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

October 26, 2023

Hank Seemann
Humboldt County Groundwater Sustainability Agency
1106 Second Street
Eureka, CA 95501
hseeman@co.humbolt.ca.us

RE: Eel River Valley Basin – 2022 Groundwater Sustainability Plan

Dear Hank Seeman,

The Department of Water Resources (Department) has evaluated the groundwater sustainability plan (GSP or Plan) submitted for the Eel River Valley Basin 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 Eel River Valley Basin 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 Eel River Valley Basin GSP no later than January 31, 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,

Paul Gosselin

Paul Gosselin
Deputy Director
Sustainable Groundwater Management

Attachment:

1. Statement of Findings Regarding the Approval of the Eel River Valley Basin Groundwater Sustainability Plan

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE APPROVAL OF THE EEL RIVER VALLEY BASIN 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 Humboldt County Groundwater Sustainability Agency (GSA or Agency) for the Eel River Valley Basin (Basin No. 1-010, Basin).

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 Basin. (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 Basin 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 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 Basin 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 Basin (with the possibility that the Department may grant GSAs an additional five years upon request if the GSA has made satisfactory progress toward sustainability); and, (4) local agencies acting as GSAs are authorized, but not required, to address undesirable results that occurred prior to enactment of SGMA. (Water Code §§ 10721(r); 10727.2(b); 10733(a); 10733.8.)

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 Basin. 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 goal, which focus on protecting high quality and abundant groundwater resources to protect the beneficial uses and users, and continued management within the Basin's sustainable yield are sufficiently justified and explained. The Plan relies on credible information and science such as long-term groundwater level data, continued refinement of the hydrogeological conceptual model, collection of high-quality data through expansion of the monitoring network, 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 Basin is being managed sustainably in accordance with SGMA. (23 CCR § 355.4(b)(1).)

2. The Plan identified and provided reasonable measures and approximate timeline to eliminate data gaps, including additional monitoring and data collection and coordination among Basin stakeholders, ultimately benefiting a refined groundwater model and water resiliency efforts. (23 CCR § 355.4(b)(2).)

3. The projects and management actions proposed are designed to help improve the hydrogeologic model, irrigation efficiency, and watershed conditions. The projects and management actions are reasonable and commensurate with the level of understanding of the Basin setting. The projects and management actions described in the Plan provide a feasible approach to achieving the Basin's sustainability goal and should provide the GSA 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 interests of groundwater uses and users in the Basin were considered in developing the sustainable management criteria and how those interests, including domestic and public supply wells, fish passage, and groundwater dependent ecosystems would be impacted by the chosen minimum thresholds. (23 CCR § 355.4(b)(4).)

5. The Plan's projects and management actions appear feasible at this time and appear capable of preventing undesirable results and ensuring that the Basin 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 that the Basin is not adjacent to another groundwater basin subject to SGMA (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 GSA has monitored groundwater annually since at least 2017, expanded its monitoring network in 2016 and 2021, and worked with stakeholders to prepare and submit a GSP alternative in 2016. Although the GSP Alternative was disapproved, the Humboldt County Board of Supervisors approved a resolution that affirmed its commitment to continue working collaboratively with water users and stakeholders to form a GSA for the Basin. Prior to becoming a GSA, Humboldt County had existing police powers to manage groundwater, including well permitting authority. Although the GSP states that before SGMA there was no coordinated groundwater management in the Basin, the GSP presents a framework for coordinated groundwater management going forward. Despite the GSA's limited history of groundwater management, the work to date provides a reasonable level of confidence that the GSA 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 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 Department developed its GSP Regulations consistent with and intending to further the State's human right to water 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. (Water Code § 106.3; 23 CCR § 350.4(g).)

2. The Plan acknowledges and identifies interconnected surface waters within the Basin. The GSA proposes initial sustainable management criteria to manage this sustainability indicator and measures to improve understanding and management of interconnected surface water. The GSA acknowledges, and the Department agrees, many data gaps related to interconnected surface water exist. The GSA 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 periodic evaluations of the Plan and amendments to the Plan should aim to improve the initial sustainable management criteria as more information and improved methodology becomes available.

3. The basin is not currently in a state of long-term overdraft and 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 appear unlikely to substantially deteriorate while the GSA implements the Department's recommended corrective actions.

4. 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 Agency for the Eel River Valley Basin 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 Agency address them by the time of the Department's periodic review, which is set to begin on January 31, 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: October 26, 2023

Exhibit A: Groundwater Sustainability Plan Assessment Staff Report – Eel River Valley Basin

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

Groundwater Basin Name:	Eel River Valley Basin (No. 1-010)
Submitting Agency:	Humboldt County Groundwater Sustainability Agency
Submittal Type:	Initial GSP Submission
Submittal Date:	January 31, 2022
Recommendation:	Approved
Date:	October 26, 2023

The Humboldt County Groundwater Sustainability Agency (GSA) submitted the Eel River Valley Groundwater Sustainability Plan (GSP or Plan) for the Eel River Valley Basin (Basin) 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 Basin 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 Basin 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 Basin.[3] Department staff will continue to monitor and evaluate the Basin'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:

- **Section 1 – Summary:** Provides an overview of Department staff's assessment and recommendations.

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

- **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 Eel River Valley GSP. The GSA has identified areas for improvement of its Plan (e.g., refining the hydrogeologic conceptual model and improving understanding of the freshwater-seawater transition at depth). Department staff concur that those items are important and recommend the GSA address them as soon as possible. Department staff have also identified additional recommended corrective actions within this assessment that the GSA should consider addressing by the first periodic evaluation of the Plan. The recommended corrective actions generally focus on the following:

(1) Clarifying the vertical and lateral extent of the Carlotta Aquifer relative to the Carlotta Formation and the defined bottom of the Basin. Provide sufficient details on why groundwater in the lower Carlotta Formation is considered to be unavailable for consumption.
(2) Applying the undesirable result definition to the previously excluded Basin areas and principal aquifers and identifying additional representative monitoring wells in these areas to define the presence of an undesirable result.
(3) Revising the description of significant and unreasonable groundwater conditions and minimum thresholds for degraded water quality to consider changes in groundwater conditions whether or not they are caused by GSP implementation.
(4) Filling data gaps, collecting additional monitoring data, and implementing the current strategy to manage depletions of interconnected surface water and define segments of interconnectivity and timing.

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 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 Eel River Valley Basin.[5] To achieve the sustainability goal for the Basin, 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 Basin, 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 made by the GSA, 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]

[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).
[14] 23 CCR §§ 355.4(b)(1), (3), (4), and (5).

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

The staff assessment of the GSP involves the review of information presented by the GSA, 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

[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.
[26] 23 CCR § 356.4 *et seq*.

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 GSA 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 basin.

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 submitted its Plan on January 31, 2022.

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 submitted an adopted GSP for the entire Basin. After an initial, preliminary review, Department staff found the GSP to be complete and appearing to include the

[27] Water Code § 10733.8; 23 CCR § 355.6.
[28] Water Code §§ 10728 *et seq.*, 10728.2.
[29] Water Code § 10720.7(a)(2).
[30] 23 CCR § 355.4(a)(2).

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 Eel River Valley Basin and the jurisdictional boundary of the submitting GSA fully contains the Basin.[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 Basin 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 description of the ability of the submitting Agency to develop and implement a Plan for that area.[37]

The Humboldt County GSA was formed as the exclusive GSA within the Eel River Valley Basin on May 5, 2020. The Eel River Valley GSP includes the name, contact information,

[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/70.
[33] Water Code § 10727(b); 23 CCR § 355.4(a)(3).
[34] Eel River Valley GSP, Section 6.2, p. 112.
[35] 23 CCR § 354.6 *et seq*.
[36] 23 CCR § 354.8 *et seq*.
[37] 23 CCR § 354.6(e).

and organization and management structure for the Humboldt County GSA.[38] The Humboldt County GSA was formed by the Humboldt County Board of Supervisors through the adoption of Resolution 20-39, which is included in Appendix A of the Eel River Valley GSP.[39] The Humboldt County GSA is governed by the Humboldt County Board of Supervisors and managed by staff of the Humboldt County Department of Public Works.

The Eel River Valley Basin is wholly located within Humboldt County and has a "high reliance on groundwater for water supply with no imported water and very little surface water use."[40] The GSP states that the "Basin is not adjacent to another groundwater basin subject to SGMA and does not contain areas with adjudicated groundwater rights."[41] The Eureka Plain Basin (No. 1-009) is located immediately north of the Eel River Valley Basin (Figure 1) and is classified by DWR as a very low priority basin, and as such is not required by SGMA to be managed under a GSP.[42]

[38] Eel River Valley GSP, Section 1.6, p. 21.
[39] Eel River Valley GSP, Section 1.6.1, p. 21, Appendix A, pp. 1152-1156.
[40] Eel River Valley GSP, Section 1.4, p. 19
[41] Eel River Valley GSP, Section 1.4, p. 19
[42] Wat. Code § 10720.7

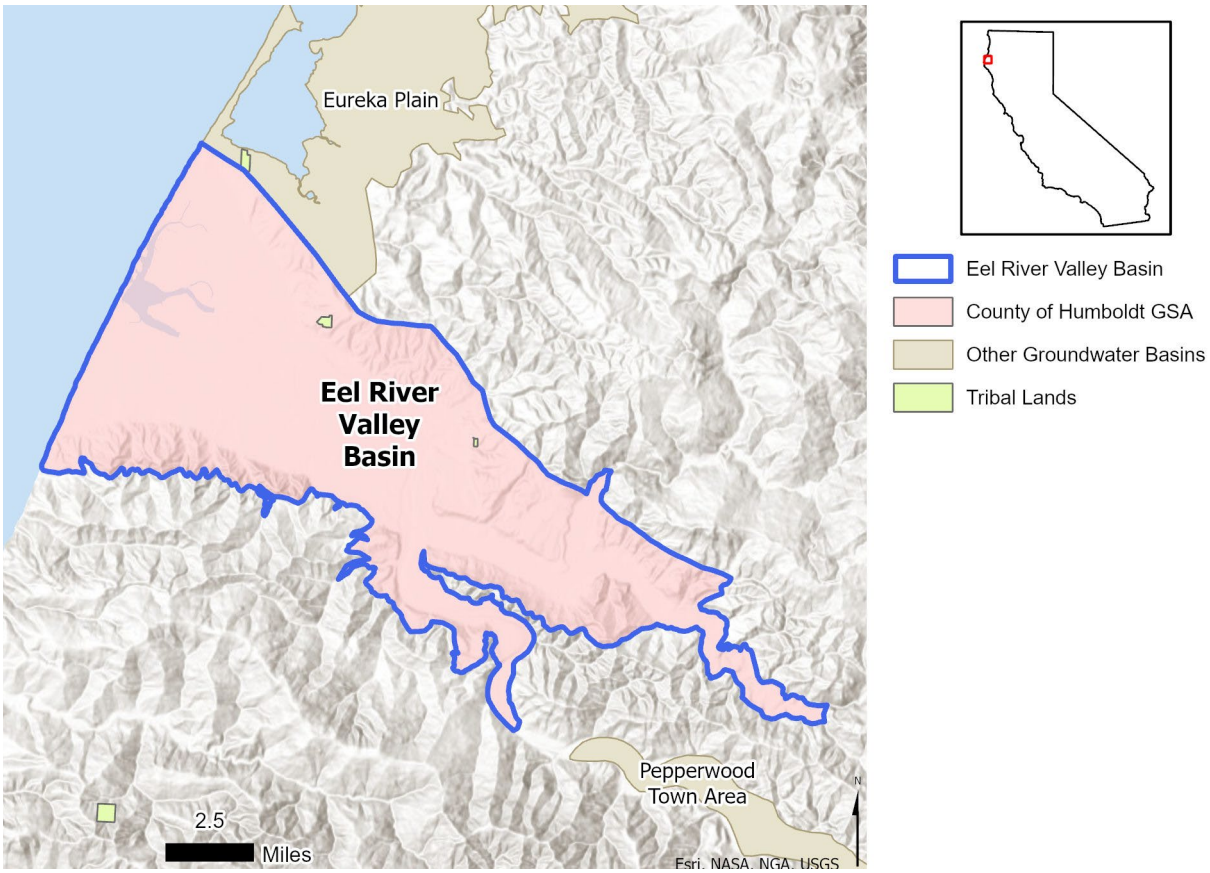

Figure 1: Eel River Valley Basin Location Map.

The GSP provides discussion on the beneficial uses and users of groundwater in the Basin, a list of public meetings,[43] comments received on the GSP, the GSA's response to comments, and revisions made to the GSP in response to comments.[44] The beneficial uses and users of groundwater in the Basin are agricultural users, domestic well owners, municipal well operators, public water systems, local land use planning agencies, environmental users of water, surface water users, federal government including military and managers of federal lands, California Native American Tribes, and disadvantaged communities.[45]

The GSP states that "public water suppliers utilizing groundwater within the basin include City of Fortuna, City of Rio Dell, Riverside Community Services District (CSD), Loleta CSD, Palmer Creek CSD, Hydesville Community Water District, Bear River Band of the Rohnerville Rancheria, and Del Oro Water Company. Del Oro Water Company is an investor-owned public utility company that provides water to the City of Ferndale and surrounding area."[46] The GSP further states that "the primary water source for the City of

[43] Eel River Valley GSP, Appendix C, pp. 1211-1217.
[44] Eel River Valley GSP, Appendix G, pp. 1303-1313.
[45] Eel River Valley GSP, Appendix C, pp. 1191-1192.
[46] Eel River Valley GSP, Section 1.4, p. 19.

Rio Dell and Scotia CSD is surface water from the Eel River; the City of Rio Dell utilizes groundwater as a secondary/emergency source."[47]

In addition to groundwater being used for municipal supply, the GSP describes that the Eel River Valley Basin "supports a vibrant agricultural community made up of both organic and conventional farms and ranches. Farming families produce milk, beef cattle, pasture, corn silage, truck crops, vegetables, apples, quinoa, and other crops in one of Humboldt County's finest growing regions... Dairy producers and ranchers pump groundwater for pasture irrigation, livestock watering, facility cleaning, and dairy nutrient management. The Basin contains approximately 28,750 acres actively used for agricultural production. In 2021, a total of 12,952 acres of agricultural land were irrigated by groundwater."[48]

The GSP describes that as the exclusive GSA, the Humboldt County GSA has the legal authority to develop and implement a GSP for the Basin, and that these authorities are "in addition to Humboldt County's inherent police power to manage groundwater, including well permitting authority."[49] The GSP further explains that "management of GSP implementation will be administered by the Humboldt County Department of Public Works consistent with the GSP and under the direction of the Humboldt County Board of Supervisors serving as the Humboldt County GSA."[50]

The GSP states that the "Humboldt County GSA will perform the monitoring and reporting activities required by SGMA and will consider other projects and management actions as appropriate to maintain sustainable groundwater conditions and enhance beneficial uses of groundwater and interconnected surface waters."[51] Additionally, the Eel River Valley GSP describes existing water resource monitoring programs.[52]

The GSP describes the land use and water resources elements of applicable general plans, including twelve goals, policies, and implementation measures it states are relevant to groundwater management from the Humboldt County General Plan (October 2017).[53]

The Humboldt County Department of Health and Human Services, Division of Environmental Health, is responsible for permitting the construction, alteration, or destruction of wells in the Basin.[54]

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

[47] Eel River Valley GSP, Section 1.4, p. 19.
[48] Eel River Valley GSP, Section 1.4, p. 19.
[49] Eel River Valley GSP, Section 1.6.3, p. 21.
[50] Eel River Valley GSP, Section 1.6.2, p. 21.
[51] Eel River Valley GSP, Executive Summary Part III, p. 6.
[52] Eel River Valley GSP, Section 2.7.1 through 2.7.5, pp. 34-35.
[53] Eel River Valley GSP, Section 2.6, pp. 32-33.
[54] Eel River Valley GSP, Section 2.11, p. 41.

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 accounting for total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions.[55]

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.[56] The GSP Regulations require a descriptive hydrogeologic conceptual model that includes a written description of geologic conditions, supported by cross sections and maps,[57] and includes a description of basin boundaries and the bottom of the basin,[58] principal aquifers and aquitards,[59] and data gaps.[60]

The GSP provides a comprehensive description of the hydrogeologic conceptual model that provides details based on the best available information to describe the groundwater systems in the Basin.[61] The GSP describes that the "Basin is in a structurally controlled valley within a complex geologic setting, approximately 20 miles north of the Mendocino Triple Junction, where three crustal plates (Gorda, North American, and Pacific plates) intersect [see GSP Figure 9]."[62] The Basin is within a fold-and-thrust belt with a "broad structural downwarp (synclinal fold), referred to as the Eel River syncline, coincident with the lower reaches of the Eel River."[63] Underlying consolidated basement rocks of the Wildcat and underlying Franciscan formation are overlain by "large quantities of unconsolidated alluvial deposits from the Eel and Van Duzen rivers, as well as streams flowing from the surrounding uplands."[64] The "Wildcat group consists of five sedimentary

[55] 23 CCR § 354.12.
[56] DWR Best Management Practices for the Sustainable Management of Groundwater: Hydrogeologic Conceptual Model
[57] 23 CCR §§ 354.14 (a), 354.14 (c).
[58] 23 CCR §§ 354.14 (b)(2-3).
[59] 23 CCR § 354.14 (b)(4) *et seq.*
[60] 23 CCR § 354.14 (b)(5).
[61] Eel River Valley GSP, Section 3, pp. 42-51.
[62] Eel River Valley GSP, Section 3.4, p. 44.
[63] Eel River Valley GSP, Section 3.4, p. 44.
[64] Eel River Valley GSP, Section 3.4, p. 44.

formations (from oldest to youngest: the Pullen, Eel River, Rio Dell, Scotia Bluffs, and Carlotta formations) deposited in the ancestral Eel River basin."[65] The thick sequence of shallow unconsolidated alluvial deposits and the underlying consolidated Carlotta formation make up the primary water bearing units within the Basin and are further discussed herein. Discussion and presentation of information on geologic and structural setting of the Basin covers the specific items listed in the regulations [66] in an understandable format using appropriate data.

Department staff are aware of no significant inconsistencies or contrary information describing the local and regional geologic setting presented in the GSP and therefore have no significant concerns regarding the quality, data, and discussion of this subject in the GSP.[67]

The Basin occupies the lower portion of the Eel River watershed and generally follows well-defined geologic features. The southern side of the Basin is bounded by the Wildcat Range and the northern side by the Little Salmon fault zone. The eastern limits of the Basin are defined by the extent of recharge areas within the two major rivers that enter the Basin, the Eel and Van Duzen Rivers. The western edge of the Basin is defined by the coastline.[68]

The GSP does not identify any specific known major geologic features that significantly affect groundwater flow. However, the GSP does identify the fault zone associated with the Little Salmon fault and Goose Lake faults, which are not well understood in terms of their lateral extent and potential influence on groundwater flow.[69] Additionally, the GSP describes that "the stratigraphy within the surficial alluvium is complex. Lateral and vertical stratigraphic variations are the result of a dynamic geologic history influenced by tectonics, sea level fluctuations, and large river systems with high sedimentation rates. The size and configuration of the aquifer(s) associated with the alluvial unit, particularly at depth, are not entirely defined. Similarly, the continuity of silt/clay layers (aquitards) across the Basin in the central western third and northern portion is not defined." These are identified in the GSP as data gaps and areas of uncertainty.[70]

The bottom of the Basin is described as the base of the Carlotta Formation where it is in contact with the Scotia Bluffs Sandstone and other finer-grained units of the Wildcat Group.[71] The placement of the bottom of the Basin is further refined by explaining the Carlotta Formation extends to depths below 3,000 feet at some locations within the Basin.

[65] Eel River Valley GSP, Section 3.4, p. 45.
[66] 23 CCR § 354.14 (b)(1).
[67] Eel River Valley GSP, Section 3.4, pp. 43-45.
[68] Eel River Valley GSP, Section 2.1, p. 24.
[69] Eel River Valley GSP, Section 3.8, p. 51.
[70] Eel River Valley GSP, Section 3.8, p. 51.
[71] Eel River Valley GSP, Appendix TM-4, p. 350.

The GSP identifies two principal aquifers in the Basin, the Alluvial and Carlotta aquifers. The Alluvial aquifer consists of near-surface unconsolidated alluvial deposits found throughout the Basin. The Alluvial aquifer is the "most productive aquifer and, combined with its relatively shallow depths, the most utilized aquifer in the Basin."[72] The GSP further states that the "alluvial aquifer is generally in direct contact and hydraulic communication with the Eel and Van Duzen Rivers" and that most "wells in the alluvial aquifer are less than 100 feet deep and yield relatively high volumes."[73] The Alluvial aquifer is found at depths from 40 feet to 260 feet with shallowing eastward.[74]

The GSP describes aquitards in the Basin, explaining that "all the stratigraphic sections within the Basin comprise beds of fine-grained sediments, many of which are thick enough and/or of low enough permeability to act as an aquitard. Well defined, laterally continuous aquitards, however, are not typical of the depositional environments in the Basin alluvium and can be difficult to define with confidence based on current well and boring information."[75] The GSP goes on to say that "properly logged, relatively deep (300 to 500 feet or greater) boreholes and monitoring wells installed out into the western half of the Basin would help address this data gap." Additional investigation in this area would not only address data gaps in the understanding of alluvial aquifer aquitard units, it would also aid in the delineation of the poorly understood contact between the Carlotta formation and the alluvium as the "contact between the alluvial aquifer and the underlying Carlotta aquifer in the western portion of the Basin, within two miles of the active Eel River channel, is only partially defined at this time due to some similarities of material types found in each of the units and a lack of relatively deep wells with screens exclusively completed into distinct Carlotta aquifer materials." The GSP describes that the "eastern half and southern portion of the Basin is now understood to have a distinct, relatively thick, fine-grained Carlotta formation aquitard unit underlying the shallow alluvium."

Underlying the alluvium is the 1,500-4,000 feet thick Carlotta Formation that makes up the second principal aquifer, referred to as the Carlotta aquifer. Reportedly, only the upper part of the aquifer is tapped. The Carlotta formation is typically tapped by water wells in "upland areas such as the slopes flanking the northern and southern boundaries of the Basin, the Ferndale area, and up on the Hydesville/Rohnerville terrace surfaces."[76] The Carlotta Formation has a laterally continuous, prominent aquitard in the eastern half and southern portion of the Basin. This aquitard represents the uppermost section of the Carlotta aquifer.[77]

Department staff recommend the GSA clarify its understanding of the vertical and lateral extent of the Carlotta Aquifer relative to the Carlotta Formation and define the bottom of

[72] Eel River Valley GSP, Section 3.6.1, p.46.
[73] Eel River Valley GSP, Section 3.6.1, p.46.
[74] Eel River Valley GSP, Section 3.6.1, p.46.
[75] Eel River Valley GSP, Section 3.6.3, p.47.
[76] Eel River Valley GSP, Section 3.6.2, p. 47.
[77] Eel River Valley GSP, Section 3.6.3, pp. 47-48.

the Basin. It would be beneficial to provide sufficient details on why groundwater in the lower Carlotta Formation is considered to be unavailable for consumption (see Recommended Corrective Action 1).

Groundwater in the Basin has various beneficial uses, including water supply for public water systems, agriculture, industrial, domestic, and freshwater replenishment to surface waters. A map is provided in the GSP that shows the location, depth of wells, and their respective type of use by section.[78]

The GSP identifies three data gaps and areas of uncertainty within the hydrogeologic conceptual model[79]:

- Primary and secondary faults are not well understood in terms of their lateral extent and potential influence on groundwater flow and gradients in both the alluvial and underlying Carlotta formation aquifers.
- The stratigraphy and aquifer characteristics associated with the unique settings of the Rohnerville and Hydesville terraces are not well known and comparatively limited in data for historical water levels and overall groundwater use.
- Size and configuration of the aquifer(s) associated with the alluvial unit, particularly at depth, are not entirely defined. Continuity of potential aquitards across the Basin in the central western third and northern portion is not defined.

Department staff encourage the GSA to continue to fill the above identified data gaps and provide updates regarding progress made in the next periodic evaluation.

Although a recommended corrective action was identified and Department staff encourage additional clarifying information in the GSP periodic evaluation, these flaws should not preclude plan approval as the basin appears to be on track to achieve sustainability based on the information presented in the GSP. Department staff conclude the Plan's descriptions of the regional geologic setting, the Plan area's physical characteristics, identification of the principal aquifers, 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,[80] a graph depicting change in groundwater storage,[81] maps and cross-sections of the seawater intrusion front,[82] maps of groundwater contamination sites and

[78] Eel River Valley GSP, Appendix, Figure 13, p. 182.
[79] Eel River Basin GSP, Section 3.8, p. 51.
[80] 23 CCR §§ 354.16 (a)(1-2).
[81] 23 CCR § 354.16 (b).
[82] 23 CCR § 354.16 (c).

plumes,[83] maps depicting total subsidence,[84] identification of interconnected surface water systems and an estimate of the quantity and timing of depletions of those systems,[85] and identification of groundwater dependent ecosystems.[86]

The GSP provides a description of current and historical groundwater conditions in the Basin.[87] While the GSP provides historical groundwater level data beginning as early as the 1950s to 2021, the Current Groundwater Conditions section describes data and analysis between 2016 and 2021.[88] Groundwater elevation contour maps for Fall 2016, Spring 2017, Fall 2020, and Spring 2021 are provided displaying current seasonal high and seasonal low elevations.[89] The contour maps indicate groundwater flow generally mirrors surface topography, flowing from the higher elevations in the east to lower elevations in the west.[90] There is little seasonal (spring-fall) variation in the gradient or flow direction depicted on the groundwater elevation contour maps. Department staff suggest that as the hydrogeological conceptual model is continually being refined, the contour maps presented in periodic evaluations should differentiate between monitoring in the various aquifers (i.e., shallow alluvial aquifer, Carlotta aquifer, or wells screened across both aquifers) and that separate groundwater elevation contour maps be included for each of the principal aquifers.

Groundwater elevation hydrographs are presented for nine CASGEM wells across the Basin.[91] These hydrographs are presented with varying periods of records beginning as early as the 1950s to 2021. Data from hydrographs indicate that measurements were discontinued in four wells. Therefore, records from are not appropriate for continued comparison and ongoing trend analysis. Additionally, the hydrographs do not provide an explanation as to whether the data represents conditions and trends in the alluvial aquifer, the Carlotta aquifer, or wells constructed in both aquifers. Department staff highly encourage that the GSA update the groundwater level hydrographs to include information indicating which principal aquifer the water levels are representing in the next periodic evaluation.

Groundwater levels depicted on the hydrographs appear generally stable for the period of record, but several do show short periods of minor decline followed by recovery, including some with recent declines. Spring measurements show more fluctuation than fall measurements and track with preceding winter precipitation and the resulting flow

[83] 23 CCR § 354.16 (d).
[84] 23 CCR § 354.16 (e).
[85] 23 CCR § 354.16 (f).
[86] 23 CCR § 354.16 (g).
[87] Eel River Valley GSP, Section 4, pp. 52-78.
[88] Eel River Valley GSP, Section 4, pp. 53-55
[89] Eel River Valley GSP, Figures 18-21, pp. 187-190
[90] Eel River Valley GSP, Figures 18-21, pp. 187-190
[91] Eel River Valley GSP, Figures 17, pp. 186

levels in the Eel and Van Duzen rivers.[92] Most hydrographs show fall water levels are consistent and do not vary significantly with water year type. A note in Figure 6.6 indicates that the small variation in fall groundwater levels and storage indicates groundwater use is "not a major contributor to storage fluctuations".[93] The plan attributes the stable minimum groundwater levels in fall to controls "by the groundwater in storage within the adjacent upland areas and the upper portions of the Van Duzen watershed which would be slower to respond to drought conditions."[94]

Under a 2020 planning grant between DWR and Humboldt County, 23 new dedicated monitoring wells at 19 locations were installed in 2021. Previously, 15 dedicated monitoring wells were installed at 9 locations in 2016. The plan describes the incorporation of these new wells into the monitoring program, including the installation of high frequency (continuous) groundwater level data via pressure transducers to aid in a more groundwater level dataset from a subset of these wells for future use.[95] The GSP includes hydrographs depicting a short period of record and intermittent high frequency data sets from these wells.

The GSP includes a description[96] of the change in groundwater storage and graphs depicting change in storage demonstrating the modeled annual and cumulative change in the volume of groundwater in storage between both spring and fall groundwater conditions for the period of 2000 – 2021[97]. Groundwater in storage appears fairly stable through the period depicted in the graphs, with greater fluctuation in the spring values that appear to track with water year type.

The GSP includes a description of historical and current seawater intrusion conditions within the Basin.[98] Recent seawater intrusion studies conducted in 2016, 2017, 2020, and 2021 were compared with results from a 1975 study (USGS study published in 1978). The GSP states that the results of the recent "studies have indicated that the freshwater-seawater interface (100 mg/L isoconcentration line) remains in the same general position as that mapped in 1975."[99] The GSP also includes seven figures depicting the locations of the chloride isoconcentration lines for the 1975 study and point concentration values for wells sampled in recent studies.[100]

Department staff note that the reported chloride concentrations are fairly stable and the location of the freshwater-seawater interface is in nearly the same location compared with

[92] Eel River Valley GSP, Section 4, p. 53 and Eel River Valley GSP, Water Levels Technical Memorandum, p. 1025
[93] Eel River Valley GSP, Figure 6.6, pp. 479
[94] Eel River Valley GSP, Water Levels Technical Memorandum, p. 1025
[95] Eel River Valley GSP, Section 4.1.2, p.53.
[96] Eel River Valley GSP, Section 4.2, pp. 59.
[97] Eel River Valley GSP, Chart 2, pp. 60.
[98] Eel River Valley GSP, Section 4.3, pp. 60-62.
[99] Eel River Valley GSP, Section 4.3, p. 61.
[100] Eel River Valley GSP, Figures 22-28, pp. 191-197.

the analysis done in 1975.[101] The GSP states that there are insufficient data available to evaluate seawater intrusion conditions in the deeper aquifer, but also notes that chloride concentrations tend to be greater in the deeper wells that were sampled.[102] The GSP describes four "deep screened County monitoring wells have been installed since 2016 (MW-5d, MW-7d, MW-14d and MW-15d) that were specifically located to explore saltwater intrusion conditions at depth."[103] The GSP also includes a cross-section, depicting the SEAWAT model output of seawater conditions at depth in the subsurface.[104] The GSP acknowledges the "configuration of the freshwater-seawater transition at depth is a known data gap and deeper wells that are screened within confined or semi-confined portions of the lower alluvial aquifer or the Carlotta were sought out to gain better understanding of the conditions at depth."[105] Department staff encourage the GSA to continue efforts to fill this data gap and present results in the next periodic evaluation.

The GSP includes a description of groundwater quality issues in the Basin.[106] The GSP also includes a map showing GeoTracker UST and cleanup sites,[107] permitted facilities,[108] and regulated facilities with active permits listed in the California Integrated Water Quality System (CIWQS).[109] These maps indicate regulated sites are found throughout the basin. Additional information regarding water quality in the Basin is provided in the Water Quality Technical Memorandum in the Appendices of the GSP.[110] The GSP states that the "four primary constituents of concern known to be present across large areas of the Basin are TDS, nitrate, iron, and manganese."[111] The Eel River Valley has been identified as a high-priority basin for salts and nutrients and the central portion of Lower Eel River Valley is identified as the area of most concern for nitrate exceedances.[112] The GSP further states that the "findings presented in the Regional Water Board's staff report on salt and nutrients indicate that elevated levels of nitrate and TDS is an existing condition within portions of the Basin."[113]

The GSP states that "water quality within the Basin is generally of good quality and suitable for its intended uses."[114] The GSP also states that while "there are some constituents with elevated concentrations and some constituents of concern that are derived from land use, there are no known conditions of degradation of groundwater

[101] Eel River Valley GSP, Figures 23-26, pp. 192-195.
[102] Eel River Valley GSP, Figures 27-28, pp. 196-197 and Section 4.3.3, pp. 61-62.
[103] Eel River Valley GSP, Section 4.3.3, pp. 61-62
[104] Eel River Valley GSP, Figures 29, pp. 198.
[105] Eel River Valley GSP, Saltwater Intrusion Technical Memorandum, pp. 888-889.
[106] Eel River Valley GSP, Section 4.4, pp. 63-66.
[107] Eel River Valley GSP, Figure 30, p. 199.
[108] Eel River Valley GSP, Figure 31, p. 200.
[109] Eel River Valley GSP, Figure 32, p. 201.
[110] Eel River Valley GSP, Water Quality Technical Memorandum, pp. 1051-1097.
[111] Eel River Valley GSP, Section 4.4.3, p. 64.
[112] Eel River Valley GSP, Section 4.4.5, p. 65.
[113] Eel River Valley GSP, Section 4.4.6, p. 65.
[114] Eel River Valley GSP, Section 4.4.6, p. 65.

related to groundwater management or use." [115] although there are elevated concentrations of some constituents, none are reportedly known to be caused by groundwater management or use.

The GSP includes a description and a map of recent land subsidence data and explains that Interferometric Synthetic Aperture Radar (InSAR) data provided by the Department shows that historical land surface displacement in the Basin is within the range of plus or minus 0.25 feet.[116] The GSP states that there is "no known land subsidence due to groundwater extraction in the Basin."[117] The GSP continues, the "relative stability and consistency in the range of groundwater elevation fluctuations and the small impact that groundwater use has on these levels suggests that the conditions that could lead to land subsidence are highly unlikely to ever occur in the Basin."[118]

The GSP identifies the Eel and Van Duzen Rivers as the "primary interconnected surface waters within the boundary of the Basin, and presumably portions of Yager Creek and Salt River."[119] The GSP adds that additional "surface waters within the basin include the coastal wetlands, springs, and tributary streams within the uplands." [120] The GSP indicates that where there is coupled "groundwater/surface water level monitoring at County monitoring wells MW-1, MW-2, and MW-3 along the left bank of the Eel River show strong connections with, and dynamic relationship between the river and the adjacent alluvial aquifer a shows strong interconnection between rivers and the adjacent alluvial aquifer along Eel River and Van Duzen River."[121] Similarly, the GSP's discussion of Van Duzen River and Yager Creek states, "the groundwater levels within the aquifer show a rapid response to rises in surface water"[122]. The GSP indicates that "the County monitoring well network was significantly expanded in 2021, with a portion of the well network specifically located to provide the ability to monitor groundwater levels near the Eel River and Van Duzen River channels."[123] The GSP also describes having installed transducers in all monitoring wells, which will "provide valuable resolution on the groundwater-surface water relationships through these critical reaches."[124] Using the expanded monitoring well network and recent surface flow studies, the GSP describes the incorporation of "empirical data to support refining the Hydrogeologic Conceptual Model, developing and calibrating the integrated groundwater surface water model, and

[115] Eel River Valley GSP, Section 4.4.6, p. 66.
[116] Eel River Valley GSP, Section 4.5, p. 66; Figure 15, p. 184.
[117] Eel River Valley GSP, Section 4.5, p. 66.
[118] Eel River Valley GSP, Section 4.5, p. 66.
[119] Eel River Valley GSP, Section 4.6, p. 66.
[120] Eel River Valley GSP, Section 4.6, p. 66.
[121] Eel River Valley GSP, Section 4.6.1, p. 68.
[122] Eel River Valley GSP, Section 4.6.2, p. 70.
[123] Eel River Valley GSP, Section 4.6, p. 66.
[124] Eel River Valley GSP, Section 4.6, p. 66.

improving the understanding of the groundwater-surface water interactions along the Eel and Van Duzen Rivers."[125]

The GSP notes that the evaluation and quantification of surface water depletion due to groundwater extraction is a challenge due to the complexity and variability of the groundwater/surface interchange.[126] Department staff recognize that understanding of the complex interplay between groundwater and surface water will continue to evolve with the collection and analysis of additional data from the recently expanded monitoring network and further model refinement and encourages the GSA to incorporate results into future periodic evaluations.

The GSP incorporates "information and findings"[127] from the Assessment of Groundwater Dependent Ecosystems for the Eel River Valley Basin Groundwater Sustainability Plan (Groundwater Dependent Ecosystems Assessment Technical Memorandum) found in the appendix.[128] The GSP utilized a decision tree framework, to "determine when species or biological communities were considered groundwater-dependent based on definitions found in the 23 CCR § 351(m) (State of California 2021) and Rohde et al. (2018)."[129] The GSP provides a figure of the Basin identifying four groundwater dependent ecosystem units.[130] All four of the groundwater dependent ecosystem units "were found to have high ecological value for aquatic and terrestrial GDEs based on the presence of directly or indirectly groundwater-dependent special status species and identified critical habitat."[131]

The GSP identifies eight special status fish, one mollusk, five amphibian, one reptile, 14 bird, and one bat species that have habitat and/or migration paths within the mapped groundwater dependent ecosystem units.[132] Furthermore, Basin groundwater dependent ecosystems contain designated critical habitat for seven federally listed species including both bird and fish species. [133] The GSP also discusses various effects of climate change on groundwater dependent ecosystems.[134]

The GSP describes the potential effects on each groundwater dependent ecosystem unit based on three primary criteria and summarizes findings.[135] The GSP describes that the, "ecological condition of GDEs is good based on stable NDVI data in all four GDE units"; acknowledges "potential for effects of groundwater management on these GDEs is uncertain" due to short term data and steady groundwater conditions; and states that "modeling suggested that pumping is unlikely to have a significant effect on fish passage

[125] Eel River Valley GSP, Section 4.6.5, p. 71.
[126] Eel River Valley GSP, Hydrological Model Technical Memorandum, p. 43.
[127] Eel River Valley GSP, Section 4.7, pp. 73.
[128] Eel River Valley GSP, Section 4.7, pp. 73-79.
[129] Eel River Valley GSP, Section 4.7.1, pp. 74.
[130] Eel River Valley GSP, Groundwater Dependent Ecosystems Assessment Technical Memo., p. 266.
[131] Eel River Valley GSP, Section 4.7.6, pp. 79.
[132] Eel River Valley GSP, Section 4.7.3, pp. 75-76.
[133] Eel River Valley GSP, Section 4.7.4, p. 77.
[134] Eel River Valley GSP, Section 4.7.5, pp. 78-79.
[135] Eel River Valley GSP, Section 4.7.6, pp. 79.

in the Middle Eel River unless groundwater withdrawals are increased by more than 150% in the September to November period when fish passage is most likely to be impaired."[136] The GSP closes this section by stating, continued "monitoring of GDE health through remote sensing and monitoring of future fish passage conditions once the GSP is adopted will help to ensure that GDE health and fish passage conditions are not being adversely impacted by groundwater management."[137]

Although the Plan lacks some detail and Department staff encourage additional information be provided in the GSP periodic evaluation, 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 Basin's groundwater conditions 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.

4.2.3 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,[138] and the sustainable yield.[139]

The Eel River Valley Groundwater Sustainability Plan provides a water budget for water years 2011 – 2020 for the Eel River Valley Basin (Basin)[140]. The GSP utilizes MODFLOW-2005, an integrated surface water/groundwater model, for the water budget analysis. The water budget information is provided in tabular and graphical format and is quantified by water source type and water use sectors as annual volumes.[141]

The historical water budget provides an estimate of the total surface water entering and leaving the Basin. The surface water inflows to the Basin include streamflow, precipitation runoff to streams, wastewater discharge, and groundwater seepage into creeks.[142] Stream flows from Eel River at Scotia [USGS 11477000] and from Van Duzen River at Bridgeville [USGS 11478500][143] contribute the most significant amount water to the total surface water inflow. On average, 49% of the total surface water inflows are stream flows from the rivers at the two sites.[144] Precipitation over the Basin is estimated using the Ferndale station data, which has the longest precipitation record (since October 1963) in

[136] Eel River Valley GSP, Section 4.7.6, pp. 79.
[137] Eel River Valley GSP, Section 4.7.6, pp. 79.
[138] 23 CCR §§ 354.18 (a), 354.18 (c) *et seq*.
[139] 23 CCR § 354.18 (b)(7).
[140] Eel River Valley GSP, Section 5.5.1, p. 99.
[141] Eel River Valley GSP, Section 5, pp. 80-109.
[142] Eel River Valley GSP, Section 5.4.1, pp. 88-90.
[143] Eel River Valley GSP, Section 5.4.1, p.88.
[144] Eel River Velley GSP, Section 5.4.1, pp. 89-90.

the Basin.[145] The estimated precipitation runoff to streams ranges from a minimum of 2,480,000 acre-ft (Dry water year, 2020) to a maximum of 8,220,000 acre-feet (2017, Wet water year)[146].

The GSP describes that PRMS, the runoff computation component of the integrated surface water/groundwater model (MODFLOW-2005), estimates the monthly flow rates and yearly total volume of runoff entering streams. and is "also used to estimate the un-gaged streams in the Yager, Salt River, and Price Creek drainages."[147] The GSP states that "the PRMS estimates runoff from areas of these contributing watersheds that are outside of the Basin boundary."[148] Department staff note that precipitation runoff entering streams appears to be overestimated, as it is an order of magnitude greater than the total amount of rainfall reported in the Plan for the entire watershed, and encourage the GSA to refine or confirm the modeled precipitation runoff values.

The GSP provides an estimate of total inflow[149] and outflow[150] from the groundwater system.

The GSP shows the annual and cumulative storage changes in spring and fall within the quaternary alluvium between 2000 and 2020, including different water year types (wet, above normal, below normal, dry, and critical).[151] The annual and cumulative changes are calculated relative to spring groundwater elevation in 2013 which is close to the average historical spring groundwater elevation.[152] The largest historical annual change in spring storage was approximately 60,000 acre-feet. In comparison, the largest annual change in the fall storage is about 15,000 acre-feet.[153] The GSP also estimates the total freshwater volume of water in storage in the alluvial and underlying Carlotta aquifers in the Basin. The GSP states that based on calculations made in the hydrologic model "the total volume of fresh water within the basin exceeds 6,000,000 acre-feet."[154] Freshwater was defined as groundwater with chloride concentrations below the Secondary Drinking Water Standard of 250 mg/L and was determined using the seawater intrusion model.[155] For the purpose of "calculating and presenting cumulative storage change", the GSP incorporates data from CASGEM sites as the "groundwater levels recorded in the CASGEM wells provide the best opportunity to evaluate a long-term reference condition." [156] The GSP describes that the overall trends for both spring and fall

[145] Eel River Valley GSP, Section 5.4.1, p. 89.
[146] Eel River Valley GSP, Table 15, p. 90.
[147] Eel River Velley GSP, Section 5.4.1, p. 88.
[148] Eel River Velley GSP, Section 5.4.1, p. 88.
[149] Eel River Velley GSP, Section 5.4.2, pp. 90-92.
[150] Eel River Velley GSP, Section 5.4.2, pp. 94-97.
[151] Eel River Valley GSP, Chart 2, p. 60.
[152] Eel River Valley GSP, Section 4.2, p. 59.
[153] Eel River Valley GSP, Chart 2, p. 60.
[154] Eel River Valley GSP, Section 4.2, pp. 58-60.
[155] Eel River Valley GSP, Section 4.2, p.59.
[156] Eel River Valley GSP, Section 4.2, p.59.

cumulative change in groundwater storage, “indicate that a reduction in storage over time is not occurring.”[157]

The GSP Regulations require that a historical water budget and a current water budget be provided in the GSP[158]. The historical water budget information is primarily used to evaluate availability or reliability of historical surface water supply and calibrate and reduce the uncertainty of the tools and methods, while the current water budget information is used to quantify current inflows and outflows using the most recent information.[159] It appears that the GSP uses the same period, 2011 – 2020, as both the current [160] and historical water budget period.[161]

The GSP states that “the Basin is not chronically overdrafted” and that for the simulated period (2011-2020), “the average change in modeled groundwater storage was a deficit of 621 acre-feet.”[162] Most elements of the historical water budget are well described in the GSP and appear to use best available science and information.

The GSP discusses uncertainties associated with the water budget calculation. The uncertainties include “imperfect data on subbasin geology and hydrology, and assumptions surrounding unmetered groundwater pumping.”[163] The GSP states that the projected water budget is “generated (or gauged for consistency with previous water budget descriptions) using historical hydrologic data, PRMS surface water model, and MODFLOWNWT…” and that projected “changes in land use, population, climate, and sea level are incorporated into the projected water budget”. The GSP describes that the “projected water budget extrapolates historical and current subbasin parameters through water year 2071.”[164] The GSP concludes that the “the projected future water budget for the Basin is equivalent (within the associated levels of uncertainty) to the current water budget (Section 5.5), due to the anticipated limited effects from climate change, limited land use changes, and population growth within the next 50 years.”[165]

The GSP provides an estimate of Basin sustainable yield while considering sustainable management criteria related to depletion of interconnected surface waters.[166] The GSP focused the general approach “on fish passage criteria and the minimum water depth required for passage of adult salmon.”[167] The GSP estimates that if current pumping is increased by 100%, the stage decline in the critical reach would be less than 0.1 ft and that the volume of annual groundwater withdrawal corresponding to a 100% increase is

[157] Eel River Valley GSP, Section 4.2, p.59; Chart 2, p. 60.
[158] 23 CCR § 354.18.
[159] 23 CCR § 354.18 (c)(1)-(2).
[160] Eel River Valley GSP, Section 5.5.2, p. 100.
[161] Eel River Valley GSP, Section 5.5.2, p. 99.
[162] Eel River Valley GSP, Section 5.4.5, p. 98.
[163] Eel River Valley GSP, Section 5.6, pp. 104-105.
[164] Eel River Valley GSP, Section 5.7, p.106.
[165] Eel River Valley GSP, Section 5.7, pp. 109.
[166] Eel River Valley GSP, Section 6.1.3, p.139.
[167] Eel River Valley GSP, Section 6.11, pp. 131.

30,000 acre-feet.[168] Based on this, the GSP states that the "sustainable yield for the Basin is estimated to be at least 30,000 acre-feet per year," and it's "important to recognize that this value is based on numerically modeled outputs and thus has inherent uncertainty."[169] The GSP notes that "conservative assumptions" were used for developing minimum thresholds for sustainable management criteria for depletion of interconnected surface water and that "the value of 30,000 acre-feet/year should be considered a minimum estimate of the Basin's sustainable yield."[170]

Despite noting that precipitation runoff may be overestimated, Department staff conclude the historical, current, and projected water budgets included in the Plan substantially comply with the requirements outlined in the GSP Regulations. The GSP provides the required historical, current, and future accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the Basin including an estimate of the sustainable yield 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.[171]

The Humboldt County GSA has determined that the Basin will be managed as a whole rather than designating management areas.[172]

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.[173]

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

[168] Eel River Valley GSP, Section 6.13, p. 139.
[169] Eel River Valley GSP, Section 6.13, p. 139.
[170] Eel River Valley GSP, Section 6.13, p. 139.
[171] 23 CCR § 354.20.
[172] Eel River Valley GSP, Section 6.2, p. 112.
[173] 23 CCR § 354.22 *et seq*.

and should include an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation.[174]

The sustainability goal for the Basin is ”to maintain high-quality and abundant groundwater resources in the Eel River Valley Groundwater Basin to support existing and long-term community needs without causing undesirable results.”[175] The sustainability goal was developed based on the current understanding of the Basin’s hydrogeology, groundwater conditions, and overall water budget.[176] The GSP states that the “sustainability goal of maintaining high-quality and abundant groundwater resources in the Basin to support existing and long-term community needs for drinking water and personal use, agricultural irrigation, industrial process water, and ecosystem services without causing undesirable results, as defined under SGMA, is currently being met within the Basin. Therefore, projects and management actions are not needed to achieve sustainability.”[177] The GSP continues, stating that the GSA does plan to pursue projects and management actions that “focus on continued monitoring, improving water resilience, and developing additional understanding of the Basin to ensure changing conditions do not cause undesirable results.”[178]

Based on review of the GSP, Department staff find that the GSP’s discussion and presentation of information related to the Basin’s sustainability goal covers the specific items listed in 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.[179] 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[180] – 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

[174] 23 CCR § 354.24.
[175] Eel River Valley GSP, Section 6.3, p. 111.
[176] Eel River Valley GSP, Section 6.3, p. 111.
[177] Eel River Valley GSP, Section 8.2, p. 151.
[178] Eel River Valley GSP, Section 8.2, p. 151.
[179] 23 CCR § 351(ah).
[180] Water Code § 10721(x).

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.[181] 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 on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.[182]

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.[183] GSAs are required to describe how conditions at minimum thresholds may affect beneficial uses and users,[184] 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.[185]

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.[186] 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.[187]

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 Basin, 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.[188]

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

[181] 23 CCR §§ 354.26 (a), 354.26 (b)(c).
[182] 23 CCR § 354.26 (b)(2).
[183] 23 CCR § 354.28 (b)(1).
[184] 23 CCR § 354.28 (b)(4).
[185] 23 CCR § 354.28 (b)(2).
[186] 23 CCR § 354.30 (a).
[187] 23 CCR § 354.30 (b).
[188] 23 CCR § 354.26 (d).

about groundwater elevation conditions and potential effects on other sustainability indicators.[189]

The GSP defined significant and unreasonable for chronic lowering of groundwater levels as "a substantial number of private, agricultural, industrial, and/or municipal production wells could no longer provide sufficient groundwater to supply beneficial uses."[190]

The GSP defines an undesirable result for chronic lowering of groundwater levels as either:[191]

- groundwater levels in four or more representative monitoring sites fall below their minimum threshold over the course of any one year; or
- groundwater levels in two or more representative monitoring sites fall below their minimum threshold for two sequential years.

The GSP defines minimum thresholds for chronic lowering of groundwater levels as the "magnitude of groundwater level lowering [that] would cause 10% or more of the wells within each region to have less than ten feet of water."[192]

A Study Area that focused on the Basin's alluvial valley was selected because it encompassed the highest concentration of groundwater wells with sufficient historical data to establish baseline conditions.[193] The GSA selected study wells by querying the Department's well completion report database, the GSA ultimately identified 140 groundwater wells to include in the analysis.[194] The Study Area was subdivided into analysis units which were subsequently defined as the West Threshold Region, which generally contained deeper wells, and the East Threshold Region, which generally contained shallower wells.[195] The GSA established baseline groundwater elevations by quantifying the average fall groundwater elevation at a subset of wells to estimate the average fall groundwater elevation at each study well.[196] The GSA subsequently compared the elevation of the bottom of study wells, the baseline groundwater elevation, and groundwater elevations associated with future lowering scenarios, to determine the groundwater level declines which would result in 10% of wells being potentially impacted.[197]

This analysis determined that a 13-foot groundwater elevation decline in the West Threshold Region, and a four-foot groundwater elevation decline in the East Threshold

[189] 23 CCR § 354.28(c)(1) *et seq*.
[190] Eel River Valley GSP, Section 6.6.2, p. 115.
[191] Eel River Valley GSP, Section 6.6.5, p. 119.
[192] Eel River Valley GSP, Section 6.6.3.1, p. 117.
[193] Eel River Valley GSP, Section 6.6.3.1, p. 115.
[194] Eel River Valley GSP, Section 6.6.3.1, p.116.
[195] Eel River Valley GSP, Section 6.6.3.1, p.116.
[196] Eel River Valley GSP, Section 6.6.3.1, p.116 and Table 22, p. 118.
[197] Eel River Valley GSP, Section 6.6.3.1, pp.116-117.

Region, would result in 10% of wells in each region being potentially impacted.[198] The GSP includes 24 representative monitoring wells, 9 in the West Threshold Region and 15 in the East Threshold Region.[199] Minimum thresholds at representative monitoring sites in the West Threshold Region were set at 13-feet below each well's average fall groundwater elevation, and minimum thresholds at representative monitoring sites in the East Threshold Region were set at four-feet below each well's fall groundwater elevation.[200] The GSP presents the minimum thresholds for each representative monitoring site in a table.[201] Additionally, the GSP summarizes the relationship between the minimum thresholds for all applicable sustainability indicators in a table.[202]

Department staff conclude that the GSP's undesirable result definition, and the criteria used to define when and where an undesirable result becomes present, meet the intent of the GSP Regulations. However, the Study Area approach employed by the GSA results in a significant portion of the basin excluded from detailed analysis, and the Plan does not provide information to demonstrate that conditions in areas outside the Study Areas were specifically evaluated or would be sufficiently protected by adherence to standards adopted for those areas.[203] Without additional information, it is not known whether beneficial uses and users in areas outside the Study Area have been considered and are adequately protected by SMCs devised for those areas. Department staff recommend that the GSA expand its Study Area to include the entirety of the Basin and establish criteria to define the presence of an undesirable result for the previously excluded portions of the Basin, or provide evidence demonstrating that conditions in the Study Areas can reasonably be extrapolated to, and are sufficiently protective of, beneficial uses and users in those outlying areas (see Recommended Corrective Action 2a).

Department staff note that while the GSA states the proposed minimum thresholds for the chronic lowering of groundwater levels will be protective of approximately 93 percent of supply wells, the GSP does not disclose the number of wells that may be impacted or the location within the Subbasin where these wells are located. The GSA should disclose any impacts to beneficial uses and users (including well owners) that may occur in the Subbasin. Department staff encourage the GSA to utilize the Department's Drinking Water Guidance as appropriate during plan implementation to assist with evaluating and assessing any potential impacts that may occur. Department staff recommend the GSAs consider the potential impacts to supply wells, including domestic wells, and identify the number and location of potentially impacted wells at the selected minimum thresholds for chronic lowering of groundwater levels (see Recommended Corrective Action 2b).

[198] Eel River Valley GSP, Section 6.6.3.1, p.117.
[199] Eel River Valley GSP, Table 22, p. 118.
[200] Eel River Valley GSP, Section 6.6.3.1, p.117.
[201] Eel River Valley GSP, Section 6.6.3.1, Table 22, p.118.
[202] Eel River Valley GSP, Section 6.12, Table 26, p.138.
[203] Eel River Valley GSP, Figure 37, p. 206.

The GSP defined measurable objectives for the chronic lowering of groundwater levels by modeling a 75% increased pumping scenario to estimate groundwater elevations at representative monitoring sites.[204] The model "predicted a groundwater elevation difference of 1.0 feet or more" for 14 of the representative monitoring wells.[205] For these wells the measurable objective was established "by subtracting the modeled groundwater elevation difference from the average fall groundwater elevation".[206] For the remaining representative monitoring wells, "the model predicted a groundwater elevation difference of less than 1.0 feet", and for "these sites the measurable objective was established by adding 1.0 feet to the minimum threshold."[207] The GSP presents the measurable objectives for each representative monitoring site in a table.[208] Additionally, the GSP summarizes the relationship between the measurable objectives for all applicable sustainability indicators in a table.[209]

Despite the recommended corrective actions, the GSP's discussion of minimum threshold and measurable objectives for the chronic lowering of groundwater levels seems to be comprehensive and includes adequate support, justification, and information to understand the GSA's process, analysis, and rationale. Although Department staff have requested the GSA develop sustainability criteria that cover the entire Basin and all principal aquifers, this should not preclude plan approval at this time since the Basin is not experiencing overdraft and proposed to maintain water levels near the historical range. 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.

4.3.2.2 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 sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.[210]

The GSP states that the "reduction in groundwater storage SMC will be evaluated using groundwater levels as a proxy based on [the] well-established hydrogeologic principle

[204] Eel River Valley GSP, Section 6.6.4, p. 119.
[205] Eel River Valley GSP, Section 6.6.4, p. 119.
[206] Eel River Valley GSP, Section 6.6.4, p. 119.
[207] Eel River Valley GSP, Section 6.6.4, p. 119.
[208] Eel River Valley GSP, Section 6.6.3.1, Table 22, p.118.
[209] Eel River Valley GSP, Section 6.12, Table 26, p.138.
[210] 23 CCR § 354.28(c)(2).

that the volume of groundwater in storage is directly proportional to groundwater elevations."[211]

Additionally, the GSP developed groundwater storage sustainability criteria based on the estimated sustainable yield. The GSP states that the sustainable yield "of the Basin is at least 30,000 acre-feet per year, based on an average across the five water year types."[212] The GSP states that historical "trends for groundwater levels are stable" and "water use in the Basin is projected to remain comparable to current conditions."[213]

The GSP defines significant and unreasonable for the reduction of groundwater storage as, "if the net volume of groundwater extractions causes other sustainability indicators to have undesirable results."[214]

The GSP defines the undesirable result for reduction of groundwater storage as, "if the total annual average groundwater extraction over a three-year period exceeds the sustainable yield."[215]

The GSP defines the minimum threshold for reduction of groundwater storage as equal to the Basin's sustainable yield (30,000 acre-feet per year).[216]

The GSP defines the measurable objective for the reduction in groundwater storage as a target volume of annual groundwater use which provides a protective buffer above the minimum threshold.[217] The measurable objective is 22,500 acre-feet per year, which is 75% of the sustainable yield and the minimum threshold.[218]

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 find 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

[211] Eel River Valley GSP, Section 6.7.1, p. 120.
[212] Eel River Valley GSP, Section 6.7.3, p. 120.
[213] Eel River Valley GSP, Section 6.7.3, p. 120.
[214] Eel River Valley GSP, Section 6.7.2, p. 120.
[215] Eel River Valley GSP, Section 6.7.5, p. 121.
[216] Eel River Valley GSP, Section 6.7.3, p. 120.
[217] Eel River Valley GSP, Section 6.7.4, p. 120.
[218] Eel River Valley GSP, Section 6.7.4, p. 121.

by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results.[219]

The GSP defines significant and unreasonable conditions for seawater intrusion as when "a substantial number of unintruded wells become impacted by seawater due to groundwater conditions and can no longer provide sufficient groundwater to supply beneficial uses."[220] The GSP defines an intruded well as a groundwater well with chloride concentrations of 250 mg/L or greater, and defines an unintruded well as a groundwater well with chloride concentrations of less than 250 mg/L.[221] The GSP uses 250 mg/L since this concentration is the secondary maximum contaminant level (MCL) for chloride in drinking water.[222]

The GSP defines the undesirable result for seawater intrusion as when "one or more of the following scenarios occurs:

- Chloride concentrations in two or more unintruded wells within the network of representative monitoring sites exceed their minimum thresholds over the course of two consecutive monitoring events.
- Chloride concentrations in two or more intruded wells within the network of representative monitoring sites exceed their minimum thresholds over the course of two consecutive monitoring events.
- Groundwater levels in two or more wells within the network of representative monitoring sites fall below their minimum thresholds for two sequential years."[223]

The GSP defines minimum thresholds and measurable objectives for seawater intrusion based on measured chloride concentrations as well as modeled groundwater levels.

Chloride Concentrations

The GSP defines minimum thresholds for seawater intrusion based on measured chloride concentrations as:

- "Unintruded wells with historical ranges less than 100 mg/L – minimum threshold is 125 mg/L
- Unintruded wells with historical ranges between 100 mg/L and 250 mg/L – minimum threshold of 250 mg/L
- Intruded wells with historical ranges between 250 mg/L and 500 mg/L – minimum threshold of 500 mg/L"[224]

[219] 23 CCR § 354.28(c)(3).
[220] Eel River Valley GSP, Section 6.8.2, p. 122.
[221] Eel River Valley GSP, Section 6.8.1, p. 121.
[222] Eel River Valley GSP, Section 6.8.1, p. 121.
[223] Eel River Valley GSP, Section 6.8.5, p. 127.
[224] Eel River Valley GSP, Section 6.8.3.1, p. 122.

The GSP states that "Wells were chosen for consistency with historical monitoring and to provide wells located both seaward and landward of the recent 100 mg/L isocontour. A total of 20 representative monitoring sites were selected for monitoring seawater intrusion."[225] The GSP further states that this "tiered approach was developed to ensure that any increasing trends in chloride concentrations will be detected in advance of potentially irreversible impacts from seawater intrusion." [226] The GSP presents the minimum thresholds for each representative monitoring site in a table.[227] Additionally, the GSP summarizes the relationship between the minimum thresholds for all applicable sustainability indicators in a table.[228]

The GSP states "measurable objectives for chloride concentrations were established by using professional judgment to select concentrations slightly below the historical maximum measured concentrations." [229] The GSP notes that "Some of these representative monitoring sites have only two historical samples so there is limited data on which to draw conclusions" and that these "objectives may be adjusted in the future based on additional monitoring data."[230] The GSP presents the measurable objectives for chloride concentrations in a table.[231] Additionally, the GSP summarizes the relationship between the measurable objectives for all applicable sustainability indicators in a table.[232]

Groundwater Levels

The GSP defines minimum thresholds for seawater intrusion based on groundwater levels as: [233]

- Wells generally located near the 100 mg/L chloride isocontour line — 3.8 ft NAVD88 (approximately 0-feet mean sea level)
- Wells further inland of the 100 mg/L chloride isocontour line — 4.8 or 5.8 feet NAVD88 (based on the natural fall groundwater gradient)
- Wells coastward of the of the 100 mg/L chloride isocontour line — 0.8 feet NAVD88

The GSP presents the water level minimum threshold values for each representative monitoring site on a table.[234] Additionally, the GSP summarizes the relationship between the minimum thresholds for all applicable sustainability indicators in a table.[235]

[225] Eel River Valley GSP, Section 6.8.3.1, p. 122.
[226] Eel River Valley GSP, Section 6.8.3.1, p. 122.
[227] Eel River Valley GSP, Section 6.8.3.1, Table 23, p.123.
[228] Eel River Valley GSP, Section 6.12, Table 26, p.138.
[229] Eel River Valley GSP, Section 6.8.4.2, p. 127.
[230] Eel River Valley GSP, Section 6.8.4.1, p. 126.
[231] Eel River Valley GSP, Section 6.8.3.1, Table 23, p. 123.
[232] Eel River Valley GSP, Section 6.12, Table 26, p.138.
[233] Eel River Valley GSP, Section 6.8.3.1, p. 125.
[234] Eel River Valley GSP, Section 6.8.3.2, Table 24, p. 125.
[235] Eel River Valley GSP, Section 6.12, Table 26, p.138.

The GSP states measurable objectives for groundwater levels "were developed using the methodology described in [measurable objectives for chronic lowering of groundwater levels]."[236] The GSP presents the measurable objectives for chloride concentrations in a table.[237] Additionally, the GSP summarizes the relationship between the measurable objectives for all applicable sustainability indicators in a table.[238]

The GSP considers minimum thresholds and effects on beneficial uses and users by stating that the "minimum thresholds for seawater intrusion associated with chloride concentrations are generally advantageous to beneficial users and land uses in the western portion of the Basin near the coast. For agricultural, municipal, and domestic land uses and users, the minimum thresholds protect users' ability to meet their water supply needs by maintaining chloride concentrations at levels that will not impact their supply wells. For ecological land uses and users, the minimum thresholds will help maintain a balance of fresh, brackish, and saline conditions."[239]

GSP's discussion of minimum threshold and measurable objectives for seawater intrusion seems to be comprehensive and includes adequate support, justification, and information to understand the GSA's process, analysis, and rationale. 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.

4.3.2.4 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.[240]

The GSP states that degraded water quality would be considered significant and unreasonable "if direct actions by the Humboldt County GSA to implement this GSP result in adverse impacts on beneficial users or uses of groundwater."[241] The GSP continues by stating that its primary focus is "to ensure that activities associated with implementing the GSP do not degrade current water quality conditions."[242] The GSP additionally states that "GSAs are not responsible for enforcing water quality standards or for collecting data

[236] Eel River Valley GSP, Section 6.8.3.2, p.126.
[237] Eel River Valley GSP, Section 6.8.3.2, Table 24, p.126
[238] Eel River Valley GSP, Section 6.12, Table 26, p.138.
[239] Eel River Valley GSP, Section 6.8.3.1, p. 124.
[240] 23 CCR § 354.28(c)(4).
[241] Eel River Valley GSP, Section 6.9.2, p. 128.
[242] Eel River Valley GSP, Section 6.9.1, p. 127.

to support existing water quality programs. In addition, GSAs are not responsible for mitigating elevated background levels of chemical constituents."[243]

The GSA analyzed groundwater quality in the Basin using existing data and by monitoring 15 County of Humboldt groundwater monitoring wells in 2021. The GSA determined that most constituents were below their MCLs, however, arsenic concentrations in several wells were greater than the MCL.[244] As a result, the GSP established sustainable management criteria for arsenic alone.

The GSP defines the undesirable result for degraded water quality as, "if two supply wells exceed the arsenic MCL of 10 ug/L as a direct result of projects or management actions taken as part of GSP implementation."[245] The GSP additionally states "Changes in groundwater quality that are independent of GSA activities would not constitute an undesirable result. If the raw water from a municipal supplier in the Basin has a detection of arsenic above the MCL, then the Humboldt County GSA would evaluate whether GSA activities were a potential factor in the exceedance of the concentration levels."[246]

The GSP's description of significant and unreasonable conditions and definition for undesirable results for degraded water quality, which solely focus on water quality impacts caused directly by the GSA implementing an action, represents an improperly narrow reading of SGMA. SGMA includes in its definition of undesirable results the "significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies."[247] SGMA specifies that the significant and unreasonable effects are those "caused by groundwater conditions occurring throughout the basin," which does not limit them to only impacts directly caused by a GSA's implementation of physical projects or actions in the basin. As currently defined in the GSP, if for instance, a minimum threshold exceedance occurs because of mobilization of naturally occurring constituents or migration of a contaminant plume to supply wells caused by groundwater pumping in the Subbasin, but the GSA has not implemented any pumping regulations, the GSP would not identify this as an undesirable result. Staff consider this to be inconsistent with the intent of SGMA, which requires GSAs to ensure management of groundwater conditions in the Subbasin, including any action taken by the GSA, will not significantly and unreasonably degrade water quality. Therefore, degraded water quality caused by groundwater pumping, changes in groundwater levels, changes in the direction of groundwater flow, or changes in horizontal or vertical movement of groundwater within the Subbasin, whether the GSA has implemented pumping regulations or not, should be considered in the assessment of undesirable results in the Subbasin. Department staff recommend the GSA revise the description of significant and unreasonable conditions and undesirable results such that groundwater

[243] Eel River Valley GSP, Section 6.9.1, p. 127.
[244] Eel River Valley GSP, Section 4.4.4, p. 64 and Section 4.4.6, p.65.
[245] Eel River Valley GSP, Section 6.9.5, p. 129.
[246] Eel River Valley GSP, Section 6.9.5, p. 129.
[247] Water Code § 10721(x)

pumping and other factors, whether due to action or inaction of the GSA with respect to Subbasin management, are considered and not excluded (see Recommended Corrective Action 3).

The GSP defines the minimum threshold for degraded water quality as "Two supply wells exceeding the arsenic MCL of 10 ug/L."[248] The GSP's representative monitoring wells are all groundwater supply wells of municipal water suppliers in the Basin. [249]

The GSP considers how the minimum threshold could impact beneficial uses and users, stating that the "minimum thresholds for degraded water quality are generally advantageous to beneficial users and land uses. For municipal and domestic water users, the minimum thresholds protect users' ability to meet their water supply needs by maintaining arsenic concentrations below drinking water standards. For ecological land uses and users, the minimum thresholds will help avoid water quality impacts to GDEs."[250]

The GSP defines the measurable objective for degraded water quality as "No supply wells exceeding the arsenic MCL of 10 ug/L."[251]

Despite the identified recommended corrective actions surrounding the definitions of significant and unreasonable conditions and undesirable results being tied solely to GSA actions, Department staff consider the GSP's approach for its water quality sustainable management criteria to be generally reasonable and consistent with the GSP Regulations. Additionally, staff conclude that the GSP's discussion and presentation of information on degradation of water quality substantially covers the specific items listed in the Regulations in an understandable format and the sustainability criteria for degraded water quality are set to prevent an increase in the number of municipal supply wells with exceedances. Additionally, based on the minimum thresholds established for groundwater levels, the GSA does not intend to significantly lower groundwater levels below the lowest levels historically observed in the Subbasin, which would otherwise, potentially result in the migration of contaminants, changes in concentrations of contaminants due to reduction in volume of groundwater in the Subbasin, or release of naturally occurring constituents.

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.[252] 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

[248] Eel River Valley GSP, Section 6.9.3, p. 128.
[249] Eel River Valley GSP, Section 6.9.3, p. 128.
[250] Eel River Valley GSP, Section 6.9.3, p. 128.
[251] Eel River Valley GSP, Section 6.9.4, p. 129.
[252] 23 CCR § 354.28(c)(5).

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.[253]

The GSP did not establish sustainable management criteria for the land subsidence sustainability indicator. The GSP states that there "is no known evidence of land subsidence associated with groundwater extraction in the Basin."[254] The GSP further states that the "relative stability and consistency in the range of groundwater elevation fluctuations and the small impact that groundwater use has on these levels suggests that the conditions that could lead to land subsidence are highly unlikely to ever occur in the Basin."[255] The GSP continues, "[the] Basin is susceptible to subsidence (or uplift) caused by seismic activity associated with the Cascadia Subduction Zone, but land subsidence caused by groundwater conditions is not considered to be a concern in the Basin for the following reasons:

- The majority of the sediments within the zone of groundwater fluctuation consist of granular deposits.
- Some thick deposits of silt and clay can be found within the vicinity of Ferndale, but these areas are not generally tapped for groundwater due to their poor water-bearing characteristics.
- The total fluctuation of groundwater elevations within the Basin is generally less than 10 feet.
- Land surface movement, where it is occurring, is most likely caused by seismic activity rather than groundwater pumping."[256]

Finally, the GSP describes that due to the "granular nature of the aquifer materials, the relative stability and consistency in the range of groundwater elevation fluctuations, and the narrow range of annual groundwater fluctuation support the conclusion that the conditions that could lead to land subsidence caused by groundwater pumping do not exist in the Basin. Therefore, SMCs were not developed for this sustainability indicator."[257]

The GSP presents a figure of cumulative land subsidence based on the Department's InSAR dataset collected between 2015 and 2022, that illustrates the absence of historical land subsidence. [258]

[253] 23 CCR §§ 354.28(c)(5)(A-B).
[254] Eel River Valley GSP, Section 4.5, p. 66.
[255] Eel River Valley GSP, Section 4.5, p. 66.
[256] Eel River Valley GSP, Section 6.10, p. 129.
[257] Eel River Valley GSP, Section 6.10, p. 129.
[258] Eel River Valley GSP, Figure 15, p. 184.

Department staff have determined that the lack of historical land subsidence, coupled with the Basin's lithology, hydrogeologic conditions, and lack of projected groundwater level declines, is adequate to demonstrate that land subsidence undesirable results are not present and are not likely to occur. Therefore, based on information presented in this Plan, Department staff agrees that sustainable management criteria for land subsidence are not necessary at this time. Although the GSP has provided convincing evidence that subsidence is not a problem in this basin, Department staff encourage the GSA to continue to monitor land subsidence at a suitable level and by appropriate means.

4.3.2.6 Depletions of Interconnected Surface Water

SGMA defines undesirable results for the depletion of interconnected surface water as those that have significant and unreasonable adverse impacts on beneficial uses of surface water and are caused by groundwater conditions occurring throughout the basin.[259] 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.[260] 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.[261]

The Plan acknowledges the presence of interconnected surface waters in the Basin as the Eel River, Van Duzen River, Yager Creek, and likely portions of the Salt River, and other surface waters[262] and identifies their location by a combination of detailed mapping and decision matrix implementation. Department staff are satisfied that the GSA has adopted a reasonable approach to identify the location of interconnected surface waters in the Basin.

The GSP states that the depletion of interconnected surface water within the Basin would be considered significant and unreasonable "if surface water depletion caused by groundwater extraction degrades the beneficial uses of an interconnected surface water or threatens the viability of special-status species, and reasonable reductions or limitations in groundwater pumping could avoid these effects without jeopardizing other beneficial uses of groundwater."[263]

The GSP defined the undesirable result for interconnected surface water as existing "if one of the following scenarios occurs:

1. Groundwater pumping within the Basin increases by 100% above current levels.

[259] Water Code § 10721(x)(6).
[260] 23 CCR § 354.16 (f).
[261] 23 CCR § 354.28 (c)(6).
[262] Eel River Valley GSP, Section 6.11.1, p. 130.
[263] Eel River Valley GSP, Section 6.11.1, p. 130.

2. Groundwater levels in two or more wells within the network of representative monitoring sites for SMC #6 [depletion of interconnected surface water] fall below their minimum thresholds for two sequential years."[264]

The GSP does not quantify the rate or volume of surface water depletions due to groundwater pumping as the sustainable management criteria as required by the GSP Regulations.[265] However, the GSP defines minimum thresholds and measurable objectives for interconnected surface water depletion based on both modeled volume of groundwater pumping and measured groundwater levels. The GSP adds that if undesirable results exist in the Basin, "further analysis would be needed to determine if beneficial uses of the interconnected surface water are degraded or the viability of special-status species are threatened, and whether reasonable reductions or limitations in groundwater pumping could avoid these effects without jeopardizing other beneficial uses of groundwater."[266] 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 demonstrated by adequate evidence that groundwater elevation can serve as a sustainability indicator for the depletions of interconnected surface water.

The GSP states that the alluvial aquifer in the Basin is hydraulically connected to the Eel River, Van Duzen River, Yager Creek, and likely portions of the Salt River, and other surface waters.[267] However, Department staff note that nearly all of the Van Duzen River and Yager Creek are excluded from the GSP's defined "Study Area."[268] The GSA established minimum thresholds based on preventing a reduction in Eel River stage of 0.1-feet in order to limit the potential impact on riffle depth and fish passage, which are the beneficial uses of interconnected surface water within the Basin.[269] It is unclear why the GSA did not establish sustainable management criteria for other portions of the Basin where surface water is hydraulically connected to groundwater. Department staff recommend the GSA establish sustainable management criteria for the other portions of the Basin where surface water is hydraulically connected to groundwater including the Van Duzen River, Yager Creek, and portions of the Salt River (see Recommended Corrective Action 4a).

Volume of Groundwater Pumping

The GSP defines the minimum threshold for depletion of interconnected surface water based on groundwater pumping as, "100% increase from existing pumping conditions."[270] The GSP utilized the integrated groundwater-surface water model for the Basin to

[264] Eel River Valley GSP, Section 6.11.5, p. 137.
[265] 23 CCR § 354.28 (c)(6).
[266] Eel River Valley GSP, Section 6.11.5, p. 137.
[267] Eel River Valley GSP, Section 6.11.1, p. 130.
[268] Eel River Valley GSP, Figure 37, p. 207.
[269] Eel River Valley GSP, Section 6.11.3.1, p. 134.
[270] Eel River Valley GSP, Section 6.11.3.1, p. 133.

develop this minimum threshold.[271] The model was used to "Identify the lowest increased-pumping scenario that causes a decrease in river stage of 0.1 feet"[272] as a "reduction in stage of 0.1 feet was set as a conservative benchmark for potential impact on riffle depth and fish passage."[273] Simulation modeling using conservative assumptions indicated that groundwater pumping could increase by 150% relative to current conditions before the stage of the Eel River would be reduced by 0.1 feet at the downstream end of the study reach when fish passage conditions exist. The GSP states that "After comparing the modeled groundwater levels under the 150% increased pumping scenario with the minimum thresholds for SMC #1 [chronic lowering of groundwater levels], a decision was made to set the minimum threshold for SMC #6 [depletion of interconnected surface water] at the 100%-increase scenario as a precautionary measure."[274]

The GSP defines the measurable objective for depletion of interconnected surface water based on groundwater pumping as, "75% of the sustainable yield (30,000 acre-feet), resulting in 22,500 acre-feet of annual groundwater use."[275] The GSP notes that "This percentage was determined to provide a conservative buffer above the minimum threshold while still providing reasonable capacity for increases in groundwater use."[276]

Groundwater Levels

The GSP defines the minimum threshold for depletion of interconnected surface water based on groundwater levels in a process that includes "subtracting the modeled water level lowering (from Step 3) from the average fall water level (from Step 4) to develop the minimum threshold for the representative monitoring site." The process was repeated for each representative monitoring site and results are presented in a table. [277] Additionally, the GSP summarizes the relationship between the minimum thresholds for all applicable sustainability indicators in a table.[278]

As part of the process to define the minimum threshold for the depletion of interconnected surface water based on groundwater levels, the GSP describes the utilization of the hydrologic model "to explore rates of streamflow depletion associated with various pumping scenarios" and "to explore changes in groundwater levels at representative monitoring sites and support the development of groundwater level minimum thresholds for surface water depletion."[279]

Ultimately, "Seven wells were selected as representative monitoring sites for monitoring water levels associated with potential impacts to interconnected surface waters" and the

[271] Eel River Valley GSP, Section 6.11.3, p. 130.
[272] Eel River Valley GSP, Section 6.11.3.1, p. 133.
[273] Eel River Valley GSP, Section 6.11.3.1, p. 134.
[274] Eel River Valley GSP, Section 6.11.3.1, p. 134.
[275] Eel River Valley GSP, Section 6.11.4.1, p. 137.
[276] Eel River Valley GSP, Section 6.11.4.1, p. 137.
[277] Eel River Valley GSP, Section 6.11.3.2, Table 25, p.136.
[278] Eel River Valley GSP, Section 6.12, Table 26, p.138.
[279] Eel River Valley GSP, Section 6.11.3.2, p. 134.

GSP acknowledges that the "limited period of record for the County monitoring wells adds uncertainty to the assigned average fall groundwater levels and the minimum thresholds", further stating that as "additional data is collected and analyzed, the defined average fall levels may change and the minimum thresholds may be adjusted."[280]

The GSP states the measurable objective for depletion of interconnected surface water based on groundwater levels "were developed using the methodology described in [measurable objectives for chronic lowering of groundwater levels]." The GSP presents the measurable objectives for depletion of interconnected surface water in a table.[281] Additionally, the GSP summarizes the relationship between the measurable objectives for all applicable sustainability indicators in a table.[282]

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 believe 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 GSA, where applicable, should consider incorporating appropriate guidance approaches into their future periodic updates to the GSP (see Recommended Corrective Action 4b). 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 4c). 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 4d).

[280] Eel River Valley GSP, Section 6.11.3.2, p. 135.
[281] Eel River Valley GSP, Section 6.11.3.1, Table 25, p.136.
[282] Eel River Valley GSP, Section 6.12, Table 26, p.138.

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 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.[283] Specifically, a monitoring network must be able to monitor impacts to beneficial uses and users,[284] monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds,[285] capture seasonal low and high conditions,[286] include required information such as location and well construction and include maps and tables clearly showing the monitoring site type, location, and frequency.[287] Department staff encourage GSAs to collect monitoring data as specified in the GSP, follow SGMA data and reporting standards,[288] fill data gaps identified in the GSP prior to the first periodic evaluation,[289] update monitoring network information as needed, follow monitoring best management practices,[290] 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 GSA's basin understanding may not represent the best available science for use to monitor basin conditions.

The GSP describes a groundwater level monitoring network that "includes 37 County wells and four CASGEM wells for measuring groundwater levels."[291] Data collection frequency ranges from semi-annual to continuous monitoring (via pressure transducers) at a subset of wells.[292] The GSP presents a summary of the various monitoring networks and related sustainability indicators each monitoring station.[293] The GSP presents 24 representative monitoring stations used to track conditions related to chronic lowering of groundwater levels.

The Department understands that numerous wells were installed across the Basin in 2016 and 2021, expanding the monitoring network significantly. As additional data and information is gained from these wells and additional actions are taken to promote the

[283] 23 CCR § 354.32.
[284] 23 CCR § 354.34(b)(2).
[285] 23 CCR § 354.34(b)(3).
[286] 23 CCR § 354.34(c)(1)(B).
[287] 23 CCR §§ 354.34(g-h).
[288] 23 CCR § 352.4 *et seq*.
[289] 23 CCR § 354.38(d).
[290] Department of Water Resources, 2016, Best Management Practices and Guidance Documents.
[291] Eel River Valley GSP, Section 7.2.2, p. 142.
[292] Eel River Valley GSP, Section 7.2.2, pp. 142-143.
[293] Eel River Valley GSP, Table 27, pp. 146-150.

collection of data 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, the GSA should make an effort to consolidate and present this information in periodic evaluations. Specifically, Department staff suggest that: 1) well construction information, including monitored depth interval, be provided for all monitoring wells; 2) all available groundwater level data for the representative monitoring stations be clearly depicted; and 3) all monitoring stations be clearly assigned to a corresponding principal aquifer.

The GSP does not describe a traditional groundwater storage monitoring network using representative monitoring stations, but instead uses a calculation of annual groundwater extraction to develop an estimate of change in annual groundwater in storage.[294] The GSP describes that data "and information will be collected for the two types of groundwater users (agricultural irrigation and municipal) that comprise approximately 95% of the groundwater use within the Basin."[295]

The GSP describes the seawater intrusion monitoring network where chloride concentrations "will be collected at least annually in the 20 wells listed on Table 23."[296] While the table includes screened intervals of representative monitoring wells to be used for monitoring seawater intrusion, the table does not indicate which principal aquifer the corresponding well is intended to monitor.[297] A map depicting the location of monitoring network wells, including those listed in Table 23, is provided on a figure.[298]

The GSP describes the groundwater quality monitoring network, stating that municipal "water suppliers will conduct sampling and testing of their raw water in accordance with their own management programs and regulatory requirements applicable to public water systems. New water quality data from sampling and testing of the raw water of municipal water suppliers within the Basin will be reviewed annually to track the status of [degraded water quality]." Although applicable elements appear to have been described in the Water Quality Technical Memorandum found in the appendix,[299] Department staff suggest that the sample locations, principal aquifer designations, water quality constituents of concern for the basin, and the monitoring and data evaluation frequency be clearly presented in the next periodic evaluation.

The GSP describes the land subsidence monitoring network as dependent on data collected by USGS and DWR and states, "subsidence caused by groundwater conditions is not a concern for the Basin but the InSAR data would be available to confirm the absence of concern."[300] Department staff has determined that because groundwater-

[294] Eel River Valley GSP, Section 7.2.1, pp. 141-142.
[295] Eel River Valley GSP, Section 7.2.1, p. 142.
[296] Eel River Valley GSP, Section 7.2.3, pp. 143.
[297] Eel River Valley GSP, Table 23, p. 123.
[298] Eel River Valley GSP, Figure 40, p. 209.
[299] SHN Water Quality Technical Memorandum, pp. 1051-1097.
[300] Eel River Valley GSP, Section 7.2.7, p. 145.

extraction-related subsidence has not been recorded in the basin and because historical groundwater conditions indicate seasonal low groundwater levels are stable, the plan to rely on available InSAR data is likely adequate if an adequate frequency of review can be established. Department staff suggest that the frequency with which the GSA intends to review the InSAR data be provided in the next periodic evaluation.

Although the GSP does not explicitly include a description of the monitoring network or monitoring plan for evaluation of conditions related to depletions of interconnected surface water in Section 7. Monitoring Network [301], it does describe monitoring objectives to demonstrate "progress toward achieving measurable objectives described in the GSP; Monitor impacts to the beneficial uses or users of groundwater; Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds; Quantify annual changes in water budget components."[302] The GSP also states that the "County monitoring well network was significantly expanded in 2021, with a portion of the well network specifically located to provide the ability to monitor groundwater levels near the Eel River and Van Duzen River channels. All County monitoring wells were outfitted with transducers in June/July of 2021 to record continuous water level data. This data will provide valuable resolution on the groundwater-surface water relationships through these critical reaches."[303] The GSP identifies seven representative monitoring site wells to be used for tracking the sustainable management criteria for depletions of interconnected surface water.[304]

Despite the request for clarifying information, Department staff believe the Plan describes the monitoring network in sufficient detail and 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. 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.[305] Each Plan's description of projects and management actions must include details such as: how projects and management actions in the GSP will achieve

[301] Eel River Valley GSP, Section 7, pp. 141-145.
[302] Eel River Valley GSP, Section 7.1, p. 141.
[303] Eel River Valley GSP, Section 4.6, p. 66.
[304] Eel River Valley GSP, Table 27, pp. 146-150 and Figure 39, p. 208.
[305] 23 CCR § 354.44 (a).

sustainability, the implementation process and expected benefits, and prioritization and criteria used to initiate projects and management actions. [306]

The GSP states that the Basin is currently meeting the sustainability goal and as such, "projects and management actions are not needed to achieve sustainability."[307] Despite this, the GSP describes seven planned projects and management actions [308] and proposes two potential projects and management actions.[309]. The GSP describes that the GSA may "choose to pursue projects and management actions to help maintain or improve groundwater conditions, enhance beneficial uses of groundwater and interconnected surface waters, improve the resilience of water resources, or prepare for future climate conditions to ensure that the Basin continues to be managed sustainably."[310]

The GSP provides details on project or management action timing, and the sustainable management criteria benefit, should the project or management actions occur.[311] The GSP states that "Some of the following projects and management actions will be incorporated into the Humboldt County GSA's normal operations, while other projects and management actions will depend on staffing capacity, available funding, and whether strategic opportunities are present."[312]

All nine projects and management actions include a description, the relationship to sustainability criteria, legal authority, and public notice. However, the GSP states that the "GSP itself is sufficient public outreach".[313] Department staff note that using the GSP is not an acceptable approach for public outreach or notice. Project plans, scope, and schedules presented in the GSPs often change and it is best to keep the public and other agencies informed of these changes in a timely manner. Department staff suggest that the GSA utilize the Department's Guidance Document for GSP Stakeholder Communication and Engagement for information on how to engage and provide notice to the public and other agencies. [314]

The GSP adequately describes proposed projects and management actions in a manner that is generally consistent and substantially complies with the GSP Regulations. The projects and management actions focus on "continued monitoring, improving water resilience, and developing additional understanding of the Basin to ensure changing conditions do not cause undesirable results." The GSA notes that, in the event that "changing conditions result in exceedances of minimum thresholds, the Humboldt County

[306] 23 CCR § 354.44 (b) *et seq.*
[307] Eel River Valley GSP, Section 8.1, p. 151.
[308] Eel River Valley GSP, Section 8.2.1, pp. 151-152.
[309] Eel River Valley GSP, Section 8.2.1, pp. 152-153.
[310] Eel River Valley GSP, Section 8.1, p. 151.
[311] Eel River Valley GSP, Table 28, p. 153.
[312] Eel River Valley GSP, Section 8.2, p. 151.
[313] Eel River Valley GSP, Section 8.6, p. 156.
[314] DWR, Guidance Document for GSP Stakeholder Communication and Engagement

GSA (1) may consider new projects and management actions, and/or (2) may revisit the sustainable management criteria to ensure that the interests of all beneficial uses and users of groundwater in the Basin are appropriately balanced." 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

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."[315] 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.[316]

The Eureka Plain Basin (No. 1-009), located immediately north of the Eel River Valley Basin (Figure 1), is classified by DWR as a very low priority basin, and as such is not required by SGMA to be managed under a GSP and no GSP has been adopted for that basin.

Department staff currently have no information that would indicate groundwater management in the Eel River Valley Basin will adversely affect groundwater conditions in the adjacent Eureka Plain Basin at this time. Department staff will continue to review periodic evaluations to the Plan to assess whether implementation of the 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.[317]

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 basin based on current and future drought conditions.

[315] Water Code § 10733(c).
[316] 23 CCR § 354.28(b)(3).
[317] 23 CCR § 354.18.

2. Explore how groundwater level data from the existing monitoring network will be used to make progress towards sustainable management of the basin given increasing aridification and effects of climate change, such as prolonged drought.
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, and
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 to evaluate how their Plan's groundwater management strategy aligns with drought planning, response, and mitigation efforts within the basin.

5 STAFF RECOMMENDATION

Department staff recommend approval of the GSP with the recommended corrective actions listed below. The Eel River Valley 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 Eel River Valley Basin. The GSA has identified several areas for improvement of its Plan and Department staff concur that those items are important and should be addressed as soon as possible. Department staff have also identified additional recommended corrective actions that should be considered by the GSA for the first periodic assessment of its GSP. Addressing these recommended corrective actions will be important to demonstrate that implementation of the Plan is likely to achieve the sustainability goal.

The recommended corrective actions include:

RECOMMENDED CORRECTIVE ACTION 1

Revise the hydrogeologic conceptual to clarify the vertical and lateral extent of the Carlotta Aquifer relative to the Carlotta Formation and the defined bottom of the Basin. Provide sufficient details on why groundwater in the lower Carlotta Formation is considered to be unavailable for consumption.

RECOMMENDED CORRECTIVE ACTION 2

Revise the sustainable management criteria for chronic lowering of groundwater levels as follows:

a. Modify and apply the undesirable result definition to cover the entire Basin and all principal aquifers. The GSA should conduct analysis for the previously excluded Basin areas and principal aquifers. The GSA should also identify additional representative monitoring wells in these areas and establish criteria to define the presence of an undesirable result.

b. Provide more information about how the proposed minimum thresholds for the chronic lowering groundwater levels may impact beneficial uses and users. Specifically, consider the impact of the selected minimum threshold levels on supply wells. The consideration should identify the degree/extent of potential impact including the percentage, number, and location of potentially impacted wells at the proposed minimum thresholds for chronic lowering of groundwater levels.

RECOMMENDED CORRECTIVE ACTION 3

Revise the sustainable management criteria for degraded water quality as follows:

a. Revise the description of significant and unreasonable conditions so that groundwater conditions, whether caused by direct actions by the GSA to implement this GSP or not, are considered in the assessment of significant and unreasonable conditions in the Subbasin.

b. Revise the definition of undesirable results so that exceedances of minimum thresholds, whether caused as a direct result of projects or management actions taken as part of GSP implementation or not, are considered in the assessment of undesirable results in the Subbasin.

RECOMMENDED CORRECTIVE ACTION 4

Department staff understand that estimating the location, quantity, and timing of stream depletion due to ongoing, basin-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 GSA should work to address the following items by the first periodic update:

a. Establish sustainable management criteria for the other portions of the Basin where surface water is hydraulically connected to groundwater including the Van Duzen River, Yager Creek, and portions of the Salt River.

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

c. 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.

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