointly by the City of Madera GSA, Madera County GSA, Madera Irrigation District GSA, and Madera Water District GSA.
- *New Stone Water District Groundwater Sustainability Agency Groundwater Sustainability Plan (New Stone GSP)* – prepared by the New Stone Water District GSA.

¹ Water Code § 10733.4(b); 23 CCR § 355.4(a)(4).
<https://sgma.water.ca.gov/portal/service/gspdocument/download/9363>; Water Code § 10733.4(b); 23 CCR § 355.4(a)(4).

² Water Code § 10720 *et seq.*

³ 23 CCR § 350 *et seq.*

- *Root Creek Water District Groundwater Sustainability Agency Groundwater Sustainability Plan (Root Creek GSP)* – prepared by the Root Creek Water District GSA.

After evaluation and assessment, Department staff conclude the GSAs have taken sufficient actions to correct deficiencies identified by the Department; however, Department staff have provided recommended corrective actions which will be required to be addressed by the Plan's next periodic evaluation.

Overall, Department staff believe the Plan contains the required components of a GSP, demonstrates a thorough understanding of the Subbasin based on what appears to be the best available science and information, sets well explained, supported, and reasonable sustainable management criteria to prevent undesirable results as defined in the Plan, and proposes a set of projects and management actions that, if successfully implemented, are likely achieve the sustainability goal defined for the Subbasin.⁴ Department staff will continue to monitor and evaluate the Subbasin's progress toward achieving the sustainability goal through Annual Reports and future Periodic Evaluations of the GSP and its implementation.

Based on the reevaluation of the Plan, Department staff recommend the Plan be approved.

This assessment includes six sections:

- **Section 1 – Summary**: Provides an overview of the Department Staff's assessment and recommendations.
- **Section 2 – Evaluation Criteria**: Describes the legislative requirements and the Department's evaluation criteria.
- **Section 3 – Required Conditions**: Describes the submission requirements of a response to an incomplete determination to be evaluated by the Department.
- **Section 4 – Deficiency Evaluation**: Provides an assessment of whether and how the contents included in the GSP submittal addressed the deficiencies identified by the Department in the initial incomplete determination.
- **Section 5 – Plan Evaluation**: Provides a detailed assessment of the contents included in the GSP organized by each Subarticle outlined in the GSP Regulations.
- **Section 6 – Staff Recommendation**: Includes the staff recommendation for the Plan and any recommended corrective actions.

⁴ 23 CCR § 354.24.

1 SUMMARY

Department staff recommend approval of the Plan for the Madera Subbasin and have recommended corrective actions designed to address shortcomings of the Plan described in this Staff Report. In the evaluation of the Plan, Department staff concluded that sufficient action was taken to correct the deficiencies; however, Department staff have provided recommended corrective actions which will be required to be address by the Plan's next periodic evaluation.

The GSA has identified areas for improvement of its Plan (e.g., addressing data gaps related to land subsidence and interconnected surface water, refining water budgets, incorporating new information into the numerical model, and expanding monitoring networks). Department staff concur that those items are important and recommend the GSA address them as soon as possible. As mentioned, Department staff have also identified additional recommended corrective actions that the GSA should consider for the next periodic evaluation of the Plan or sooner (see [Section 6](#)). Addressing these recommended corrective actions will be important to demonstrate, on an ongoing basis, that implementation of the Plan is likely to achieve the sustainability goal. The recommended corrective actions generally focus on the following:

1. Providing a detailed explanation specifically discussing and identifying Madera Irrigation District GSA's legal, contractual, or other authorities or arrangements to implement its obligations under the Joint GSP in the next periodic evaluation.
2. Continuing efforts to further coordinate the GSPs and groundwater management.
3. Sufficiently describing the effect of chronic lowering of groundwater level interim milestones on other sustainability indicators.
4. Reevaluating the quantitative metrics that constitute undesirable results due to land subsidence and sufficiently describing the effect and extent of land subsidence interim milestones that allow continued subsidence during the GSP implementation period.
5. Describing data gaps in the hydrogeologic conceptual model.
6. Sufficiently detailing the degraded water quality undesirable results and explaining the rationale to allow potential further degradation.

2 EVALUATION CRITERIA

The Department evaluates whether a Plan conforms to the statutory requirements of SGMA⁵ 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 update 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 GSAs in the basin could achieve the sustainability goal under the proposed Plan. After a GSA has been afforded up to 180 days to address the deficiencies and based on the GSA's efforts, the Department can either approve¹³ 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 Regulations¹⁵ 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

The recommendation to approve a Plan previously determined to be incomplete is based on a determination that the GSAs 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 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

GSP Regulations specify that the Department shall evaluate a resubmitted GSP in which the GSAs have taken corrective actions within 180 days from the date the Department issued an incomplete determination to address deficiencies.¹⁸

The Department issued the incomplete determination on September 22, 2022. The GSAs resubmitted their individual GSPs and the Coordination Agreement on March 21, 2023 in compliance with the 180 day deadline. However, the Madera Irrigation District GSA (MID GSA) did not adopt a resolution approving and/or adopting the Revised Joint GSP, which was prepared jointly by MID GSA, the City of Madera GSA, Madera County GSA, and Madera Water District GSA. However, MID GSA did approve the related Coordination Agreement.

MID GSA’s failure to adopt the Revised Joint GSP concerned Department staff. Accordingly, on April 6, 2023, the Sustainable Groundwater Management Office sent a letter seeking clarification from MID GSA regarding its failure to adopt the Revised Joint GSP. The MID GSA responded by letter dated April 21, 2023, confirming that “the MID GSA has not and does not intend to adopt the Revised Joint GSP,” stating that “MID GSA has determined the Revised Joint GSP is inadequate,” and explaining that “the MID GSA cannot adopt the Revised Joint GSP without substantial revision.” At the same time, the letter indicated that “[t]he lack of action on the Revised Joint GSP was not due to any intention on the part of MID GSA to avoid its implementation of the Revised Joint GSP,” and vowed that “MID GSA will continue to fully implement its own obligations under the Revised Joint GSP.”

¹⁷ 23 CCR § 355.4(b).

¹⁸ 23 CCR § 355.4(a)(4).

MID GSA's refusal to adopt the Revised Joint GSP, but its apparent intent to implement its obligations under the Revised Joint GSP, creates a level of inconsistency and uncertainty regarding Plan implementation that continues to concern staff. SGMA provides that a GSA may exercise any of the powers granted by SGMA if the GSA adopts and submits a Plan to the Department. Because of MID GSA's failure to adopt the Revised Joint GSP, it is unclear whether MID GSA has the necessary powers and authorities to implement its obligations under the Revised Joint GSP. In its previous letter, MID GSA claimed it would implement the Plan, but did not provide specific references to existing, non-SGMA authorities granting it the powers to implement the Revised Joint GSP or otherwise explaining how it retained SGMA authorities to do so, or identifying other agreements or entities that had the power and would implement those aspects of the Revised Joint GSP. Without an understanding of these issues, Department staff remain concerned that overall SGMA implementation in the Subbasin may be infeasible or delayed as a result of MID GSA's failure to adopt the Revised Joint GSP. However, Department staff do not believe this issue precludes an approval recommendation at this time, because various components of the overall Subbasin Plan have been and continue to be implemented and staff is not aware of any existing impediment or delay in implementation caused by these circumstances.

Nevertheless, MID GSA is the only GSA of which Department staff are aware that has refused to adopt a GSP that it intends to implement. This novel circumstance continues to be a concern to Department staff. To alleviate those concerns, Department staff provide a recommended corrective action requiring identification and listing of the specific projects and management actions that MID GSA will or may be responsible for implementing under the Revised Joint GSP and a parallel listing and detailed identification and discussion of the legal, contractual, or other authorities or arrangements that MID GSA is relying or will rely upon in adequately implementing the Plan including those projects or management actions to clearly demonstrate the feasibility of all projects and management actions (see [Recommended Corrective Action 1](#)) Department staff will closely monitor Plan implementation and may change its recommendation if MID GSA does not provide a satisfactory response addressing these issues in the next periodic evaluation or if it appears that MID GSA's failure to adopt the Revised Joint GSP is preventing or delaying Plan implementation or otherwise impacting the likelihood of the Subbasin to achieve sustainability consistent with SGMA timelines.

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 September 2022.¹⁹ In September 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 HAVE NOT SUFFICIENTLY COORDINATED ON DATA AND METHODOLOGIES INCLUDING COORDINATION OF SUSTAINABILITY GOAL, WATER BUDGET AND SUSTAINABLE YIELD, AND UNDESIRABLE RESULTS AS REQUIRED BY SGMA AND THE GSP REGULATIONS.

4.1.1 Corrective Action 1

As described in the Department’s GSP Assessment Staff Report released on September 22, 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. The Department provided the following corrective actions for the Subbasin to consider and address:

The Plan does not provide sufficient explanation to confirm that the GSPs have been developed using the same data and methodologies and that elements of the GSPs have been based upon consistent interpretations of the Subbasin’s setting. The GSAs in the Subbasin should modify each of their respective GSPs, as well as any applicable coordination materials, to substantially comply with the GSP Regulations and define sustainable yield and undesirable results, and develop water budgets in a manner that addresses groundwater conditions occurring throughout the Subbasin, not for only the portion of the Subbasin represented by the respective GSPs.

¹⁹ *Incomplete Determination of the 2020 Groundwater Sustainability Plan for the San Joaquin Valley – Madera Subbasin*, Department of Water Resources, September 22, 2022.
<https://sgma.water.ca.gov/portal/service/gspdocument/download/9363>

4.1.2 Evaluation

To address the identified deficiencies, the GSAs have supplemented portions of each Plan to use consistent data and methodologies. Specifically, the descriptions supporting the sustainability goal, water budgets, and undesirable results have been further detailed or revised. Most of the supplemented material is provided in the Joint GSP and Coordination Agreement and referenced by the other GSPs.

The Department's Incomplete Determination notified the GSAs that the Plan did not present a coordinated sustainability goal in the Coordination Agreement applicable to the entire Subbasin. Instead, each GSP described related, but varied sustainability goals. In response, the GSAs amended the Coordination Agreement to include a sustainability goal that all parties agree to as presented below:

The sustainability goal for the Madera Subbasin is to implement a package of projects and management actions that will, by 2040, balance long-term groundwater system inflows and outflows based on a 50-year period representative of average historical hydrologic conditions.²⁰

The Gravelly Ford GSP,²¹ New Stone GSP,²² and Root Creek GSP²³ still contain the varied language describing the sustainability goal that was present in the initial Plan submission; however, the language does not conflict with the overarching sustainability goal definition found in the Coordination Agreement. A detailed assessment of the sustainability goal is provided in [Section 5.3.1](#).

The Department's Incomplete Determination also notified the GSAs that the water budgets presented in each GSP were unclear, used different data, and were difficult to assess. Additionally, the water budget along with an estimate of sustainable yield was not included in the Coordination Agreement as required. In response, the GSAs have amended the GSPs and the Coordination Agreement to include agreed upon water budgets and estimates of sustainable yield. Specifically, the GSPs now all reference historical, current, and projected water budgets²⁴ developed in February 2018 for the entire Madera Subbasin and developed for the seven subregions representing each GSA. This water budget information was part of the initial Joint GSP submission in 2020 but was not clearly recognized in the other GSPs at the time. A detailed assessment of the water budget is provided in [Section 5.2.3](#).

The GSPs acknowledge that there are still refinements needed to remove discrepancies and further improve the accuracy of the water budgets. The New Stone and Root Creek resubmitted GSPs note that the availability of more specific information and knowledge on the regional scale (i.e., geography, geology, water management practices, familiarity,

²⁰ Madera Subbasin Coordination Agreement, p. 34.

²¹ Gravelly Ford GSP (Redlined), Section 3.1, p. 53.

²² New Stone GSP (Redlined), Section 4.1, pp. 129-130.

²³ Root Creek GSP (Redlined), Section 4.1, pp. 184-185.

²⁴ Joint GSP (Resubmitted), Appendix 2.F, pp. 1322-1620; Appendix 6.D, pp. 2012-3335.

and understanding)²⁵ have been discussed amongst the GSAs and updates to the model will occur during the 2025 evaluation cycle.²⁶ Department staff encourage these efforts and also recommend the GSAs continue productive coordination and refinement of each GSP to be a cohesive Plan for sustainable groundwater management in the Subbasin (see [Recommended Corrective Action 2](#)).

4.1.3 Conclusion

Overall, Department staff believe the GSAs have taken sufficient action to address the identified deficiencies. Staff conclude that the enhanced coordination and addition of a coordinated sustainability goal and water budget with agreed upon estimates of sustainable yield for the Subbasin allows the GSAs to manage the Subbasin as intended by SGMA. However, as highlighted in the recommended corrective actions, the GSP should continue efforts to increase cooperative coordination and alignment of each GSP by the next periodic evaluation. The Plan also provides an agreed upon definition of undesirable results occurring in the Subbasin, which is discussed in [Section 4.2.2.1](#).

4.2 DEFICIENCY 2. THE PLAN DOES NOT ESTABLISH MINIMUM THRESHOLDS FOR CHRONIC LOWERING OF GROUNDWATER LEVELS IN A MANNER SUBSTANTIALLY COMPLIANT WITH THE GSP REGULATIONS.

4.2.1 Corrective Action 2

As described in the Department's GSP Assessment Staff Report released on September 22, 2022, Department staff determined that the GSAs must provide more detailed explanation and justification regarding the selection of the sustainable management criteria for groundwater levels, particularly the undesirable results, the minimum thresholds, and the effects of those criteria on the interests of beneficial uses and users of groundwater. The Department provided the following corrective actions for the Subbasin to consider and address:

1. The GSAs should describe the specific undesirable results they aim to avoid through implementing the Plan. If, for example, significant and unreasonable impacts to domestic wells are a primary management concern for the Subbasin, then the GSAs should sufficiently explain why that effect was selected and what level of impact(s) to those wells the GSAs consider to be significant and unreasonable. In support of its explanation, the GSPs should also clearly discuss and disclose the anticipated impact of operating the Subbasin at conditions protective against those effects on users of domestic wells and all other beneficial uses and users of groundwater in the Subbasin. The discussion should be supported using best available information, such as using State or county information on well completion reports and dry well reports, to analyze the

²⁵ New Stone GSP (Redlined), Section 3.3, p. 106; Root Creek GSP (Redlined), Section 3.3.3, p. 180.

²⁶ New Stone GSP (Redlined), Section 3.3.1, p. 107.

locations and quantities of domestic wells and other types of well infrastructure that could be impacted by groundwater management when implementing the Plan.

2. The GSAs should either explain how the existing minimum threshold groundwater levels are consistent with avoiding undesirable results or they should establish minimum thresholds at the representative monitoring wells that account for the specific undesirable results the GSAs aim to avoid. The Plan should include a detailed description of the factors and information considered and the analytic route and rationale the GSAs employed to reach conclusions regarding significant and unreasonable effects constituting undesirable results for groundwater levels and other applicable sustainability indicators.
3. The GSAs need to provide a description of the relationship between established minimum thresholds for all applicable sustainability indicators including how conditions at minimum thresholds avoid undesirable results for each applicable indicator.

4.2.2 Evaluation

To address the identified deficiencies, the GSAs have supplemented portions of the Plan related to the sustainable management criteria for chronic lowering of groundwater levels. Specifically, descriptions supporting the undesirable result, minimum thresholds, measurable objectives, interim milestones, and a domestic well mitigation program have been further detailed or revised. Most of the supplemented material is provided in the Joint GSP and referenced by the other GSPs.

4.2.2.1 Describing Undesirable Results and Potential Effects (1)

The Department's Incomplete Determination notified the GSAs that the Plan incorrectly established undesirable results which were applicable only within each GSP area—without agreement between GSPs—and some of the information provided in each GSP was insufficiently detailed.

In response to the corrective action, the GSAs coordinated to develop agreed-upon undesirable results applicable to the entire Subbasin. The GSPs reference information in the Joint GSP as a basis for developing undesirable results, particularly coordinating on defining when an undesirable result will occur (i.e., the quantitative description of minimum threshold exceedances that cause significant and unreasonable effects). In describing undesirable results, each GSP provides a different level of detail. For example, the Joint GSP describes an undesirable result as “those conditions that: 1) Cause significant financial burden to local agricultural interests or other beneficial uses and users who rely on the Subbasin's groundwater resources, 2) Cause groundwater level conditions at private domestic wells that cannot be mitigated, and 3) Interfere with other sustainability indicators.”²⁷ The Gravelly Ford GSP refers to this information but also, alongside the New Stone GSP and the Root Creek GSP, provides additional description

²⁷ Joint GSP (Redlined), Section 3.4.1, p. 323.

such as: “Chronic lowering of groundwater levels in the Plan area cause significant and unreasonable declines if they are sufficient in magnitude to lower the rate of production of pre-existing groundwater wells below that necessary to meet the minimum required to support overlying beneficial use where alternative means of obtaining sufficient groundwater resources are not technically or financially feasible.”²⁸ The varied descriptions presented in each GSP do not conflict and appear to be generally coordinated. All GSPs refer to a domestic well mitigation framework which provides more specific information describing effects on beneficial uses and users.²⁹

The Plan states that an undesirable result would occur when “... more than 30 percent of RMS in the Subbasin (including RMS in all four GSP plan areas) [are] exceeding their [minimum thresholds] for the same two consecutive Fall readings.”³⁰ The Plan further describes that “...implementation of the GSP is designed to avoid undesirable results during the sustainability period (i.e., the “planning and implementation horizon,” per CWC §10721(v)), after 2040.”³¹

As mentioned, the Plan describes details for a domestic well mitigation program,³² which the GSAs will implement to provide assistance to domestic and municipal wells adversely impacted by declining groundwater levels that have occurred since 2015.³³ The Plan includes supporting information for the mitigation program which document the expected location and quantity of domestic wells that will experience undesirable results during the GSP implementation period. Staff believe the details provided for this framework effectively describe the specific undesirable results the GSAs are trying to avoid. Based on an analysis of 4,822 wells, the GSP documents that up to 1,294 wells,³⁴ located primarily in the central and eastern portion of the Subbasin,³⁵ would be impacted due to future modeled groundwater conditions. The total cost to assist impacted wells is estimated to be approximately \$39,000,000; however, the Plan describes that the cost of mitigating domestic wells due to lowering groundwater levels is shown to be economically preferable to the costs associated with immediately stabilizing groundwater levels and the resulting impact to the local economy.³⁶ The GSAs have provided a commitment to this program including a schedule, timeline, and have reported progress in recent Annual Reports. The GSAs expect that the program would be implemented during the GSP

²⁸ Gravelly Ford GSP (Redlined), Section 3.4.1, p. 60; New Stone GSP (Redlined), Section 4.2.1.1, p. 131; Root Creek GSP (Redlined), Section 4.2.1, p. 186.

²⁹ Joint GSP (Redlined), Section 3.3.1.1, pp. 294-295; Gravelly Ford GSP (Redlined), Section 3.4.1, p. 60; New Stone GSP (Redlined), Section 4.2.1.2, pp. 132-133; Root Creek GSP (Redlined), Section 4.2.1.1, pp. 187-188.

³⁰ Joint GSP (Redlined), Section 3.4.1, p. 323.

³¹ Joint GSP (Redlined), Section 3.4.1, p. 323.

³² Joint GSP (Resubmitted), Appendix 3.E, pp. 1904-1918, Appendix 2.G, pp. 1733-1813.

³³ Joint GSP (Redlined), Section 3.3.1.1, p. 294.

³⁴ Joint GSP (Resubmitted), Appendix 2.G, p. 1762.

³⁵ Joint GSP (Resubmitted), Appendix 2.G, pp. 1783-1787.

³⁶ Joint GSP (Resubmitted), Appendix 3.D, p. 1902.

implementation period, no later than 2025; as of March 2023, the GSP states, the GSAs are continuing to develop the program's eligibility criteria and terms.³⁷

In addition to the domestic well mitigation program, the Plan includes a suite of over 25 projects and management actions (e.g., demand management, increased recharge, increased surface water supply) which will be utilized to meet interim milestones and bring groundwater levels back up to minimum thresholds, mitigate overdraft, and operate the Subbasin sustainably. At full implementation, by 2040, the projects and actions will provide 215,840 acre-feet per year of annual gross benefit. The estimated capital cost of the projects is over \$260,000,000, with an estimated annual operating cost of over \$70,000,000; Department staff note that the GSAs have included an estimated economic cost from reduced crop production resulting from demand management in the estimated annual operating cost, which is approximately \$54,000,000 per year or over 75% of the total annual cost provided.³⁸ The implementation schedule and expected benefit of each project was also considered in the modeling scenario used to develop interim milestones.³⁹ A review of the Annual Reports submitted to the Department shows progress on many of the projects.⁴⁰ For example, the GSAs report a cumulative total benefit of over 63,000 acre-feet from projects and management actions to date, with a benefit of 7,300 acre-feet for the latest reported water year.⁴¹ With reporting of active progress toward project implementation, Department staff have increased confidence in the likelihood of the Plan to achieve the sustainability goal of the Subbasin.

Based on the information provided, Department staff think the Plan provides a reasonable description of the potential effects of undesirable results due to lowering of groundwater levels to domestic wells, generally the shallowest wells, and encourage the GSAs to continue development of the domestic well mitigation program and provide progress updates in Annual Reports. The GSAs should continue to progress projects and provide updates of observed benefits to the Department in Annual Reports. Department staff conclude that defining agreed upon undesirable results for the Subbasin and describing the potential effects of planned undesirable results that are likely to occur has sufficiently addressed component 1 of the corrective action.

4.2.2.2 Establishing Minimum Thresholds, Measurable Objectives, and Interim Milestones (2)

The Department's Incomplete Determination notified the GSAs that each Plan's varied descriptions and methods to establish minimum thresholds for chronic lowering of groundwater levels were not provided with sufficient supporting information to allow Department staff to evaluate whether the criteria were reasonable or whether operating

³⁷ Joint GSP (Redlined), Section 3.3.1.1, p. 295.

³⁸ Joint GSP (Redlined), Table 4-3, p. 366; Section 4.4.4.5, p. 409.

³⁹ Joint GSP (Redlined), Section 3.2.1.2, p. 270; Joint GSP, Appendix 6.D, pp. 2323-2326.

⁴⁰ Madera Subbasin Annual Reports, <https://sgma.water.ca.gov/portal/gspar/submitted>.

⁴¹ Joint GSP Water Year 2022 Annual Report, pp. 57-58.

the Subbasin to avoid those thresholds is consistent with avoiding undesirable results—in part due to undesirable results being insufficiently defined in the Plan.

In response to the corrective action, the GSAs revised the chronic lowering of groundwater levels minimum thresholds to be set at the fall 2015 groundwater level measurement recorded at each representative monitoring site.⁴² The Plan explains that the groundwater level minimum thresholds based on fall 2015 groundwater levels are consistent with the avoidance of significant and unreasonable impacts to other sustainability indicators.⁴³ The Plan states that the minimum thresholds will keep groundwater elevations generally above levels that have been experienced in the past, and that impacts to shallow well users and other beneficial users of groundwater will generally not exceed what has historically been experienced in the Subbasin.⁴⁴ Furthermore, the Plan explains that minimum thresholds established at fall 2015 groundwater levels are consistent with the avoidance of significant and unreasonable impacts for subsidence, water quality, and depletions of interconnected surface water.⁴⁵ The measurable objectives were revised to the fall 2010 groundwater levels which represents Subbasin conditions prior to the 2012 to 2015 drought period.⁴⁶

Department staff believe that establishing minimum thresholds at the fall 2015 groundwater level is a reasonable approach. However, the GSAs intend to allow continued groundwater level declines during the 20-year implementation period based on the GSP's proposed interim milestones. The process to establish interim milestones is described as a "review and evaluation of measured groundwater level data and future projected fluctuations in groundwater levels during the GSP implementation period utilizing the numerical groundwater flow model, which simulated implementation of projects and management actions."⁴⁷ As a result, interim milestones were set to levels below minimum thresholds in years 2025, 2030, and 2035, prior to recovering by 2040 due to the implementation of projects and management actions.⁴⁸ Interim milestones for 2030 are the lowest groundwater elevations expected to occur during the GSP implementation period. When examining the hydrographs provided, Department staff note the 2030 milestones are frequently below historical lows.⁴⁹

To successfully implement such a management program, GSAs are required to fully and thoroughly describe undesirable results that may occur prior to achieving sustainability, implement necessary projects and management actions to eliminate those undesirable results, and show measurable progress in annual reporting. The GSP provides information detailing how the proposed management of lowering groundwater levels

⁴² Joint GSP (Redlined), Section 3.3.1, p. 293.

⁴³ Joint GSP (Redlined), Section 3.3.1.4, pp. 301-303.

⁴⁴ Joint GSP (Redlined), Section 3.3.1, pp. 293-294.

⁴⁵ Joint GSP (Redlined), Section 3.3.1.4, pp. 302-303.

⁴⁶ Joint GSP (Redlined), Section 3.2.1.1, pp. 269-270.

⁴⁷ Joint GSP (Redlined), Section 3.2.1.2, p. 270.

⁴⁸ Joint GSP (Redlined), Section 3.2.1.3, p. 271.

⁴⁹ Joint GSP (Resubmitted), Appendix 2.E.b, pp. 1243-1380; Gravelly Ford GSP (Redlined), Appendix G, pp. 218-224.

below minimum thresholds for an extended period will affect the interests of beneficial uses and users of groundwater in the Subbasin. As discussed above, during the period when interim milestones exceed minimum thresholds, the GSAs plan to implement a domestic well mitigation program to assist impacted users that effectively manages the effects of the undesirable results that are expected to occur; also, the Plan includes a suite of over 25 projects and management actions which the GSAs have reported progress on implementing in recent Annual Reports.

Based on a review of the information found in the resubmitted Plan and Annual Reports, Department staff conclude that at this time the GSAs have sufficiently addressed component 2 of the corrective action.

4.2.2.3 Describing How Minimum Thresholds Avoid Undesirable Results For Other Sustainability Indicators (3)

The Department's Incomplete Determination notified the GSAs that the GSPs require a description of how conditions at minimum thresholds avoid undesirable results for each applicable indicator.

In response to the corrective action, the GSAs revised the GSPs to include a discussion of the relationship between established minimum thresholds and undesirable results for other sustainability indicators. However, the GSP Regulations require the Department to evaluate whether the minimum thresholds and interim milestones are reasonable⁵⁰ and established in a manner to avoid undesirable results for each of the other sustainability indicators.⁵¹ Department staff believe the lower interim milestones have the potential to cause undesirable results related to land subsidence, water quality, and interconnected surface water in the Subbasin. For example, the highest annual rate of subsidence was recorded between December 2012 and July 2014, when groundwater levels were declining to historical lows.⁵² The GSAs should consider and disclose their understanding of the correlation between the declining groundwater levels and the maximum historical rate of subsidence while also describing the relationships between groundwater levels and the other applicable sustainability indicators. Department staff are concerned that impacts on other indicators (such as subsidence and water quality) may not recover in the same manner that groundwater levels may. Therefore, the GSAs should analyze how the groundwater levels at interim milestones will avoid causing undesirable results for other sustainability indicators (see [Recommended Corrective Action 3](#)).

Based on a review of the information found in the resubmitted Plan, Department staff conclude that the GSAs have taken sufficient action to address component 3 of the corrective action.

⁵⁰ 23 CCR § 355.4(b)(1).

⁵¹ 23 CCR § 354.28(b)(2).

⁵² New Stone GSP (Redlined), Section 3.2.6.1, p. 99.

4.2.3 Conclusion

At this time, Department staff believe the GSAs have taken sufficient action to address the deficiency identified. Department staff believe that having all the GSPs coordinated and establishing minimum thresholds at 2015 groundwater levels – in conjunction with the implementation of a well mitigation program and the projects and managements actions outlined in the Plan – to be a reasonable means of mitigating overdraft to achieve sustainability by 2040. However, Department staff note the GSAs intend to continue overdraft before 2040 based on the revised interim milestones, which after examining the hydrographs provided, are frequently below historical lows.⁵³ While SGMA and the GSP Regulations do not preclude undesirable results from occurring during Plan implementation, undesirable results cannot remain or continue after 20 years of Plan implementation. Department staff encourage the GSAs to continue with planning and implementation of the domestic well mitigation program to assist those users and uses of groundwater and other sustainability indicators (e.g., land subsidence, water quality, or interconnected surface water) that may be affected by lowering groundwater levels. The recommended corrective actions should also be considered by the next Periodic Evaluation for further advancement of the sustainable groundwater management in the Subbasin.

4.3 DEFICIENCY 3. THE PLAN DOES NOT DEVELOP SUSTAINABLE MANAGEMENT CRITERIA FOR LAND SUBSIDENCE BASED ON BEST AVAILABLE INFORMATION AND SCIENCE.

4.3.1 Corrective Action 3

As described in the Department’s GSP Assessment Staff Report released on September 22, 2022, Department staff determined that the GSAs do not sufficiently demonstrate that undesirable results related to land subsidence are not present and are not likely to occur in the Subbasin. The Department provided the following corrective actions for the Subbasin to consider and address the following:

1. Clarify and address the currently conflicting information in the Plan regarding what is known, qualified by the level of associated uncertainty, about the existence and impact of land subsidence.
2. The GSP should develop sustainable management criteria based on information in the basin setting and establish a monitoring network to adequately monitor conditions.⁵⁴ The basin setting should sufficiently detail the physical setting and characteristics of the Subbasin including descriptions of principal aquifers, the definable bottom of the Subbasin and identify data gaps and uncertainty within the

⁵³ Joint GSP (Resubmitted), Appendix 2.E.b, pp. 1243-1380; Gravelly Ford GSP (Redlined), Appendix G, pp. 218-224, New Stone GSP (Redlined), Figures 4-2 through 4-7, pp. 145-150; Root Creek GSP (Redlined), Figures 4-2 through 4-7, pp. 196-201.

⁵⁴ 23 CCR § 354.26.

hydrogeologic conceptual model. If applicable, data gaps monitoring and steps to fill data gaps before the next periodic assessment should be described.

4.3.2 Evaluation

To address the identified deficiency, the GSAs have supplemented portions of each Plan to develop sustainable management criteria and monitoring for land subsidence. Most of the supplemented material is provided in the Joint GSP and referenced by the other GSPs.

4.3.2.1 Clarifying Conflicting Information in the Plan (1)

The Department's Incomplete Determination notified the GSAs that the GSPs provided conflicting information related to whether significant and unreasonable land subsidence has occurred or will occur in the Subbasin.

In response to the corrective action, the GSPs acknowledge that significant and unreasonable land subsidence has historically occurred during periods with groundwater pumping in excess of the sustainable yield in areas where critical infrastructure exists and in the western areas that overlay the Lower Aquifer, where the Corcoran Clay exists.⁵⁵ Additionally, loss of groundwater storage and associated reduction in pore pressures in clay layers in the Lower Aquifer (indicated by lowering groundwater levels) is understood by all parties to lead to conditions that cause or exacerbate land subsidence.⁵⁶ Between 1926 and 1972, subsidence resulted in up to 4.0 feet of elevation change within the western portion of the Subbasin.⁵⁷ The highest rate of subsidence, also in western portion of the Subbasin, was 0.60 feet per year from December 2012 through July 2014.⁵⁸ The Plan also provides various maps documenting the location and extent of subsidence in the Subbasin.⁵⁹

The Plan provides information about infrastructure that is susceptible to subsidence. Specifically, the Joint GSP provides an infrastructure sensitivity assessment of critical infrastructure including roads, railroads, highways, waterways, surface water conveyance structures, agricultural wells, domestic wells, public supply wells, and wastewater infrastructure. The assessment discusses impacts or interference with surface land uses and includes details such as proximity, orientation, and relative vulnerability to adverse effects of land subsidence.⁶⁰ Generally, the assessment states that the critical infrastructure were not anticipated to be impacted by future subsidence rates. For example, the GSP identifies the Chowchilla Bypass and the Eastside Bypass as critical infrastructure overlaying the Corcoran Clay, near an area of past documented subsidence; based on annual average subsidence rates from 2011 to 2017, the design profile and freeboard of the bypass will not be impacted by residual subsidence through

⁵⁵ Joint GSP (Redlined), Section 3.4.3, p. 325.

⁵⁶ Joint GSP (Redlined), Section 3.3.3.7, p. 313.

⁵⁷ Gravelly Ford GSP (Redlined), Section 2.2.2, p. 41.

⁵⁸ New Stone GSP (Redlined), Section 3.2.6.1, p. 99.

⁵⁹ New Stone GSP (Redlined), Figures 3-23 and 3-24, pp. 101-102.

⁶⁰ Joint GSP (Resubmitted), Appendix 3.G, pp. 1921-1953.

2026.⁶¹ Additionally, for impacted wells, such as domestic wells, well owners are to be assisted by the domestic well mitigation program.⁶² The GSP also states the GSAs are analyzing the potential to couple implementation efforts with the Subsidence Control Measures Agreement that is currently in effect in parts of the Chowchilla Subbasin near the Subbasin boundary.⁶³

Based on a review of the information found in the resubmitted Plan, Department staff conclude that the GSAs have addressed component 1 of the corrective action.

4.3.2.2 Developing Sustainable Management Criteria and Monitoring Network (2)

The Department's Incomplete Determination notified the GSAs that the GSPs do not sufficiently demonstrate that undesirable results related to land subsidence are not present and are not likely to occur in the Subbasin.

In response to the corrective action, the GSPs establish revised, coordinated sustainable management criteria for the Subbasin to not allow subsidence once sustainability is achieved in 2040. With that the GSPs amended the minimum thresholds to 0 feet per year (ft/yr).⁶⁴ The Plan also identifies a total uncertainty of subsidence to be -0.16 ft/yr, meaning any amount of subsidence less than -0.16 ft/yr would be considered within the uncertainty of measurement and considered 0 ft/yr.⁶⁵ The Plan states that this minimum threshold is consistent with the sustainable management criteria for groundwater levels which seeks to keep levels above 2015 conditions by 2040.⁶⁶ The GSAs also revised the measurable objective rate to 0 ft/yr.⁶⁷ The Plan allows for minimum threshold exceedances throughout the duration of the implementation phase with the proposed interim milestones, which were revised based on two areas: areas of subsidence monitoring and areas of greater subsidence concern.⁶⁸ For areas of monitoring, interim milestones are established at -0.20 ft/yr by 2025, -0.13 ft/yr by 2030, -0.07 ft/yr by 2035, and 0 ft/yr by 2040 which are monitored by three survey benchmarks and one continuous GPS station. For areas of concern, interim milestones are established at -0.60 ft/yr by 2025, -0.40 ft/yr by 2030, -0.20 ft/yr by 2035, and 0 ft/yr by 2040 and monitored at three survey benchmarks. The established interim milestones are based on observed data with the highest rates (i.e., milestones to 2025) being slightly higher than actual subsidence rates experienced in the Subbasin between 2011 and 2016.⁶⁹ The Plan defines an undesirable result as occurring when "... the average subsidence across 75 percent or

⁶¹ Joint GSP (Resubmitted), Appendix 3.G, p. 1932.

⁶² Joint GSP (Resubmitted), Appendix 3.G, p. 1935.

⁶³ Joint GSP (Resubmitted), Appendix 3.G, p. 1933; Joint GSP (Redlined) Section 3.3.3.7, p. 312.

⁶⁴ Joint GSP (Redlined), Section 3.3.3, pp. 310-314.

⁶⁵ Joint GSP (Redlined), Section 3.3.3.1, p. 311.

⁶⁶ Joint GSP (Redlined), Section 3.3.1.4, p. 301.

⁶⁷ Joint GSP (Redlined), Section 3.2.3.1, p. 279.

⁶⁸ Joint GSP (Redlined), Section 3.2.3.2, pp. 279-280.

⁶⁹ Joint GSP (Redlined), Section 3.2.3.2, p. 280.

more RMS in the Subbasin (including RMS in all four GSP plan areas) exceeds the minimum threshold for two consecutive years.”⁷⁰

Department staff have identified areas for improvement in the GSAs’ defined undesirable results. Specifically, the quantification of conditions that likely would cause undesirable results as when more than 75 percent of the representative monitoring sites in the Subbasin exceed threshold levels for two consecutive years is unsatisfactory, because the Plan does not explain how this threshold would avoid effects the GSAs have determined to be significant and unreasonable. On the contrary, the values and timing of exceedances appear to be arbitrary. Subsidence is prominent and likely to occur in western portions of the Subbasin in correlation with the presence of the Corcoran Clay. Two of the seven representative monitoring sites are located in that area of the Subbasin; using the current definition, localized subsidence could occur indefinitely without meeting the quantitative criteria for an undesirable result. Furthermore, when considering land subsidence, compacted sediments may not rebound alongside rising groundwater levels due to irreversible changes in the subsurface. Additionally, the Plan establishes two subsidence areas, as mentioned above, which the GSAs do not consider when establishing the quantitative metrics for an undesirable result (i.e., Department staff would expect more stringent metrics in the areas of greater subsidence concern as compared to the subsidence monitoring areas). These criteria should be considered when defining when and where undesirable results occur (see [Recommended Corrective Action 4a](#))

While Department staff are encouraged by the updated sustainable management criteria, the Plan still does not identify a total (i.e., cumulative) amount of subsidence which would be considered significant and unreasonable. The interim milestones established using annual rates would allow for up to 6.5 feet of total subsidence by 2040. This appears inconsistent with the legislative intent of SGMA to avoid or minimize subsidence, and no adequate justification for allowing this amount of additional subsidence is provided in the GSP.⁷¹ Considering the Subbasin has recently experienced subsidence and contains infrastructure that the GSP identifies as susceptible to subsidence, the GSAs should identify and disclose the cumulative amount of subsidence that can occur without causing significant and unreasonable impacts to the beneficial uses and users of groundwater, surface land uses, and property interests, all of which must be clearly defined. In establishing the cumulative amount of potential subsidence that could occur during GSP implementation, the GSAs should consider the conditions necessary to minimize or halt subsidence during GSP implementation and maintain those conditions once sustainability has been achieved on or before 2040. Based on the amount of subsidence anticipated between now and 2025, Department staff believe this does not preclude approval at this time. However, given that the Plan projects minimum threshold exceedances during implementation, which may likely result in undesirable results related to water levels, and the Plan intends for subsidence to be 0 ft/yr only by and after 2040, Department staff

⁷⁰ Joint GSP (Redlined), Section 3.4.3, p. 325.

⁷¹ Water Code § 10720.1 (e).

recommend identifying and including a quantitative value for cumulative subsidence for minimum thresholds and other sustainability criteria related to subsidence by the first Periodic Evaluation (see [Recommended Corrective Action 4b](#)).

SGMA and the GSP Regulations indicate that for a basin to be sustainably managed, the basin must experience no undesirable results within 20 years of plan implementation and then throughout the planning and implementation horizon. Unlike other indicators, the legislature specifically indicated its intent that SGMA implementation avoid or minimize subsidence.⁷² Unlike groundwater levels that may fall and then rise in a basin, subsidence can often be inelastic and permanent. This means that undesirable results from subsidence during plan implementation will likely still exist and persist to 2040 and beyond. For instance, subsidence that occurs during early Plan implementation that causes lasting impacts to infrastructure, like flood control structures, that substantially interferes with the infrastructure's operations and utility in 2040 and beyond, constitutes an undesirable result under SGMA. Department staff believe that the Plan's continued allowance of minimum threshold exceedances during the first 20 years of plan implementation (i.e., allowing further subsidence as a result of water level declines below historic lows at the interim milestones) and potential permanent impacts to surface infrastructure and uses is not consistent with the intent of SGMA to achieve sustainability and to avoid or minimize subsidence. The Plan should consider and provide details describing the current and potentially lasting impacts of subsidence on land uses and groundwater beneficial uses and users as described above in [Recommended Corrective Action 4b](#).

The GSP Regulations require the Department to evaluate whether the minimum thresholds and interim milestones are reasonable⁷³ and established in a manner to avoid undesirable results for each of the other sustainability indicators.⁷⁴ Department staff believe the interim milestones below the minimum threshold have the potential to cause undesirable results related to other sustainability indicators which the GSAs also have a responsibility to avoid. For example, the Plan does not provide a discussion of how the subsidence milestones, that allow for continued subsidence and associated irreversible compaction of aquifer materials, relate to the reduction of groundwater storage or the degradation of water quality sustainability indicators. The GSAs should consider and disclose their understanding of this and other relationships between sustainability indicators. The GSAs should analyze whether or how the land subsidence rates at interim milestones will avoid causing undesirable results for other sustainability indicators (see [Recommend Corrective Action 4c](#)).

In the establishment of the minimum thresholds for land subsidence, the Plan describes the application of a level of uncertainty to measurements, claiming that the survey measurements have a vertical accuracy of plus or minus 2.5 centimeters. The Plan

⁷² Water Code § 10720.1(e).

⁷³ 23 CCR § 355.4(b)(1).

⁷⁴ 23 CCR § 354.28(b)(2).

proposes adding these uncertainty values so that when two measurements are taken the Agencies consider the total uncertainty in subsidence to be 5 centimeters, which equals approximately -0.16 ft/yr. By this rationale, the Plan assumes that subsidence values less than 0.16 ft/yr are within the uncertainty of measurement and considered to be compliant with the minimum threshold of 0 ft/yr.⁷⁵ However, although there may be some uncertainty in subsidence measurements, the uncertainty does not necessarily mean that small measurements of subsidence within that range of uncertainty (or accuracy) should be ignored or mean that no subsidence is occurring. Department staff believe this approach of always rounding any annual subsidence measurements within the range of error to zero every year is inconsistent with standard practices. When multiple measurements are taken at the same location, they are compared to the same baseline measurement and, in turn, have the same single level of uncertainty. While it's understandable to build in an allowance for some level of uncertainty, it appears the Plan allows for the continued subsidence if the measured rate is equal to or less than 0.16 ft/yr. Department staff recommend the Plan revise its application of the level of uncertainty as it relates to subsidence measurements according to standard professional practices (see [Recommended Corrective Action 4d](#)).

The Plan acknowledges there are data gaps in assessing subsidence in the Subbasin and provides a workplan⁷⁶ which aims to provide sufficient data and analysis to fill data gaps, including enhancing monitoring and understanding relationships between land subsidence and groundwater levels at different depths within the western part of the Subbasin, improving quantification of groundwater pumping within Upper Aquifer and Lower Aquifer, and assessing the adequacy of the sustainable management criteria. Considering the Department provides quarterly updates for monthly InSAR subsidence data covering much of the Subbasin, the GSP should address or explain why the GSAs have decided to not utilize this reliable data source to assess whether management is causing significant and unreasonable effects to surface land uses. Department staff encourage these efforts and also recommend the GSAs take steps to address the recommended corrective actions by the next Periodic Evaluation of the Plan.

Based on a review of the information found in the resubmitted Plan, Department staff conclude that the GSAs have addressed component 2 of the corrective action.

4.3.3 Conclusion

Overall, Department staff believe the GSAs have taken sufficient action to address the deficiency identified. Staff conclude that the zero tolerance for land subsidence minimum thresholds and measurable objectives at the end of the implementation period in 2040 is commensurate with the understanding of SGMA. However, Department staff are concerned with the amount of subsidence that may occur during the implementation period and the potential undesirable results that may cause as a result of permanent impacts to infrastructure and surface land uses. The recommended corrective actions

⁷⁵ Joint GSP (Redlined), Section 3.3.3.1, p. 311.

⁷⁶ Joint GSP (Resubmitted), Appendix 3.H, pp. 1954-1968.

should be considered by the next Periodic Evaluation to more align with the intent of SGMA to avoid or minimize subsidence.

4.4 DEFICIENCY 4. THE PLAN DOES NOT DEVELOP SUSTAINABLE MANAGEMENT CRITERIA FOR THE DEPLETIONS OF INTERCONNECTED SURFACE WATER BASED ON BEST AVAILABLE INFORMATION AND SCIENCE.

4.4.1 Corrective Action 4

As described in the Department's GSP Assessment Staff Report released on September 22, 2022, Department staff determined that the GSAs do not sufficiently demonstrate that interconnected surface water or undesirable results related to depletions of interconnected surface water are not present and are not likely to occur in the Subbasin. The Department provided the following corrective actions for the Subbasin to consider and address the following:

1. Clarify and address the currently conflicting information in the Plan regarding what is known, qualified by the level of associated uncertainty, about the presence and degree of interconnected surface water and, if applicable, the depletion of that interconnected surface water by groundwater use, including quantities, timing, and locations.⁷⁷
2. If the GSAs cannot provide a sufficient, evidence-based justification for the absence of interconnected surface water, then they should develop sustainable management criteria, as required in the GSP Regulations⁷⁸ based on best available information and science. Evaluate and disclose, sufficiently and thoroughly, the potential effects of the Plan's sustainable management criteria for depletion of interconnected surface water on beneficial uses of the interconnected surface water and on groundwater uses and users. Additionally, development of sustainable management criteria must be supported by information in the basin setting and the GSAs must develop a monitoring network capable of collecting sufficient data to support analysis of the quantified spatial and temporal exchanges between surface water and groundwater that can be associated with groundwater pumping.

4.4.2 Evaluation

To address the identified deficiency, the GSAs have supplemented portions of the Plan to describe the basin setting, develop sustainable management criteria and monitoring for depletions of interconnected surface water.

4.4.2.1 Clarifying Conflicting Information in the Plan (1)

The Department's Incomplete Determination notified the GSAs that the GSPs provided conflicting information related to identifying the presence of interconnected surface water in the Subbasin.

⁷⁷ 23 CCR §§ 354.28(c)(6)(A-B).

⁷⁸ 23 CCR §§ 354.26, 354.28, 354.30.

In response to the corrective action, the GSPs revised the descriptions of groundwater—surface water interactions in the Subbasin, acknowledging that data indicates that the San Joaquin River appears to be in connection with groundwater during some periods and there is at least some potential for regional groundwater pumping to impact groundwater dependent ecosystems (GDEs) with roots extending down 20 to 30 feet along the San Joaquin River.⁷⁹

The method the GSP used to determine the connectivity was to compare the historical regional aquifer groundwater elevations to stream thalweg (deepest portion of stream channel) elevations and assess stream seepage. The comparison of the groundwater levels and stream thalweg suggest the San Joaquin River was likely connected with groundwater from 1958 through 1984, but groundwater was about 10 to 50 feet below the thalweg from 1989 through 2016.⁸⁰ While this approach is sufficient to confirm the presence of a hydraulic connection, Department staff note groundwater levels dropping below the thalweg of the San Joaquin River would not be sufficient to prove surface water and groundwater are disconnected. This is because water from the river is still recharging the aquifer and may do so at a rate that would cause mounding in the local water table surrounding the river. The mounding in the water table may enable the river and aquifer to maintain a saturated hydraulic connection when groundwater levels drop well below the bottom of the river. Additionally, stream seepage indicates that during above normal and wet years, such as 2017 and 2019, groundwater is discharged to streams.⁸¹ The GSP states that there are data gaps, and provides a workplan⁸² which aims to provide sufficient data and analysis to fill data gaps, including making a more informed determination of whether or not interconnected surface water is present along the San Joaquin River, improving understanding of the relationship between streamflow and regional groundwater pumping, and providing an improved basis for setting sustainable management criteria if it is determined that interconnected surface water conditions exist.⁸³ At this time, Department staff conclude sufficient action has been taken on this deficiency and believe the GSAs can work with the Department to further efforts on interconnected surface water.

Based on a review of the information found in the resubmitted Plan, Department staff conclude that the GSAs have addressed component 1 of the corrective action.

4.4.2.2 Sustainable Management Criteria and Monitoring Network (2)

The Department's Incomplete Determination notified the GSAs that the GSPs do not sufficiently demonstrate that undesirable results related to depletions of interconnected surface water are not present and are not likely to occur in the Subbasin. Therefore, if the GSAs cannot provide a sufficient, evidence-based justification for the absence of

⁷⁹ Joint GSP (Redlined), Section 2.2.2.5, p. 120.

⁸⁰ Joint GSP (Redlined), Section 2.2.2.4, p. 118.

⁸¹ Joint GSP (Resubmitted), Figure 2-76, p. 310.

⁸² Joint GSP (Resubmitted), Appendix 3.1, pp. 1969-1981

⁸³ Joint GSP (Resubmitted), Appendix 3.1, p. 1971.

interconnected surface water, then they should develop sustainable management criteria, as required in the GSP Regulations.

In response to the corrective action, the GSPs established interim sustainable management criteria for depletions of interconnected surface water along the San Joaquin River. Specifically, the GSAs define an undesirable result occurring when greater than 30 percent of representative monitoring wells exceed their minimum thresholds for two consecutive five-year rolling averages.⁸⁴ Minimum thresholds are defined as the percent of time surface water and groundwater was connected over the historical period of 1989 to 2015. Measurable objectives and interim milestones are the same as minimum thresholds. Monitoring will be conducted annually using three monitoring sites.

The GSAs used a metric called “percent of time connected” to develop the interim sustainable management criteria for depletion of interconnected surface water.⁸⁵ In reviewing the information provided in the GSP, Department staff conclude that while developing sustainable management criteria for interconnected surface water is a substantial step forward in addressing the deficiency, the development of sustainable management criteria in the Plan is not consistent with the GSP Regulations. Reporting the percent of time connected does not provide adequate information to describe or evaluate the quantity and timing of depletions of interconnected surface water due to groundwater use, as required by the GSP Regulations.⁸⁶ As mentioned in [Section 4.4.2.1](#), the GSAs prepared a work plan outlining an approach to fill these data gaps.⁸⁷ The work plan states the GSAs intend to compile and review pertinent existing data and reports, construct and install new monitoring facilities, collect additional field data, and conduct additional technical analysis. The purpose is to make a more informed determination of whether interconnected surface water is present along the San Joaquin River, to improve understanding of the relationships between streamflow, shallow groundwater levels, and regional groundwater pumping.⁸⁸ While the work plan states that the GSAs will potentially refine or modify the interim sustainable management criteria, it also indicates that the GSAs will continue using the metric of “percent of time connected” for sustainable management criteria⁸⁹ – a metric Department staff conclude is not appropriate in estimating timing and volume of interconnected surface water depletion and evaluating potential impacts to beneficial uses and users. The GSAs proposed to complete most of the tasks in the work plan by 2024 with the intent of including the early results in the first Periodic Evaluation.⁹⁰ Department staff are encouraged by the GSA’s intent to increase data collection and fieldwork. At this time, Department staff conclude sufficient action has

⁸⁴ Joint GSP (Redlined), Section 3.4.5, p. 327.

⁸⁵ Joint GSP (Redlined), Section 3.2.5.1, p. 291, Section 3.3.5.1, p. 319.

⁸⁶ 23 CCR §§ 354.28(c)(6)(A), 354.28(c)(6)(B).

⁸⁷ Joint GSP (Resubmitted), Appendix 3.I, pp. 1969-1981.

⁸⁸ Joint GSP (Resubmitted), Appendix 3.I, pp. 1970-1971.

⁸⁹ Joint GSP (Resubmitted), Appendix 3.I, p. 1979.

⁹⁰ Joint GSP (Resubmitted), Appendix 3.I, p. 1980.

been taken on this deficiency and believe the GSAs can work with the Department to further efforts on interconnected surface water.

Based on a review of the information found in the resubmitted Plan, Department staff conclude that the GSAs have addressed component 2 of the corrective action.

4.4.3 Conclusion

Overall, Department staff believe the GSAs have taken sufficient action to address the deficiency identified.

Department staff understand that quantifying depletions of interconnected surface water from groundwater extractions is a complex task that likely requires developing new, specialized tools, models, and methods to understand local hydrogeologic conditions, interactions, and responses. During the initial review of GSPs, Department staff have observed that most GSAs have struggled with this requirement of SGMA. However, staff believe that most GSAs will more fully comply with regulatory requirements after several years of Plan implementation that includes projects and management actions to address the data gaps and other issues necessary to understand, quantify, and manage depletions of interconnected surface waters. Department staff further advise that at this stage in SGMA implementation GSAs address deficiencies related to interconnected surface water depletion where GSAs are still working to fill data gaps related to interconnected surface water and where these data will be used to inform and establish sustainable management criteria based on timing, volume, and depletion as required by the GSP Regulations.

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 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 updates to the GSP. 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. 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.

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.⁹¹

The Madera Subbasin is bound by the San Joaquin River and Kings Subbasin in the south, Delta-Mendota Subbasin in the west, Chowchilla Subbasin in the north, and the foothills of Sierra Nevada in the east.⁹² No adjudicated areas are shown on the maps provided in the GSP.⁹³ The Subbasin does not have any considerable federal lands or state-owned lands.⁹⁴

The Subbasin is managed by seven groundwater sustainability agencies. Four of those seven groundwater sustainability agencies have developed the Madera Joint Groundwater Sustainability Plan, and the other three groundwater sustainability agencies developed individual groundwater sustainability plans.⁹⁵ The four GSPs that cover the entire Madera Subbasin are:

- Madera Joint Groundwater Sustainability Plan (Joint GSP)
- Gravelly Ford Water District Groundwater Sustainability Plan (Gravelly Ford GSP)
- New Stone Water District Groundwater Sustainability Plan (New Stone GSP)

⁹¹ 23 CCR § 354.2 *et seq.*

⁹² Joint GSP, Section 2.1, p. 63.

⁹³ Joint GSP, Section 2.1.1, p. 63, Figure 2-1, p. 64.

⁹⁴ Joint GSP, Section 2.1.1, p. 63. Note: Federal land includes primarily rights of way along canals conveying USBR Central Valley Project water. State land includes primarily California Department of Parks and Recreation land along San Joaquin River near Friant, California.

⁹⁵ Joint GSP, Table 1-4, p. 56.

- Root Creek Water District Groundwater Sustainability Plan (Root Creek GSP)

The four groundwater sustainability agencies that developed the Joint GSP collectively are:

- Madera County Groundwater Sustainability Agency
- City of Madera Groundwater Sustainability Agency
- Madera Irrigation District Groundwater Sustainability Agency
- Madera Water District Groundwater Sustainability Agency

The Joint GSP plan area represents 94% of the Madera Subbasin.⁹⁶ The Joint GSP provides information that is encompassing-of, relevant-to, and reiterated-in the other three groundwater sustainability plans and is often cited by Department staff when referencing information relevant to the entire Subbasin. Collectively, unless otherwise specified, the four GSPs are referred to as the Plan for the Subbasin.

The Gravelly Ford GSP boundaries are contiguous with the Gravelly Ford Water District and contain approximately 8,500 acres comprised of grape vineyards, tree groves, and rural residences.⁹⁷ The New Stone GSP boundaries are coterminous with the New Stone Water District boundaries, encompassing approximately 4,200 acres in the northwestern area of the Madera Subbasin. The New Stone Water District consists primarily of agriculture and two landowners.⁹⁸ The Root Creek GSP boundaries are the same as the Root Creek Water District boundaries and is located in the southeastern portion of the Madera subbasin—bounded on the south by San Joaquin River—with the majority of the land being used as agriculture.⁹⁹

A map showing the Subbasin and adjacent subbasins is shown in Figure 1 below.

⁹⁶ Joint GSP, Table 1-2, p. 42.

⁹⁷ Gravelly Ford GSP, Section 1.1.1, p. 6.

⁹⁸ New Stone GSP, Executive Summary, p. 12.

⁹⁹ Root Creek GSP, Executive Summary, p. 13, Figure 2-5, p. 43.

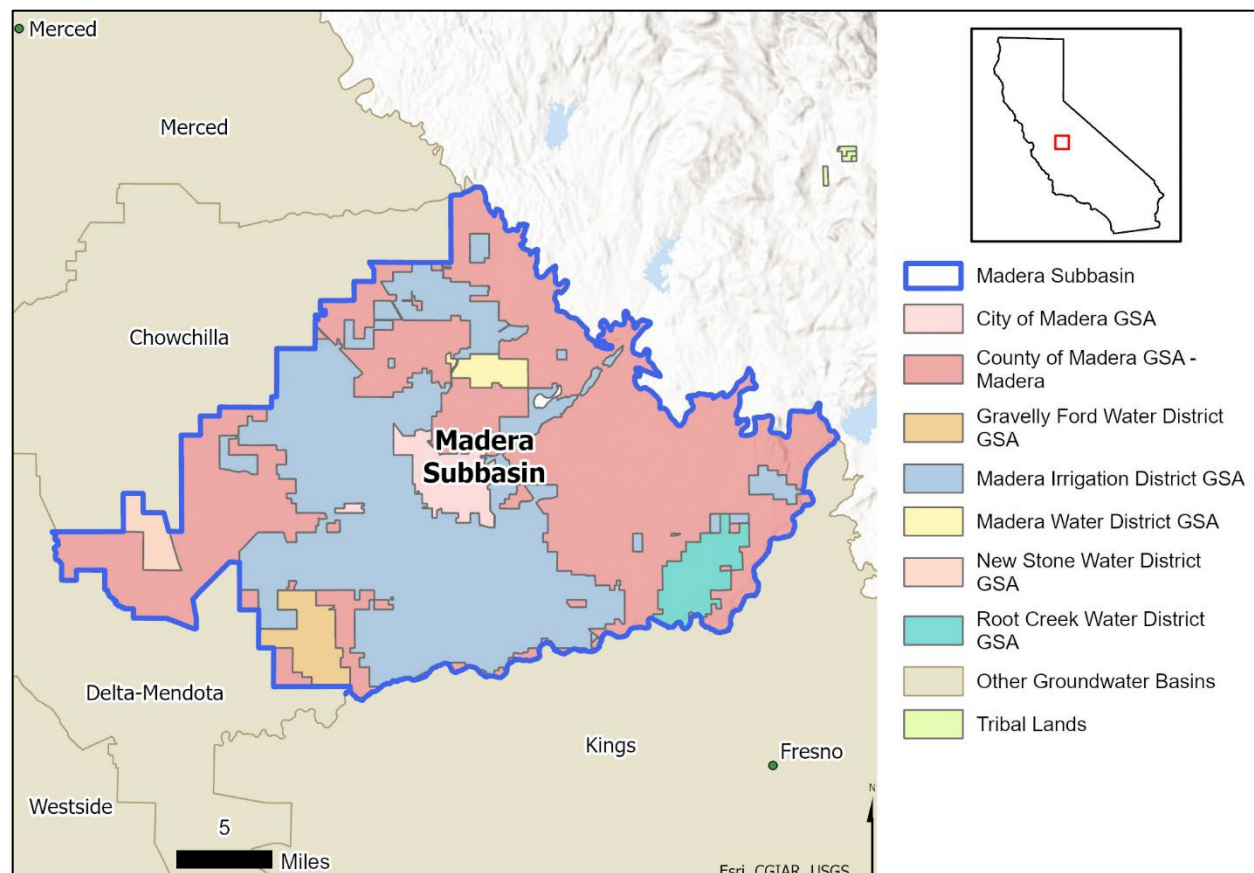


Figure 1. Madera Subbasin Location Map¹⁰⁰

The land use areas in the Subbasin are broadly classified across three sectors: agricultural (including dairies), urban, and native vegetation.¹⁰¹ The Plan includes a summary of land use stating irrigated agriculture is the most prominent land use in the Subbasin, covering approximately 213,000 acres.¹⁰² For example, the New Stone GSP states that 100% of land use in the GSP is agricultural.¹⁰³ Native vegetation and water surfaces collectively were reported to cover the second highest acreage approximately 100,000 acres.¹⁰⁴ Urban area that includes cities, residential, and semi-agricultural cover approximately 36,000 acres.¹⁰⁵

The water use source type was not independently presented for the entire Subbasin. For example, the Gravelly Ford GSP states an unquantified, small amount of groundwater pumping occurs for domestic use.¹⁰⁶ Instead, it is reported that the water source type is

¹⁰⁰ Joint GSP, Figure 2-1, p. 64.

¹⁰¹ Joint GSP, Section 2.1.1, p. 65, Figure 2-2, p. 66.

¹⁰² Joint GSP, Table 2-1, p. 68.

¹⁰³ New Stone GSP, Section 2.5.1, p. 38.

¹⁰⁴ Joint GSP, Table 2-1, p. 68.

¹⁰⁵ Joint GSP, Table 2-1, p. 68.

¹⁰⁶ Gravelly Ford GSP, Section 2.1.5, p. 21.

both groundwater and local surface water supplies, but groundwater appears to be the primary water source in the Subbasin.¹⁰⁷

The Plan includes maps that depict the density of wells (domestic, agricultural, and public supply) by township range and section in Figure 2-5, Figure 2-6, and Figure 2-7 of the Joint GSP prepared from the Department's Well Completion Report Map Application.¹⁰⁸ The highest concentrations of reported domestic wells are centered primarily around the City of Madera and Bonadelle Ranchos-Madera Ranchos in the eastern portion of the Subbasin.¹⁰⁹ Reported irrigation wells are generally less concentrated and more evenly distributed across the Subbasin, though slightly higher concentrations are found in some areas within rural Madera County, Madera Irrigation District, and Root Creek Water District.¹¹⁰

The Plan describes existing water resource management programs operating in the Subbasin. The Joint GSP states the local agencies that have formed each of the Subbasin's groundwater sustainability agencies have prepared and adopted several water planning documents in the past, including Madera Integrated Regional Water Management Plan and Madera Regional Groundwater Management Plan. The Subbasin's other local water management plans, federal, state, and regional groundwater and surface water programs were discussed.¹¹¹ The Joint GSP states the existing water resource monitoring and management programs constitute a well-developed and broadly distributed system that provides representative data throughout the Subbasin that have been, and will be, incorporated into the Plan as appropriate.¹¹²

The Plan provides a list of public meetings where the Plan was discussed, including GSA board meetings, Coordination Committee meetings, stakeholder advisory committee meetings, and public workshops.¹¹³ The GSPs include stakeholder communication and engagement plans to assist Subbasin groundwater sustainability agencies in their efforts to develop general and strategic communications to engage stakeholders in groundwater management activities.¹¹⁴

The Plan identifies beneficial uses and users of groundwater in the Subbasin. The various stakeholders identified are the general public, private water users, urban and agricultural water users, industrial water users, environmental and ecosystem water uses, tribes, federal lands and integrated regional water management groups.¹¹⁵ The Plan describes the beneficial uses of groundwater in the Subbasin, which includes irrigation and drinking

¹⁰⁷ Joint GSP, Figure 2-2, p. 66.

¹⁰⁸ Joint GSP, Figures 2-5 through 2-7, pp. 171-173.

¹⁰⁹ Joint GSP, Section 2.1.1, p. 70.

¹¹⁰ Joint GSP, Section 2.1.1, p. 70.

¹¹¹ Joint GSP, Section 2.1.2, pp. 70-77.

¹¹² Joint GSP, Section 2.1.2, pp. 70-77.

¹¹³ Joint GSP, Section 2.1.5, pp. 83-90, Table A6.C-2, pp. 1768-1779.

¹¹⁴ Joint GSP, Appendix 2.C.a, pp. 586-638; Gravelly Ford GSP, Section 2.1.5, p. 22, New Stone GSP, Section 2.5.3 and 2.5.4, pp.39-40, Root Creek GSP, Section 2.5.3 to 2.5.4, pp. 73-75.

¹¹⁵ Joint GSP, Table 2-5, pp. 85-86, Table A2.C.a-1, pp. 592-593.

water supply (i.e., municipal, urban, and rural).¹¹⁶ According to the Joint GSP, each of the seven groundwater sustainable agencies in the Subbasin held regular public meetings, coordination committee meetings, and subbasin wide technical meetings.¹¹⁷ For example, according to the Root Creek GSP,¹¹⁸ engagement with the groundwater users occurred at the time of formation of GSAs, development of the draft GSP, finalization of the GSP and engagement will continue for the implementation of the GSP.¹¹⁹

Overall, Department staff believe the GSAs have thoroughly described Agency information, plan area, and notice and communication process, in substantial compliance with the 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.¹²⁰

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.¹²¹ 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 the geologic assumptions used in developing mathematical models, such as those that allow for quantification of the water budget.¹²²

The Plan provides a description of the hydrogeologic conceptual model documented in a 2017 technical memoranda¹²³ and qualified maps.¹²⁴ The Gravelly Ford GSP provided additional descriptions to the hydrogeological conceptual model using a 2018 report titled *Hydrogeologic Conceptual Model and Groundwater Conditions for the Gravelly Ford Water District GSP*,¹²⁵ which describes the physical components in the Gravelly Ford

¹¹⁶ Joint GSP, Section 1, p. 40.

¹¹⁷ Joint GSP, Section 2.1.5.3, p. 86.

¹¹⁸ Root Creek GSP, Appendix 2-C, pp. 245-246.

¹¹⁹ Root Creek GSP, Section 2.5.1, pp. 72-73.

¹²⁰ 23 CCR § 354.12 *et seq.*

¹²¹ 23 CCR § 354.12 *et seq.*

¹²² 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.

¹²³ Joint GSP, Section 2.2.1, pp. 90-96.

¹²⁴ Joint GSP, Figures 2-5 through Figure 2-46, pp. 171-211, Appendix 2.D, pp. 1078-1090.

¹²⁵ Gravelly Ford GSP, Appendix B, pp. 89-124.

GSP area, including, but not limited to, the principal aquifers,¹²⁶ surface water bodies,¹²⁷ and primary users of groundwater¹²⁸ in the Gravelly Ford GSP area.

The surface geology of the Subbasin is described predominantly as younger and older alluvium with subsurface deposits, from the surface to the bottom of the Subbasin, consisting of alluvium and unconsolidated continental deposits.¹²⁹ The Subbasin is depicted to be underlain by crystalline basement complex rocks of the Sierra Nevada.¹³⁰

The lateral boundaries of the Subbasin are described as the hydrogeologic boundary created by the bedrock of the Sierra Nevada to the east; and the political boundaries of the Kings Subbasin to the south, Chowchilla Subbasin to the north, and Delta-Mendota Subbasin to the west.¹³¹

The Plan describes that the bottom of the Subbasin, throughout most of the Subbasin, is defined by the depth to the base of fresh water (groundwater with conductivity up to 3,000 micromhos per centimeter), except in the eastern portion where it is defined by the depth to basement rock.¹³² However, the Plan states that there are wells screened below the defined base of fresh water while explaining these wells will likely have hydraulic connection with the overlying freshwater zone, so they are considered to be part of the Subbasin.¹³³ For example, cross-sections provided by the Joint GSP depict wells that extend below the bottom of the Subbasin.¹³⁴

The Plan does not explicitly use the term principal aquifers to describe aquifers within the Subbasin, instead the Plan provides a description of aquifer systems present in the Subbasin. The Plan states that the Corcoran Clay underlies the western one-third of the Subbasin¹³⁵ and acts as a confining layer separating the upper unconfined aquifer from the lower confined aquifer.¹³⁶ The top of Corcoran Clay lies between 200 to 350 feet beneath the New Stone GSP area.¹³⁷ The Plan describes that the area outside of the Corcoran Clay, located in the central and eastern portions of the Subbasin, contains discontinuous clay layers interspersed with permeable coarse-grained units and is generally considered to be semi-confined. The semi-confined aquifer is further described as an upper semi-confined aquifer and a lower semi-confined aquifer (at an estimated depth ranging from 200 to 400 feet which generally correlates to the depth of the Corcoran Clay).¹³⁸ The Plan states the Subbasin contains areas of perched water. For example,

¹²⁶ Gravelly Ford GSP, Appendix B, p. 102.

¹²⁷ Gravelly Ford GSP, Appendix B, pp. 96-99.

¹²⁸ Gravelly Ford GSP, Appendix B, p. 107.

¹²⁹ Joint GSP, Section 2.2.1.1, p. 91.

¹³⁰ Joint GSP, Section 2.2.1.1, p. 91, Figure 2-19, p. 184.

¹³¹ Joint GSP, Section 2.2.1.2, p. 91, Figure 2-17, p. 182.

¹³² Joint GSP, Section 2.2.1.2, pp. 91-92, Figures 2-24 through 2-34, pp. 189-199.

¹³³ Joint GSP, Section 2.2.1.2, p. 92.

¹³⁴ Joint GSP, Figures 2-24 to 2-34, pp. 189-199.

¹³⁵ Joint GSP, Section 2.2.1.3, p. 93.

¹³⁶ New Stone GSP, Section 3.1.8, p. 60.

¹³⁷ New Stone GSP, Section 3.1.8, p. 60.

¹³⁸ Joint GSP, Section 2.2.1.3, pp. 93-94.

the Joint GSP states that the approximate location of the perched aquifers are six miles southeast of the City of Madera and ten miles northwest of the City of Madera; depths range from 3 to 27 feet southeast of the City of Madera, 100 feet within the City of Madera, and 105 to 130 feet northeast of Madera. Other sites with perched groundwater are believed to exist, but locations and depths are uncertain due to limited data.¹³⁹

Department staff find that the Plan introduces uncertainty in the hydrogeologic conceptual model by identifying several aquifers in the Subbasin, but not directly defining any of these aquifers as principal aquifer(s). Additional details are provided below.

- The Plan identifies formations (i.e., Modesto, Riverbank, and Turlock Lake Formation - which contains the Corcoran Clay)¹⁴⁰ of the Subbasin but does not associate them with principal aquifer(s).
- The Plan describes the lateral and vertical boundaries of the Subbasin¹⁴¹ but does not provide details that describe the lateral and vertical boundaries by principal aquifer. Also, the GSP does not provide sufficient details to support that east of the Corcoran Clay, the upper regional aquifer is semi-confined, instead of unconfined.
- The Plan does not provide a map depicting the source and point of delivery for imported waters.
- The Plan provides a description of water quality for total dissolved solids, nitrate, and arsenic along with maps of concentrations within the Subbasin.¹⁴² None of the water quality data is identified by principal aquifer, although some of the data is identified by different aquifer descriptions such as upper, lower, shallow wells and deep wells.¹⁴³

The Plan provides cross-sections that provide sufficient information to depict the major stratigraphic and structural features in the Subbasin. Physical characteristics of the Subbasin are depicted on various maps and figures. The cross-sections depict the base of freshwater, top of crystalline basement complex of the Sierra Nevada along the eastern portion of the Subbasin. Also shown is the upper aquifer and lower aquifer separated by the Corcoran Clay. Additionally, the GSP describes that east of the Corcoran Clay extent, the aquifer system is considered to consist of an upper semi-confined aquifer and a lower semi-confined aquifer;¹⁴⁴ however, the cross-sections show unconfined groundwater levels in the areas identified in the GSP as semiconfined.

The Plan does not explicitly identify data gaps and uncertainty concerning the hydrogeologic conceptual model as required by the GSP Regulations.¹⁴⁵ Department staff believe that a discussion regarding data gaps and uncertainty in the hydrogeologic

¹³⁹ Joint GSP, Section 2.2.2.1, p. 98.

¹⁴⁰ Joint GSP, Section 2.2.1.1, p. 91; Root Creek GSP, Section 3.1.2, p. 76.

¹⁴¹ Joint GSP, Section 2.2.1.2, p. 91.

¹⁴² Joint GSP, Section 2.2.2.3, pp. 102-104.

¹⁴³ Joint GSP, Appendix 2.E., pp. 1267-1321.

¹⁴⁴ Joint GSP, Section 2.2.1.1, p. 95.

¹⁴⁵ 23 CCR § 354.14(b)(5).

conceptual model, and plans to address data gaps is necessary, as lack of data and understanding of the physical characteristics of the subbasin may limit sustainable groundwater management (see [Recommended Corrective Action 5](#)).

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.¹⁴⁶

Groundwater levels are currently declining across much of the Subbasin in both the unconfined and lower aquifer zones.¹⁴⁷ The current conditions are a continuation of historical trends of declining groundwater levels across much of the Subbasin that have been observed for at least the past 30 years.¹⁴⁸ In total, more than 500 hydrographs are included in the Plan covering varying timelines over the last 100 years. Hydrographs included in the Plan show two measurements per year over the well's entire period of record with the timeline beginning in 1945 or 1920.¹⁴⁹

The Subbasin is also losing groundwater storage and has been since at least 1988 based on information provided in the Plan.¹⁵⁰ The Joint GSP includes a summary of various studies which utilized different specific yield values to estimate the total volume of groundwater storage loss ranging between 1,891,308 acre-feet to 3,073,376 acre-feet for the period 1988 to 2014 and 2,809,149 acre-feet to 4,564,868 acre-feet for the period 1988 to 2016.¹⁵¹ This equates to an annual storage loss of 73,000 to 163,000 acre-feet per year since 1988.¹⁵² The range in change in groundwater storage conditions result from five different specific yield estimates that vary from 5% to 12% for the Subbasin. The Joint GSP includes a summary table (Table 2-8) showing the total change of storage over two time periods: 1988 to 2014 and 1988 to 2016 based on five different specific yield values.¹⁵³

The Plan identifies nitrate, total dissolved solid (TDS), and arsenic as the current key water quality constituents in the Subbasin. These three constituents were highlighted because they “have greater potential for presenting broader regional groundwater quality concerns extending beyond localized or site-specific contamination cases and are likely to reflect a range of potential contamination sources.”¹⁵⁴ The New Stone GSP also states that salinity, chloride, specific conductance, and pesticides are constituents being detected in areas in the district; however, data available within and near the district indicates that levels of these constituents are generally below respective maximum

¹⁴⁶ 23 CCR § 354.16 (a-f).

¹⁴⁷ Joint GSP, Section 2.2.2.1, pp. 97-100.

¹⁴⁸ Joint GSP, Figures 2-56 and 2-57, pp. 221-222.

¹⁴⁹ Joint GSP, Appendix 2.E.b, pp. 1129-1266.

¹⁵⁰ Joint GSP, Section 2.2.2.2, p. 101.

¹⁵¹ Joint GSP, Section 2.2.2.2, pp. 101-102, Table 2-8, p. 102.

¹⁵² Joint GSP, Section 2.2.2.2, pp. 101-102, Table 2-8, p. 102.

¹⁵³ Joint GSP, Table 2-8, p. 102.

¹⁵⁴ Joint GSP, Section 2.2.2.3, p. 102.

contaminant limits (MCLs) for drinking water.¹⁵⁵ The Root Creek GSP also included an evaluation of other constituents historically present in the GSP area, and states that the evaluation of historical results indicate that the area generally has acceptable groundwater quality for agricultural use and drinking water.¹⁵⁶ The Plan includes more than 50 maps displaying chemical concentrations for the key water quality constituents and other chemicals.¹⁵⁷

Land subsidence has occurred and continues to occur in the Subbasin. The Joint GSP includes a written description detailing land subsidence over three time periods: 1926 to 1970, 2007-2011, and 2015-2017.¹⁵⁸ The discussion in the GSP focuses on the northwestern portion of the Subbasin where 1 to 2 feet of land subsidence occurred between 1926 and 1970, 0.5 to 1.0 feet occurred between 2007 and 2011, and 1.0 to 1.5 feet between 2015 and 2017.¹⁵⁹ The New Stone GSP states the subsiding area near El Nido is approximately 25 miles in diameter and its outer reach extends to the Plan area and the western area of the Subbasin.¹⁶⁰ United States Bureau of Reclamation monitoring point 1007R located on the western boundary of Plan area has indicated an annual subsidence rate ranging from 0.09 to 0.60 feet per year since December 2011 with the highest annual rate occurring from December 2012 through July 2014.¹⁶¹ The Plan includes maps displaying both historical and current land subsidence.¹⁶² Department staff provide information relevant to this in [Section 4.3](#).

Interconnected surface water potentially exists in localized areas along the San Joaquin River within the Subbasin based on an analysis of comparing groundwater levels to the stream thalweg.¹⁶³ Based on this analysis, there were also additional portions of the San Joaquin River that were connected with groundwater historically (from 1958 to 1984) but may no longer be connected due to declining groundwater levels.¹⁶⁴ The Joint GSP states characterization of hydrogeologic conditions related to the potential for interconnected surface water is currently based on very limited data and, therefore, additional data collection and analyses are needed to update and refine the understanding of how surface water and GDEs may (or may not) be connected to the regional aquifers where groundwater pumping occurs.¹⁶⁵ Department staff provide information relevant to this in [Section 4.4](#).

¹⁵⁵ New Stone GSP, Section 3.2.5, pp. 77-79.

¹⁵⁶ Root Creek GSP, Section 3.2.6, pp. 120-125.

¹⁵⁷ Joint GSP, Appendix 2.E, pp. 1268-1321; Root Creek GSP, Figures 3-27 through 3-29, pp. 121-123.

¹⁵⁸ Joint GSP, Section 2.2.2.4, p. 105.

¹⁵⁹ Joint GSP, Section 2.2.2.4, p. 105, Figures 2-67 through 2-70, pp. 232-235.

¹⁶⁰ New Stone GSP, Section 3.2.6.1, p. 82.

¹⁶¹ New Stone GSP, Section 3.2.6.1, p. 82.

¹⁶² New Stone GSP, Figures 3-23 and 3-24, pp. 84-85.

¹⁶³ Joint GSP (Redline), Section 2.2.2.5, p. 118.

¹⁶⁴ Joint GSP, Section 2.2.2.5, p. 105.

¹⁶⁵ Joint GSP (Redline), Section 2.2.2.5, p. 121.

The Plan identifies four areas within the Subbasin as “Potential GDE Units”.¹⁶⁶ The Joint GSP includes a technical memorandum that provides additional information about each of the four Potential GDE Areas including a series of maps, identification of potential GDE species, and a description of GDE conditions in the Subbasin.¹⁶⁷

Overall, the Plan sufficiently describes the historical and current groundwater conditions throughout the Subbasin and the information included in the Plan substantially complies with the requirements outlined in the GSP Regulations.

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 seven GSAs in the Subbasin use the data and analysis provided in the Technical Memorandum: Data Collection and Analysis (Davids engineering and Luhdorff & Scalmanini Consulting Engineers, July 2017) and the Draft Preliminary Basin Boundary Water Budget (Davids engineering and Luhdorff & Scalmanini Consulting Engineers, February 2018).¹⁶⁸ These documents were used to develop the Subbasin’s water budget.¹⁶⁹ The water budget described in the Joint GSP presents a water budget for the entire Plan area, including annual water budget information for Gravelly Ford GSP, New Stone GSP, and Root Creek GSP; the Gravelly Ford GSP, New Stone GSP, and Root Creek GSP also reference the water budget information in the Joint GSP.¹⁷⁰ Detailed information is provided for all seven GSAs in Appendix 6.D of the Joint GSP.¹⁷¹ An assessment of the information is provided below.

The water budgets contain a surface water system and a groundwater system (referred to as accounting centers) for the entire Subbasin. The Plan clearly lists the inflow, outflow, and change in storage components for each accounting center.¹⁷² This framework is applied to the current, historical, and projected budgets.

The period 1989-2014 is used as the base period for both the historical and current water budget and represents average hydrologic conditions based on cumulative departure from mean precipitation.¹⁷³ The average annual change in storage is calculated as -34,200 acre-feet per year¹⁷⁴ for the historical budget. The overdraft estimate for the current water budget is -93,276 acre-feet, calculated using an average of historical

¹⁶⁶ Joint GSP, Section 2.2.2.6, p. 107.

¹⁶⁷ Joint GSP, Appendix 2.B, pp. 518-584.

¹⁶⁸ Madera Subbasin Coordination Agreement, p. 12.

¹⁶⁹ Joint GSP, Section 2.2.3.1, p. 114.

¹⁷⁰ Joint GSP, Appendix 2.F, pp. 1322-1620.

¹⁷¹ Joint GSP, Appendix 6.D, pp. 2012-2175.

¹⁷² Joint GSP, Table 2-10, p. 117.

¹⁷³ Joint GSP, Section 2.2.3.2, pp. 122-123, Figures 2-81 and 2-82, p. 124.

¹⁷⁴ Joint GSP, Table 2-26, p. 159.

hydrologic conditions from 1989-2014 with 2015 land use data.¹⁷⁵ The information presented indicates that change in storage is positive only during wet years at a volume of 122,900 acre-feet. All other years indicate decreases in storage ranging from -82,700 to -230,400 acre-feet.¹⁷⁶

Sustainable yield is calculated for the historical and projected water budgets.¹⁷⁷ As reported in the Plan, the historical sustainable yield for the Subbasin is 437,300 acre-feet per year.¹⁷⁸ The projected sustainable yield for the Subbasin is 439,300 acre-feet per year with a lower bound of 329,500 acre-feet per year and upper bound of 549,100 acre-feet per year.¹⁷⁹ The projected sustainable yield was calculated only for the sustainability period 2040-2090 with the reasoning that ongoing projects and demand management during the implementation period (2020-2039) will continually shift sustainable yield as project efficacy is evaluated.¹⁸⁰ The similarity of historical and projected sustainable yields suggests the sustainable yield during the implementation period would not differ appreciably from these estimates.

Department staff conclude the historical, current, and projected water budgets included in the Plan substantially comply with the requirements outlined in the GSP Regulations. The GSP provides the required historical, current, and future accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the Subbasin including an estimate of the sustainable yield of the Subbasin and projected future water demands.

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.¹⁸¹

No management areas were designated per the information provided in the Plan.

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

¹⁷⁵ Joint GSP, Table 2-30, p. 163.

¹⁷⁶ Joint GSP, Table 2-33, p. 165.

¹⁷⁷ Joint GSP, Section 2.2.3.4, pp. 166-167.

¹⁷⁸ Joint GSP, Table 2-34, p. 167.

¹⁷⁹ Joint GSP, Table 2-35, p. 168.

¹⁸⁰ Joint GSP, Section 2.2.3.4, p. 167.

¹⁸¹ 23 CCR § 345.20.

characterizes undesirable results and establishes minimum thresholds and measurable objectives for each applicable sustainability indicator.¹⁸²

5.3.1 Sustainability Goal

The GSAs establish a sustainability goal for the Subbasin in the Coordination Agreement which is to "...implement a package of projects and management actions that will, by 2040, balance long-term groundwater system inflows and outflows based on a 50-year period representative of average historical hydrologic conditions."¹⁸³ The Joint GSP explains that during the 20-year implementation period a combination of recharge projects, replacing groundwater use with surface water, and demand reduction management actions are planned. These efforts will "increase groundwater inflows and decrease groundwater outflows to bring the groundwater system into balance by 2040 and will allow its operation to remain sustainable over a 50-year period representing average hydrologic conditions."¹⁸⁴

Each GSP also provides additional specific information describing the goal for each GSP area. For example, the Gravelly Ford GSP describes the sustainability goal for the Subbasin as "...to minimize the listed undesirable results throughout the Subbasin by providing a Gravelly Ford GSP water supply that supports current cultivated acreage in the Plan area by developing an expanded surface water irrigation and recharge program, and groundwater monitoring and land elevation measurement program."¹⁸⁵ The New Stone GSP states that "[t]he goal for the GSP is to provide a tool for managing groundwater, basin-wide, on a long-term basis and to meet measurable objectives for each indicator by maintaining a sustainable yield, thus avoiding undesirable results."¹⁸⁶ The Root Creek GSP explains that the sustainability goal is to work collectively with the other GSAs within the Subbasin to "sustainably manage the groundwater resources of the basin while maintaining openness to the public and stakeholders such that local citizenry has a voice in the outcome."¹⁸⁷ Additionally, the goal of the Root Creek GSP is to "immediately reduce and eventually eliminate systematic overdraft within the [GSP] area."¹⁸⁸ While, specifying how each GSP will support the Subbasin sustainability goal within its' GSP area is an appropriate level of detail for each GSP, Department staff recommend the GSAs continue to coordinate and align this portion of each GSP to provide a more cohesive definition between the specific GSP goal and the sustainability goal for the Subbasin (see [Recommended Corrective Action 2](#)).

¹⁸² 23 CCR § 354.22 *et seq.*

¹⁸³ Madera Subbasin Coordination Agreement, p. 34.

¹⁸⁴ Joint GSP, Section 3.1.2, p. 244.

¹⁸⁵ Gravelly Ford GSP, Section 3.1, p. 48.

¹⁸⁶ New Stone GSP, Section 4.1, p. 110.

¹⁸⁷ Root Creek GSP, Section 4.1, p. 157.

¹⁸⁸ Root Creek GSP, Section 1.2, p. 17.

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.¹⁸⁹ 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 water¹⁹⁰ – 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.

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.¹⁹¹

5.3.2.1 Chronic Lowering of Groundwater Levels

The GSP Regulations require the minimum threshold for chronic lowering of groundwater levels to be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results.¹⁹²

In the September 2022 Incomplete Determination, the Department identified deficiencies related to the sustainable management criteria for the chronic lowering of groundwater levels. The GSAs revised this portion of the Plan, and Department staff evaluate this sustainability indicator in [Section 4.2](#) of this Staff Report. As presented above, Department staff concluded that the GSAs took sufficient action to correct this deficiency to warrant approving the Plan, but staff also provided recommended corrective actions based on the changes the Agencies have made to the sustainable management criteria for this sustainability indicator to further improve management during Plan implementation.

¹⁸⁹ 23 CCR § 351(ah).

¹⁹⁰ Water Code § 10721(x).

¹⁹¹ 23 CCR § 354.26(d).

¹⁹² 23 CCR § 354.28(c)(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 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.¹⁹³

The Plan states groundwater levels act as a proxy for the groundwater storage sustainability indicator and the sustainable management criteria for reduction in groundwater storage are the same as those established for chronic lowering of groundwater levels.¹⁹⁴ Department staff will evaluate and compare the groundwater level conditions and reduction of storage in Annual Reports submitted to the Department. Department staff expect the information will be reported on a per aquifer basis given the groundwater level monitoring network identifies which aquifer the representative monitoring site is monitoring.

5.3.2.3 Seawater Intrusion

The GSP Regulations require the minimum threshold for seawater intrusion to be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results.¹⁹⁵

As stated in the Plan, seawater intrusion sustainability criteria are not applicable to the Subbasin, because it is located more than 70 miles inland and hydraulically disconnected from the ocean.¹⁹⁶

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.¹⁹⁷

The GSP states that “an undesirable result for degraded groundwater quality occurs when groundwater quality exceeds an established MCL and minimum threshold for arsenic, nitrate, or TDS [total dissolved solids] for a significant duration of time and at a significant number of representative monitoring sites and is the direct result of projects or management actions undertaken as part of the GSP implementation.”¹⁹⁸ More

¹⁹³ 23 CCR § 354.28(c)(2).

¹⁹⁴ Joint GSP, Section 3.4.2, pp. 277-278.

¹⁹⁵ 23 CCR § 354.28(c)(3).

¹⁹⁶ Joint GSP, Section 3.2.6, p. 259.

¹⁹⁷ 23 CCR § 354.28(c)(4).

¹⁹⁸ Joint GSP, Section 3.4.4, p. 279.

specifically, a “significant duration of time” is defined as “a three-year monitoring period” and a “significant number of representative monitoring sites” is defined as “greater than 10 percent of representative groundwater quality monitoring wells exceeding a minimum threshold for a given constituent.”¹⁹⁹ This definition is overly narrow. SGMA specifies that the significant and unreasonable effects are those “caused by groundwater conditions occurring throughout the basin” not just from groundwater management activities. By solely focusing on water quality impacts caused directly by the GSAs implementing an action, the GSP does not define undesirable results for degraded water quality in accordance with the SGMA. SGMA’s definition of undesirable results includes “significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.”²⁰⁰ As currently defined in the Plan, if, for instance, a minimum threshold exceedance occurs because of mobilization of naturally occurring constituents or migration of a contaminant plume to supply wells caused by groundwater pumping in the Subbasin, but the GSAs have not determined this to be a result of a project or management action, the GSAs would not identify this as an undesirable result. Staff consider this to be inconsistent with the intent of SGMA, which requires GSAs to ensure management of groundwater conditions in the Subbasin, including any action taken by the GSAs, will not significantly and unreasonably degrade water quality. Therefore, degraded water quality caused by groundwater pumping, changes in groundwater levels, changes in the direction of groundwater flow, or changes in horizontal or vertical movement of groundwater within the Subbasin should be considered in the assessment of undesirable results in the Subbasin. Department staff recommend the GSAs revise the definition of their overly-narrow definition of undesirable results such that groundwater pumping and other factors, whether due to action or inaction of the GSAs with respect to Subbasin management, is considered and not excluded in the undesirable result definition (see [Recommended Corrective Action 6a](#)).²⁰¹

Significant and unreasonable degradation of water quality is defined as “when beneficial uses for groundwater are adversely impacted by constituent concentrations increasing to levels above the drinking water MCLs for one of the key constituents of interest ...due to implementation of a GSP project or management action.”²⁰² Though the definition provided appears to consider specific effects of degradation of groundwater quality, the GSP does not provide details that explain how the GSAs determined what “adversely impacted by constituent concentrations” means. Additionally, the GSP does not provide descriptions, supported by analysis, of the potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results. The GSAs should update the definition of undesirable results to include specific scenarios the GSAs are trying to avoid (e.g., additional cost to domestic well users for well treatment, decrease in water available

¹⁹⁹ Joint GSP, Section 3.4.4, p. 279.

²⁰⁰ Water Code § 10721(x).

²⁰¹ 23 CCR § 354.26 (b)(2).

²⁰² Joint GSP, Section 3.4.4, p. 279.

for certain beneficial uses, etc.). Department staff recommend that the GSAs refine the definition to better describe the specific significant and unreasonable effects related to degraded water quality the GSAs are managing to avoid ([see Recommended Corrective Action 6b](#)).

The GSP provides a description of potential causes of an undesirable result, limited to direct effects of GSP projects or management actions, such as localized pumping clusters (which would particularly affect areas prone to elevated arsenic concentrations occurring at greater pumping water level depths)²⁰³ and groundwater recharge which particularly affect areas of actively or formerly cultivated lands where high residual concentrations of nutrients, especially nitrogen, may exist.²⁰⁴

The GSP establishes the minimum thresholds for degraded water quality at the “[maximum contaminant level (MCLs)] for drinking water for identified key constituents (10 mg/L for nitrate as nitrogen; 500 mg/L for TDS; 10 ug/L for arsenic) or when existing or historical concentrations for the key constituents already exceed the MCL, the minimum threshold is set at the recent concentration plus 20 percent.”²⁰⁵ Measurable objectives are set at current constituent concentrations.²⁰⁶ However, the GSP does not identify which wells have had exceedances in the past or provide the current constituent concentrations in the Plan. The GSP also states “significant and unreasonable degradation of water quality occurs when beneficial uses for groundwater are adversely impacted by constituent concentrations increasing to levels above the drinking water MCLs,”²⁰⁷ but the GSP does not explain or justify setting minimum thresholds at 20 percent above MCLs, or demonstrate that these increased levels would not adversely impact beneficial uses and users of water. Department staff are not aware of specific concerns regarding degraded water quality that warrant immediate action based on what is provided in the Plan; however, staff believe the GSAs should identify the exact minimum threshold values what will be used and justify how establishing minimum thresholds at the higher of either MCLs or existing concentrations plus 20 percent does not constitute significant and unreasonable effects as defined by the GSP (i.e., “when beneficial uses for groundwater are adversely impacted by constituent concentrations) ([see Recommended Corrective Action 6c](#)).

5.3.2.5 Land Subsidence

SGMA defines the undesirable result for subsidence to be significant and unreasonable land subsidence that substantially interferes with surface land uses, caused by groundwater conditions occurring throughout the basin.²⁰⁸ The GSP Regulations require the minimum threshold for land subsidence to be the rate and extent of subsidence that

²⁰³ Joint GSP, Section 3.4.4, pp. 279-280.

²⁰⁴ Joint GSP, Section 3.4.4, p. 280.

²⁰⁵ Joint GSP, Section 3.3.4, p. 271.

²⁰⁶ Joint GSP, Section 3.4.2.1, p. 253.

²⁰⁷ Joint GSP, Section 3.4.4, p. 271.

²⁰⁸ Water Code § 10721(x)(5).

substantially interferes with surface land uses and may lead to undesirable results.²⁰⁹ Minimum thresholds for subsidence shall be supported by the identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects and maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.²¹⁰

In the September 2022 Incomplete Determination, the Department identified deficiencies related to the sustainable management criteria for land subsidence. The GSAs revised this portion of the Plan and Department staff provide evaluation for this sustainability indicator in [Section 4.3](#) of this Staff Report. As presented above, Department staff concluded the GSAs had taken sufficient actions to correct the deficiencies and provided additional recommended corrective actions based on the changes the Agencies have made to the sustainable management criteria for this sustainability indicator to further improve basin management as the Plan is implemented.

5.3.2.6 Depletions of Interconnected Surface Water

SGMA defines undesirable results for the depletion of interconnected surface water as those that have significant and unreasonable adverse impacts on beneficial uses of surface water and are caused by groundwater conditions occurring throughout the basin.²¹¹ The GSP Regulations require that a Plan identify the presence of interconnected surface water systems in the basin and estimate the quantity and timing of depletions of those systems.²¹² The GSP Regulations further require that minimum thresholds be set based on the rate or volume of surface water depletions caused by groundwater use, supported by information including the location, quantity, and timing of depletions, that adversely impact beneficial uses of the surface water and may lead to undesirable results.²¹³

In the September 2022 Incomplete Determination, the Department identified deficiencies related to the sustainable management criteria of depletions of interconnected surface water. The GSAs revised this portion of the Plan and Department staff provide evaluation for this sustainability indicator in [Section 4.4](#) of this Staff Report. As presented above, Department staff concluded the GSAs had taken sufficient actions to correct the deficiencies and provided additional recommended corrective actions based on the changes the Agencies have made to the sustainable management criteria for this sustainability indicator.

²⁰⁹ 23 CCR § 354.28(c)(5).

²¹⁰ 23 CCR §§ 354.28(c)(5)(A-B).

²¹¹ Water Code § 10721(x)(6).

²¹² 23 CCR § 354.16(f).

²¹³ 23 CCR § 354.28(c)(6).

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 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.²¹⁴ Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,²¹⁵ monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,²¹⁶ capture seasonal low and high conditions,²¹⁷ include required information such as location and well construction, and include maps and tables clearly showing the monitoring site type, location and frequency.²¹⁸ Department staff encourage GSAs to collect monitoring data as specified in the GSP, fill data gaps identified in the GSP prior to the first 5 year update,²¹⁹ update monitoring network information as needed, follow monitoring best management practices,²²⁰ and submit all monitoring data to the Department's Monitoring Network Module immediately after collection including any additional groundwater monitoring data that is collected within the Plan area that is used for groundwater management decisions. Staff note that if GSAs do not fill their identified data gaps, the GSA's basin understanding may not represent the best available science for use to monitor basin conditions.

Each GSP identifies a distinct monitoring network that measures groundwater elevations for assessment of chronic lowering of groundwater levels. The Joint GSP identifies 37 monitoring wells with 11 wells in the Upper Aquifer, 22 wells in the Lower Aquifer, and four composite wells screened in both aquifers.²²¹ The Joint GSP acknowledges the spatial coverage of the monitoring network for the Upper Aquifer is limited to the southwestern portion of the GSP area.²²² The Gravelly Ford GSP states that two different groups of wells are currently being used for monitoring chronic lowering of groundwater levels; one with a network of 24 wells and another network of four wells from outside the GSP area to compare future measurements.²²³ However, the Gravelly Ford GSP does not specify which aquifer the wells are monitoring. The New Stone GSP monitoring network includes six monitoring wells comprised of three California Groundwater Elevation Monitoring Program (CASGEM) monitoring sites and three district wells that will

²¹⁴ 23 CCR § 354.32.

²¹⁵ 23 CCR § 354.34(b)(2).

²¹⁶ 23 CCR § 354.34(b)(3).

²¹⁷ 23 CCR § 354.34(c)(1)(B).

²¹⁸ 23 CCR §§ 354.34(g)-(h).

²¹⁹ 23 CCR § 354.38(d).

²²⁰ Department of Water Resources, 2016, [Best Management Practices and Guidance Documents](#).

²²¹ Joint GSP, Section 3.5.1, p. 281.

²²² Joint GSP, Section 3.5.1, p. 282.

²²³ Gravelly Ford GSP, Section 3.5.1, pp. 57-58.

be monitoring the unconfined aquifer and confined aquifer respectively.²²⁴ The Root Creek GSP states that the GSA will use the five wells in the monitoring network within the single aquifer that underlies the GSP area.²²⁵

The Plan proposes to use groundwater levels and the groundwater level monitoring network as a proxy for the loss of groundwater in storage monitoring network because changes in groundwater storage are directly dependent on changes in groundwater levels.²²⁶

The groundwater quality monitoring network in the Joint GSP consists of 12 monitoring sites selected from the GSP groundwater level monitoring network.²²⁷ Of these wells, two are screened in the Upper Aquifer, eight in the Lower Aquifer, and two are composite wells screened in both.²²⁸ Additionally, two domestic wells from the Irrigated Lands Regulatory Program, and thirteen public supply wells with ongoing monitoring conducted by other entities are also part of the representative monitoring sites but the GSP does not identify which aquifers the wells are completed in.²²⁹ The Gravelly Ford GSP states groundwater quality samples will be collected from 24 wells throughout the district and the samples will be collected once a year.²³⁰ The New Stone GSP states the GSA will use the three district wells that monitor the confined aquifer.²³¹ The Root Creek GSP states that degraded water quality will be monitored from 17 sites throughout the GSA's area of the Subbasin which includes municipal wells, monitoring wells associated with the Riverstone wastewater treatment plant, agricultural wells used in the GSP, and wells associated with CASGEM.²³² The Plan states that several agencies monitor and regulate water quality in the Subbasin and the GSAs will collect and review the data published by these agencies, which include the Regional Water Quality Control Board, Environmental Protection Agency, Department of Toxic Substance Control, Madera County, United States Geological Survey, and State Water Resources Control Board.²³³

The land subsidence monitoring network in the Joint GSP is comprised of six benchmark survey points monitored by the United States Bureau of Reclamation as part of the San Joaquin River Restoration Program (SJRRP) and one continuous GPS station monitored by UNAVCO as part of the Plate Boundary Observatory Project.²³⁴ Two of the benchmark survey points are underlain by the Corcoran Clay, where subsidence is of most concern. Representative monitoring site 1007R, a benchmark survey point which is located on the

²²⁴ New Stone GSP, Section 5.2.1, pp. 133-134.

²²⁵ Root Creek GSP, Section 5.2.1, p. 191.

²²⁶ Joint GSP, Section 3.5.1.2, p. 286; Gravelly Ford GSP, Section 3.5, p. 59; New Stone GSP, Section 5.3.1, p. 138; Root Creek GSP, p. 196.

²²⁷ Joint GSP, Section 3.5.1.4, p. 287.

²²⁸ Joint GSP, Figure 3-2, p. 300.

²²⁹ Joint GSP, Section 3.5.1.4, p. 287.

²³⁰ Gravelly Ford GSP, Section 3.5.1, p. 58.

²³¹ New Stone GSP, Section 5.5.1, p. 139, Figure 5-1, p. 137.

²³² Root Creek GSP, Section 5.4.1, pp. 199-201.

²³³ Root Creek GSP, Section 5.4.1, p. 199.

²³⁴ Joint GSP (Redlined), Section 3.2.3.2, p. 279, Figure 3-10, p. 360.

western edge of the New Stone GSP area, has reported the most severe rate of recent subsidence in the Subbasin.²³⁵ The Plan states that all SJRRP and UNAVCO sites will be used to monitor for subsidence in the area and monitoring stations outside the Subbasin will be used to provide regional context. The Root Creek GSP also provides a list of subsidence monitoring done by other agencies such as USGS, DWR, USACE which will be used to verify the Plan's monitoring network.²³⁶ The Gravelly Ford GSP subsidence monitoring program will be expanded by the district to include observations on all the 24 monitoring sites in the GSP area, at a period of three to five years, with some wells observing the Lower Aquifer.²³⁷ See [Section 4.3.2](#) for further evaluation of the Plans sustainable management criteria and monitoring network for land subsidence.

Interconnected surface water is evaluated by monitoring groundwater levels at three wells²³⁸ screened in the Upper Aquifer near the San Joaquin River. The Joint GSP explains the representative monitoring sites include a combination of irrigation and monitoring wells with data representing surface water-groundwater interconnection trends from 1989.²³⁹ Streamflow data from gaging stations is also collected and will be used in future studies and evaluations of interconnected surface water, including generating data to better estimate groundwater basin conditions related to interconnected surface water²⁴⁰ (also see [Section 4.4.2](#)).

The description of the monitoring in the Plan substantially complies with the requirements outlined in the GSP Regulations. Overall, the Plan describes in sufficient detail a monitoring network that promotes the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin and evaluate changing conditions that occur through Plan implementation. The GSP provides a good explanation for the conclusion that the monitoring network is supported by the best available information and data and is designed to ensure adequate coverage of sustainability indicators. The Plan also describes existing data gaps and the steps that will be taken to fill data gaps and improve the monitoring network. Department staff consider the information presented in the Plan as satisfying the general requirements of the GSP Regulations regarding monitoring networks, but also provide recommended corrective actions related to managing and monitoring land subsidence (see [Recommended Corrective Action 4](#)).

²³⁵ New Stone GSP (Redlined), Section 3.2.6.1, p. 99, Figure 5-2, p. 185.

²³⁶ Root Creek GSP (Redlined), Section 5.5.1, pp. 266-267, Section 5.5.3, p. 268.

²³⁷ Gravelly Ford GSP (Redlined), Section 3.5.1, p. 76, Section 3.5.4.2, p. 77.

²³⁸ Joint GSP (Redlined), Figure 3-4, p. 352, Section 3.5.1.5, p. 336.

²³⁹ Joint GSP (Redlined), Section 3.5.1.5, p. 336, Section 3.2.5, p. 288.

²⁴⁰ Joint GSP (Redlined), Section 3.5.1.5, p. 336.

5.5 PROJECTS AND MANAGEMENT ACTIONS

The GSP Regulations require a description of the projects and management actions the GSAs have determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.²⁴¹

The Plan lays out the projects which were selected by the GSAs to achieve the Subbasin sustainability goal by 2040.²⁴² Generally, the projects are supply augmentation (i.e., recharge or conveyance enhancement) projects which source water from flood releases, Section 215 water, bypass flows, or water purchases. While the total cost of project implementation is not provided, the estimated costs provided in each individual GSP total to over \$270,000,000 in capital costs and over \$70,000,000 in annual costs; Department staff note that the GSAs have also included an estimated economic cost from reduced crop production resulting from demand management in the estimated annual operating cost, which is approximately \$54,000,000 per year or over 75% of the total.²⁴³ Many of the projects are currently being implemented, having been initiated by past efforts, or will be implemented by 2040. The total expected benefit is 215,840 acre-feet per year²⁴⁴ at full implementation with the majority of the benefit deriving from a demand management program led by the Madera County GSA which will conserve 90,000 acre-feet per year. Madera County determined that projects were unlikely to generate enough benefit to offset the estimated current and projected future overdraft conditions and decided to implement a management action to gradually reduce groundwater pumping over the GSP implementation period.²⁴⁵ The demand management effort started in 2020 with 2% demand reduction per year until 2025. Starting in 2026, the demand reduction increases to a 6% reduction rate until 2040.²⁴⁶

Since the submission of the Plan in 2020, the GSAs have provided Annual Reports to the Department that provide updates on progress, a brief overview of these efforts from Water Year 2019 to Water Year 2022 is provided in each revised GSP. A review of the Annual Reports submitted shows progress on a majority of the projects and enhancements of monitoring networks, which now collect more land subsidence, water quality, and groundwater level data; the GSAs also report efforts being made to collect more interconnected surface water data.²⁴⁷

A review of the projects presented in each GSP is provided below.

²⁴¹ 23 CCR § 354.44 et seq.

²⁴² Joint GSP (Redlined), Section 4, pp. 361-431; Gravelly Ford GSP (Redlined), Section 4, pp. 83-37; Root Creek GSP (Redlined), Section 6, pp. 309-327; New Stone GSP (Redlined), Section 6, pp. 189-199.

²⁴³ Joint GSP, Table 4-3, p. 312, Section 4.4.4.5, p. 352.

²⁴⁴ Joint GSP, Tables 4-1 and 4-2, pp. 310-311.

²⁴⁵ Joint GSP, Section 4.4.4, p. 347.

²⁴⁶ Joint GSP, Section 4.4.4.2, p. 348.

²⁴⁷ Joint GSP Water Year 2022 Annual Report, Table 7-1, pp. 56-57; Gravelly Ford GSP Water Year 2022 Annual Report, Section 2.4.3, pp. 18-19; New Stone GSP Water Year 2022 Annual Report, Section 3.1.2, p. 10; Root Creek GSP Water Year 2022 Annual Report, p. 26.

The Joint GSP describes each project and management action proposed by Madera Water District GSA, Madera Irrigation District GSA, City of Madera GSA, and Madera County GSA.²⁴⁸ They are:

Madera Water District GSA

1. Surface Water Purchase Program

Madera Irrigation District GSA

1. Groundwater Recharge Basins
2. On-Farm Recharge (Flood-MAR)
3. Madera Irrigation District System Improvements and Programs
4. Madera Ranch Annexation

The City of Madera GSA

1. Berry Basin for groundwater recharge
2. The City of Madera Metering and Volumetric Billing program.

Madera County GSA

1. Water Purchase for Direct or In-Lieu Recharge (starts in 2025)
2. Import and Recharge of Millerton Flood Releases (Flood-MAR) (starts in 2025)
3. Chowchilla Bypass Flood Water Recharge Basins (starts in 2025)
4. Chowchilla Bypass Flood Water Recharge Basins (starts in 2040)
5. Management Action: Demand Management (starts in 2020)

The Joint GSP provides an estimate for implementing projects and management actions, which totals approximately \$193,460,000 in capital costs and \$69,550,000 in annual operating costs.²⁴⁹ As noted above, the GSAs have included an estimated economic cost from reduced crop production resulting from demand management of approximately \$54,000,000 per year in the total annual cost.²⁵⁰ Based on information provided in the Joint GSP resubmittal and the 2022 Annual Report,²⁵¹ the GSA reports that a cumulative total benefit of over 63,000 acre-feet from projects and management actions to date, with a benefit of 7,300 acre-feet for the latest reported water year for the GSP area.²⁵² Demand management is described to potentially utilize a range of options including allocations, a water trading program, or easements to reduce groundwater demand. In 2022, Madera County took steps to develop a demand management study that was intended to result

²⁴⁸ Joint GSP (Redlined), Section 4, pp. 361-341.

²⁴⁹ Joint GSP (Redlined), Table 4-3, p. 366.

²⁵⁰ Joint GSP (Redlined), Section 4.4.4.5, p. 409.

²⁵¹ Joint GSP Water Year 2022 Annual Report, Section 7.1, pp. 53-69.

²⁵² Joint GSP Water Year 2022 Annual Report, Table 7-2, p. 58.

in an acreage-based rate for extraction of groundwater within the GSA area. However, following an injunction issued by the Madera County Superior Court in December 2022, the Madera County GSA was ordered to refrain from imposing or collecting any new fees, rates, or GSP Project Fees enacted under Madera County Resolution 2022-086 against landowners in the Madera Subbasin.²⁵³ Nonetheless, Department staff encourage the GSAs to continue efforts to develop and implement a successful management strategy to reduce groundwater pumping in the Subbasin, since the reduction of groundwater demand, as detailed in the Plan, is an essential part of achieving the sustainability goal for the basin. Department staff will closely monitor and track the implementation of the demand management program; delays in implementation due to litigation or funding are insufficient to justify delays in implementing demand reduction strategies that are needed to sustainably manage the basin.

The Gravelly Ford GSP²⁵⁴ provides details for two projects which the GSA is currently implementing:

1. Recharge Program: this project is the continuation of the recharge program established by the Gravelly Ford Water District in 1961.
2. Increased Measurement, Sampling and Monitoring: this project is to continue data collection efforts.

The Gravelly Ford GSP does not provide an estimate for projects and management actions; the cost of implementing the GSP is estimated to be \$961,000.²⁵⁵ Based on information in the 2022 Annual Report,²⁵⁶ the GSA reports that a number of measurements (i.e., depth to groundwater) of private agricultural wells in the GSP area were made and the installation of measurement meters has started on those wells to increase data collection; but the GSAs were not able to discharge surface water into the existing recharge basins during the 2022 Water Year.

The New Stone GSP includes a brief description of one project that is “currently being considered by the [New Stone Water] District”²⁵⁷ which is the:

1. Construct Chowchilla Bypass Turnout, New Canals, and Recharge Basins (Bypass Project)

The Bypass Project is in the “conceptual phase” and implementation will “depend on the availability of land for new recharge basins [which will also determine amount of recharge] and acquiring a source of funding”; the amount of recharge will depend on acres available for recharge facilities but the district has a 15,700 acre-feet appropriative water right.²⁵⁸ The estimated cost over 20-years for implementing the project is \$7,800,000 but no

²⁵³ Joint GSP (Redlined), Section 4.10.5.4, p. 430.

²⁵⁴ Gravelly Ford GSP, Section 4, pp. 64-66.

²⁵⁵ Gravelly Ford GSP (Redlined), Section 5.3.1, p. 88.

²⁵⁶ Gravelly Ford GSP Water Year 2022 Annual Report, Section 2.4.3, p. 18-19.

²⁵⁷ New Stone GSP, Section 6.2, pp. 151-157.

²⁵⁸ New Stone GSP, Section 6.2.1.2 through 6.2.1.6, pp. 152-153.

schedule is provided.²⁵⁹ Management actions will be enacted “[i]f basin overdraft isn’t mitigated”²⁶⁰ and the GSP doesn’t provide related cost of implementation or schedule estimates. Based on information in the 2022 Annual Report,²⁶¹ the GSA did not provide substantial updates on the project or management action progress for the 2022 Water Year—but the GSA did report three new wells were added to the monitoring network.

The Root Creek GSP²⁶² includes brief descriptions of three projects:

1. Expansion of the In-Lieu Pipeline (to fully utilize surface water allocations)
2. Intentional Recharge Projects
3. Agricultural Land Conversion (Development of Riverstone)
4. Monitoring Well Program – Interconnected Surface Water

The Root Creek GSP provides project cost estimates and projects 2 and 3 are currently being implemented. Additionally, though management actions are referenced,²⁶³ no specific details are provided; the GSP references the continuation of programs that were enacted prior to SGMA related to the use and sustainable management of groundwater.²⁶⁴ During 2022, the GSP states, a benefit of 4,500 acre-feet was realized from projects for the GSP area.²⁶⁵

The Plan adequately describes proposed projects and management actions in a manner that is generally consistent and substantially complies with the GSP Regulations.²⁶⁶ The projects and management actions, which focus largely on recharge or conveyance projects and demand management, are directly related to the sustainable management criteria and present a generally feasible approach to achieving the sustainability goal of the Subbasin.

As projects and management actions are implemented, the Department expects that progress be included in Annual Reports and any addition or removal of project and management actions be documented in Periodic Evaluations.

5.6 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.”²⁶⁷ Furthermore, the GSP Regulations state that minimum thresholds defined in each GSP

²⁵⁹ New Stone GSP, Table 7-3, p. 160.

²⁶⁰ New Stone GSP, Section 6.3, p. 154.

²⁶¹ New Stone GSP Water Year 2022 Annual Report, Section 3.1, pp. 10-11.

²⁶² Root Creek GSP, Section 6.1 through 6.4, pp. 212-226.

²⁶³ Root Creek GSP, Table 6-1, p. 213.

²⁶⁴ Root Creek GSP, Section 6.5, p. 226.

²⁶⁵ Root Creek GSP (Redlined), Section 6.7, pp. 326-327.

²⁶⁶ 23 CCR §§ 354.44 (a), 354.44 (b), 354.44 (c), 354.44 (d).

²⁶⁷ 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.²⁶⁸

The Madera Subbasin has three adjacent basins; the Kings Subbasin, Delta-Mendota Subbasin, and the Chowchilla Subbasin, are all high-priority and required to be managed under a GSP. The Delta-Mendota Subbasin and Chowchilla Subbasins are critically overdrafted and currently have inadequate plans which the Department has referred to the State Water Resources Control Board under Chapter 11 of SGMA. The Kings Subbasin is to the south of the Madera Subbasin bordering the south bank of the San Joaquin River. The Kings Subbasin is designated critically overdrafted and the Kings Subbasin Plan has been approved by the Department.

The Plan states that the Madera Subbasin GSAs have met multiple times with GSAs in adjacent subbasins to ensure that implementation of the Madera Subbasin GSPs will not interfere with the ability of adjacent subbasins to also achieve sustainable groundwater management; however, further details are not provided in the Plan.²⁶⁹ The Plan also qualitatively describes how minimum thresholds and measurable objectives may affect an adjacent basin, concluding that the Madera Subbasin Plan will not hinder the ability of an adjacent basin to be sustainable;²⁷⁰ however, the evaluation is provided without specifics.

Based on information available at this time, Department staff have insufficient evidence to conclude that groundwater management in the Madera Subbasin will adversely affect the implementation of a plan or impede achievement of sustainability goals in an adjacent basin. Department staff encourage the GSAs to evaluate whether their 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. Department staff will continue to review periodic evaluations to the Plan and Annual Reports to assess whether implementation of the Madera Subbasin GSP is likely to impact adjacent basins.

5.7 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.²⁷¹

Since the GSP was adopted and submitted, climate change conditions have advanced faster and more dramatically. It is anticipated that the hotter, dryer conditions will result in a loss of 10% 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

²⁶⁸ 23 CCR § 354.28(b)(3).

²⁶⁹ Joint GSP (Redlined), Executive Summary, p. 25.

²⁷⁰ Joint GSP (Redlined), Section 3.2.1.4, p. 277, Section 3.2.2.4, p. 278, Section 3.2.4.4, p. 285, Section 3.2.5.4, p. 291, Section 3.3.1.5, p. 304, Section 3.3.2.3, p. 309, Section 3.3.3.3, p. 312, Section 3.3.4.3, p. 318, Section 3.3.5.3, p. 319.

²⁷¹ 23 CCR § 354.18.

encourages the GSAs to explore how the proposed groundwater level thresholds have been established in consideration of groundwater level conditions in the Subbasin based on current and future drought conditions. The Department encourages the GSAs to also explore how groundwater level data from the existing monitoring network will be used to make progress towards sustainable management of the Subbasin given increasing aridification and effects of climate change, such as prolonged drought. Lastly, the Department encourages the 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 forces²⁷² to evaluate how the GSAs' groundwater management strategy aligns with drought planning, response, and mitigation efforts within the Subbasin.

²⁷² Water Code § 10609.50.

6 STAFF RECOMMENDATION

Department staff believe sufficient action has been taken by the GSAs to the deficiencies identified. Department staff recommend approval of the Plan with the required and 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. Implementation of the Plan will likely achieve the sustainability goal for the Madera Subbasin. The GSAs have identified several areas for improvement of its Plan and Department staff concur that those items are important and should be addressed as soon as possible. Department staff have also identified additional recommended corrective actions that should be considered by the GSAs for the first periodic assessment of its GSP. Addressing these recommended corrective actions will be important to demonstrate that implementation of the Plan is likely to achieve the sustainability goal. The recommended corrective actions include:

RECOMMENDED CORRECTIVE ACTION 1

Considering MID GSA has yet to adopt the Plan, by the first periodic evaluation, MID GSA should identify and list the specific projects and management actions that MID GSA will or may be responsible for implementing under the Revised Joint GSP and provide a parallel listing and detailed identification and discussion of the legal, contractual, or other authorities or arrangements that MID GSA is relying or will rely upon in adequately implementing the Plan including those projects or management actions to clearly demonstrate the feasibility of MID GSA implementing all projects and management actions.

RECOMMENDED CORRECTIVE ACTION 2

While the GSAs have established a framework for coordination of multiple GSPs that could serve as a basis to achieve Subbasin sustainability, it is vital that the GSAs continue their efforts to improve coordination and eliminate any remaining areas of disagreement that could delay Plan implementation or affect the likelihood of achieving sustainability. For example, the GSA should come to a consensus regarding the data and methods utilized to develop refined future water budgets for the entire Subbasin, and agreement regarding the availability and use of more detailed data as it becomes available from each GSP area. These efforts should be done with the ultimate goal that the contents of each GSP should represent a component of a cohesive, unified Plan that will achieve the sustainability goal in the Subbasin consistent with SGMA timelines and not be an isolated document only for a specific GSP area.

RECOMMENDED CORRECTIVE ACTION 3

The GSAs should revise the GSPs to include a discussion of the relationship between the management criteria for chronic lowering of groundwater levels and the other

sustainability indicators, including an explanation of how the criteria, including interim milestones, were established to avoid undesirable results for each of the other sustainability indicators.

RECOMMENDED CORRECTIVE ACTION 4

Department staff recommend the following as it relates to land subsidence:

- a. The GSAs should refine the description of undesirable results to clearly describe the significant and unreasonable conditions the GSAs are managing the Subbasin to avoid, as it relates to land subsidence. More specifically, the GSAs should reevaluate the quantitative metrics that define an undesirable result for subsidence. The reevaluation should consider localized subsidence conditions and the irreversibility of continued inelastic subsidence, especially in the area deemed of “greater subsidence concern.” This is to say that the current quantitative metrics (i.e., 75 percent of the representative monitoring sites in the Subbasin exceed threshold levels for two consecutive years across the entire Subbasin) would not minimize or avoid inelastic subsidence in the most susceptible areas of the Subbasin – predominantly in the north-northwestern portion of the Subbasin which are describe as the areas of greater subsidence concern.
- b. The GSAs should identify the cumulative amount of subsidence that, if exceeded, would substantially interfere with groundwater and land surface beneficial uses and users in the Subbasin. The Plan should explain how the rate and extent of any future subsidence permitted in the Subbasin may interfere with surface land uses. The Plan should also include additional details describing measures that consider and disclose the current and potentially lasting impacts of subsidence on land uses and groundwater beneficial uses and users.

Additionally, the GSAs should provide specific details and schedule for projects or management actions that will be implemented to minimize or eliminate subsidence. The projects or management actions must be supported by best available information and science²⁷³ and consider the level of uncertainty associated with the Subbasin.²⁷⁴

- c. The GSAs should revise the GSPs to include a discussion of the relationship between the management criteria for land subsidence and the other sustainability indicators, including an explanation of how criteria, including interim milestones, were established to avoid undesirable results for each of the other sustainability indicators.
- d. The GSAs should reevaluate or eliminate the application of the level of uncertainty as it relates to subsidence measurements according to standard professional practices. Establishment of sustainable management criteria should not allow for

²⁷³ 23 CCR § 354.44 (c).

²⁷⁴ 23 CCR § 354.44 (d).

subsidence in perpetuity based on the error of measurement. The GSAs should also consider incorporation of remotely sensed subsidence data (i.e., InSAR data) made available by the Department on an ongoing basis to monitor for subsidence in conjunction with the representative monitoring sites. For reference, the statewide vertical displacement measurements provided via the InSAR data present an error of 0.1 foot.

RECOMMENDED CORRECTIVE ACTION 5

The GSA should provide a discussion of the uncertainty concerning the hydrogeologic conceptual model and a description of hydrogeologic conceptual model data gaps.²⁷⁵ For example, the GSP should include revisions to identify how many wells are completed below the bottom of the Subbasin, the amount of water that is extracted from these wells, and a description of changes to groundwater storage calculations for the Subbasin based on best available information.

RECOMMENDED CORRECTIVE ACTION 6

The GSAs must provide more detailed explanation and justification regarding the selection of the sustainable management criteria for degradation of water quality. Department staff recommend the GSAs consider and address the following:

- a. The GSAs should revise the definition of undesirable results so that exceedances of minimum thresholds caused by groundwater extraction are considered in the assessment of undesirable results in the Subbasin.
- b. The GSAs should provide a clear definition of what the Plan considers an undesirable result for degraded water quality by describing conditions that it would consider to be significant or unreasonable. For example, the Plan should—in addition to qualitative descriptions—quantify the specific potential effects to beneficial users and uses from undesirable results using best available data and science. This definition should be supported by information described in the basin setting, and other data or models as appropriate, as required by the GSP Regulations.²⁷⁶
- c. The GSAs should identify which minimum threshold values—either the MCL or existing concentration plus 20 percent—will be used at which representative monitoring sites. Also, the GSAs should justify how establishing minimum thresholds at the higher of either MCLs or existing concentrations plus 20 percent does not constitute significant and unreasonable effects as defined by the GSP (i.e., “when beneficial uses for groundwater are adversely impacted by constituent concentrations).

²⁷⁵ 23 CCR § 354.14(b)(5).

²⁷⁶ 23 CCR § 354.26 (b)(1).