CALIFORNIA DEPARTMENT OF WATER RESOURCES

SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE

715 P Street, 8th Floor | Sacramento, CA 95814 | P.O. Box 942836 | Sacramento, CA 94236-0001

July 27, 2023

Christina Buck
Butte County Department of Water and Resource Conservation
308 Nelson Ave
Oroville, CA 95965
cbuck@buttecounty.net

RE: Sacramento Valley Basin – Vina Subbasin - 2022 Groundwater Sustainability Plan

Dear Christina Buck,

The Department of Water Resources (Department) has evaluated the groundwater sustainability plan (GSP) submitted for the Sacramento Valley Basin – Vina Subbasin and has determined the GSP is approved. The approval is based on recommendations from the Staff Report, included as an exhibit to the attached Statement of Findings, which describes that the Vina Subbasin GSP 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 Vina Subbasin GSP no later than January 28, 2027.

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,

Steven Springhorn

Steven Springhorn
Supervising Engineering Geologist
Sustainable Groundwater Management

Attachment:

1. Statement of Findings Regarding the Approval of the Sacramento Valley Basin – Vina Subbasin Groundwater Sustainability Plan

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE APPROVAL OF THE SACRAMENTO VALLEY – VINA 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.) This Statement of Findings explains the Department's decision regarding the Plan submitted by the Rock Creek Reclamation District Groundwater Sustainability Agency (GSA) and Vina GSA (collectively referred to as the GSAs or Agencies) for the Vina Subbasin (Basin No. 5-021.57).

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

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

    1. The Plan was submitted within the statutory deadline of January 31, 2022. (Water Code § 10720.7(a); 23 CCR § 355.4(a)(1).)

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

    3. The Plan, either on its own or in coordination with other Plans, covers the entire Subbasin. (23 CCR § 355.4(a)(3).)

B. 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 Vina 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.

C. In making these findings and Plan determination, the Department also recognized that: (1) The Department maintains continuing oversight and jurisdiction to ensure the Plan is adequately implemented; (2) the Legislature intended SGMA to be implemented over many years; (3) SGMA provides Plans 20 years of implementation to achieve the sustainability goal in a Subbasin (with the possibility that the Department may grant GSAs an additional five years upon request if the GSAs have 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.)

D. The Plan conforms with Water Code §§ 10727.2 and 10727.4, substantially complies with 23 CCR § 355.4, and appears likely to achieve the sustainability goal for the Vina Subbasin. It does not appear at this time that the 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 sustainability goals, which focus on having stable groundwater levels for the long term and operating the Subbasin within its sustainable yield, are sufficiently justified and explained. The Plan relies on credible information and science such as long-term groundwater level data, a reasonable understanding of aquifer properties, and an updated groundwater model to quantify the groundwater conditions that the Plan seeks to avoid and provides an objective way to determine whether the Subbasin is being managed sustainably in accordance with SGMA. (23 CCR § 355.4(b)(1).)

2. The Plan has identified reasonable measures and schedules to eliminate data gaps such as collecting data from active domestic wells to adjust minimum thresholds, installing additional wells and other monitoring sites to analyze the interaction of streams and groundwater pumping, and updating and refining the Butte Basin Groundwater Model. Refinement of the groundwater model is expected to a) eliminate the data gap related to the interconnect surface water and develop appropriate sustainable management criteria, b) help understand the net outflow at the western boundary, and c) support evaluation of projects or GSP updates as appropriate and warranted). (23 CCR § 355.4(b)(2).)

3. The projects and management actions proposed are designed to address the groundwater level decline in the Subbasin through an adaptive management strategy that, if implemented in a reasonable and timely manner, will likely achieve the sustainability goal defined for the Subbasin. The GSAs plan to mitigate the groundwater level decline by implementing projects and management actions that will increase direct and in-lieu recharge, promote water conservation, and enhance monitoring in the Subbasin. 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 GSA(s) with greater versatility to adapt and respond to changing conditions and future challenges during GSP implementation. (23 CCR § 355.4(b)(3).)

4. The Plan provides a detailed explanation of how the varied interest of groundwater uses and users in the Subbasin were considered in developing the sustainable management criteria and how those interests, including beneficial uses and users of groundwater including domestic well owners, would be impacted by the chosen minimum thresholds. Furthermore, the GSP includes a management action entitled "Domestic Well Mitigation" that aims to potentially provide resources to well owners impacted by groundwater management and lowering groundwater levels

planned under the GSAs' management of the Subbasin. Under this management action, the GSAs plan to collect data on domestic wells to determine which well owners potentially need assistance; secure financial resources to assist with the repair, replacement, and deepening of domestic wells; and provide emergency response to well owners including supplying bottled water and potable water for sanitation. (23 CCR § 355.4(b)(4).)

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

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

7. At this time, it does not appear that the 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 collaboration and coordination with 10 adjacent basins began in 2020 which will be continued during the Plan implementation period to ensure that undesirable results will be avoided, and sustainability will be achieved at the regional level. (23 CCR § 355.4(b)(7).)

8. Because a single plan was submitted for the Subbasin, a coordination agreement was not required. (23 CCR § 355.4(b)(8).)

9. The GSAs' member agency, Butte County, has a groundwater management plan, established monitoring networks, and Basin Management Objectives for groundwater level, groundwater quality related to seawater intrusion, and land subsidence. The Butte County's history of groundwater management and its participation in the Department's groundwater elevation and subsidence monitoring programs provide a reasonable level of confidence that the GSA(s) has the legal authority and financial resources necessary to implement the Plan. (23 CCR § 355.4(b)(9).)

10. Through review of the Plan and consideration of public comments, the Department determines that the GSA(s) 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).)

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

1. The Plan focuses on the protection of sustainably constructed domestic wells because dewatering domestic wells is a concern in the Subbasin. Per the GSP, the minimum thresholds aim to protect most domestic wells, including those not constructed sustainably. Domestic wells are generally shallower than other well types; therefore, the minimum threshold water level that is protective of domestic users is considered protective of other beneficial users too. The GSAs plans to implement a mitigation program for domestic well owners to assist with the repair, replacement, and deepening of wells; and provide emergency response to well owners including supplying bottled water and potable water for sanitation. 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 GSAs have an adaptive management approach in regard to managing groundwater; therefore, there will be continued monitoring, assessment of groundwater conditions, and evaluation of benefits obtained from projects and management actions. The GSAs plan to implement the groundwater allocation to manage groundwater demand only in the event that the proposed projects fail to achieve interim milestones and the Subbasin is projected to not be able to achieve sustainability goals by 2042.

3. The Plan acknowledges and identifies interconnected surface waters within the Subbasin. The GSA(s) proposes initial sustainable management criteria to manage this sustainability indicator and measures to improve understanding and management of interconnected surface water. The GSA(s) acknowledge(s), and the Department agrees, many data gaps related to interconnected surface water exist. The GSA(s) 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.

4. Projections of future basin extractions are likely to stay within current and historic ranges, at least until the next periodic evaluation by the GSA and the Department. Basin groundwater levels and other SGMA sustainability indicators are unlikely to substantially deteriorate while the GSA implements the Department's recommended corrective actions. State intervention is not necessary at this time to ensure that local agencies manage groundwater in a sustainable manner. (Wat. Code § 10720.1(h).)

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

Accordingly, the GSP submitted by the Agencies for the Vina Subbasin is hereby **APPROVED.** The recommended corrective actions identified in the Staff Report will assist the Department's future review of the Plan's implementation for consistency with SGMA and the Department therefore recommends the Agencies address them by the time of the Department's periodic review, which is set to begin on January 28, 2027, 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: July 27, 2023

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – Sacramento Valley – Vina Subbasin

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

Groundwater Basin Name:	Sacramento Valley – Vina Subbasin (No. 5-021.57)
Submitting Agency:	Rock Creek Reclamation District Groundwater Sustainability Agency and Vina Groundwater Sustainability Agency
Submittal Type:	Initial GSP Submission
Submittal Date:	January 28, 2022
Recommendation:	Approved
Date:	July 27, 2023

The Rock Creek Reclamation District Groundwater Sustainability Agency (GSA) and Vina GSA (collectively referred to as the GSAs or Agencies) submitted the Sacramento Valley – Vina Groundwater Subbasin Groundwater Sustainability Plan (GSP or Plan) for the Vina Subbasin (Subbasin) to the Department of Water Resources (Department) for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA)[1] and GSP Regulations.[2] The GSP covers the entire Subbasin for the implementation of SGMA.

After evaluation and assessment, Department staff conclude that the Plan includes 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 will likely achieve the sustainability goal defined for the Subbasin.[3] Department staff will continue to monitor and evaluate the Subbasin's progress toward achieving the sustainability goal through annual reporting and future periodic evaluations of the GSP and its implementation.

- ***Based on the current evaluation of the Plan, Department staff recommend the GSP be approved with the recommended corrective actions described herein.***

This assessment includes five sections:

[1] Water Code § 10720 *et seq*.
[2] 23 CCR § 350 *et seq*.
[3] 23 CCR § 350 *et seq*.

- **Section 1 – Summary:** Overview of 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, Plan completeness, and basin coverage required for a GSP to be evaluated by the Department.
- **Section 4 – Plan Evaluation:** Provides an assessment of the contents included in the GSP organized by each Subarticle outlined in the GSP Regulations.
- **Section 5 – Staff Recommendation:** Includes the staff recommendation for the Plan and any recommended or required corrective actions, as applicable.

1 SUMMARY

Department staff recommend approval of the Vina Subbasin GSP. The GSA(s) have identified areas for improvement of their Plan (e.g., collecting data from active domestic wells to adjust minimum thresholds, installing additional wells and other monitoring *sites* to analyze interaction of streams and groundwater pumping, updating and refining the Butte Basin Groundwater Model a) to eliminate the data gap related to the interconnect surface water and develop appropriate sustainable management criteria, b) to understand the net outflow at the western boundary, and c) to support evaluation of projects or GSP updates as appropriate and warranted). Department staff concur that those items are important and recommend the GSA(s) address them as soon as possible. Department staff have also identified additional recommended corrective actions within this assessment that the GSA(s) should consider addressing by the first periodic evaluation of the Plan. The recommended corrective actions generally focus on the following:

(1) Improving the understanding of water quality conditions in the Subbasin, coordinating with lead regulatory agencies, and updating the GSP with information about how ongoing regulatory programs operating in the Subbasin may impact groundwater management,

(2) Continuing to fill data gaps, collecting additional monitoring data, coordinating with resource agencies and interested parties to understand beneficial uses and users that may be impacted by depletions of interconnected surface water caused by groundwater pumping, and potentially refine sustainable management criteria,

(3) Evaluating the potential impacts to beneficial uses and users of groundwater from the proposed sustainable management criteria for the chronic lowering of groundwater levels and revising the definition of undesirable results and language pertaining to significant and unreasonable lowering of groundwater level, and

(4) Establishing a monitoring network and sustainable management criteria for land subsidence.

Addressing the recommended corrective actions identified in Section 5 of this assessment will be important to demonstrate, on an ongoing basis, that implementation of the Plan is likely to achieve the sustainability goal.

2 EVALUATION CRITERIA

The GSA(s) submitted a single GSP to the Department to evaluate whether the Plan conforms to specified SGMA requirements[4] and is likely to achieve the sustainability goal for the Vina Subbasin.[5] To achieve the sustainability goal for the Subbasin, the GSP must demonstrate that implementation of the Plan 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.[6] Undesirable results must be defined quantitatively by the GSAs.[7] The Department is also required to evaluate whether the GSP will adversely affect the ability of an adjacent basin to implement its GSP or achieve its sustainability goal.[8]

For the GSP to be evaluated by the Department, it must first be determined that the Plan was submitted by the statutory deadline,[9] and that it is complete and covers the entire basin.[10] If these conditions are satisfied, the Department evaluates the Plan to determine whether it complies with specific SGMA requirements and substantially complies with the GSP Regulations.[11] 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 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.[12]

When evaluating whether the Plan is likely to achieve the sustainability goal for the Subbasin, Department staff reviewed the information provided and relied upon in the GSP for sufficiency, credibility, and consistency with scientific and engineering professional standards of practice.[13] The Department's review considers whether there is a reasonable relationship between the information provided and the assumptions and conclusions

[4] Water Code §§ 10727.2, 10727.4.
[5] Water Code § 10733(a).
[6] Water Code § 10721(v).
[7] 23 CCR § 354.26 *et seq.*
[8] Water Code § 10733(c).
[9] 23 CCR § 355.4(a)(1).
[10] 23 CCR §§ 355.4(a)(2), 355.4(a)(3).
[11] 23 CCR § 350 *et seq.*
[12] 23 CCR § 355.4(b).
[13] 23 CCR § 351(h).

made by the GSAs, including whether the interests of the beneficial uses and users of groundwater in the basin have been considered; whether sustainable management criteria and projects and management actions described in the Plan are commensurate with the level of understanding of the basin setting; and whether those projects and management actions are feasible and likely to prevent undesirable results.[14]

The Department also considers whether the GSA has the legal authority and financial resources necessary to implement the Plan.[15]

To the extent overdraft is present in a basin, the Department evaluates whether the Plan provides a reasonable assessment of the overdraft and includes reasonable means to mitigate the overdraft.[16] The Department also considers whether the Plan provides reasonable measures and schedules to eliminate identified data gaps.[17] Lastly, the Department's review considers the comments submitted on the Plan and evaluates whether the GSAs adequately responded to the comments that raise credible technical or policy issues with the Plan.[18]

The Department is required to evaluate the Plan within two years of its submittal date and issue a written assessment of the Plan.[19] The assessment is required to include a determination of the Plan's status.[20] The GSP Regulations define the three options for determining the status of a Plan: Approved,[21] Incomplete,[22] or Inadequate.[23]

Even when review indicates that the GSP satisfies the requirements of SGMA and is in substantial compliance with the GSP Regulations, the Department may recommend corrective actions.[24] Recommended corrective actions are intended to facilitate progress in achieving the sustainability goal within the basin and the Department's future evaluations, and to allow the Department to better evaluate whether the Plan adversely affects adjacent basins. While the issues addressed by the recommended corrective actions do not, at this time, preclude approval of the Plan, the Department recommends that the issues be addressed to ensure the Plan's implementation continues to be consistent with SGMA and the Department is able to assess progress in achieving the sustainability goal within the basin.[25] Unless otherwise noted, the Department proposes

[14] 23 CCR §§ 355.4(b)(1), (3), (4), and (5).
[15] 23 CCR § 355.4(b)(9).
[16] 23 CCR § 355.4(b)(6).
[17] 23 CCR § 355.4(b)(2).
[18] 23 CCR § 355.4(b)(10).
[19] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[20] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[21] 23 CCR § 355.2(e)(1).
[22] 23 CCR § 355.2(e)(2).
[23] 23 CCR § 355.2(e)(3).
[24] Water Code § 10733.4(d).
[25] Water Code § 10733.8.

that recommended corrective actions be addressed by the submission date for the periodic assessment.[26]

The staff assessment of the GSP involves the review of information presented by the GSAs, including models and assumptions, and an evaluation of that information based on scientific reasonableness, including standard or accepted professional and scientific methods and practices. The assessment does not require Department staff to recalculate or reevaluate technical information provided in the Plan or to perform its own geologic or engineering analysis of that information. The staff recommendation to approve a Plan does not signify that Department staff, were they to exercise the professional judgment required to develop a GSP for the basin, would make the same assumptions and interpretations as those contained in the Plan, but simply that Department staff have determined that the assumptions and interpretations relied upon by the submitting GSAs are supported by adequate, credible evidence, and are scientifically reasonable.

Lastly, the Department's review and approval of the Plan is a continual process. Both SGMA and the GSP Regulations provide the Department with the ongoing authority and duty to review the implementation of the Plan.[27] Also, GSAs have an ongoing duty to provide reports to the Department, periodically reassess their plans, and, when necessary, update or amend their plans.[28] The passage of time or new information may make what is reasonable and feasible at the time of this review to not be so in the future. The emphasis of the Department's periodic reviews will be to assess the progress toward achieving the sustainability goal for the basin and whether Plan implementation adversely affects the ability of adjacent basins to achieve their sustainability goals.

3 REQUIRED CONDITIONS

A GSP, to be evaluated by the Department, must be submitted within the applicable statutory deadline. The GSP must also be complete and must, either on its own or in coordination with other GSPs, cover the entire Subbasin.

3.1 SUBMISSION DEADLINE

SGMA required basins categorized as high- or medium-priority and not subject to critical conditions of overdraft to submit a GSP no later than January 31, 2022.[29]

The GSA(s) submitted their Plan on January 28, 2022.

[26] 23 CCR § 356.4 *et seq*.
[27] Water Code § 10733.8; 23 CCR § 355.6.
[28] Water Code §§ 10728 *et seq.*, 10728.2.
[29] Water Code § 10720.7(a)(2).

3.2 COMPLETENESS

GSP Regulations specify that the Department shall evaluate a GSP if that GSP is complete and includes the information required by SGMA and the GSP Regulations.[30]

The GSA(s) submitted an adopted GSP for the entire Subbasin. After an initial, preliminary review, Department staff found the GSP to be complete and appearing to include the required information, sufficient to warrant a thorough evaluation by the Department.[31] The Department posted the GSP to its website on February 14, 2022.[32]

3.3 BASIN COVERAGE

A GSP, either on its own or in coordination with other GSPs, must cover the entire basin.[33] A GSP that is intended to cover the entire basin may be presumed to do so if the basin is fully contained within the jurisdictional boundaries of the submitting GSAs.

The GSP intends to manage the entire Vina Subbasin and the jurisdictional boundary of the submitting GSA(s) fully contains the Subbasin.[34]

4 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 Subbasin is provided below.

4.1 ADMINISTRATIVE INFORMATION

The GSP Regulations require each Plan to include administrative information identifying the submitting Agency, its decision-making process, and its legal authority;[35] a description of the Plan area and identification of beneficial uses and users in the Plan area;[36] and a

[30] 23 CCR § 355.4(a)(2).
[31] The Department undertakes a preliminary completeness review of a submitted Plan under section 355.4(a) of the GSP Regulations to determine whether the elements of a Plan required by SGMA, and the Regulations have been provided, which is different from a determination, upon review, that a Plan is "incomplete" for purposes of section 355.2(e)(2) of the Regulations.
[32] https://sgma.water.ca.gov/portal/gsp/preview/86
[33] Water Code § 10727(b); 23 CCR § 355.4(a)(3).
[34] Vina Subbasin GSP, Section 1.1.4, p. 42, Figure ES-2, p.24.
[35] 23 CCR § 354.6 *et seq*.
[36] 23 CCR § 354.8 *et seq*.

description of the ability of the submitting Agency to develop and implement a Plan for that area.[37]

A single GSP covering the entire Vina Subbasin was prepared and submitted to the Department by the Vina GSA and Rock Creek Reclamation District GSA. The Vina GSA which covers the larger portion of the Subbasin was formed by the County of Butte, the City of Chico, and Durham Irrigation District through a Joint Power Agreement.[38] A five-member GSA Board serves the policy-making role for SGMA implementation and is composed of five seats.[39] The five board members are representatives from the agricultural community, domestic well users, the County of Butte, the City of Chico, and Durham Irrigation District.[40] The decision-making process of the Vina GSA is reaching a consensus among board members who have equal and full voting rights.[41] The GSP states that the Vina GSA possesses the ability to exercise powers granted by the Joint Power Agreement, SGMA, and the common powers of its members.[42] Rock Creek Reclamation District GSA covers the portion of the Subbasin within its jurisdictional boundary.[43] The Rock Creek Reclamation District, formed in 1985 under the State Reclamation Act, provides flood control and groundwater sustainability services.[44] A seven-member Board of Trustees, elected by the landowners, manages Rock Creek Reclamation District GSA with input from its SGMA ad-hoc committee.[45] The role of the ad-hoc committee is to facilitate the coordination between Rock Creek Reclamation District GSA and Vina GSA.[46] The GSP states that several joint meetings were held between the two GSAs during the development of the GSP.

The Vina Subbasin is located within Butte County which also includes the City of Chico and Mechoopda tribal area.[47] The Subbasin is part of the larger Sacramento Valley Groundwater Basin and is bounded to the north by Los Molinos and Corning Subbasins; to the south by Butte and Wyandotte Creek Subbasins; and to the east by the Sierra Nevada geomorphic province as shown in Figure 1.[48] All the adjacent groundwater basins are medium and high-priority basins with their GSPs under review by the Department.

[37] 23 CCR § 354.6(e).
[38] Vina Subbasin GSP, Section 1.1.4.1, p. 43.
[39] Vina Subbasin GSP, Section 1.1.4.1, p. 43.
[40] Vina Subbasin GSP, Section 1.1.4.1, p. 43.
[41] Vina Subbasin GSP, Section 1.1.4.1, pp. 43-45.
[42] Vina Subbasin GSP, Section 1.1.4.1, p. 43.
[43] Vina Subbasin GSP, Section 1.1.4.1, p. 43.
[44] Vina Subbasin GSP, Section 1.1.4.2, pp. 47-48.
[45] Vina Subbasin GSP, Section 1.1.4.2, p. 48.
[46] Vina Subbasin GSP, Section 1.1.4.2, p. 48.
[47] Vina Subbasin GSP, Section 1.2.1, pp. 49-52.
[48] Vina Subbasin GSP, Section 1.2.1, pp. 49-52.

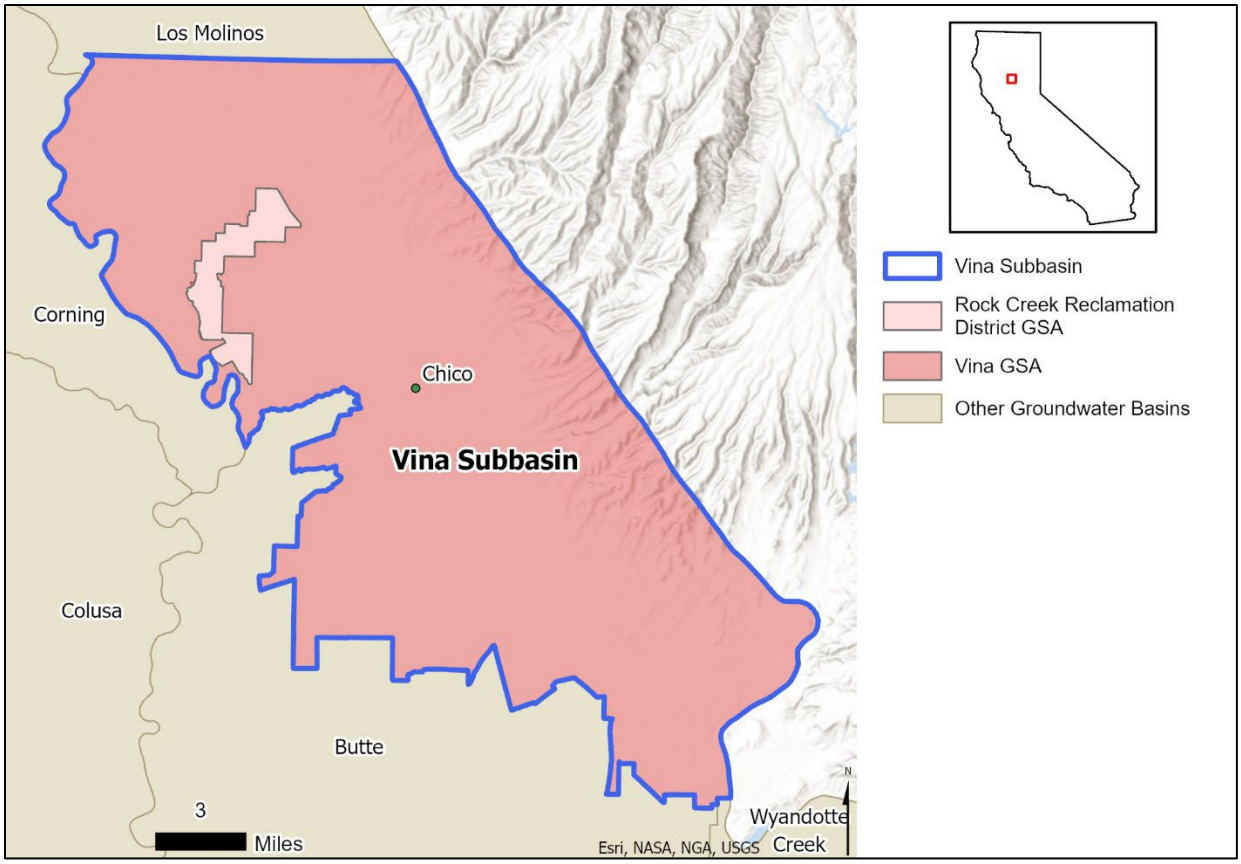

Figure 1: Vina Subbasin Location Map.

The GSP states that land use in the Subbasin is dominated by agriculture with other land use types being industrial, urban, and undeveloped.[49] The GSP also provides a map showing three land use types: agricultural areas, developed areas, and "other" land use;[50] however, the GSP does not appear to provide the quantitative information regarding the total area for each land use type. The GSP states that both agricultural and urban land uses rely on a combination of surface water and groundwater. The GSP provides a list of beneficial uses and users of groundwater in the Subbasin and further identifies potential stakeholder groups and their engagement purpose.[51] The GSP states that more than 4,000 domestic wells are recorded per the Department's Online System for Well Completion Reports (OSWCR) database as being located within the Vina Subbasin; however, the GSP adds that the data within this database cannot be guaranteed to be always accurate or precise.[52]

[49] Vina Subbasin GSP, Section 1.2.1, p. 52.
[50] Vina Subbasin GSP, Figure 1-7, p. 56.
[51] Vina Subbasin GSP, Section 1.8.3, p. 79; Table 1-1, p. 80.
[52] Vina Subbasin GSP, Section 1.4.4, p. 75.

The County of Butte has been monitoring groundwater since 2000 under Butte County Code regarding groundwater conservation and protection.[53] In 2004, the County Code required the establishment of monitoring networks and Basin Management Objectives for groundwater level, groundwater quality related to seawater intrusion, and land subsidence.[54] The Basin Management Objective program transitioned to SGMA implementation through a revision to the County Code in 2019.[55] Additionally, the Butte County Department of Water and Resources Conservation Program has been collaborating with the Department's monitoring programs by volunteering as the monitoring entity for the California Statewide Groundwater Elevation Monitoring Program for the Vina Subbasin and analyzing the data from the Department's subsidence monitoring program to develop an understanding of land subsidence in the Subbasin.[56]

In addition to the monitoring programs, the County of Butte has a Groundwater Management Plan that covers the entire County except for the areas covered by an Urban Water Management Plan developed for the City of Chico.[57] The Groundwater Management Plan supports groundwater sustainability through groundwater level and quality management, inelastic land subsidence prevention, and groundwater replenishment.[58] Furthermore, the Butte County General Plan 2030 and the Chico 2030 General Plan are intended to promote water conservation, improve water quality, protect groundwater recharge areas, and utilize reclaimed wastewater.[59] Given the history of groundwater monitoring and management in the Subbasin by the GSAs, the County of Butte and the City of Chico, and the transition of ongoing programs to SGMA implementation, Department staff believe that the GSAs have the ability to implement the GSP in the Subbasin.

The GSP's discussion and presentation of administrative information covers the specific items listed in the GSP Regulations in an understandable format using appropriate detail. Department staff are aware of no significant inconsistencies or contrary information to that presented in the GSP and, therefore, have no significant concerns regarding the quality, data, and discussion of this subject in the GSP. The administrative information included in the Plan substantially complies with the requirements outlined in the GSP Regulations.

4.2 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

[53] Vina Subbasin GSP, Section 1.4.1, p. 74.
[54] Vina Subbasin GSP, Section 1.4.1, p. 74.
[55] Vina Subbasin GSP, Section 1.4.1, pp. 74-75.
[56] Vina Subbasin GSP, Section 1.4.2, p. 75, Section 1.6, p. 77.
[57] Vina Subbasin GSP, Section 1.3.1, p. 65.
[58] Vina Subbasin GSP, Section 1.3.1, p. 65.
[59] Vina Subbasin GSP, Section 1.3.6.1, pp. 66-70, Section 1.3.6.2, pp. 70-73.

accounting for total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions.[60]

4.2.1 Hydrogeologic Conceptual Model

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 local agency'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.[61] The GSP Regulations require a descriptive hydrogeologic conceptual model that includes a written description of geologic conditions, supported by cross sections and maps,[62] and includes a description of basin boundaries and the bottom of the basin,[63] principal aquifers and aquitards,[64] and data gaps.[65]

The Subbasin is surrounded by medium and high-priority groundwater basins in all directions except for the eastern boundary where it is bounded by the edge of alluvium.[66] Groundwater flows across these boundaries to some degree because the boundaries with adjacent groundwater basins are jurisdictional in nature.[67] Additionally, per the GSP, no known structural properties (i.e., faults) significantly restrict groundwater flow within the Subbasin.[68] The continentally derived formations including the major freshwater-bearing zones in the Subbasin are underlain by marine deposits.[69] The bottom of the basin is defined as the base of fresh groundwater-bearing formations, which vary in depth from 800 to 1,200 feet below ground surface.[70]

The GSP describes the groundwater system in the Subbasin as a single principal aquifer with multiple stratigraphic zones.[71] The GSP identifies the zones as Quaternary Deposits, Tehama/Upper Tuscan, and the Lower Tuscan units. Although the GSP states that the zones exhibit different hydrogeologic properties,[72] the GSP reports that similarity in the

[60] 23 CCR § 354.12.
[61] 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.
[62] 23 CCR §§ 354.14 (a), 354.14 (c).
[63] 23 CCR §§ 354.14 (b)(2-3).
[64] 23 CCR § 354.14 (b)(4) *et seq.*
[65] 23 CCR § 354.14 (b)(5).
[66] Vina Subbasin GSP, Section 2.1.1.1, p. 84.
[67] Vina Subbasin GSP, Section 2.1.1.1, p. 84.
[68] Vina Subbasin GSP, Section 2.1.8.1, p. 110.
[69] Vina Subbasin GSP, Section 2.1.1.2, pp. 84-85.
[70] Vina Subbasin GSP, Section 2.1.1.2, pp. 84-85.
[71] Vina Subbasin GSP, Section 2.1.8.1, p. 110.
[72] Vina Subbasin GSP, Section 2.1.8.1, p. 110.

groundwater levels, recorded at wells screened in various aquifer zones, provides evidence to support the GSP's treatment of these zones as a single principal aquifer.[73]

The GSP acknowledges that hydrographs, pumping tests, and water level data suggest a varying degree of connectivity between the aquifer zones.[74] The GSP states that a pump test demonstrated that, in some cases, low-permeability lahar units caused different discrete aquifer zones to be hydraulically disconnected, while in other cases the lahar layers functioned as a leaky aquitard, allowing a delayed hydraulic connection between aquifer zones.[75] However, the GSP further states that hydrographs for nested shallow and deep wells show nearly identical water level measurements indicating the aquifers are hydrologically connected and behave as one hydrogeologic unit, with an exception of a nested well which shows weak communication between the aquifer zones.[76] The GSP provides reasonable and persuasive evidence that because of hydraulic connectivity between aquifer zones and comparable patterns of groundwater levels in nested wells screened in shallow and deep aquifer zones, the various stratigraphic zones form a single principal aquifer in the Subbasin.[77]

Despite the determination that a single principal aquifer is defined in the Subbasin, Department staff believe the GSP provides inconsistent information regarding geologic formations that comprise the aquifer zones. The first inconsistency is regarding the role of the Laguna Formation as a part of the principal aquifer. The GSP identifies the Tehama, Tuscan, and Laguna Formations as the major fresh groundwater-bearing zones[78] but the GSP also discusses Tuscan, Tehama, and Riverbank and Modesto Formations as the primary groundwater-producing formations.[79] It is unclear to staff if the Laguna Formation is a primary water-producing zone in the Subbasin. The second inconsistency is regarding the litho-stratigraphic placement of the Laguna Formation in the Subbasin. Figure 2-8 shows the Tuscan Formation overlying Laguna Formation; [80] however, Table 2-2 shows the Laguna Formation overlying the Tehama and Tuscan Formations.[81] Because of these discrepancies, the GSP's lithostratigraphic description of geologic formations is inconsistent and unclear. Department staff encourage the GSA to provide clarification regarding the Laguna Formation and other formations that make up the principal aquifer in the Subbasin and update the hydrogeological conceptual model section to provide consistent information.

[73] Vina Subbasin GSP, Section 2.2.2.2, p. 123.
[74] Vina Subbasin GSP, Section 2.1.8.1, p. 110.
[75] Vina Subbasin GSP, Section 2.1.8.1, p. 110.
[76] Vina Subbasin GSP, Section 2.2.2.2, pp. 119-124.
[77] Vina Subbasin GSP, Section 2.1.8.1, p. 110.
[78] Vina Subbasin GSP, Executive Summary, p. 25 & Section 2.1.1.2, p. 84.
[79] Vina Subbasin GSP, Section 2.1.5, pp. 102-104.
[80] Vina Subbasin GSP, Figure 2-8, p. 97.
[81] Vina Subbasin GSP, Table 2.2, p. 99.

The GSP identifies several data gaps relevant to development and understanding of the hydrogeologic conceptual model of the basin.[82] The highly variable aquifer characteristics and varying degrees of vertical hydrologic connectivity between geologic units are identified as a data gap.[83] The GSP also notes the lack of sufficient data to analyze the interaction of surface water with groundwater pumping within the primary aquifer system.[84] The GSP plans to address these data gaps primarily through additional data collection and interconnected surface water monitoring.[85] Furthermore, the GSP also provides cost estimates and schedules for addressing data gaps.[86]

The information provided in the GSP that comprises the hydrogeologic conceptual model substantially complies with the requirements outlined in the GSP Regulations. In general, the Plan's descriptions of the regional geologic setting, the Plan area's physical characteristics, the identification of the principal aquifer, and hydrogeologic conceptual model appear to utilize the best available science. Department staff are aware of no significant inconsistencies or contrary technical information to that presented in the Plan.

4.2.2 Groundwater Conditions

The GSP Regulations require a written description of historical and current groundwater conditions for each of the applicable sustainability indicators and groundwater dependent ecosystems that includes the following: groundwater elevation contour maps and hydrographs,[87] a graph depicting change in groundwater storage,[88] maps and cross-sections of the seawater intrusion front,[89] maps of groundwater contamination sites and plumes,[90] maps depicting total subsidence,[91] identification of interconnected surface water systems and an estimate of the quantity and timing of depletions of those systems,[92] and identification of groundwater dependent ecosystems.[93]

The GSP divides the Subbasin into three management areas: Vina North, Vina Chico, and Vina South. The GSP discusses groundwater conditions in relation to the management areas. For more information on the management areas outlined in the GSP, please see Management Areas (Section 4.2.4).

The GSP identifies 12 hydrographs as representative hydrographs which depict long-term groundwater elevation trends in the Subbasin.[94] The GSP provides additional

[82] Vina Subbasin GSP, Section 4.10, p. 226.
[83] Vina Subbasin GSP, Section 2.1.8.1, p. 110.
[84] Vina Subbasin GSP, Section 3.8.1, p. 198.
[85] Vina Subbasin GSP, Section 5.4,1, p. 251; Section 5.4.4, p. 252.
[86] Vina Subbasin GSP, Section 6.1.5, p. 256; Section 6-3, p. 258; Figure 6-1, p. 259.
[87] 23 CCR § 354.16 (a) (1-2).
[88] 23 CCR § 354.16 (b).
[89] 23 CCR § 354.16 (c).
[90] 23 CCR § 354.16 (d).
[91] 23 CCR § 354.16 (e).
[92] 23 CCR § 354.16 (f).
[93] 23 CCR § 354.16 (g).
[94] Vina Subbasin GSP, Figure 2-15, 2-16, and 2-17, pp. 120-122.

hydrographs in Appendix 3-C, for wells identified as representative monitoring sites for chronic lowering of groundwater level, which also show long-term groundwater level data.[95] The GSP states that the 2001 and 2016 Water Resource Inventory and Analysis Reports produced by Butte County show groundwater levels have been declining over the past 20 years.[96] Based on a cursory review of the hydrographs by Department staff, it appears that in the past 20 years, groundwater elevation levels have declined up to 30 feet in the Vina North and Vina Chico management areas and up to 40 feet in the Vina South management area.[97] The observations that the groundwater level decline in the Vina South management area is more prominent compared to the other two management areas is supported by the GSP, as it states the Vina South management area displays a more pronounced response to the drought than wells to the north.[98] Department staff note that every well in the Subbasin does not show a groundwater level decline, as groundwater levels have been stable in some wells, and has increased in at least one well.[99]

While the hydrographs show a long-term decline in groundwater levels over the past 20 to 30 years, they do not show an obvious historical high groundwater level because cyclic fluctuations of groundwater levels have been occurring over a four-to-seven-year period,[100] and the historical data provided are for various date ranges starting from the 1940s to the 2000s. Based on the review of the hydrographs, it appears to Department staff that historical low groundwater levels were observed during 2014-2015 in multiple wells.[101] The groundwater elevation contour maps show that groundwater flows from the north toward the southwestern corner of the Subbasin.[102] Locally, groundwater flows toward the City of Chico and Durham because they are groundwater depression areas.[103]

The GSP states that groundwater levels during recent dry-year cycles are lower than groundwater levels in earlier dry-year cycles, and this downward trend during dry years indicates an overall decline in groundwater storage.[104] The GSP reports that between 2000 and 2018, there has been a cumulative decline in groundwater storage of about 400,000 acre-feet.[105] The annual storage decline during the same period is reported as 19,600 acre-feet per year.[106] Per the GSP, this annual change in storage is about 0.1 percent of the total freshwater storage of the Subbasin which is about 16,000,000 acre-

[95] Vina Subbasin GSP, Appendix 3-C, pp. 311-331.
[96] Vina Subbasin GSP, Section 2.2.1, p. 113.
[97] Vina Subbasin GSP, Figure 2-15, 2-16, and 2-17, pp. 120-122.
[98] Vina Subbasin GSP, Section 2.2.2.2, p. 123.
[99] Vina Subbasin GSP, Figure 2-15, 2-16, and 2-17, pp. 120-122.
[100] Vina Subbasin GSP, Section 2.2.2.3, p. 124.
[101] Vina Subbasin GSP, Figure 2-15, 2-16, and 2-17, pp. 120-122.
[102] Vina Subbasin GSP, Figure 2-10, to 2-13, pp. 115-118.
[103] Vina Subbasin GSP, Section 2.2.2.2, p. 119.
[104] Vina Subbasin GSP, Section 2.2.2.3, p. 124, Figure 2-17, p. 125.
[105] Vina Subbasin GSP, Section 2.2.2.3, p. 124.
[106] Vina Subbasin GSP, Section 2.3.4, p. 160, Table 2-8, p.163.

feet.[107] The Plan does not specify how much of the 16 million acre-feet of groundwater in storage in the Vina Subbasin is accessible and/or useable.

The GSP states that seawater intrusion is not an applicable sustainability indicator for this Subbasin because it is located far from the coastline.[108] Department staff consider the GSP's conclusion to be reasonable as the nearest coastline is about 100 miles away from the Subbasin.

The GSP identifies total dissolved solids (TDS), calcium, nitrate, halogenated solvents, tetrachloroethene (PCE), trichloroethene (TCE), perfluorooctanesulfonic acid (PFOS), and per- and polyfluoroalkyl substance (PFAS) as the water quality constituents of concern in the Subbasin.[109] The groundwater quality description includes a map showing the location of contaminant sites; however, the extent and the location of the contaminant plumes within the Subbasin are not shown on the map.[110] A water quality chart shows that, between 2008 and 2020, specific conductance, which is an indirect measure of TDS, has been relatively stable in the representative monitoring wells.[111]

The GSP identifies metal manufacturing sites and dry cleaning operations that have caused water quality degradation in the Subbasin.[112] The GSP also identifies military clean-up and underground storage tank sites, as well as land disposal sites, all of which are active contamination remediation sites.[113] However, the GSP does not provide sufficient information on the water quality constituents of concern related to these sites, such as the change in contamination concentrations over time, if the water quality degradation is local or regional, or how the groundwater extraction is affecting the water quality. The GSP mentions the localized high concentration of calcium, nitrate, and TDS in the Chico area[114] but lacks the detail to understand the factors that may have caused the elevated concentration, and it is uncertain to Department staff whether the GSA believes these concentrations are high enough to affect the supply and the beneficial uses of groundwater.

The GSP states that the groundwater quality in the Subbasin is currently monitored by Butte County, Sacramento Valley Water Quality Coalition, State Drinking Water Program, California Department of Toxic Substances Control (DTSC), and the United States Environmental Protection Agency (USEPA). Per the GSP, water quality data collected by Sacramento Valley Water Quality Coalition for compliance with the Central Valley Regional Board's Irrigated Lands Regulatory Program is an important set of data because

[107] Vina Subbasin GSP, Section 2.2.2.3, p. 124.
[108] Vina Subbasin GSP, Section 2.2.3, p. 125.
[109] Vina Subbasin GSP, Section 2.2.4, pp. 125-129.
[110] Vina Subbasin GSP, Figure 2-18, p. 127.
[111] Vina Subbasin GSP, Figure 3-5, p. 193.
[112] Vina Subbasin GSP, Section 2.2.4.1, pp. 126-129.
[113] Vina Subbasin GSP, Section 2.2.4.1, pp. 126-129.
[114] Vina Subbasin GSP, Section 2.2.4.1, p. 125.

irrigated agriculture is the predominant land use in the Vina Subbasin.[115] The GSP states that PFOS and PFAS will not be monitored by the GSAs for SGMA implementation but GSAs will be attentive to the effect the presence of these contaminants may have on groundwater management.[116]

The GSP's description of groundwater quality conditions in the Subbasin includes relevant topics such as water quality constituents of concern, and some discussion of the factors that have caused water quality degradation; however, Department staff conclude that the Plan is also lacking important details related to groundwater quality. Department staff recommend the GSAs provide additional information in the GSP outlining the location and extent of contamination plumes, identifying which constituents are being monitored under various regulatory programs, and thoroughly describing ongoing remediation efforts within the Subbasin (see Recommended Corrective Action 1a). Further, the GSAs should evaluate whether groundwater management activities, including groundwater production under the jurisdiction of the GSAs, may influence the migration of contaminant plumes (see Recommended Corrective Action 1b). Because the GSP acknowledges that the aquifer used for drinking water supply is potentially affected by the contaminants,[117] the GSAs should also evaluate how existing groundwater quality issues and existing contamination plumes present in the Subbasin may be impacting beneficial uses and users of groundwater (see Recommended Corrective Action 1c). Lastly, Department staff recommend the GSAs coordinate with the lead agencies overseeing these remediation sites regularly and update the Plan to explain how existing groundwater quality conditions and/or remediation efforts may impact the GSAs' ability to manage groundwater (see Recommended Corrective Action 1d).

The GSP states that no land subsidence has been recorded in Butte County to date[118] and "inelastic land subsidence due to groundwater withdrawal is unlikely to result in an Undesirable Result in the Vina Subbasin".[119] The GSP includes two maps showing the stations and displacement values from the Sacramento Valley Global Positioning System (GPS) study of 2008 to 2017,[120] and the Department's Interferometric Synthetic Aperture Radar (InSAR) displacement data coverage between 2015 and 2019.[121] Land subsidence observations from the GPS Subsidence Monitoring stations show a total cumulative displacement range of 0.176 to -0.074 feet between 2008 to 2017, and the InSAR data shows a total cumulative displacement range of 0.25 to -0.25 feet between 2015-2019.[122] Per the GSP, inelastic land subsidence has not occurred in the Subbasin because of

[115] Vina Subbasin GSP, Section 2.2.4.1, p. 126.
[116] Vina Subbasin GSP, Section 2.2.4.1, p. 126.
[117] Vina Subbasin GSP, Section 2.2.4.1, p. 126.
[118] Vina Subbasin GSP, Section 2.2.5.1, p. 129.
[119] Vina Subbasin GSP, Section 2.2.5.2, p. 131.
[120] Vina Subbasin GSP, Figure 2-19, p. 132.
[121] Vina Subbasin GSP, Figure 2-20, p. 133.
[122] Vina Subbasin GSP, Table 2-4, p. 131.

relatively stable groundwater levels and subsurface materials are not prone to compaction.[123]

The GSP identifies interconnected surface water systems and estimates the quantity and timing of depletions of those systems based on Butte Basin Groundwater Model.[124] While the GSP states it provides an estimate for the quantity and timing of depletions, it is unclear to Department staff whether these values represent depletion due to groundwater pumping or the overall interaction between groundwater and surface water in the Subbasin. The GSP classifies the stream reaches as either Gaining (> 80% of the time), Losing (>80% of the time), or Mixed.[125] The GSP states that most of the streams that traverse from the foothills to the Sacramento River lose water to the groundwater system, whereas the Sacramento River shows net gaining conditions along the reaches adjacent to the Subbasin. Between 2000 and 2018, the streams traversing the Subbasin lost about 16,650 acre-feet per year to the groundwater system, and the Sacramento River gained approximately 50,600 acre-feet per year.[126] According to this data, there is a net annual gain of about 33,950 acre-feet per year by the surface water system from the groundwater system. However, Department staff note the water budget section of the GSP provides different data for stream gains and losses for the same period.[127]

The water budget summary table for the groundwater system shows that the average annual inflow from the surface water system to the groundwater system was 20,800 acre-feet, and the outflow from the groundwater system to the surface water system was 3,700 acre-feet.[128] This shows there is a net annual loss of about 17,100 acre-feet per year of surface water to groundwater. The Plan does not explain what caused the discrepancy in stream gains and losses between the two estimates. Due to the difference in estimates between the groundwater conditions description and the water budget information, it is unclear to Department staff whether the annual depletion of surface water to groundwater is a positive 33,950 acre-feet or negative 17,100 acre-feet. Department staff recommend that the GSAs review the model inputs/outputs and provide consistent information regarding stream loss and gains throughout the GSP. Further, Department staff recommend the GSA clarify whether these values simply represent the overall interaction between the surface water and groundwater system or the quantity of depletion due to groundwater pumping (see Recommended Corrective Action 2).

The GSP states that the groundwater model incorporates the interaction of surface water and groundwater at a regional scale, but concedes that significant data gaps that limit calibration of the groundwater response to the uppermost layer of the model.[129]

[123] Vina Subbasin GSP, Section 4.5.1, p. 213.
[124] Vina Subbasin GSP, Section 2.2.6, p. 131-144.
[125] Vina Subbasin GSP, Section 2.2.6.3, p. 140-141, Figure 2-26, p.142.
[126] Vina Subbasin GSP, Section 2.2.6.4, p. 144.
[127] Vina Subbasin GSP, Table 2-8, p. 163.
[128] Vina Subbasin GSP, Table 2-8, p. 163.
[129] Vina Subbasin GSP, p. 200.

Department staff note that the GSAs plan to complete the first model update by 2027 and the second model update by 2032.[130] Department staff encourage the GSAs to refine the model prior to the next periodic evaluation of the Plan and provide information on the interaction of surface water and groundwater at a reasonable scale, thereby eliminating the data gap related to groundwater response to the uppermost layer of the model.

The GSP utilizes the Natural Communities Commonly Associated with the Groundwater (NCCAG) dataset to identify GDEs. Per the GSP, the NCCAG dataset defines two habitat classes: wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions; and vegetation types commonly associated with the sub-surface presence of groundwater (phreatophytes). The GSP provides figures showing the locations of all potential GDEs identified by the NCCAG database within the Vina Subbasin.[131] The GSP states that GDE's dependence on groundwater was analyzed based on: land use changes; proximity to perennial surface water supplies; areas accessing supplemental water supplies; adjacency to irrigated agriculture; dependency on agricultural-dependent surface water; and non-survival of vegetation during drought years. Additionally, the potential GDE dataset was further reviewed against land use classifications to identify unlikely GDEs based on adjacency to agricultural operations.[132] Based on this analysis, the GSP classified the potential GDEs as "Not likely a GDE" or "Likely a GDE" showing their locations on maps.[133] Additionally, the maps also show the location of Valley Oak Dominated Areas which are classified as "Likely a GDE" because, per the GSP, this species can access groundwater over a wide range of depths.[134]

Although recommended corrective actions are identified, the Plan adequately describes the historical and current groundwater conditions related to chronic lowering of groundwater level, change in storage, seawater intrusion, and land subsidence throughout the Plan area, and the information included in the Plan substantially complies with the requirements outlined in the GSP Regulations. However, more information is required to fully understand groundwater conditions related to degraded water quality and depletions of interconnected surface water as discussed above.

4.2.3 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,[135] and the sustainable yield.[136]

[130] Vina Subbasin GSP, Figure 6-1, p.259.
[131] Vina Subbasin GSP, Figure 2-28, p. 146, Figure 2-29, p. 147.
[132] Vina Subbasin GSP, Section 2.2.7.4, p. 150.
[133] Vina Subbasin GSP, Appendix 2-A, pp. 283-284.
[134] Vina Subbasin GSP, Section 2.2.7.4, p. 150, Appendix 2-A, pp. 283-284.
[135] 23 CCR §§ 354.18 (a), 354.18 (c) *et seq*.
[136] 23 CCR § 354.18 (b)(7).

The GSP utilizes the Butte Basin Groundwater Model, originally developed in 1992 and updated over the decades, to estimate the water budget for historical, current, and projected conditions.[137] The GSP identifies water years 2000 to 2018 as the historical water budget and states data collected from 1971 to 2018 reflects the current water budget, with 2018 representing the most recent hydrology.[138] The GSP uses a 50-year period from 1971 to 2018 with 2004-2005 repeated after 2018 to develop a projected water budget.[139]

The water budgets are estimated for both the Land and Surface Water System and Groundwater System.[140] The water budget information is provided in tabular and graphical formats for both systems.[141] The water budget includes a detailed discussion and estimates of inflows and outflows to the groundwater system. The main components of inflows are subsurface inflows from adjacent basins and foothills, deep percolation of precipitation and agricultural return flow, and stream seepage.[142] The main components of outflows are groundwater extraction, subsurface outflows to adjacent basins and foothills, stream gains from groundwater, and western boundary net outflows.[143] Groundwater extraction is the main source of outflow which makes up about 65% of the total outflow from the Subbasin.[144]

Between 2000 and 2018, groundwater storage declined by 19,600 acre-feet per year, and between 1971 and 2018, groundwater storage declined by 1,200 acre-feet per year.[145] The GSP simulates three projected water budget scenarios: future conditions with no climate change, future conditions with 2030 climate change factor, and future conditions with 2070 climate change factor. The estimated change in storage for future conditions with no climate change, future conditions with 2030 climate change factor, and future conditions with 2070 climate change factor are a decline in storage of 1,900 acre-feet per year, 1,700 acre-feet per year and 2,700 acre-feet per year, respectively.[146]

The GSP estimates the sustainable yield based on projected water levels under baseline conditions. Per the GSP, on average, groundwater levels will be 21 feet below measurable objective in 2042 if no groundwater management measures are implemented.[147] This decline of 21 feet translates into 12,840 acre-feet per year of storage decline.[148] While the GSP does not explicitly state this information, it appears that the GSP rounds this decline in storage to 10,000 acre-feet per year and deducts this from

[137] Vina Subbasin GSP, Section 2.3, p. 151-178.
[138] Vina Subbasin GSP, Table 2-6, p. 154.
[139] Vina Subbasin GSP, Section 2.3.1, p. 152
[140] Vina Subbasin GSP, Section 2.3, p. 151-178.
[141] Vina Subbasin GSP, Figure 2-31 to 2-43, pp. 153-177, Table 2-6 to 2-9, pp. 154 to 166.
[142] Vina Subbasin GSP, Table 2-8, p. 163.
[143] Vina Subbasin GSP, Table 2-8, p. 163.
[144] Vina Subbasin GSP, Table 2-8, p. 163.
[145] Vina Subbasin GSP, Table 2-8, p. 163.
[146] Vina Subbasin GSP, Table 2-8, p. 163.
[147] Vina Subbasin GSP, Section 2.3.6, p. 178.
[148] Vina Subbasin GSP, Table 2-10, p. 179.

historical pumping of 243,500 acre-feet per year to estimate sustainable yield.[149] Thus, the GSP estimates a sustainable yield of 233,500 acre-feet per year which is expected to stop the projected decline in groundwater levels.[150] Department staff encourage the GSAs to update the Plan during future periodic evaluations to clarify how the sustainable yield was calculated to ensure the inference by Department staff is correct.

Department staff conclude that 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 Plan area and includes an estimate of the sustainable yield of the Plan area and projected future water demands.

4.2.4 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.[151]

The GSP divides the Subbasin into three management areas: Vina North, Vina Chico, and Vina South. The GSP states that the management areas are created to develop sustainable management criteria, monitoring networks, and projects that best serve the needs of the uses and users of groundwater unique to the management area.[152] The GSP further elaborates that the management areas are unique in terms of interest and vulnerability of stakeholders and groundwater uses, the nature of water demand such as agricultural, domestic and municipal sectors, the number and characteristics of wells supplying groundwater, and to some degree the hydrogeology and recharge sources.[153]

The GSP states that the Vina North management area is dominated by irrigated agriculture dependent on wells with sparsely distributed rural residential domestic wells. The streams in the Vina North are ephemeral (Pine Creek, Rock Creek, and Mud Creek) except for the Sacramento River which flows along the western boundary.[154]

The GSP states that the Vina Chico management area is predominantly an urban area with a small number of domestic wells and California Water Service providing groundwater supplies for residential and municipal use. There are a number of creeks

[149] Vina Subbasin GSP, Section 2.3.6, p. 179.
[150] Vina Subbasin GSP, Section 2.3.6, p. 179.
[151] 23 CCR § 354.20.
[152] Vina Subbasin GSP, Section 1.2.2, p. 64.
[153] Vina Subbasin GSP, Section 1.2.2, p. 64.
[154] Vina Subbasin GSP, Section 1.2.2.1, p. 64.

(Big Chico Creek, Little Chico Creek, and Butte Creek) that traverse the Vina Chico, but the GSP does not identify if the streams are ephemeral or perennial.[155]

In the Vina South management area, the GSP states that significant numbers of users typically depend on groundwater from relatively shallow domestic wells and the management area is dominated by irrigated agriculture dependent on groundwater and, to a lesser extent, surface water diversions primarily from Butte Creek. A number of perennial and ephemeral streams (Butte Creek, Little Dry Creek, and Dry Creek) traverse the Vina South management area.[156]

The GSP sufficiently describes the reasoning for dividing the Subbasin into management areas along with the characteristics and features of each management area. Department staff believe that the established management areas will likely help in Plan implementation as each management area appear to have unique challenges and opportunities.

4.3 Sustainable Management Criteria

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 characterizes undesirable results and establishes minimum thresholds and measurable objectives for each applicable sustainability indicator.[157]

4.3.1 Sustainability Goal

GSP Regulations require that GSAs establish a sustainability goal for the basin. The sustainability goal should be based on information provided in the GSP's basin setting and should include an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation.[158]

The sustainability goal for the Subbasin is "to ensure that groundwater is managed to provide a water supply of adequate quantity and quality to support rural areas and communities, the agricultural economic base of the region, and environmental uses now and in the future."[159] The GSP states that groundwater management is already occurring in the Subbasin which has resulted in enhanced monitoring.[160] While the GSP states that the groundwater levels in the Subbasin may continue to decline during the implementation period, the GSP focuses on having stable groundwater levels for the long term and

[155] Vina Subbasin GSP, Section 1.2.2.2, pp. 64-65.
[156] Vina Subbasin GSP, Section 1.2.2.3, p. 65.
[157] 23 CCR § 354.22 *et seq*.
[158] 23 CCR § 354.24.
[159] Vina Subbasin GSP, Section 3.1, p. 183.
[160] Vina Subbasin GSP, Section 3.1, p. 183.

operating the Subbasin within its sustainable yield.[161] The GSAs intend to achieve the Subbasin's sustainability goal by implementing projects and management actions which are aimed to increase direct and in-lieu recharge, promote water conservation, and enhance monitoring.[162] The GSAs have adopted an adaptive management strategy under which new projects may be proposed, and the projects proposed in this GSP may be further expanded and modified depending on the groundwater conditions in the Subbasin.[163] The GSP has included demand management as one of the management actions and intends to implement it only if the proposed projects fail to achieve interim milestones and the Subbasin is projected to not achieve sustainability goals by 2042.[164]

Department staff note the Subbasin's sustainability goal substantially complies with the requirement of the GSP Regulations.

4.3.2 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.[165] Sustainability indicators thus correspond with the six undesirable results – chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon, significant and unreasonable reduction of groundwater storage, significant and unreasonable seawater intrusion, significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies, land subsidence that substantially interferes with surface land uses, and depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water[166] – 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.

GSP Regulations require that GSAs provide descriptions of undesirable results including defining what are significant and unreasonable potential effects to beneficial uses and users for each sustainability indicator.[167] GSP Regulations also require GSPs provide the criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based

[161] Vina Subbasin GSP, Section 3.1, p. 183.
[162] Vina Subbasin GSP, Section 3.1, p. 183, Table 5-1, pp. 231-232.
[163] Vina Subbasin GSP, Section 5, pp. 228-251.
[164] Vina Subbasin GSP, Section 5.3.7, pp. 250-251.
[165] 23 CCR § 351(ah).
[166] Water Code § 10721(x).
[167] 23 CCR §§ 354.26 (a), 354.26 (b)(c).

on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.[168]

GSP Regulations require that the description of minimum thresholds include the information and criteria relied upon to establish and justify the minimum threshold for each sustainability indicator.[169] GSAs are required to describe how conditions at minimum thresholds may affect beneficial uses and users,[170] and the relationship between the minimum thresholds for each sustainability indicator, including an explanation for how the GSA has determined conditions at each minimum threshold will avoid causing undesirable results for other sustainability indicators.[171]

GSP Regulations require that GSPs include a description of the criteria used to select measurable objectives, including interim milestones, to achieve the sustainability goal within 20 years.[172] GSP Regulations also require that the measurable objectives be established based on the same metrics and monitoring sites as those used to define minimum thresholds.[173]

The following subsections thus 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 Subbasin, as quantified through the establishment of minimum thresholds, are addressed for each applicable sustainability indicator. A submitting agency is not required to establish criteria for undesirable results that the agency can demonstrate are not present and are not likely to occur in a basin.[174]

4.3.2.1 Chronic Lowering of Groundwater Levels

In addition to components identified in 23 CCR §§ 354.28 (a-b), for the chronic lowering of groundwater, 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 that is supported by information about groundwater elevation conditions and potential effects on other sustainability indicators.[175]

The GSP defines significant and unreasonable lowering of groundwater levels as "sustainably constructed domestic wells going dry during non-dry year conditions".[176] Sustainably constructed wells are defined in the GSP as "wells that have been installed following the relevant County Well standards within permeable aquifer material and the

[168] 23 CCR § 354.26 (b)(2).
[169] 23 CCR § 354.28 (b)(1).
[170] 23 CCR § 354.28 (b)(4).
[171] 23 CCR § 354.28 (b)(2).
[172] 23 CCR § 354.30 (a).
[173] 23 CCR § 354.30 (b).
[174] 23 CCR § 354.26 (d).
[175] 23 CCR § 354.28(c)(1) *et seq*.
[176] Vina Subbasin GSP, Section 3.3.2, p. 185.

wells have been appropriately maintained (e.g., well problems are not due to clogging of well screens or silting of well)".[177]

The GSP states that "[a]n undesirable result caused by the chronic lowering of groundwater levels is experienced if sustained groundwater levels are too low to provide a water supply of adequate quantity and quality to support rural areas and communities, and the agricultural economic base of the region, or if significant and unreasonable impacts to environmental uses of groundwater occur".[178] Department staff note that "adequate quantity and quality" and "significant and unreasonable impacts to environmental uses of groundwater" are not defined when qualifying undesirable results. The undesirable result in terms of quantified exceedance of minimum threshold is defined as "[t]wo [representative monitoring site] wells within a management area reach their [minimum threshold] for two consecutive years of non-dry year-types."[179] The GSP states that "[n]on-dry year types include wet, above normal, and below normal as defined by the Sacramento Valley Water Year Index".[180]

Department staff note that the GSP excludes dry and critical years in the definition of undesirable results, and these dry conditions are also excluded in the definition of significant and unreasonable lowering of groundwater levels. SGMA includes a provision which states, "overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods." [109] As such, Department staff conclude the inclusion of language in the definition of an undesirable result and in the discussion of significant and unreasonable conditions that precludes undesirable results during dry years without discussing how extractions and recharge will be managed to offset these potential impacts in other periods is problematic. The GSAs should revise the definition of undesirable results to remove the non-dry year condition, or discuss how extractions and recharge will be managed to ensure that reductions in groundwater levels or storage during dry years are offset by increases in groundwater levels or storage during other periods (see Recommended Corrective Action 3a).

While establishing groundwater level minimum thresholds, the GSP focuses on the protection of sustainably constructed domestic wells because dewatering domestic wells is a concern in the Subbasin. Per the GSP, the minimum thresholds are aimed to protect the majority of domestic wells, including those not constructed sustainably. Domestic wells are generally shallower than other well types; therefore, the water level that is protective of domestic wells is considered protective of other wells too.[181] The GSP states

[177] Vina Subbasin GSP, Section 3.3.2, p. 186.
[178] Vina Subbasin GSP, Section 3.3.1, p. 185.
[179] Vina Subbasin GSP, Section 3.3.2, p. 185.
[180] Vina Subbasin GSP, Section 3.3.2, p. 185.
[181] Vina Subbasin GSP, Section 3.3.2, p. 186.

that the domestic well dataset was refined by removing wells installed before 1980 so that the wells that remained in the dataset are likely to be consistent with the current County well standards and currently serving domestic households.[182] Maps showing the depths of domestic wells and other wells in the Subbasin are provided in the GSP.[183]

To establish groundwater level minimum thresholds, the GSP divides management areas into "polygons that represent proximate areas to each [representative monitoring site] well".[184] There is one representative monitoring site well per polygon.[185] A unique minimum threshold is established at each representative monitoring site well to protect the sustainably constructed domestic wells, as well as to mitigate the impact on the majority of domestic wells. The GSP states that the Vina Chico management area was not divided into polygons because of its size and the same minimum threshold is applied to all representative monitoring site wells.[186]

The minimum threshold groundwater levels are the levels "that would be protective of the majority of the domestic wells in the [representative monitoring site] zone".[187] The GSP recognizes that the representative monitoring site well is not fully representative of wells within the zone due to changes in ground surface and water surface elevations.[188] The GSP clarifies that the wells with the bottom of well above the minimum thresholds are either shallow wells (less than 100 feet deep) or have a significantly different (higher) ground surface elevation than the representative well.[189]

While the GSAs established minimum thresholds to protect the majority of the domestic wells and provide some information on which wells might be protected, the Plan does not explain what is meant by "the majority of the domestic wells." Because the GSP did not say that all the sustainably constructed domestic wells will be protected, this indicates that some of the domestic wells may be impacted or go dry at the proposed minimum threshold. Department staff recommend the GSAs provide information on impacts to domestic wells during projected conditions where minimum thresholds are exceeded but undesirable results do not occur and quantify domestic wells that will be impacted. Furthermore, the Department staff recommend evaluating impacts of proposed minimum thresholds on other beneficial uses and users, such as public and small water systems and environmental uses and users, as the GSP does not evaluate those impacts (see Recommended Corrective Action 3b).

Further, Department staff note the GSA does not access how the proposed minimum thresholds for the chronic lowering of groundwater levels may impact other sustainability

[182] Vina Subbasin GSP, Section 3.3.2, p. 186.
[183] Vina Subbasin GSP, Appendix 3-A, pp. 289-292.
[184] Vina Subbasin GSP, Section 3.3.2, p. 186.
[185] Vina Subbasin GSP, Appendix 3-B, pp. 294 and 304.
[186] Vina Subbasin GSP, Section 3.3.2, p. 186.
[187] Vina Subbasin GSP, Section 3.3.2, p. 187.
[188] Vina Subbasin GSP, Section 3.3.2, p. 187.
[189] Vina Subbasin GSP, Section 3.3.2, p. 187.

indicators (e.g., groundwater storage, depletion of interconnected surface water, etc.). Considering the GSA is choosing to manage the Subbasin below historic lows, understanding this relationship will be important during plan implementation. Department staff recommend the GSA provide a description of the relationship between established minimum thresholds for the chronic lowering of groundwater levels and how they avoid undesirable results for each of the other sustainability indicators (see Recommended Corrective Action 3c).

Department staff note the GSP includes a management action entitled "Domestic Well Mitigation" that aims to potentially provide resources to well owners impacted by groundwater management and lowering groundwater levels planned under the GSAs' management of the Subbasin. Under this management action, the GSAs plan to collect data on domestic wells to determine which well owners potentially need assistance; secure financial resources to assist with the repair, replacement, and deepening of domestic wells; and provide emergency response to well owners including supplying bottled water and potable water for sanitation. Department staff are encouraged by the GSAs' proposed management action to assist well owners who may be impacted by the proposed groundwater management of the Subbasin. Department staff recommend the GSAs utilize the Department's Drinking Water Guidance as appropriate and provide updates to the Plan about the progress of this program during GSP implementation.

The measurable objective is defined as "the groundwater level based on the groundwater trend line of the [representative monitoring site] well for the dry periods (since 2000) of observed short-term climatic cycles extended to 2030".[190] In other words, measurable objectives reflect the groundwater level trend that will be observed in 2030 based on the linear projection of the groundwater level data for the dry periods since 2000. Groundwater level data shows cyclic fluctuations over a four-to seven-year cycle and, generally, the lowest groundwater levels of a given cycle were used for this projection.[191] Since there is a continuous long-term decline in groundwater levels, the measurable objectives or the projected 2030 levels are the lowest levels observed since 2000 and generally lower than the groundwater levels observed in 2015.[192] The GSP clarifies that the measurable objective water level is chosen as the 2030 water level because it will take time to stop the long-term decline through the implementation of water efficiency and supply augmentation projects.[193]

The GSP states that interim milestones are based on linear interpolation of groundwater levels at each representative monitoring site.[194] However, the majority of the interim milestone groundwater levels are the same as the measurable objectives and when the

[190] Vina Subbasin GSP, Section 3.3.3, p. 188.
[191] Vina Subbasin GSP, Section 3.3.3, pp. 187-188.
[192] Vina Subbasin GSP, Section 3.3.3, p. 188, Appendix 3-C, pp. 311-331.
[193] Vina Subbasin GSP, Section 3.3.3, p. 188.
[194] Vina Subbasin GSP, Section 3.3.3, p. 189.

interim milestones are different, they only differ by a few feet.[195] The GSP also states that the observed groundwater levels may be higher than the established interim milestones because the interim milestones are projected based on the dry years in the cycle.[196]

The GSP considers the beneficial uses and users of groundwater by analyzing minimum threshold impacts on domestic wells and establishing minimum thresholds that are protective of sustainably constructed wells. The measurable objectives set at 2030 groundwater levels are 10 to 84 feet higher than the minimum threshold levels. The GSP states that this range between minimum thresholds and measurable objectives provides operational flexibility for active management.[197] Although groundwater levels will continue to decline for some time, the GSAs plan to stabilize groundwater levels by 2030 through the implementation of various projects and management actions. For more information on the proposed projects and management actions, please see Projects and Management Actions (Section 4.5). Department staff note that the Agencies' approach, of allowing the groundwater level to further decline until 2030, is based on the anticipation that it will take a few years to implement the water conservation and supply augmentation projects and to reflect the benefit of these projects on groundwater levels.

Despite the identification of multiple recommended corrective actions, the GSP's discussion of minimum thresholds and measurable objectives for the chronic lowering of groundwater levels seems to be comprehensive and includes adequate support, justification, and information to understand the GSAs' process, analysis, and rationale. Although Department staff have requested the GSA further evaluate potential impacts to beneficial uses and users, the GSP includes a well mitigation program to assist any well owners who may be impacted during initial plan implementation which is a consideration of these users. While Department staff have also noted the GSA needs to evaluate the potential impacts to other sustainability indicators at the proposed minimum thresholds, this does not preclude plan approval at this time since the GSA's planned management maintains current groundwater level trends until 2030 and will likely not cause undesirable results as defined in the Plan. Department staff expect the GSA to update the plan accordingly and potentially refine the groundwater level sustainable management criteria as more information becomes available to ensure the proposed management considers beneficial uses and users and does not cause undesirable results for other sustainability indicators.

4.3.2.2 Reduction of Groundwater Storage

In addition to components identified in 23 CCR §§ 354.28 (a-b), for the 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

[195] Vina Subbasin GSP, Table 3-1, p. 190.
[196] Vina Subbasin GSP, Section 3.3.3, p. 189.
[197] Vina Subbasin GSP, Table 3-1, p. 190, Section 3, p. 182, Section 3.3.2, p. 187.

sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.[198]

The GSP states that the sustainable management criteria developed for groundwater levels are used for groundwater storage because groundwater levels and groundwater storage are closely related and measured changes in groundwater levels can serve as a proxy for change in groundwater storage.[199] Because groundwater levels are used as a proxy, the minimum thresholds and measurable objectives for groundwater storage are the same as groundwater levels.[200]

The GSP states that an undesirable result related to the reduction of groundwater storage is experienced "if sustained groundwater storage volumes are insufficient to support rural areas and communities, the agricultural economic base of the region, and environmental uses".[201] The GSP further states that minimum thresholds intended to prevent significant and unreasonable impacts on groundwater levels are assumed adequate to protect against significant and unreasonable reductions of groundwater storage.[202] As per the GSP "[t]he aquifer system in the Vina Subbasin generally has sufficient groundwater storage capacity to take additional groundwater recharge during wet periods and remain saturated during dry periods, allowing for a range of active management reflecting the desired state for groundwater storage at the year 2042."

The GSP's discussion of minimum thresholds and measurable objectives for the reduction of groundwater storage seems to be comprehensive and includes adequate support, justification, and information to understand the GSAs' process, analysis, and rationale. Department staff conclude that the GSP's discussion and presentation of information covers the specific items listed in the GSP Regulations in an understandable format using appropriate data and assumptions. Staff are aware of no significant inconsistencies or contrary information to that presented in the GSP and, therefore, have no significant concerns regarding the discussion of this subject in the GSP.

4.3.2.3 Seawater Intrusion

In addition to components identified in 23 CCR §§ 354.28 (a-b), for 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.[203]

The GSP does not consider seawater intrusion an applicable sustainability indicator in the Subbasin due to its distance from the Pacific Ocean.[204] Therefore, the GSP does not

[198] 23 CCR § 354.28(c)(2).
[199] Vina Subbasin GSP, Section 3.4.1, p. 191.
[200] Vina Subbasin GSP, Section 3.4.2, p. 191, Section 3.4.3, p. 191.
[201] Vina Subbasin GSP, Section 3.4.1, p. 190.
[202] Vina Subbasin GSP, Section 3.4.2, p. 191.
[203] 23 CCR § 354.28(c)(3).
[204] Vina Subbasin GSP, Section 3.6, p. 194.

define undesirable results and establish sustainable management criteria for seawater intrusion. Department staff regard the GSAs' rationale for not setting sustainable management criteria for seawater intrusion to be reasonable given the location of the Subbasin.

4.3.2.4 Degraded Water Quality

In addition to components identified in 23 CCR §§ 354.28 (a-b), for 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 threshold 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.[205]

Per the GSP, undesirable results related to water quality due to groundwater pumping in the Subbasin have not occurred historically, are not currently occurring, and are not likely to occur in the future.[206] While the GSP briefly discusses the presence of various water quality constituents of concern in the Subbasin, the only acknowledgment of groundwater quality conditions in the Subbasin to support the sustainable management criteria is for specific conductance, which is a measurement of salinity. The salinity appears to be relatively stable over the years and well below the regulatory limits as the GSP states, "observations of specific conductance at [representative monitoring sites] from 2008 through 2019 ranged between 148 and 364 [microsiemens per centimeter (µS/cm)] and demonstrated no trend."[207]

To determine what is considered "significant and unreasonable" degraded water quality, the GSAs consulted with stakeholders in the Subbasin and determined that the following could be potential impacts: aesthetic concerns for drinking water; reduced crop yield and quality; and increased reliance on surface water for blending.[208] Considering these potential impacts, degraded water quality would be significant and unreasonable, and therefore an undesirable result, "if groundwater quality degrades such that the specific conductance exceeds the upper limit of the Secondary Maximum Contaminant Level (SMCL) of 1,600 µS/cm based on the State Secondary Drinking Water Standards."[209] The GSP acknowledges that the State Secondary Drinking Water Standards are set on the basis of aesthetic concerns and water exceeding the SMCL is typically unacceptable for drinking water.

[205] 23 CCR § 354.28(c)(4).
[206] Vina Subbasin GSP, Section 3.5.2, p. 192.
[207] Vina Subbasin GSP, Section 3.5.2, p. 192.
[208] Vina Subbasin GSP, Section 3.5.2, p. 192.
[209] Vina Subbasin GSP, Section 3.5.2, p. 192.

The GSP states that an undesirable result related to degraded water quality is experienced if "groundwater pumping that degrades water quality and compromises the long-term viability of rural areas and communities, the agricultural economic base of the region, and environmental uses for suitable habitat".[210] The GSP also defines undesirable result occurrence in terms of a minimum threshold exceedance, where an undesirable result "occurs in the Vina Subbasin when two [representative monitoring site] wells exceed their [minimum threshold] for two consecutive non-dry years."[211]

Department staff note that the GSP excludes dry and critical years in the definition of undesirable results. Department staff conclude that including language in the definition of an undesirable result that precludes undesirable results during dry years without discussing how the degradation of groundwater quality will be managed in other periods may be problematic. The GSAs should revise the definition of undesirable results to remove the non-dry year condition or discuss how degradation during dry periods will be managed as necessary to ensure that adverse water quality conditions are offset during other periods (see Recommended Corrective Action 4).

The minimum thresholds and measurable objectives are established based on the SMCL of specific conductance (salinity).[212] The minimum threshold and the measurable objective are established at 1,600 µS/cm and 900 µS/cm, respectively, which are the upper and the lower limits of the SMCL for specific conductance.[213] The minimum threshold is defined as "the upper limit of the SMCL for specific conductance based on the State Secondary Drinking Water Standards".[214] The measurable objective is defined as "the recommended SMCL for specific conductance based on the State Secondary Drinking Water Standards". As previously explained, the GSP states that an undesirable result is considered significant and unreasonable if groundwater quality degrades such that the specific conductance exceeds the upper limit of the SMCL of 1,600 µS/cm."[215]

Despite the presence of various constituents of concern, the GSAs established sustainable management criteria only for salinity and do not intend to manage other constituents of concern because the groundwater quality management in the Subbasin is led and overseen by other entities under existing laws and regulations. Department staff note that the GSAs plan to coordinate with the applicable agencies implementing water quality management and regulatory programs to understand if the existing regulations are being met or if groundwater pumping in the Subbasin is adversely impacting the constituents managed or regulated under these programs.[216] Department staff reiterate the need for the GSAs to provide detailed information on all water quality

[210] Vina Subbasin GSP, Section 3.5.1, p. 191.
[211] Vina Subbasin GSP, Section 3.5.1, p. 191.
[212] Vina Subbasin GSP, Section 3.5.2, p. 192.
[213] Vina Subbasin GSP, Section 3.5.2, p. 192, Section 3.5.3, p. 193.
[214] Vina Subbasin GSP, Section 3.5.2, p. 192
[215] Vina Subbasin GSP, Section 3.5.2, p. 192
[216] Vina Subbasin GSP, Section 3.5.1, p. 192.

constituents of concern and to discuss how existing groundwater quality conditions and/or remediation efforts may impact the GSAs' ability to manage groundwater as requested in Recommended Corrective Actions 1a through 1d.

Despite the identification of a recommended corrective action, the GSP's discussion of constituents of concern in the Subbasin and the degraded water quality sustainability indicator is comprehensive and includes adequate support, justification, and information to understand the GSAs' process, analysis, and rationale. While Department staff have noted the GSA needs to remove the exemption that excludes dry and critical years from the definition of undesirable results, this flaw does not preclude plan approval at this time as water quality is closely regulated by many other agencies in the Subbasin. Staff are aware of no significant inconsistencies or contrary information to that presented in the GSP and, therefore, have no significant concerns regarding the discussion of this subject in the GSP.

4.3.2.5 Land Subsidence

In addition to components identified in 23 CCR §§ 354.28 (a-b), the GSP Regulations require the minimum threshold for land subsidence to be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.[217] Minimum thresholds for land subsidence shall be supported by 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 thresholds and measurable objectives.[218]

The GSP states a review of data collected from 2005 to 2019 at GPS monuments located within the Subbasin showed that changes in ground surface elevations were slight and remained at or above baseline levels, indicating that inelastic land subsidence has not occurred in the Subbasin.[219] The GSP further states that the absence of inelastic subsidence is likely due to the presence of subsurface materials that are not susceptible to subsidence and relatively stable groundwater levels.[220]

The GSP states that the sustainable management criteria developed for groundwater levels are used for land subsidence because land subsidence typically occurs concurrently or shortly after significant declines in groundwater levels; therefore, measured changes in groundwater levels can serve as a proxy for potential land subsidence.[221] Since groundwater levels are used as a proxy for determining undesirable

[217] 23 CCR § 354.28(c)(5).
[218] 23 CCR §§ 354.28(c)(5)(A-B).
[219] Vina Subbasin GSP, Section 3.7.1, p. 195.
[220] Vina Subbasin GSP, Section 3.7.1, p. 195.
[221] Vina Subbasin GSP, Section 3.7.1, pp. 194-195

result associated with land subsidence, the minimum thresholds and measurable objectives for land subsidence are the same as groundwater levels.[222]

The GSP states that an undesirable result resulting from land subsidence is experienced if "groundwater pumping leads to changes in the ground surface elevation severe enough to disrupt critical infrastructure, development of projects that enhance the viability of rural areas, communities, and the agricultural economic base of the region."[223] The GSP identifies critical infrastructure that could be affected by subsidence as federal, state, and county roads and highways, irrigation district infrastructure, railroad infrastructure, and power transmission lines. The GSP states that undesirable results related to land subsidence in the Vina Subbasin have not occurred historically, are not currently occurring, and are not likely to occur in the future.[224] Department staff note that while undesirable results related to land subsidence have not occurred in the past, there is a potential to occur undesirable results in the future given the GSAs' proposed management strategy to lower groundwater levels below historic lows. Department staff recommend GSAs provide a clear, quantitative definition of when undesirable results for land subsidence may occur in the Subbasin, as required by the GSP regulations (see Recommended Corrective Action 5a).

While the GSP states that inelastic land subsidence due to groundwater pumping is unlikely to produce an undesirable result in the Subbasin,[225] the groundwater levels will continue to decline before they will stabilize in 2030.[226] Because the groundwater level is anticipated to decline in the near future and the future groundwater levels will be lower than historical lows, Department staff believe that it is important for GSAs to monitor the land subsidence using a method that can directly measure land elevation changes and provide quantitative data. Furthermore, Department staff conclude that the use of groundwater level as a proxy for land subsidence is inappropriate because of GSAs' plan to allow continued lowering of groundwater level. Therefore, Department staff recommend the GSAs establish sustainable management criteria for land subsidence utilizing a monitoring network that directly measures land elevation change such as remote sensing data, survey monuments, or global positioning system stations (see Recommended Corrective Action 5b).

Despite the identification of a recommended corrective action, the GSP's discussion of land subsidence is comprehensive and includes adequate support, justification, and information to understand the GSAs' process, analysis, and rationale. While Department staff have asked the GSA to remove the use of groundwater levels as a proxy for land subsidence, this flaw does not preclude plan approval as the Subbasin does not appear to have any significant current of historical land subsidence. Department staff are aware

[222] Vina Subbasin GSP, Section 3.7.1, pp. 194-195, Section 3.7.2, p. 195.
[223] Vina Subbasin GSP, Section 3.7.1, p. 194.
[224] Vina Subbasin GSP, Section 3.7.1, p. 195.
[225] Vina Subbasin GSP, Section 3.7.1, p. 195.
[226] Vina Subbasin GSP, Section 3.3.3, pp. 187-188

of no significant inconsistencies or contrary information to that presented in the GSP and, therefore, have no significant concerns regarding the discussion of this subject in the GSP.

4.3.2.6 Depletions of Interconnected Surface Water

SGMA defines undesirable results for the depletions 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.[227] 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.[228] 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.[229]

The Plan acknowledges that most of the streams in the Subbasin are interconnected surface water bodies and identifies their location using Butte Basin Groundwater Model. Department staff are satisfied that the GSA(s) have adopted a reasonable approach of utilizing groundwater model to identify the location of interconnected surface waters in the Subbasin.

Although the GSP provides inconsistent information regarding stream gains and losses, it does provide rate and volume of surface water depletions. However, the GSP does not specify if the quantified rate or volume of surface water depletions due to groundwater pumping as required by the GSP Regulations.[230] Instead, the GSP proposes to use groundwater levels as a proxy for depletions of interconnected surface water because the connectivity between the surface water and groundwater is not well measured or understood at this time.[231] The GSP further elaborates that the groundwater model incorporates interaction of surface water and groundwater at a regional scale but there are significant data gaps that limit calibration of the groundwater response to the uppermost layer of the model.[232] The GSP also states that an accelerated schedule has been developed to fill these data gaps, and the sustainable management criteria for depletions of interconnected surface water will be established in the future.[233]

The GSAs have not provided a technical justification for the use of groundwater elevations as a proxy for quantifying the location, quantity, and timing of depletions of interconnected surface water due to groundwater extraction. As a result, the GSAs have not

[227] Water Code § 10721(x)(6).
[228] 23 CCR § 354.16 (f).
[229] 23 CCR § 354.28 (c)(6).
[230] 23 CCR § 354.28 (c)(6).
[231] Vina Subbasin GSP, Section 3.8.3, p. 200, Section 3.8.4, p. 200, Section 3.8.5, p. 200.
[232] Vina Subbasin GSP, Section 3.8.4, p. 200.
[233] Vina Subbasin GSP, Section 3.8.3, p. 200.

demonstrated by adequate evidence that groundwater elevation can serve as a sustainability indicator for the depletions of interconnected surface water.

The GSP defines undesirable result as "[a]voiding significant and unreasonable depletions of surface water flows caused by groundwater pumping that significantly impacts beneficial uses".[234] The minimum thresholds and measurable objectives for depletions of interconnected surface water are the same as groundwater levels because groundwater levels are used as a proxy.[235]

Department staff understand that quantifying depletions of 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 new 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. Accordingly, Department staff believes that affording GSAs adequate time to refine their Plans to address interconnected surface waters is appropriate and remains consistent with SGMA's timelines and local control preferences.

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, the GSAs, where applicable, should consider incorporating appropriate guidance approaches into their future periodic evaluations to the GSP (see Recommended Corrective Action 6a). GSAs should consider availing themselves of the Department's financial or technical assistance, but in any event must continue to fill data gaps, collect additional monitoring data, and implement strategies to better understand and manage depletions of interconnected surface water caused by groundwater extractions and define segments of interconnectivity and timing within their jurisdictional area (see Recommended Corrective Action 6b). Furthermore, GSAs should coordinate with local, state, and federal resources agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion (see Recommended Corrective Action 6c).

4.4 MONITORING NETWORK

The GSP Regulations describe the monitoring network that must be developed for each sustainability indicator including monitoring objectives, monitoring protocols, and data

[234] Vina Subbasin GSP, Section 3.8.3, p. 200.
[235] Vina Subbasin GSP, Section 3.8.4, p. 200, Section 3.8.5, pp. 200-201.

reporting requirements. Collecting monitoring data of a sufficient quality and quantity is necessary for the successful implementation of a groundwater sustainability plan. The GSP Regulations require a monitoring network of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.[236] Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,[237] monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,[238] capture seasonal low and high conditions,[239] include required information such as location and well construction and include maps and tables clearly showing the monitoring site type, location, and frequency.[240] Department staff encourage GSAs to collect monitoring data as specified in the GSP, follow SGMA data and reporting standards,[241] fill data gaps identified in the GSP prior to the first periodic evaluation,[242] update monitoring network information as needed, follow monitoring best management practices,[243] 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. Department staff note that if GSAs do not fill their identified data gaps, the GSAs' basin understanding may not represent the best available science for use to monitor basin conditions.

The GSAs have developed monitoring networks for chronic lowering of groundwater level and degraded water quality. The GSAs propose to use the groundwater level monitoring network as a proxy for the reduction of groundwater in storage, land subsidence, and depletions of interconnected surface water sustainability indicators. The GSAs do not establish a dedicated monitoring network for the seawater intrusion sustainability criterion because the GSAs have determined this sustainability indicator is not applicable to the Subbasin.

The GSP included 78 wells (59 sites) in the groundwater levels monitoring network, with 25 of the wells located in the Vina North management area, 14 in the Vina Chico management area, and 39 in the Vina South management area.[244] Of the 78 wells, a total of 17 wells are identified as representative monitoring wells with six located in the Vina North management area, five located in the Vina Chico management area, and six located in the Vina South management area.[245] The wells are drilled and screened at various depths to measure groundwater levels in the single principal aquifer. The

[236] 23 CCR § 354.32.
[237] 23 CCR § 354.34(b)(2).
[238] 23 CCR § 354.34(b)(3).
[239] 23 CCR § 354.34(c)(1)(B).
[240] 23 CCR §§ 354.34(g-h).
[241] 23 CCR § 352.4 *et seq*.
[242] 23 CCR § 354.38(d).
[243] Department of Water Resources, 2016, Best Management Practices and Guidance Documents.
[244] Vina Subbasin GSP, Section 4.2, p. 204.
[245] Vina Subbasin GSP, Table 3-1, p. 190.

densities of monitoring wells are 22 wells per 100 square miles in Vina North management area, 30 well per 100 square miles in Vina Chico management area, and 30 wells per 100 square miles in Vina South management area, which are above the range of 0.2 to 10 wells per 100 square miles recommended in the Department's Best Management Practices. [246] Additionally, Department staff calculate the density of the proposed monitoring wells in the Subbasin to be approximately 27 wells per 100 square miles which is slightly less than the 31 wells per 100 square miles stated in the GSP, but still exceeding the range (0.2 – 10 wells per 100 square miles) recommended by the Department.[247] The monitoring wells are unevenly distributed in the Subbasin; however, Department staff believe that the proposed monitoring network contains a reasonable density of monitoring wells in the principal aquifer to demonstrate groundwater occurrence, flow direction, and lateral hydraulic gradient within the aquifer.

The frequency of groundwater level monitoring varies between hourly, tri-annually, and quarterly to capture seasonal highs and lows.[248] The GSP states water levels in the representative monitoring wells will be monitored at least bi-annually (spring and fall) for the purpose of SGMA compliance, and data will continue to be taken at wells now monitored at greater frequencies according to their existing monitoring schedules.[249] While the GSAs are planning to monitor groundwater levels bi-annually at a minimum, the GSP does not provide specific months when the monitoring will take place. The GSP does not provide analysis to support the justification that the proposed frequency of measurements can accurately capture the seasonal highs and lows in the Subbasin. Therefore, Department staff recommend GSAs should specify which months depict the seasonal high and low and provide justification on specified months representing the seasonal high and low.

The GSP proposes to use the groundwater level monitoring network as a proxy for the groundwater storage monitoring network.[250] Department staff concur with the GSAs' approach of using groundwater level as a proxy to monitor changes in groundwater storage.

The GSP states that the seawater intrusion sustainability indicator is not applicable to this Subbasin; therefore, no monitoring network is proposed.[251] Department staff agree with the GSAs' assessment of seawater intrusion; therefore, the development of a monitoring network is not required.

[246] Vina Subbasin GSP, Section 4.2.1, p. 209.
[247] Vina Subbasin GSP, Section 4.2.1, p. 209.
[248] Vina Subbasin GSP, Section 4.2.1, p. 208.
[249] Vina Subbasin GSP, Section 4.2.1, p. 208.
[250] Vina GSP, Section 4.3.2, p. 210.
[251] Vina Subbasin GSP, Section 2.2.3, p. 125, Section 4.9, p. 420.

The proposed water quality monitoring network consists of seven monitoring wells [252] and eight representative monitoring wells.[253] There is one monitoring well in each of the Vina North and Vina Chico management areas and five monitoring wells in the Vina South management area.[254] There are three representative monitoring wells in the Vina North management area, one in the Vina Chico management area, and four in the Vina South management area.[255] The GSAs plan to monitor pH and temperature, but plan only to track specific conductance or salinity at the representative monitoring sites.[256] The GSP states that the month of August is near the peak season for groundwater demand, so therefore, the GSAs plan to collect groundwater quality samples once a year in August to understand the water quality when the demand is at its highest.[257]

Department staff note a clerical error in Section 4.9.2, [258] which states that the representative monitoring sites were selected independently from the wells discussed in Section 4.5, but this section relates to subsidence monitoring. Section 4.9.2 also refers to Figure 4-5 while discussing the location of water quality monitoring sites, but the figure shows the location of groundwater level monitoring sites.[259] Department staff recommend updating the section and figure numbers to direct the reader to the appropriate section and figure.

The GSP discusses the Sacramento Valley GPS Subsidence Monitoring Network and the availability of InSAR data for the Subbasin; [260] however, the GSP does not clearly discuss how and if these data will be utilized for subsidence monitoring. Furthermore, in the sustainable management criteria section, the GSP discusses using the groundwater level as a proxy for land subsidence, but the GSP does not indicate or discuss using the groundwater level monitoring network as a proxy for the land subsidence monitoring network. Because GSAs' intent to monitor and manage land subsidence in the Subbasin is not clearly described in the Plan, Department staff recommend the GSAs establish monitoring for land subsidence utilizing a method that directly measures land elevation change such as remote sensing data, survey monuments, or global positioning system stations (see Recommended Corrective Action 5b).

The GSP states that a total of 78 monitoring wells and seven stream gages are included in the Subbasin's network for monitoring groundwater and streamflow interactions, [261] which means all the groundwater level monitoring sites in the Subbasin are included in the depletions of interconnected surface water monitoring network. Therefore,

[252] Vina Subbasin GSP, Section 4.4.1, p. 212.
[253] Vina Subbasin GSP, Section 4.9.2, p. 224.
[254] Vina Subbasin GSP, Section 4.4.1, pp. 211-212.
[255] Vina Subbasin GSP, Table 4-7, p. 225.
[256] Vina Subbasin GSP, Section 3.5.1, p. 191 and Section 4.4.1, p. 210.
[257] Vina Subbasin GSP, Section 4.4.2, p. 212.
[258] Vina Subbasin GSP, Section 4.9.2, p. 224.
[259] Vina Subbasin GSP, Section 4.9.2, p. 224.
[260] Vina Subbasin GSP, Section 4.5.1, p. 213.
[261] Vina Subbasin GSP, Section 4.6.1, p. 215.

Department staff are unable to determine which monitoring wells will be utilized to evaluate depletions of interconnected surface water. Department staff are unable to determine if the proposed monitoring network is sufficient to evaluate conditions related to depletions of interconnected surface water because pertinent information about the monitoring network, such as specific details regarding monitoring sites, frequency of monitoring, and scientific justification for site selection are not provided. Department staff recommend the GSAs clarify the groundwater level monitoring sites that will be used for the evaluation of depletions of interconnected surface water and provide site-specific information (see Recommended Corrective Action 6d).

While one or more recommended corrective actions are identified, the description of the monitoring network included 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 Plan area 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 to satisfy the general requirements of the GSP Regulations regarding monitoring network.

4.5 Projects and Management Actions

The GSP Regulations require a description of the projects and management actions the submitting Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.[262] Each Plan's description of projects and management actions must include details such as: how projects and management actions in the GSP will achieve sustainability, the implementation process and expected benefits, and prioritization and criteria used to initiate projects and management actions. [263]

The GSP includes a suite of projects and management actions which are developed to benefit the Vina Subbasin's groundwater supply and quality for all beneficial users.[264] Between 2000 and 2018, the decrease in storage or the overdraft in the Subbasin is about 20,000 acre-feet per year which is about 0.1 percent of the total freshwater storage.[265] The GSP includes 15 projects which are designed to increase direct and in-lieu recharge, promote water conservation and enhance monitoring. Among the 15 projects, five are

[262] 23 CCR § 354.44 (a).
[263] 23 CCR § 354.44 (b) *et seq.*
[264] Vina Subbasin GSP, Section 5.1, p. 228.
[265] Vina Subbasin GSP, Section 2.3.6, p. 178.

categorized as Planned Projects, eight are identified as Potential Projects, and two are described as Conceptual Projects as shown below.[266]

Planned Projects

1. Agricultural Irrigation Efficiency
2. Residential Conservation
3. Scoping for Flood Managed Aquifer Recharge/Surface Water Supply and Recharge
4. Community Water Education Initiative
5. Fuels Management for Watershed Health

Potential Projects

1. Paradise Irrigation District Intertie
2. Agricultural Surface Water Supplies
3. Streamflow Augmentation
4. Community Monitoring Program
5. Recycled Wastewater
6. Rangeland Management
7. Removal of Invasive Species
8. Surface Water Supply and Recharge

Conceptual Projects

1. Extend Orchard Replacement
2. Recharge from the Miocene Canal

As per the GSP, Planned Projects "are anticipated to move forward to help achieve the region's sustainability before 2042", Potential Projects "are currently in the initial planning stages and may move forward as feasibility and project requirements are determined", and Conceptual Projects "are in the early conceptual planning states and would require significant additional work to move forward".[267] While the GSP tentatively identifies the implementation timeline of most projects, it also states that "[a]ll projects, regardless of status, remain subject to available funding, any required CEQA compliance, and any required approvals".[268] The GSP further states that the projects included in the GSP may be further expanded or modified, or additional projects may be added in the future, as the GSAs work toward GSP implementation to achieve sustainability by 2042.[269]

The GSP states that the projects included were based on the public acceptance of the project and the GSAs plan to continue conducting public outreach and will be responsible for notification of the projects.[270] The GSP provides the estimated cost for a few projects,

[266] Vina Subbasin GSP, Section 5.2.2.1, p. 229.
[267] Vina Subbasin GSP, Section 5.2.2.1, p. 229.
[268] Vina Subbasin GSP, Section 5.2.2.1, p. 229.
[269] Vina Subbasin GSP, Section 5.2.2.1, p. 229.
[270] Vina Subbasin GSP, Section 5.2.2.1, p. 228, Section 5.2.6, p.249.

but for most of the projects the cost is to be determined.[271] The sources of funding for the projects are identified as grant funding from the Department or from other Federal and State Agencies.[272]

Based on the implementation schedule provided, all the Planned Projects and Potential Projects will be completed by 2042. One of the Planned Projects is already underway, another one is ready for implementation, and the remaining Planned Projects are in the planning stage.[273] Consistent with GSP Regulations, the project descriptions for projects contain information regarding a description of the measurable objective that is expected to benefit from the project, implementation trigger, a summary of the permitting and regulatory process required, expected benefits, and legal authority under which each project will be implemented.

The GSP includes seven management actions as shown below. The GSP states that these management actions are options that the GSAs may consider during GSP implementation.[274] The GSP further states that the groundwater allocation to manage groundwater demand will be implemented in the event that the proposed projects fail to achieve interim milestones and the Subbasin is projected to not be able to achieve sustainability goals by 2042.[275]

Management Actions

1. General Plan Updates
2. Domestic Well Mitigation
3. Well Permitting Ordinance
4. Landscape Ordinance
5. Prohibition of Groundwater Use for Ski (Recreational) Lakes
6. Expansion of Water Purveyors' Service Area
7. Groundwater Allocation

The GSAs plan to collaborate with Butte County and the City of Chico so that important components of the GSP are addressed in their general plans.[276] The GSP states that data on domestic wells will be collected, and financial resources will be secured, to provide emergency response to homeowners with dry domestic wells.[277] The GSAs plan to work with Butte County to amend the County code which requires domestic wells to be screened below the groundwater levels measured during the 1989 to 1994 drought.[278] The GSP states that this amendment will improve water supply reliability of future

[271] Vina Subbasin GSP, Table 5-1, pp. 231-232.
[272] Vina Subbasin GSP, Section 5-2, pp. 228-249.
[273] Vina Subbasin GSP, Table 5-1, pp. 231-232.
[274] Vina Subbasin GSP, Section 5.3, p. 249.
[275] Vina Subbasin GSP, Section 5.3.7, pp. 250-251.
[276] Vina Subbasin GSP, Section 5.3.1, p. 249.
[277] Vina Subbasin GSP, Section 5.3.2, pp. 249-250.
[278] Vina Subbasin GSP, Section 5.3.3, p. 250.

agricultural and domestic wells.[279] A new ordinance will be enacted by Butte County and/or the City of Chico requiring new development to use drought-resistant plants for landscaping.[280] The GSAs would encourage the expansion of water purveyor's service area so that the areas that solely rely on groundwater will have an alternate source of water and would reduce groundwater extraction.[281]

The GSP does not provide an implementation schedule for the management actions and states that the schedule is likely to vary depending on the groundwater conditions of the Subbasin. [282] While some of the management actions are likely to help reduce groundwater demand, the GSP does not quantify the expected benefit or the expected groundwater supply reduction.

Although the GSP lacks specific details regarding the expected benefit from management actions, the GSP provides an estimate of an expected groundwater supply reduction from most projects. The groundwater supply reductions from Planned, Potential, and Conceptual projects are up to 4,000 acre-feet per year, 19,000 acre-feet per year, and 20,000 acre-feet per year, respectively.[283] The combined supply reduction from all the projects for which the expected benefits are quantified is about 33,000 acre-feet per year which is much higher than the estimated overdraft of 20,000 acre-feet per year.

The GSAs have an adaptive management strategy for the Subbasin as the GSP states that Planned Projects are anticipated to move forward but the implementation of Potential Projects and Conceptual Projects will be based on long-term management or changing needs of the GSAs or Vina Subbasin.[284] The implementation of the projects is also based on the availability of funding and any required regulatory compliance and approvals.[285] According to the adaptive management strategy, new projects may be proposed, and the projects proposed in the GSP may be further expanded and modified or the management actions may be implemented.[286] The GSP acknowledges that additional data collected during this period helps reduce uncertainty and future decision-making for the Agencies. Department staff agree that adaptive management should be implemented given that proposed projects and management actions have not been fully developed. Additionally, Department staff recommend that the adaptive management strategy continues to be utilized to update projects and management actions to adapt to future conditions in the Subbasin.

The Plan adequately describes proposed projects and management actions in a manner that is generally consistent and substantially complies with the GSP Regulations.[302] The

[279] Vina Subbasin GSP, Section 5.3.3, p. 250.
[280] Vina Subbasin GSP, Section 5.3.4, p. 250.
[281] Vina Subbasin GSP, Section 5.3.6, p. 250.
[282] Vina Subbasin GSP, Section 5.3, p. 249.
[283] Vina Subbasin GSP, Table 5-1, pp. 231-232.
[284] Vina Subbasin GSP, Section 5, pp. 228-249.
[285] Vina Subbasin GSP, Section 5.2.2.1, p. 229.
[286] Vina Subbasin GSP, Section 5, pp. 228-251.

projects and management actions, which focus largely on refining the GSAs' understanding of basin conditions and avoiding undesirable results, are directly related to the sustainable management criteria and present a generally feasible approach to achieving the sustainability goal of the Plan area.

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.

4.6 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."[287] Furthermore, the GSP Regulations state that minimum thresholds defined in each GSP be designed to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.[288]

The GSP acknowledges that the water management decisions and actions in the Vina Subbasin can affect adjacent basins because groundwater basins in the Northern Sacramento Valley are hydrologically interconnected. Therefore, the GSAs in the Vina Subbasin have been collaborating with GSAs in the adjacent basins on SGMA implementation efforts. Although there are only four groundwater basins that are adjacent to the Vina Subbasin, GSAs for the Vina Subbasin have been coordinating with GSAs from 10 groundwater basins (Antelope, Bowman, Butte, Colusa, Corning, Los Molinos, Red Bluff, Sutter, Wyandotte Creek, and Yolo) since 2020.[289] While the collaboration among the GSAs began in 2020, because of insufficient time during the GSP development phase the GSAs were not able to fully characterize or address inconsistencies among the 11 GSPs.[290] Therefore, the GSAs have developed a framework for long-term coordination which will be followed during Plan implementation.[291] The GSP also discusses its inter-basin coordination plan which involves identifying and acknowledging significant discrepancies, understanding why those differences exist, and evaluating to the extent they need to be reconciled.[292] According to the inter-basin coordination plan, the GSAs will also evaluate sustainable management criteria among the GSPs to assess impacts and identify significant differences and possible impacts between subbasins that could potentially lead to undesirable results, joint monitoring, regional modeling, and other efforts to address data gaps at subbasin boundaries, compiling and comparing model outputs, and so on.[293]

[287] Water Code § 10733(c).
[288] 23 CCR § 354.28(b)(3).
[289] Vina Subbasin GSP, Appendix 6-A, p. 335.
[290] Vina Subbasin GSP, Appendix 6-A, p. 335.
[291] Vina Subbasin GSP, Appendix 6-A, p. 335.
[292] Vina Subbasin GSP, Appendix 6-A, p. 337.
[293] Vina Subbasin GSP, Appendix 6-A, p. 338.

Department staff concur with the GSAs' plan to collaborate and coordinate with multiple groundwater basins to ensure that sustainability will be achieved at the regional level and the management of one basin will not adversely impact the management of other interconnected basins.

Based on information available at this time, Department staff have no information that would indicate that groundwater management in the Subbasin will adversely affect groundwater conditions in the adjacent Subbasins at this time. Department staff will continue to review periodic evaluations to the Plan to assess whether implementation of the Vina GSP is potentially impacting adjacent basins.

4.7 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.[294]

Since the GSP was adopted and submitted, climate change conditions have advanced faster and more dramatically. It is anticipated that the hotter, drier 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 encourages GSAs to:

1. Explore how their proposed groundwater level thresholds have been established in consideration of groundwater level conditions in the Subbasin based on current and future drought conditions.
2. 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.
3. Take into consideration changes to surface water reliability and that impact on groundwater conditions.
4. Evaluate updated watershed studies that may modify assumed frequency and magnitude of recharge projects, if applicable.
5. Continually coordinate with the appropriate groundwater users, including but not limited to domestic well owners and state small water systems, and the appropriate overlying county jurisdictions developing drought plans and establishing local drought task forces[295] to evaluate how their Plan's groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

[294] 23 CCR § 354.18.
[295] Water Code § 10609.50.

5 STAFF RECOMMENDATION

Department staff recommend approval of the GSP with the recommended corrective actions listed below. The Vina Subbasin GSP conforms with Water Code Sections 10727.2 and 10727.4 of SGMA and substantially complies with the GSP Regulations. Implementation of the GSP will likely achieve the sustainability goal for the Vina Subbasin. The GSA(s) have identified several areas for improvement of their Plan and Department staff concur that those items are important and should be addressed as soon as possible. Department staff have also identified additional recommended corrective actions that should be considered by the GSA(s) for the first periodic evaluation of the 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

Provide additional information on historical and current groundwater quality conditions in the Subbasin and refine the definition of sustainable management criteria including:

a. Provide additional information in the GSP outlining the location and extent of contamination plumes, identifying which constituents are being monitored under various programs, and thoroughly describing ongoing remediation efforts within the Subbasin.

b. Evaluate whether groundwater management actions, including production and/or replenishment under the jurisdiction of the GSAs, may influence the migration of contaminant plumes.

c. Investigate if groundwater quality issues are adversely impacting groundwater supply and beneficial uses and provide information if there are any mitigation programs in place and the effectiveness of such programs.

d. Coordinate with the lead agencies overseeing these remediation sites regularly and update the Plan stating how existing groundwater quality conditions and/or remediation efforts may impact the GSAs' ability to manage groundwater.

RECOMMENDED CORRECTIVE ACTION 2

Review the model inputs/outputs and provide consistent information regarding stream loss and gains throughout the GSP. Clarify whether these values simply represent the overall interaction between the surface water and groundwater system or the quantity of depletion due to groundwater pumping.

RECOMMENDED CORRECTIVE ACTION 3

Provide sufficient information regarding criteria used to identify significant and unreasonable conditions, undesirable results, and the potential impacts to various beneficial uses and users of groundwater related to the chronic lowering of groundwater level minimum thresholds. The GSAs should address the following items:

a. Revise the definition of undesirable results and language pertaining to significant and unreasonable lowering of groundwater level to remove the non-dry year condition or discuss how extractions and recharge will be managed as necessary to ensure that reductions in groundwater levels or storage during dry years are offset by increases in groundwater levels or storage during other years within the sustainable management criteria for the chronic lowering of groundwater levels.

b. Provide information on impacts to domestic wells during projected conditions where minimum thresholds are exceeded but undesirable results do not occur and also quantify domestic wells that will be impacted by the proposed minimum threshold. Furthermore, the GSAs should evaluate the impacts of proposed minimum thresholds on other beneficial uses and users, such as public and small water systems and environmental users and users.

c. Evaluate how the proposed minimum thresholds for the chronic lowering of groundwater levels may impact other sustainability indicators (e.g., groundwater storage, depletion of interconnected surface water, etc.).

RECOMMENDED CORRECTIVE ACTION 4

Revise the definition of undesirable results to remove the non-dry year condition or discuss how degradation during dry period will be managed as necessary to ensure that adverse water quality conditions are offset during other periods.

RECOMMENDED CORRECTIVE ACTION 5

Provide additional information on criteria used to identify undesirable results, and sustainable management criteria for land subsidence, including:

a. Provide a clear, quantitative definition of when undesirable results for land subsidence may occur in the Subbasin, as required by the GSP regulations, to support the selection of land subsidence minimum thresholds that demonstrate avoidance of undesirable results.

b. Establish sustainable management criteria for land subsidence for the Subbasin utilizing a monitoring network that directly measures land elevation change such as remote sensing data, survey monuments, or global positioning system stations.

RECOMMENDED CORRECTIVE ACTION 6

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

In addition, the GSAs should work to address the following items by the first periodic evaluation:

a. Consider utilizing the interconnected surface water guidance, as appropriate, when issued by the Department to establish quantifiable minimum thresholds, measurable objectives, and management actions.

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

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

d. Clarify the groundwater level monitoring sites that will be used for the evaluation of depletions of interconnected surface water and provide site-specific information.