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July 4, 2022

Via E-mail

Chris Cardella
Chair
SJREC Water Authority
541 H Street
P.O. Box 2115
Los Banos, CA 93635
contactus@sjrecwa.net

Re: Provisional Comments on Revised SJREC GSP

Dear Mr. Cardella:

On behalf of California Sportfishing Protection Alliance (CSPA) we provide the following comments opposing adoption of the revised Groundwater Sustainability Plan for the San Joaquin River Exchange Contractors portion of the Delta-Mendota Subbasin ("Revised GSP").

The GSA Has Failed to Provide Adequate Opportunities for Public Participation

On June 30, 2022, the SJREC Water Authority ("SJREC WA") posted for the first time a complete copy of the Revised GSP. The hearing for adoption of a resolution amending GSP is scheduled for July 5, 2022 at 9:00 am. July 4th is a national holiday. The agenda for the hearing on July 5th appears to contemplate submission of written comments but provides no contact information to do so.[1] Nor does it provide a deadline for written comment. Nor does it provide a copy of the draft resolution amending the GSP. The agenda states that the public is, in fact, "asked to attend the meeting by conference call"—in effect barring them from the meeting room. The Revised GSP is 1,735 pages. Thus, the public has less than two business days to review almost two thousand pages of material and provide comments. This is not an effective opportunity for comment.

As a result, the hearing on July 5th does not provide the public an opportunity to exhaust any "administrative remedies" that may exist. At the outset, SGMA has no

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[1] The agenda is available at http://www.sjrecwa.net/sjrecwa/wp-content/uploads/2022/06/GSA-Agenda-7-5-22.pdf (accessed July 1, 2022.)

statutory exhaustion requirement, and CSPA's submission of this comment letter should not be construed as an acknowledgement by CSPA that an administrative remedy exists under SGMA. As the courts have held, "[I]f the Legislature has not provided an administrative remedy, or the administrative remedy is not effective, the exhaustion requirement is not applicable." (*Cal. Correctional Peace Officers Assn. v. State Personnel Bd.* (1995) 10 Cal.4th 1133, 1151.) In instances where "no forum or administrative remedy is afforded for the issues raised, recourse to the local administrative agency is not required before initiation of court action." (*Park 'N Fly of San Francisco, Inc. v. City of South San Francisco* (1987) 188 Cal.App.3d 1201, 1209.) "[W]hen an administrative remedy *is provided by statute*, relief must be sought from the administrative body and this remedy exhausted before the courts will act." (*Abelleira v. Dist. Court of Appeal* (1941) 17 Cal.2d 280, 292, emphasis added.) Moreover, the statutory remedy must be an "effective" one for the exhaustion requirement to apply: an administrative remedy is required to be exhausted "in those instances where the administrative body is required to actually accept, evaluate and resolve disputes or complaints." (*City of Coachella v. Riverside County Airport Land Use Com.* (1989) 210 Cal.App.3d 1277, 1287.) Nonetheless, SJREC has argued in court that exhaustion is required.

Even if exhaustion were required, however, the hearing on July 5th would not be an "effective" administrative remedy that would be required to be exhausted. The short timeline does not provide an adequate period for the public to evaluate the lengthy and technical changes to the GSP. And SGMA contains no requirement that a GSA "accept, evaluate, and resolve" any issues raised in public comments. (*Id*.)

Moreover, the SJREC GSP is just one component GSP of the Delta-Mendota Coordinated GSP. Its methodologies and assumptions must be consistent with the common chapter of the Coordinated GSP and with the other five component GSPs. (Wat. Code §§ 10727, subd. (b)(3), 10726.6, subd. (a); Cal. Code Regs., tit 23, § 357.4(a).)

Changes to the Delta-Mendota GSP were directed at a meeting of the Special Joint Meeting of the Northern Delta-Mendota Region Management Committee Central Delta-Mendota Region Management Committee Central Delta-Mendota GSA, and Delta-Mendota Subbasin Coordination Committee on June 20, 2022. Counsel for CSPA appeared and gave oral comments both on the inadequacy of the public process and made substantive comments, to the extent possible, on the failure of the proposed revisions to the GSP to comply with SGMA and applicable law. Throughout the spring of 2022, most of the substantive changes to the coordinated and component GSPs were made in closed session and relevant documents were never made available to the public. Indeed, the material discussed at the June 20 meeting included four technical memos, public versions of which appear to never have been released and which are not attached to the agenda for the July 5 meeting. In other words, the record before the agency and made available to the public is incomplete. This is a violation of Government Code section 54957.5, subdivision (b).

As a result, and given the July 20 deadline to submit the revisions to DWR, there is no time for the SJREC WA or any of its sub-GSAs to respond meaningfully to comments and make appropriate revisions. As such, for the purpose of exhausting any administrative remedies that may exist, CSPA can "positively state that the [agency] has declared what its ruling will be on" this "particular case" and thus any administrative remedy, assuming one is required, is also "futile" in addition to ineffective. (*Coachella Valley Mosquito & Vector Control Dist. v. California Public Employment Relations Bd.* (2005) 35 Cal.4th 1072, 1080-81.)

As a result of the failures of SJREC WA, the other GSAs in the SJREC GSP Group, and the GSAs in the Delta-Mendota Subbasin to provide an adequate process for the public to review and comment on these revisions to the coordinated and component GSP, these comments are provisional. CSPA reserves all rights to make further and future comments and to pursue all available legal remedies in court and before other administrative agencies once it has had an adequate opportunity to analyze, inter alia, the entire coordinated GSP for the Delta Mendota Sub-basin, including all six component GSPs; the Revised SJREC GSP; all supporting materials for these GSPS, the relationships between the component GSPs and the relationships between the component GSPs and the coordinated GSP.

Substantive Comments on the Revised GSP

The Revised GSP Does Not Alter CSPA's Previous Assessment That It Violates SGMA, the Public Trust Doctrine, and the Waste and Unreasonable Use Doctrine.

In previous comments and filings, CSPA presented legal authority that the coordinated Delta-Mendota GSP and its component GSPs, including the SJREC GSP, failed to consider and comply with the waste and unreasonable use doctrine and the public trust doctrine. (Cal Const., art. X, § 2; *National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 426; *Environmental Law Foundation v. State Water Resources Control Bd.* (2018) 26 Cal.App.5th 844; see also *United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 105.) The Revised GSP provides no additional analysis under these doctrines, nor does it demonstrate any compliance with the requirements imposed by them.

CSPA also presented comments showing that the coordinated and component GSPs failed to adequately measure, map, characterize, and analyze interconnected surface waters ("ISWs") and groundwater dependent ecosystems ("GDEs") as required by SGMA. Nor do the coordinated and component GSPs rely on the best available information in violation of California Code of Regulations, title 23, section 354.18(e). These comments are attached to this letter. Nothing in the Revised GSP demonstrates any change in CSPA's conclusions regarding the adequacy of the identification of GDEs or

ISWs—they violated SGMA in 2020 and violate SGMA today.

*The Sustainable Management Criteria Violate SGMA Are
Not Supported by the Best Available Science or by Adequate Evidence*

The Revised GSP makes superficial changes to the definitions of sustainable management criteria, undesirable results, minimum thresholds, and measurable objectives. These changes do not resolve the issues identified by CSPA in earlier correspondence and the Revised GSP continues to fail to comply with SGMA. As stated above, the following comments are provisional in light of the thoroughly inadequate comment period. CSPA reserves further comments for a future date after full evaluation of the Revised GSP.

The Revised GSP changes the sustainability goal for ISW to:

> Maintain interconnected surface waters comparable to existing conditions (historic low conditions as of Water Year 2016) in order to prevent a trend of increasing interconnected surface water losses from the San Joaquin River. Work with neighboring Subbasins to address increased interconnected surface water losses caused by pumping from outside of the Subbasin.

(Revised GSP at 97.)[2] It is unclear what the basis for the selection of the 2016 water year as "existing conditions" is. It is unclear why the sustainability goal is limited to the San Joaquin River, when the GSP fails to characterize other potential ISWs and GDEs in the subbasin.

The Revised GSP changes the measurable objective ("MO") for ISW to:

> The Measurable Objective for Interconnected Surface Water is as of present not finalized due to an identified data gap at the Subbasin level. As an interim measurable objective, the Chronic Lowering of Groundwater Level Measurable Objective will be used as a proxy for interconnected surface waters (see Section 3.2.1). The subbasin will be utilizing grant funds to fill this data gap and refine the Measurable Objective for this criteria.

(Revised GSP at 100.) The minimum threshold (MT) also relies on groundwater levels as a proxy for interconnected surface waters:

[2] Page references are to the redlined version of the Revised GSP linked to in the Agenda.

> Minimum threshold has been defined at the subbasin level, see Table CC-23 in the Appendix B; interconnected Surface Water is an identified data gap in the Delta-Mendota Subbasin. As an interim minimum threshold, use the Chronic Lowering of Groundwater Level Minimum Threshold as a proxy for impacts to interconnected surface waters (see section 3.3.1).

(Revised GSP at 111; App. B, table CC-23.) The failure to establish an MO is a facial violation of SGMA and its regulations. SGMA requires a measurable objective to be set for each sustainability criterion "to achieve the sustainability goal in the basin within 20 years of the implementation of the plan." (Wat. Code § 10727.2, subd. (b)(1).) An MO must contain "specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin." (Cal. Code Regs., tit. 23, § 351, def. (s).) A GSP may only use groundwater elevation as a "proxy" for other sustainability indicators when the Agency can "demonstrate" that such value is a "reasonable proxy" as "supported by adequate evidence." (Cal. Code Regs., tit. 23, § 354.30(d).) The GSP does not supply such evidence.

And the MT must be "supported" by:

> (A) The location, quantity, and timing of depletions of interconnected surface water.
>
> (B) A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.

(Cal. Code Regs., tit. 23, § 354.28(c)(6).) The use of groundwater levels as a proxy does not tell the GSP or the public anything about the "location, quantity, and timing" of depletions of interconnected surface water. And as SJREC has chosen not to use a "numerical groundwater and surface water model," it has not demonstrated that the use of the groundwater level proxy is "equally effective" to accomplish the "requirements" of SGMA.

The definition of the groundwater level proxy has its own problems. The Revised GSP states that, with respect to chronic lowering of groundwater levels, "Significant and unreasonable is quantitatively defined as exceeding the MT at more than 50% of representative monitoring sites by aquifer in a GSP area." There is no evidence tying this 50% figure to flow depletion figures in identified ISWs. Nor is there justification for why

50% was chosen: it is conceivable, in fact likely, that significant effects could occur should half of the wells in a given area drop below 2015 levels—levels that were catastrophically low due to the historic 2012-2016 drought.[3] By choosing a 50% figure, and by tying it to a four-year rolling average, the Revised GSP in fact guarantees that the basin will experience effects more severe than in the 2016 scenario because it permits up to 50% of wells to drop below that level, into uncharted and potentially disastrous territory.

The description of undesirable results is likewise inadequate. SGMA requires a definition of undesirable results that includes "[t]he criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator," and this criteria "shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin." (Cal. Code Regs., tit. 23, § 354.26(b)(2).) The Revised GSP states that:

> An undesirable result of depletions of interconnected surface water is defined as: depletions of interconnected surface water as a direct result of groundwater pumping that cause significant and unreasonable impacts on natural resources or downstream beneficial uses and users….
>
> Significant and unreasonable depletion of interconnected surface water occurs when groundwater extraction from the SJREC GSP Group decreases streamflow to a significant and unreasonable level for beneficial users in a stretch of the San Joaquin River that was historically losing (seeping from the river).

(Revised GSP at 115; App. B table CC-23.)[4] The undesirable results description in the Revised GSP fails because, among other things, it does not provide a "quantitative description of the combination of minimum threshold exceedances." Nor does it provide a definition of "significant and unreasonable" with respect to actual effects on the ground,

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[3] Of course, the circular and inadequate definition of "significant and unreasonable" in the GSP prevents evaluation of what such effects are and determination of whether they are occurring at any given time.

[4] There are inconsistencies between the SMCs on pages 100-115 of the SJREC GSP and the SMCs described in the common chapter. SGMA requires that coordinated plans rely on the "same data and methodologies" and that "elements of the Plans necessary to achieve the sustainability goal for the basin are based upon consistent interpretations of the basin setting." Because not all of the component GSPs nor all of the supporting material is yet public, it is impossible to comment on whether these inconsistencies reveal violations of SGMA.

including the ecological consequences of depleted surface water flows to species, ecosystems, and the beneficial users who rely on them. Nor does the statement that additional monitoring wells will be drilled provide assurance that these effects on the environment will be monitored and incorporated into the SMC definitions in the future. Again, it is limited to the San Joaquin River when the subbasin includes other identified and potential ISWs. And it limits itself to "losing" reaches, when nothing in SGMA permits such a limitation.

For all of the SMCs, the GSP has unlawfully punted the development of the required study and work to prepare a plan that would be protective of interconnected surface waters. Despite five years to the prepare the Plan, lengthy comment letters proposing additional facts and methodologies, and two additional years following submission, and six months following DWR's determination that the GSP was inadequate, the GSP has still not been amended to comply with SGMA.

The Revised GSP identifies "interconnected surface water" as a "data gap." (Revised GSP at 100, 111, App. B at table CC-23) This misuses the term "data gap" as used in the SGMA regulations. (Cal. Code Regs., tit. 23, §§ 350.4(d), 351(*l*), 354.38.) SGMA contains no authority for a GSA to simply fail to describe undesirable results nor to set minimum thresholds or measurable objectives that meet the regulatory requirements. In any event, comments provided to the GSPs earlier in the process provide much of the data and methodology that the GSP claims is a "gap." Notably, CSPA's comments provided a methodology to map depletions of interconnected surface waters. And the Nature Conservancy provided a methodology for evaluating GDEs. Yet the GSPs ignored these offers, choosing instead to simply do nothing. This violates SGMA.

Conclusion

For the reasons stated in this letter, the Revised GSP violates SGMA. In addition, other component GSPs and the common chapter contain deficiencies that preclude approval because the coordinated GSP must manage the basin as a whole. We urge that the relevant agencies vote against approving this revision.

Sincerely,

Nathaniel H. Kane

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Executive Director
Environmental Law Foundation

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May 14, 2020

Mr. Tom Lippe, Law Office of Thomas N. Lippe, APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Review of Final Groundwater Sustainability Plan
For the North and Central Delta-Mendota Regions

Dear Mr. Lippe:

I have been retained by your practice to review the Final Groundwater Sustainability Plan (GSP) for the North and Central Delta-Mendota Groundwater Subbasin. I submitted comments on the Public Draft GSP to the San Luis & Delta-Mendota Water Authority on October 11, 2019. The Final GSP indicates that these and other public comments were not addressed as part of final plan development. To the best of my knowledge, the Final GSP does not resolve the concerns and deficiencies presented in my comments. Therefore, I'm resubmitting these comments as Attachment A as they still apply to the Final GSP.

Based on my review of the Final GSP and comment letters submitted by the National Marine Fisheries Service (NMFS)[1] and California Department of Fish and Wildlife (CDFW)[2], I'm providing the following additional comments and opinion pertaining to additional deficiencies with the Final GSP.

1. Section 354.16 of the GSP Regulations stipulates that each plan describe current and historic groundwater conditions in the basin based on the best available information. With regard to Section 5.3.7 of the GSP (Interconnected Surface Water Systems), I would like you to be aware of a study completed by Kamman Hydrology & Engineering, Inc.[3], which delineates subterranean streams and Potential Stream Depletion Areas (PSDA) along the San Joaquin River within Stanislaus County. PSDA's are areas where groundwater pumping could potentially cause stream depletion. This report and selected maps are attached for reference and integration into Section 5.3.7 of the GSP.

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[1] Strange, E., 2020, NOAA's National Marin Fisheries Service comments on the Public Final Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions. Letter to California Department of Water Resources, NMFS, West Coast Region, April 6, 5p.
[2] Vance, J., 2020, Comments on the Northern and Central Delta Mendota Final Groundwater Sustainability Plan. Letter to California Department of Water Resources and San Luis & Delta-Mendota Water Authority, California Department of Fish and Wildlife, Central Region, March 11, 13p.
[3] Kamman Hydrology & Engineering, Inc., 2018, Delineating subterranean streams and Potential Stream Depletion Areas, Lower Stanislaus and Tuolumne River Watershed. Draft Technical Memorandum prepared for: Law Offices of Thomas N. Lippe, APC, July 23, 9p. and 15 sheets.

2. The GDEs presented on Figures 5-118 and 5-119 of the GSP have been screened to remove NCCAG areas where groundwater is in excess of 30-feet below ground surface. However, it is my opinion that when adhering to The Nature Conservancy (TNC) GDE identification guidelines (2019)[4] for developing depth-to-groundwater contours, it will be found that many of these data gap areas eliminated will have groundwater depths much less than 30 feet. This conclusion is based on the depth-to-water mapping along the Stanislaus and San Joaquin Rivers completed by WRIMES in 2007[5], which indicates values much less than 30-feet in contrast to the greater than 30 feet used to generate the GDE maps in the Final GSP (see Figure 1 below).

3. I've reviewed all five of the spreadsheet water budgets presented in the GSP and have identified a number of deficiencies, uncertainties and inconsistencies within water budgets and proposed GSP projects and management actions. In total, these problems and general lack of transparency in describing water budget assumptions call into question the accuracy and validity of the water budget calculations. The water budget problems and associated concerns include the following.

    a. The water budgets do not factor in stream flow gains and losses associated with interconnected surface water and groundwater. Although the water budgets are the primary tools being used to quantify sustainable yield, they don't provides a way to evaluate the effects of water operations and management actions on ISW or GDEs. Without a quantification of stream flow gains and losses, there is no way to determine if groundwater pumping is causing undesirable stream flow depletions. Quantifying stream flow depletions is required in order to develop ISW sustainability indicators as required under SGMA. As you recall, using the water budgets for the neighboring Eastern San Joaquin groundwater subbasin GSP, I was able to identify undesirable depletions from the Stanislaus River associated with their projected conditions scenario. These undesirable impacts on the beneficial uses of the river would have otherwise been missed without the quantification and presentation of estimates for stream flow gains and losses.

    b. The water budgets do not incorporate evapotranspiration losses from riparian and wetland areas (i.e., GDE). Page 10 of Appendix D (Water Budget Model Documentation) to the GSP states, "*Evapotranspiration volumes were limited in non-crop and non-irrigated areas to avoid having evapotranspiration volumes exceed precipitation volumes. This was enforced to ensure that evapotranspiration volumes alone didn't exceed inflows into any control volume where irrigation was not occurring.*" The omission of evapotranspiration calls into question the accuracy and ability of the water budgets to identify undesirable impacts to GDEs, let alone the quantification of sustainable yield. The water budget is an accounting of all sources of water. Disregarding a known and quantifiable output will skew the computation of storage higher and underestimate the amount of overdraft.

[4] https://groundwaterresourcehub.org/public/uploads/pdfs/TNC_NCdataset_BestPracticesGuide_2019.pdf.
[5] WRIME, 2007, Recharge characterization for Stanislaus and Tuolumne Rivers Groundwater Basin Association. Memorandum prepared for MID and DWR, May 2, 31p.

c. A primary purpose of the water budgets is to quantify changes in groundwater storage. The standard water budget equation is:

Inflows – outflows = change in storage

However, the change in storage estimates computed and utilized in the water budgets were derived from a different method as described on page 6 of Appendix D to the GSP, which states:

In the groundwater system, long-term water storage exists within the aquifers and the difference in inflows and outflows should be equal to the change in groundwater in storage. Annual changes in groundwater storage were calculated independent of the inflow and outflow accounting using hydrographs from wells around the Plan area. This independently-calculated change in groundwater storage is presented as a part of the Groundwater Budget. The difference between this independently-calculated change in storage (based on hydrographs) and the estimated (accounted) value is a result of inaccuracies in both the calculated change in groundwater storage and inaccuracies in inflow and outflow estimations.

This statement in itself calls into question the accuracy and validity of the water budgets. Based on review of the historic period water budget tables, the 10-year average difference in annual total groundwater storage volumes between "accounted" and "based on hydrographs" methods is 36% and annual differences range from 1% to 844%. The difference in annual total groundwater storage volumes between "accounted" and "based on hydrographs" for the current period water budget is 31%. These differences are not trivial when applied to overdraft estimates - the large imbalance in water budget estimates of groundwater storage call into question their overall accuracy and water budget derived estimates of overdraft volumes and safe yield.

d. A series of three projected water budgets were used to develop a baseline condition and evaluate the effects of climate change and implementation of projects and management actions intended to reduce groundwater demands. These water budgets include: 1) Baseline projected water budget (BPWB); 2) baseline projected water budget with climate change (BPWB+CC); and 3) baseline projected water budget with climate change and projects and management actions (BPWB+CC+P&MA). Page 22 of Appendix D states that the change in storage volumes used in the historic and current water budgets were averaged by water year type and used throughout the projected water budget periods. However, review of annual change in storage values for the water budgets vary by water year type. The rationale for these changes and how these values are quantified and how/why these values change between water budgets is not explained. The cumulative sum of the change in storage values are the key variable used to quantify the amount of overdraft and sustainable yield. Any deviation from the values as defined in the GSP call into question the transparency of the assumptions and values used in the water budget. The water budgets need to be clear and understandable to be defensible.

e. The BPWC+CC+P&MA incorporates the projects and management actions listed on Table 5-5 of Appendix D (pages 26 - 27). This table includes a total of 13 projects: two (2) projects increase surface water deliveries; one (1) project proposes a decrease in groundwater pumping associated with the Orestimba Creek Recharge and Recovery Project; and 10 projects propose deep percolation to recharge groundwater. The additional groundwater pumping incorporated into this water budget is due to the projects and management actions described in Table 5-5. Water budget results indicate that these projects will results in 35,000 AF/yr of reduced groundwater pumping and a 12,000 AF/yr increase in groundwater recharge. These figures equate to a 25% reduction in groundwater pumping from the basin and 14% increase in groundwater recharge, when compared to the baseline. Together, these demand reductions total 37,000 AF/yr and are attributed with significantly reducing groundwater overdraft and bringing the basin closer to safe yield. . In my opinion, the volume of pumping involved and reported benefits of a 25% reduction in groundwater pumping from the entire subbasin are not feasible from this single location. The Orestimba Creek Recharge and Recovery Project is described in detail on page 117 of the Final GSP for the San Joaquin River Exchange Contractors Group in the Delta-Mendota Subbasin. The 80 acre recharge facility will divert and retain excess flood flows from Orestimba Creek. It is expected to recharge up to 15,000 AF/yr. During a critical year, up to 7,500 AF of stored groundwater can be extracted. The Plan does not explain how this facility could possibly result in the reduced pumping rates presented in the water budget, and frankly, given the numbers presented here, there is no way it could.

4. I agree with NMFS and CDFW's recommendations that the Final GSP develop conservative streamflow depletion thresholds and sustainable management criteria protective of surface water beneficial uses. As recommended by NMFS and CDFW, and required under SGMA {Section 354.28(c)(6)}, the GSP must identify a way to quantify how historic, current and future changes in groundwater levels have/will affect the timing and rate of surface water depletions and impacts on stream flow levels/rates, water quality and the associated aquatic habitats sustained by stream hydrology. This requires understanding the interrelated set of hydrologic and ecological processes that occur on spatial and temporal scales much finer than the coarse scales represented by the proposed monitoring network and typical of groundwater basin model grids. In order to quantify just the hydrologic processes at a single point, one would ideally need to: construct, screen and continuously monitor a well within suitable distance and depths of the stream channel; measure and record well pumping rates; measure water levels and flow rates in the stream channel adjacent to well; characterize the hydraulic properties of the intervening aquifer sediments and stream bed material; and analyze the data over a suitable period that captures seasonal changes in groundwater and surface water levels and flow rates. Through analytical or modeling methods, the

concomitant changes in stream flow depletions, stream water levels, pumping rates and stream flow rates could be correlated and quantified. These empirically-based correlations could then be incorporated into an integrated surface water-groundwater model for areas displaying similar geologic and hydrologic conditions. The monitoring data would also be used to calibrate the surface water-groundwater interaction solutions performed by a numerical model.

However, this only covers the physical processes. Additional monitoring and analyses of the benefits and impacts of varying stream flow and water levels on ecological conditions would need to be developed in order to determine how changes in stream flow depletions impact aquatic habitats, including salmonids. This analysis would need to consider all life stages of target species, which means understanding seasonal habitat requirements. Bridging the cause and effect relationships between physical and biological processes in an ISW system can't be done by monitoring water levels alone. Nor monitoring only water levels and stream levels – the full spectrum of interrelated physical and biological processes need to be correlated.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Greg Kamman, PG, CHG
Principal Hydrologist

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May 15, 2020

Mr. Tom Lippe, Law Office of Thomas N. Lippe, APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Review of Final Groundwater Sustainability Plans
Delta-Mendota Groundwater Subbasin

Dear Mr. Lippe:

I have been retained by your practice to review the six (6) Final Groundwater Sustainability Plan (GSP) within the Delta-Mendota Groundwater Subbasin. These include the following GSPs:

- North and Central Delta-Mendota Regions (NCDM);
- San Joaquin River Exchange Contractors (SJREC);
- Aliso Water District (Aliso);
- Farmers Water District (Farmers);
- County of Fresno (Fresno); and
- Grassland Groundwater Sustainability Agency (Grassland).

Based on my review and comment letters submitted by the National Marine Fisheries Service (NMFS)[1] and California Department of Fish and Wildlife (CDFW)[2], I'm providing the following common comments and opinions to each of the Final GSPs listed above.

1. The presentation and discussion of Interconnected Surface Water (ISW) in most GSPs are difficult to understand without the aid of a map. With the exception of the Aliso GSP, ISWs are not mapped. SGMA code 354.14(d)(4) and 354.16(f) require that ISWs are mapped as they are areas of potential recharge and discharge. The GSPs should be required to include this mapping.

2. Section 354.16 of the GSP Regulations stipulates that each plan describe current and historic groundwater conditions in the basin based on the best available information. With regard to the characterization and delineation of Interconnected Surface Water

[1] Strange, E., 2020, NOAA's National Marin Fisheries Service comments on the Public Final Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions. Letter to California Department of Water Resources, NMFS, West Coast Region, April 6, 5p.
[2] Vance, J., 2020, Comments on the Northern and Central Delta Mendota Final Groundwater Sustainability Plan. Letter to California Department of Water Resources and San Luis & Delta-Mendota Water Authority, California Department of Fish and Wildlife, Central Region, March 11, 13p.

(ISW), I would like you to be aware of a study completed by Kamman Hydrology & Engineering, Inc.[3], which delineates subterranean streams and Potential Stream Depletion Areas (PSDA) along the San Joaquin River within Stanislaus County. PSDA's are areas where groundwater pumping could potentially cause stream depletion. This report and maps (attached to my May 14, 2020 comment letter on the Northern and Central Delta-Mendota Regions GSP) provide a method for identifying and delineating ISW and can be integrated into GSPs where applicable.

3. A number of the Groundwater Dependent Ecosystems (GDE) presented in GSPs have been screened to remove NCCAG areas where groundwater is in excess of 30-feet below ground surface. However, it is my opinion that when adhering to The Nature Conservancy (TNC) GDE identification guidelines (2019)[4] for developing depth-to-groundwater contours, it will be found that many of these data gap areas eliminated will have groundwater depths much less than 30 feet. This conclusion is based on the depth-to-water mapping along the Stanislaus and San Joaquin Rivers completed by WRIMES in 2007[5], which indicates values much less than 30-feet in contrast to the greater than 30 feet used to generate the GDE maps in the Final GSP (see Figure 1 below).

4. I've reviewed all the spreadsheet water budgets presented in the GSPs and have identified a number of deficiencies, uncertainties and inconsistencies within water budgets. In part or total, these problems and general lack of transparency in presenting data and describing water budget assumptions call into question the accuracy and validity of the water budget calculations. The water budget problems and associated concerns are presented below. Table 1 is a water budget review matrix, which I refer to in this discussion.

    a. The GSP water budgets do not factor in stream flow gains (see Row 1 of Table 1). Many water budgets do not estimate or account for losses associated with stream seepage (see Row 2, Table 1). Although the water budgets are the primary tools being used to quantify sustainable yield, the GSPs don't provides a way to evaluate the effects of water operations and management actions on ISW or GDEs. Without a quantification of stream flow gains and losses, there is no way to determine if groundwater pumping is causing undesirable stream flow depletions. For example, without accounting for stream gains from groundwater inflow, there is no way to determine or quantify if nearby pumping is extracting water that would otherwise discharge to a stream. Quantifying stream flow depletions is required in order to develop ISW sustainability indicators as required under SGMA. As you recall, using the independent stream gains and seepage water budget estimates for the Eastern San Joaquin groundwater subbasin GSP, I

[3] Kamman Hydrology & Engineering, Inc., 2018, Delineating subterranean streams and Potential Stream Depletion Areas, Lower Stanislaus and Tuolumne River Watershed. Draft Technical Memorandum prepared for: Law Offices of Thomas N. Lippe, APC, July 23, 9p. and 15 sheets.
[4] https://groundwaterresourcehub.org/public/uploads/pdfs/TNC_NCdataset_BestPracticesGuide_2019.pdf.
[5] WRIME, 2007, Recharge characterization for Stanislaus and Tuolumne Rivers Groundwater Basin Association. Memorandum prepared for MID and DWR, May 2, 31p.

was able to identify undesirable depletions from the Stanislaus River associated with their projected conditions scenario. These undesirable impacts on the beneficial uses of the river would have otherwise been missed without the quantification and presentation of estimates for stream flow gains and losses.

b. Technical memorandum #1 (Common Datasets and Assumptions used in the Delta-Mendota Subbasin GSPs) in the Common Chapter Appendix indicates GSPs will apply DWR's Climate Change Factors (CCF) for precipitation, evapotranspiration and stream flow. Although the application of precipitation and evapotranspiration CCFs is stated in all GSPs, some do not indicate that the stream flow CCFs were applied (see Rows 3 through 5, Table 1). If not applied, climate change stream flow volumes in the projected conditions water budgets are incorrect and could adversely impact calculation of sustainable yields.

c. A primary purpose of the water budgets is to quantify changes in groundwater storage. The standard water budget equation is:

Inflows – outflows = change in storage

This is the Inflow/Outflow (I/O) Method referred to in Row 8 of Table 1. Water budgets developed for the SJREC, Farmers and Fresno GSPs use the I/O Method. The Inflow/Outflow Method is based on the water budget difference between inflow to the area (supply sources) and outflow from the area (uses). However, the change in storage estimates computed and utilized in the NCDM, Aliso, and Grassland GSP water budgets, as well as the Delta-Mendota Subbasin water budget found in the Common Chapter (indicated by "SY" in Row 8, Table 1) were derived by the Specific Yield (SY) Method. The SY Method is used to calculate change in storage based on average annual measured water level decline and the specific yield[6] for the associated aquifer. Multiplying the SY by the change in water level and aquifer area provides an estimate of the change in aquifer storage. The SY Method is an empirically-based method to calculate past change in storage, while the I/O method predicts the change using a process-based accounting method.

In my opinion, the SY Method is not well suited to predict future changes in storage in a spreadsheet model. In order to complete the projected water budgets, GSPs using the SY Method derived representative change in storage volumes for designated year-types by averaging the values of same year-types from the historic water budget. These values were then applied to same year-types in the projected water budget. In essence, the SY method defeats the purpose of a water budget intended to calculate change in storage, because it has already calculated the change in storage and "hard-wired" that value into the water budget. I don't agree with using the SY Method in the water budgets, especially as a predictive

[6] Specific yield is the ratio of the volume of water that drains from a saturated aquifer under gravity to the total volume of the aquifer.

tool. I suspect that the professionals opting to use the I/O Method for the SJREC, Farmers and Fresno GSP water budgets agree.

d. Several GSPs chose to complete water budgets using volumes averaged over the entire multi-year period of analysis (see Row 7, Table 1). Not having a chronological summary of annual inputs and outputs prevented me from identifying or tracking how different operations changed sequentially or by water year-type. As a professional hydrologist, I appreciate and strive to provide as much transparency to an analysis as possible. I believe that is also the intent of SGMA as Section 354.18(a) of the code stipulates that basin water budgets provide an accounting and assessment of total <u>annual</u> inflow and outflow volumes. GSP water budgets that don't provide an annual accounting (i.e., SJREC, Aliso and Grassland) are insufficient and the GSP should be considered unacceptable.

e. Other GSP issues that warrant your attention, which may render the GSPs incomplete, include:

- The NCDM GSP does not provide an estimate of sustainable yield;
- The Fresno GSP reports no overdraft from the upper aquifer, however Table 3-6 of the GSP (Historical period water budget) indicates an annual overdraft of 1,400 AF/yr; and
- The Farmers and Fresno GSPs state they are operating within sustainable conditions and no projects or management actions are required. Although the Fresno GSP quantifies no overdraft conditions, the Farmers GSP estimates and average annual overdraft of 600 AF in the upper aquifer and does not provide an estimate for the lower aquifer.

f. After reviewing all the GSP spreadsheet water budgets, including the Basin Wide water budget, it is my scientific opinion that a more coordinated and sophisticated modeling water budget tool covering the entire subbasin is necessary to generate a scientifically valid water budget and would eliminate inconsistencies between individual water budgets and address many of the concerns I've raised. An integrated surface water-ground water numerical model would better address stream-aquifer interactions, especially since they are highly varied within the subbasin. Such a tool would also better quantify the interactions between GSP areas, some of which are very small and attribute potential depletions from pumping from neighboring jurisdictions.

5. I agree with NMFS and CDFW's recommendations, where provided, that Final GSPs develop conservative streamflow depletion thresholds and sustainable management criteria protective of surface water beneficial uses. As recommended by NMFS and CDFW, and required under SGMA {Section 354.28(c)(6)}, the GSP must identify a way to quantify how historic, current and future changes in groundwater levels have/will affect the timing and rate of surface water depletions and impacts on stream flow levels/rates, water quality and the associated aquatic habitats sustained by stream hydrology. This requires understanding the

interrelated set of hydrologic and ecological processes that occur on spatial and temporal scales much finer than the coarse scales represented by the proposed monitoring network and typical of groundwater basin model grids. In order to quantify just the hydrologic processes at a single point, one would ideally need to: construct, screen and continuously monitor a well within suitable distance and depths of the stream channel; measure and record well pumping rates; measure water levels and flow rates in the stream channel adjacent to well; characterize the hydraulic properties of the intervening aquifer sediments and stream bed material; and analyze the data over a suitable period that captures seasonal changes in groundwater and surface water levels and flow rates. Through analytical or modeling methods, the concomitant changes in stream flow depletions, stream water levels, pumping rates and stream flow rates could be correlated and quantified. These empirically-based correlations could then be incorporated into an integrated surface water-groundwater model for areas displaying similar geologic and hydrologic conditions. The monitoring data would also be used to calibrate the surface water-groundwater interaction solutions performed by a numerical model.

However, this only covers the physical processes. Additional monitoring and analyses of the benefits and impacts of varying stream flow and water levels on ecological conditions would need to be developed in order to determine how changes in stream flow depletions impact aquatic habitats, including salmonids. This analysis would need to consider all life stages of target species, which means understanding seasonal habitat requirements. Bridging the cause and effect relationships between physical and biological processes in an ISW system can’t be done by monitoring water levels alone. Nor monitoring only water levels and stream levels – the full spectrum of interrelated physical and biological processes need to be correlated.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Gregory R. Kamman

Greg Kamman, PG, CHG
Principal Hydrologist

REGISTERED GEOLOGIST
GREGORY R. KAMMAN
NO. 360
CERTIFIED HYDROGEOLOGIST
12/31/20
STATE OF CALIFORNIA

TABLES & FIGURES

TABLE 1: GSP water budget review matrix for GSPs in Delta-Mendota Groundwater Subbasin

<table>
<tr><th>Water Budget (WB) Element</th><th>NCDM</th><th>SJREC</th><th>Aliso</th><th>Farmers</th><th>Fresno</th><th>Grassland</th><th>Basin wide[6]</th></tr>
<tr><td>1. Does WB[1] account for stream gains from groundwater?</td><td>no</td><td>no</td><td>no</td><td>no</td><td>no</td><td>no</td><td>no</td></tr>
<tr><td>2. Does WB account for stream seepage/recharge?</td><td>no</td><td>yes</td><td>yes</td><td>yes, but lumped[3]</td><td>yes, but lumped</td><td>no</td><td>no</td></tr>
<tr><td>3. Does WB apply CCF[2] to precipitation?</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td></tr>
<tr><td>4. Does WB apply CCF to evapotranspiration?</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td><td>yes</td></tr>
<tr><td>5. Does WB apply CCF to stream flow?</td><td>not stated</td><td>yes</td><td>not stated</td><td>yes</td><td>not stated</td><td>not stated</td><td>yes</td></tr>
<tr><td>6. Are projects and management actions into projected WB?</td><td>yes</td><td>yes</td><td>yes</td><td>not required</td><td>not required</td><td>yes</td><td>yes</td></tr>
<tr><td>7. Does WB present total annual volume?</td><td>yes</td><td>no</td><td>no</td><td>yes</td><td>yes</td><td>no</td><td>yes</td></tr>
<tr><td>8. Method used to calculate aquifer change-in-storage volume?</td><td>SY[4]</td><td>I/O[4]</td><td>SY</td><td>I/O</td><td>I/O</td><td>SY</td><td>SY</td></tr>
<tr><td>9. WB estimate of sustainable yield - upper aquifer (AF/yr)</td><td>NA[5]</td><td>189,000</td><td rowspan="2">83,600</td><td>6700 - 9200</td><td>NA</td><td>NA</td><td>325,000 - 480,000</td></tr>
<tr><td>10. WB estimate of sustainable yield - lower aquifer (AF/yr)</td><td>NA</td><td>73,000</td><td>733</td><td>NA</td><td>NA</td><td>250,000</td></tr>
<tr><td>11. WB estimate of historic overdraft - upper aquifer (AF/yr)</td><td>42,000</td><td>13,000</td><td rowspan="2">2,200</td><td>600</td><td>0</td><td>0</td><td>118,182</td></tr>
<tr><td>12. WB estimate of historic overdraft - lower aquifer (AF/yr)</td><td>8,000</td><td>10,000</td><td>NA</td><td>0</td><td>0</td><td>61,636</td></tr>
</table>

Notes:

1. WB= water budget
2. CCF = Climate Change Factor
3. Stream seepage volume integrated into total surface water recharge estimate - not reported as independent estimate.
4. I/O = input/output method; SY = specific yield method.
5. NA = not available/reported
6. Basin wide water budget presented in Common Chapter appendix

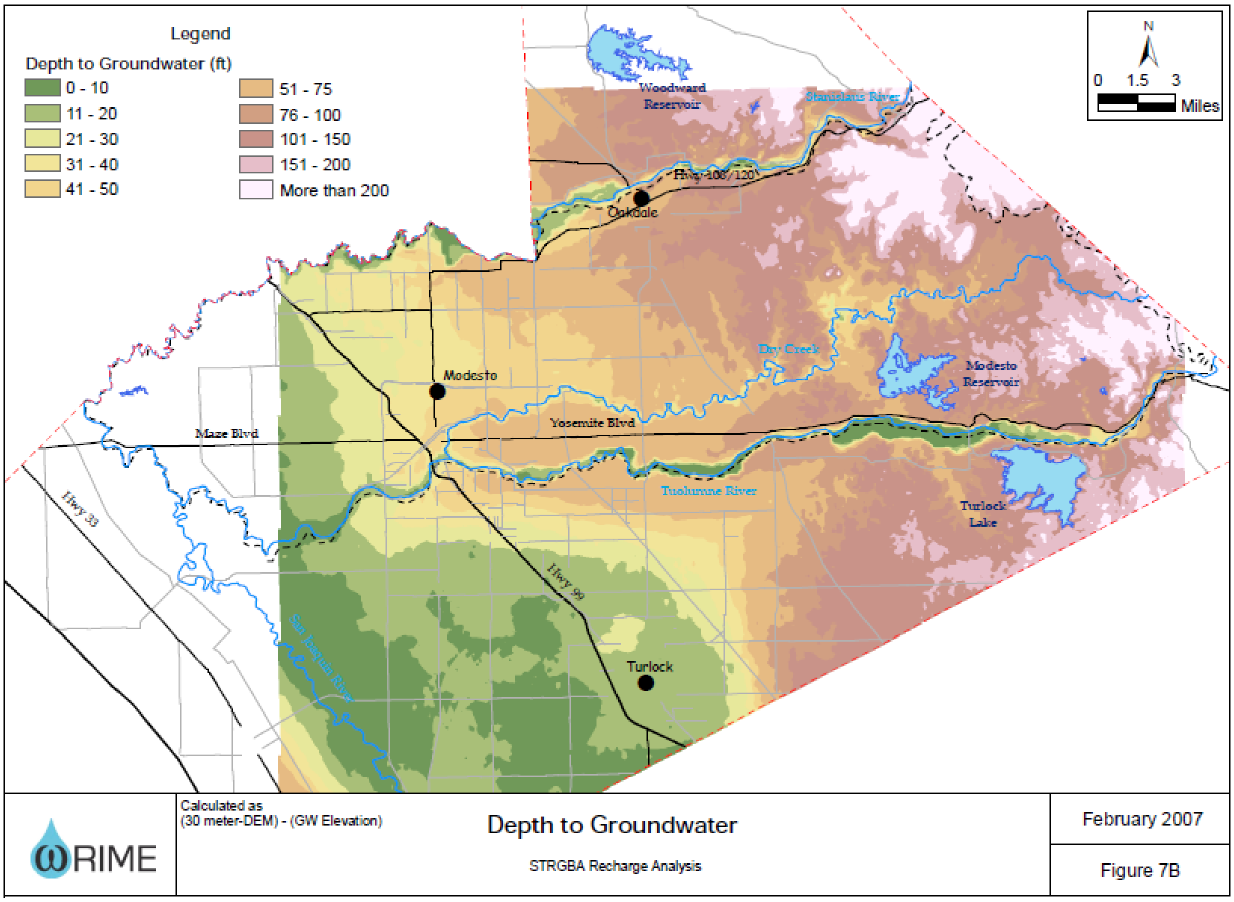

FIGURE 1: Depth-to-water estimates along Stanislaus River (boxed area) from Figure 7B of WRIME study. Note depth to water is less than 30 feet along majority of Stanislaus River corridor within boxed area.

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May 15, 2020

Craig Altare
Supervising Engineering Geologist
California Department of Water Resources
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Re: California Sportfishing Protection Alliance's Comments on the Groundwater Sustainability Plans for the Delta Mendota Subbasin (5-022.07):
- Groundwater Sustainability Plan For the Northern and Central Delta-Mendota Regions.
- Groundwater Sustainability Plan for the San Joaquin River Exchange Contractors GSP Group in the Delta-Mendota Subbasin.
- Groundwater Sustainability Plan for Fresno County Management Area A and Management Area B in the Delta-Mendota Subbasin.
- Farmers Water District Groundwater Sustainability Agency Groundwater Sustainability Plan.
- The Aliso Water District Groundwater Sustainability Agency Groundwater Sustainability Plan.
- Grassland Groundwater Sustainability Plan.

Dear Mr. Altare:

This office represents the California Sportfishing Protection Alliance (CSPA) regarding the Groundwater Sustainability Plans (GSPs) for the Delta Mendota Subbasin (Subbasin 5-022.07), including the six GSPs identified above (Plan or Plans).

I. INTRODUCTION

CSPA's concerns substantially overlap the concerns expressed by the National Marine Fisheries Service (NMFS) and the California Department of Fish & Wildlife (CDFW) in their comments on these Plans. CSPA adopts the comments presented in each of these letters as its own, with the following emphasis: in all instances where NMFS or CDFW identifies a shortcoming in the Plan or recommends a change in the Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan. CSPA also provides additional legal, biological, geological, and hydrological context for these comments where additional information is available and pertinent.

CSPA also adopts the comments made by Greg Kamman, its consulting geologist and hydrologist, in his letters dated May 14, 2020, and May 15, 2020, attached hereto as Exhibits 11 and 12, respectively.

These six Plans operate pursuant to a coordination agreement. (See Water Code § 10727(b).) They are also interdependent with respect to their calculation of water budgets and sustained yield goals (see "Common Chapter" included in each GSP as either Appendix A or B) and their shared reliance on implementing common projects and management actions in attempting to achieve sustainable yield of groundwater. Consequently, a comment on one GSP in this subbasin is a comment on all six GSPs in the subbasin. Therefore, CSPA requests that DWR consider its comments on each Delta Mendota subbasin GSP to be a comment on all six Delta Mendota Subbasin GSPs.

This letter discusses the Northern and Central Delta-Mendota GSP in section IV; the San Joaquin River Exchange Contractors GSP in section V; the Fresno County Management Area A and B GSP in section VI; the Farmers Water District GSP section VII; the Aliso Water District GSP in section VIII; and the Grassland GSP in section IX.

While these plans share many common analytic tools and approaches, they also differ in many crucial respects. As explained by Greg Kamman, these differences obfuscate, rather than illuminate, the extent to which the Plans considered as a whole will achieve sustainable yield for the entire Delta-Mendota Region subbasin. (Exs 11, 12.) For political and "local control" reasons, the GSAs in the Delta-Mendota Region chose to balkanize their preparation of GSPs for the subbasin into the six areas with six plans now before DWR for review. The result is scientifically indefensible. The result is also legally invalid, because the six plans, whether considered individually or collectively, fail to demonstrate **achievement of sustainable** groundwater management or the Plans' sustainability goals. (Water Code §§ 10720.1; 10721(v); 10733(a).)

CSPA is concerned with the deleterious effects of groundwater pumping on stream flow, which severely damages populations and habitat of many species of fish and wildlife dependent on aquatic and riparian ecosytems. These Plans fails to use the best available information to identify the geographic locations where, and times of year when, groundwater pumping depletes or is likely to deplete stream flow. Also, to the extent there are legitimate "data gaps," the Plans fail to include a plan or protocol to fill these gaps. While the Sustainable Groundwater Management Act (SGMA) contemplates the possibility of "data gaps," it does not authorize the wholesale "kick the can down the road" approach taken by these Plans.

The same is true regarding areas where the groundwater table has already dropped below the elevation of hydrologic connection to stream channels due to pumping groundwater. In these areas, the continuing loss of stream flow to groundwater remains an undesirable result. The Plans gives no thought to changing these conditions to recover hydrologic connection between such channels and their historical sources of groundwater derived base flow.

As discussed below, the streams and rivers in this subbasin are home to several species of endangered or special concern salmonids on the verge of extinction. The failure of the Plans to describe how they will avoid further harm to these species and contribute to their recovery from the brink of extinction represents a failure to comply with SGMA's requirement to avoid undesirable results by establishing minimum thresholds, measurable objectives, and interim milestones supported by the best available information and best available science.

With respect to identifying the undesirable result of stream flow depletion as a result of pumping inter-connected groundwater, the Plans treat the topic as an afterthought, when it must be recognized as a critical factor in determining the extinction or recovery of Central Valley steelhead and Central Valley spring-run Chinook salmon, two anadromous salmonid species listed as "threatened" under the federal Endangered Species Act ("ESA").[1]

CSPA objects to DWR's approval of these Plans because they do not meet the requirements of the Sustainable Groundwater Management Act, DWR's GSP Emergency Regulations at Title 23, Cal. Code Regs. section 350 et seq. (GSP Rules), the reasonable use doctrine, or the public trust doctrine. The Plans do not satisfy GSP Rule 355.4(b)(1), the reasonable use doctrine, or the public trust doctrine because the Plans' descriptions of sustainability goals, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable or supported by the best available information and best available science.

The Plans fail to demonstrate **achievement of sustainable** groundwater management or the Plan's sustainability goal within 20 years. (See Water Code § 10720.1 ["it is the intent of the Legislature to ... (a) To provide for the sustainable management of groundwater basins"]; § 10721(v) ["Sustainable groundwater management" means "the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results"]; § 10733(a) ["DWR must determine if GSP "is likely to achieve the sustainability goal for the basin"].)

[1]In 2005 and 2006, respectively, the National Marine Fisheries Service (NMFS) designated the the California Central Valley spring-run Chinook salmon ESU and the California Central Valley steelhead DPS as "threatened species" under the federal ESA after finding both species to be "at risk of becoming endangered in the foreseeable future throughout all or a significant portion of their range." (Ex 4, p. 50412; Ex. 2 p. 857.)

II. FACTUAL BACKGROUND

Four distinct runs of Chinook Salmon spawn in the Sacramento-San Joaquin River system, named for the season when the majority of the run enters freshwater as adults. Fall-run Chinook Salmon migrate upstream as adults from July through December and spawn from early October through late December. The timing of runs varies from stream to stream. Late-fall-run Chinook Salmon migrate into the rivers from mid-October through December and spawn from January through mid-April. The majority of young salmon of these runs migrate to the ocean during the first few months following emergence, although some may remain in freshwater and migrate as yearlings.

Spring-run Chinook Salmon enter the Sacramento River from late March through September. Adults hold in cool water habitats through the summer, then spawn in the fall from mid-August through early October. Spring run juveniles migrate soon after emergence as young-of-the-year, or remain in freshwater and migrate as yearlings.[2]

Fall-run Chinook Salmon are currently the most abundant of the Central Valley races, contributing to large commercial and recreational fisheries in the ocean and popular sport fisheries in the freshwater streams. Fall-run Chinook Salmon are raised at five major Central Valley hatcheries which release more than 32 million smolts each year. Due to concerns over population size and hatchery influence, Central Valley fall and late-fall-run Chinook Salmon are a Species of Concern under the federal Endangered Species Act.[3]

NMFS' proposed decision to list Central Valley steelhead as "threatened" under the federal ESA states:

> This coastal steelhead ESU occupies the Sacramento and San Joaquin Rivers and their tributaries. In the San Joaquin Basin, however, the best available information suggests that the current range of steelhead has been limited to the Stanislaus, Tuolumne, and Merced Rivers (tributaries), and the mainstem San Joaquin River to its confluence with the Merced River by human alteration of formerly available habitat. The Sacramento and San Joaquin Rivers offer the only migration route to the drainages of the Sierra Nevada and southern Cascade mountain ranges for anadromous fish. The distance from the Pacific Ocean to spawning streams can exceed 300 km, providing unique potential for reproductive isolation among

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[2] https://wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon

[3] https://wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon

> steelhead. The Central Valley is much drier than the coastal regions to the west, receiving on average only 10– 50 cm of rainfall annually. The valley is characterized by alluvial soils, and native vegetation was dominated by oak forests and prairie grasses prior to agricultural development. Steelhead within this ESU have the longest freshwater migration of any population of winter steelhead.

(Ex 1, p. 41547.)

> In the San Joaquin River Basin, there is little available historic or recent information on steelhead distribution or abundance. According to McEwan and Jackson (1996), there are reports of a small remnant steelhead run in the Stanislaus River. Also, steelhead were observed in the Tuolumne River in 1983, and large rainbow trout (possibly steelhead) have been observed at Merced River Hatchery recently. NMFS concludes that the Central Valley steelhead ESU is presently in danger of extinction. Steelhead have already been extirpated from most of their historical range in this ESU. Habitat concerns in this ESU focus on the widespread degradation, destruction, and blockage of freshwater

(Ex 1, p. 41554.)

> Steelhead on the west coast of the United States have experienced declines in abundance in the past several decades as a result of natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes (especially in the Columbia River and Sacramento-San Joaquin Basins) have greatly reduced or eliminated historically accessible habitat. Studies indicate that in most western states, about 80 to 90 percent of the historic riparian habitat has been eliminated. Further, it has been estimated that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded. Washington and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91-percent loss of its wetland habitat. Loss of habitat complexity has also contributed to the decline of steelhead. For example, in national forests in Washington, there has been a 58-percent reduction in large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood. Similarly, in Oregon, the abundance of large, deep pools on private coastal lands has decreased by as much as 80 percent. Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west coast steelhead.

(Ex. 1, p. 41557.)

NMFS' final decision to list Central Valley steelhead as "threatened" under the federal ESA states:

> Modification of natural flow regimes have resulted in increased water temperatures, changes in fish community structures, depleted flow necessary for migration, spawning, rearing, flushing of sediments from spawning gravels, reduced gravel recruitment and the transport of large woody debris. In addition to these indirect effects from dams and other water control structures, they have also resulted in increased direct mortality of adult and juvenile steelhead.

(Ex 2, p. 856.)

NMFS's proposed decision to list Central Valley spring-run Chinook salmon as "threatened" under the federal ESA states:

> Chinook salmon (O. tshawytscha) are easily distinguished from other Oncorhynchus species by their large size. Adults weighing over 120 pounds have been caught in North American waters. ... Chinook salmon are anadromous and semelparous. This means that as adults, they migrate from a marine environment into the fresh water streams and rivers of their birth (anadromous) where they spawn and die (semelparous). Adult female chinook will prepare a spawning bed, called a redd, in a stream area with suitable gravel composition, water depth and velocity. ... Stream flow, gravel quality, and silt load all significantly influence the survival of developing chinook salmon eggs.

(Ex 3, p. 11483.)

> Native spring chinook salmon have been extirpated from all tributaries in the San Joaquin River Basin, which represents a large portion of the historic range and abundance of the ESU as a whole. The only streams considered to have wild spring-run chinook salmon are Mill and Deer Creeks, and possibly Butte Creek (tributaries to the Sacramento River), and these are relatively small populations with sharply declining trends. Demographic and genetic risks due to small population sizes are thus considered to be high.
>
> Habitat problems are the most important source of ongoing risk to this ESU. Spring-run fish cannot access most of their historical spawning and rearing habitat in the Sacramento and San Joaquin River Basins (which is now above impassable dams), and current spawning is restricted to the mainstem and a few

> river tributaries in the Sacramento River. The remaining spawning habitat accessible to fish is severely degraded. Collectively, these habitat problems greatly reduce the resiliency of this ESU to respond to additional stresses in the future. The general degradation of conditions in the Sacramento River Basin (including elevated water temperatures, agricultural and municipal diversions and returns, restricted and regulated flows, entrainment of migrating fish into unscreened or poorly screened diversions, and the poor quality and quantity of remaining habitat) has severely impacted important juvenile rearing habitat and migration corridors

(Ex 3, pp. 11491-11492.)

NMFS’s final decision to designate critical habitat for Central Valley steelhead and Central Valley spring-run Chinook salmon, under the federal ESA states, regarding these species’ life cycle and habitat needs:

> Juveniles and subadults typically spend from 1 to 5 years foraging over thousands of miles in the North Pacific Ocean before returning to spawn. Some species, such as coho and Chinook salmon, have precocious life history types (primarily male fish known as “jacks”) that mature and spawn after only several months in the ocean. Spawning migrations known as “runs” occur throughout the year, varying by species and location. Most adult fish return or “home” with great fidelity to spawn in their natal stream, although some do stray to non-natal streams. Salmon species die after spawning, except anadromous O. mykiss (steelhead), which may return to the ocean and make one or more repeat spawning migrations. This complex life cycle gives rise to complex habitat needs, particularly during the freshwater phase (see review by Spence et al., 1996). Spawning gravels must be of a certain size and free of sediment to allow successful incubation of the eggs. Eggs also require cool, clean, and well oxygenated waters for proper development. Juveniles need abundant food sources, including insects, crustaceans, and other small fish. They need places to hide from predators (mostly birds and bigger fish), such as under logs, root wads and boulders in the stream, and beneath overhanging vegetation. They also need places to seek refuge from periodic high flows (side channels and off channel areas) and from warm summer water temperatures (cold water springs and deep pools). Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages salmon require cool water that is free of contaminants. They also require rearing and migration corridors with adequate passage conditions (water quality and quantity available at specific

> times) to allow access to the various habitats required to complete their life cycle.

(Ex 6, p. 52519 (italics added.)

NMFS's final decision to designate critical habitat for Central Valley steelhead and Central Valley spring-run Chinook salmon also discusses the required scale for analyzing impacts on these species:

> We are now also able to identify "specific areas" (ESA section 3(5)(a)) and "particular areas" (ESA section 4(b)(2)) at a finer scale than in 2000. As used the State of California's CALWATER watershed classification system, which is similar to the USGS watershed classification system that was used for salmonid critical habitat designations in the Northwest. This information is now generally available via the internet, and we have expanded our GIS resources to use these data. We used the CALWATER Hydrologic Subarea (HSA) unit (which is generally similar in size to USGS HUC5s) to organize critical habitat information systematically and at a scale that, while somewhat broad geographically, is applicable to the spatial distribution of salmon. Organizing information at this scale is especially relevant to salmonids, since their innate homing ability allows them to return to the watersheds where they were born. Such site fidelity results in spatial aggregations of salmonid populations that generally correspond to the area encompassed by HSA watersheds or aggregations of these watersheds.
>
> The CALWATER system maps watershed units as polygons, bounding a drainage area from ridge-top to ridgetop, encompassing streams, riparian areas and uplands. Within the boundaries of any HSA watershed, there are stream reaches not occupied by the species. Land areas within the CALWATER HSA boundaries are also generally not "occupied" by the species (though certain areas such as flood plains or side channels may be occupied at some times of some years). We used the watershed boundaries as a basis for aggregating occupied stream reaches, for purposes of delineating "specific"' areas at a scale that often corresponds well to salmonid population structure and ecological processes. This designation refers to the occupied stream reaches within the watershed boundary as the "habitat area'" to distinguish it from the entire area encompassed by the watershed boundary. Each habitat area was reviewed by the CHARTs to verify occupation, PCEs, and special management considerations (see "Critical Habitat Analytical Review Teams" section below).
>
> The watershed-scale aggregation of stream reaches also allowed us to analyze the impacts of designating a "particular area,"' as required by ESA section 4(b)(2). As

> a result of watershed processes, many activities occurring in riparian or upland areas and in nonfish-bearing streams may affect the physical or biological features essential to conservation in the occupied stream reaches. The watershed boundary thus describes an area in which Federal activities have the potential to affect critical habitat (Spence et al., 1996). Using watershed boundaries for the economic analysis ensured that all potential economic impacts were considered. Section 3(5) defines critical habitat in terms of "specific areas," and section 4(b)(2) requires the agency to consider certain factors before designating "'particular areas." In the case of Pacific salmonids, the biology of the species, the characteristics of its habitat, the nature of the impacts and the limited information currently available at finer geographic scales made it appropriate to consider "specific areas"' and "particular areas" as the same unit.

(Ex 6, p. 52520.)

III. LEGAL FRAMEWORK

A. SGMA and GSP Regulations.

Both SGMA and the GSP regulations require that GSPs consider, identify, and map the interactivity between surface waters and groundwater extractions where and when groundwater pumping may cause depletion of groundwater that is deleterious to beneficial use of waters before GSAs adopt and before DWR approves a GSP.

The purpose of a GSP is to facilitate the achievement of a basin's sustainability goal,[4] which is the "implementation of measures targeted to ensure that the applicable basin is operated within its sustainable yield."[5] A basin's "sustainable yield" is "the maximum quantity of water… that can be withdrawn annually from a groundwater supply without causing an undesirable result."[6] Six undesirable results are identified, including "depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water."[7] Thus, a GSP must facilitate achieving no depletions of interconnected surface waters that have significant and unreasonable adverse impacts on the beneficial uses of the surface water

[4] See Water Code, § 10727, subd. (a).

[5] *Ibid.*, subd. (u).

[6] *Ibid.*, subd. (v).

[7] *Ibid.*, subd. (x)(6).

in a basin.

Each GSP must include a water budget—"an accounting of the total groundwater and surface water entering and leaving a basin including the changes in the amount of water stored."[8] Further, SGMA requires consideration of the interests of all beneficial uses and users of groundwater, which include "surface water users, if there is a hydrologic connection between surface and groundwater bodies."[9] GSPs must also identify "groundwater dependent ecosystems",[10] which are "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occur near the ground surface."[11] Finally, GSPs must identify minimum thresholds for depletions of interconnected surface water, which are "the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results."[12] Thus, both SGMA and the regulations require DWR to consider the interactivity between groundwater pumping and interconnected surface water.

B. Reasonable and beneficial use doctrine.

The "reasonable and beneficial use" doctrine, to which SGMA expressly must comply,[13] is codified in the California Constitution. It requires that "the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare." (Cal Const, Art. X § 2; see also *United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 105 ["…superimposed on those basic principles defining water rights is the overriding constitutional limitation that the water be used as reasonably required for the beneficial use to be served."].) The reasonable and beneficial use doctrine applies here given the negative impacts of the Draft GSP on groundwater supply, which are likely to unreasonably interfere with the use of groundwater for in-stream and riparian

[8] Water Code, § 10727, subd. (y)

[9] *Id.*, § 10723.2, subd.(f).

[10] *Id.*, subd. (g).

[11] *Ibid.*, § 351, subd. (m).

[12] *Ibid.*, § 354.28, subd. (6).

[13] Water Code § 10720.1(a)

habitat uses. As the GSP authorizes waste and unreasonable use, it conflicts with the reasonable and beneficial use doctrine and the California Constitution.

C. Public Trust Doctrine.

The "public trust" doctrine applies to the waters of the State, and establishes that "the state, as trustee, has a duty to preserve this trust property from harmful diversions by water rights holders" and that thus "no one has a vested right to use water in a manner harmful to the state's waters."[14] The "public trust" doctrine has recently been applied to groundwater where there is a hydrological connection between the groundwater and a navigable surface water body. (*Environmental Law Foundation v. State Water Resources Control Bd.* (2018) 26 Cal.App.5th 844 (*Environmental Law Foundation* or *ELF*). In *Environmental Law Foundation*, the court held that the public trust doctrine applies to "the extraction of groundwater that adversely impacts a navigable waterway" and that the government has an affirmative duty to take the public trust into account in the planning and allocation of water resources.[15] The court also specifically held that SGMA does not supplant the requirements of the common law public trust doctrine.[16] In contrast to these requirements, the GSP does not consider impacts on public trust resources, or attempt to avoid insofar as feasible harm to the public's interest in those resources.

The Public Trust Doctrine imposes an "affirmative duty on the state to act on behalf of the people to protect their interest in navigable water."[17] The doctrine is expansive and flexible—public trust uses include not only navigation, commerce, and fishing, but also hunting, bathing and swimming.[18] Further, "an increasingly important public use is the preservation of trust lands 'in their natural state, so that they may serve as ecological units for scientific study, as open space, and as environments which provide food and habitat for birds and marine life, and

[14] *United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 106; see also *National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 426 ["before state courts and agencies approve water diversions they should consider the effect of such diversions upon interests protected by the public trust, and attempt, so far as feasible, to avoid or minimize any harm to those interests."].

[15] *Id*. at 856-62.

[16] *Id*. at 862-870.

[17] *ELF, supra*, 26 Cal.App.5th 844, 857.

[18] *ELF, supra*, 26 Cal.App.5th at p. 857

which favorably affect the scenery and climate of the area.'"[19]

ELF held that the State Board's public trust obligation was independent of, and not limited by, its authority to oversee permitting.[20] Relying on *National Audubon Society v. Superior Court*, ELF held that state agencies have "an affirmative duty to take the public trust into account in the planning and allocation of water resources and to protect public trust uses whenever feasible."[21] Further, ELF held that "SGMA does not . . . replace or fulfill public trust duties, or scuttle decades of decisions upholding, defending, and expanding the public trust doctrine."[22] Therefore, SGMA does not supplant a state agency's affirmative and independent obligation to consider the public trust in decisions regarding the planning and allocation of water resources and to protect public trust uses whenever feasible.

Both GSAs and DWR must comply with the holding of *Environmental Law Foundation v. State Water Resources Control Board* in deciding to adopt or approve GSPs. Pursuant to *Environmental Law Foundation*, GSAs and DWR must: (1) identify any public trust resources within each basin; (2) identify any public trust uses within each basin; (3) identify and analyze the potential adverse impact of groundwater extractions on public trust resources and uses; and (4) determine the feasibility of protecting public trust uses and protect such uses "whenever feasible."

The affirmative and independent obligation to consider the public trust imposes on applies to GSAs and DWR a legal duty to not only consider the potential adverse impacts of groundwater extractions on navigable waterways but also "to protect public trust uses whenever feasible."[23] ELF explicitly held that this affirmative duty is not supplanted by SGMA.[24] GSAs and DWR are thus legally obligated to consider the public trust in adopting or approving GSPs. The criteria for each basin should include: (1) identifying any public trust resources within the

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[19] *ELF, supra*, 26 Cal.App.5th 844, 857 [quoting *San Francisco Baykeeper, Inc. v. State Lands Com.* (2015) 242 Cal.App.4th 202, 234.]

[20] *ELF, supra*, 26 Cal.App.5th at p. 862.

[21] *ELF, supra*, 26 Cal.App.5th at p. 865 [quoting *National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 446-47 [hereinafter *National Audubon*].)

[22] *ELF, supra*, 26 Cal.App.5th at p. 865.

[23] *ELF, supra*, 26 Cal.App.5th at p. 865

[24] *ELF, supra*, 26 Cal.App.5th at p. 856-67.

basin; (2) identifying any public trust uses within the basin; (3) identifying and analyzing potential adverse impacts of groundwater extractions on public trust resources and uses; and (4) determining the feasibility of protecting public trust uses and protecting such uses "whenever feasible."

The first step is to identify any public trust resources—state-owned navigable waterways—within the groundwater basin.[25] The public trust doctrine mandates that "the title which a State holds to land under navigable waters is . . . held in trust for the people of the State."[26] In ELF, the Scott River was a navigable waterway and so constituted a public trust resource.[27] Thus, to satisfy its public trust duty, GSAs and DWR must identify all state-owned navigable waterways in each basin—this step should be formally incorporated as the first public trust criteria in the GSP regulations. GSAs and DWR must ensure that the GSP identifies all state-owned navigable waterways in each basin when making its decision regarding a submitted GSP or Alternative.

The second step is to identify any public trust uses within the groundwater basin for each public trust resources identified above. DWR must identify all public trust uses, including but not limited to: navigation, commerce, fishing, hunting, bathing, and swimming as well as preserving natural spaces to "serve as ecological units for scientific study, as open space, and as environments which provide food and habitat for birds and marine life, and which favorably affect the scenery and climate of the area."[28] As explained in ELF, "the range of public trust uses is broad" as well as "flexible, accommodating changing public needs."[29] To satisfy its public trust obligation, GSAs and DWR must identify all public trust uses in each basin.

The third step is to identify potential adverse impacts of groundwater extractions on the identified public trust resources and uses. As held in ELF, "the public trust doctrine applies if

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[25] See *Illinois Central Railroad Co. v. State of Illinois* (1892) 146 U.S. 387, 436 ["the [public trust] doctrine is founded upon the necessity of preserving to the public the use of navigable waters"]; ELF, supra, 26 Cal.App.5th at p. 857-58.

[26] *ELF, supra*, 26 Cal.App.5th at p. 856-57 [quoting *Long Sault Development Co. v. Call* (1916) 242 U.S. 272, 278-79.]

[27] *ELF, supra*, 26 Cal.App.5th at p. 853.

[28] *ELF, supra*, 26 Cal.App.5th at p. 857

[29] ELF, supra, 26 Cal.App.5th at p. 857 [quoting *San Francisco Baykeeper, Inc. v. State Lands Com., supra*, 242 Cal.App.4th at p. 233.]

extraction of groundwater adversely impacts a navigable waterway to which the public trust doctrine does apply."[30] GSAs and DWR must analyze all potential harm from groundwater pumping to the identified public trust resources and uses within each basin. This encompasses analyzing all instances where groundwater extractions "allegedly harm[] a navigable waterway" and "thereby violate[] the public trust."[31]

The fourth step is to analyze the feasibility of protecting the identified public trust uses from the identified potential harms due to groundwater extractions. As held in *ELF* and *National Audubon*, "the state has an affirmative duty to . . . protect public trust uses whenever feasible."[32] Thus, GSAs and DWR must analyze the feasibility of protecting public trust uses before making its decision regarding a GSP or Alternative.

However, not only must agencies analyze feasibility, they must also protect public trust uses within each basin "whenever feasible." If it is feasible to protect public trust uses in decisions regarding GSPs, then DWR and GSAs must do so—even if the depletions of interconnected surface water are not determined to have "significant and unreasonable adverse impacts" on its beneficial uses.[33]

While SGMA sets a deadline of 2020 or 2022 for adopting GSPS for high- and medium-priority basins,[34] it delays until 2025 any SGMA-based interim plan by the State Water Resources Control Board intended to remedy a condition where the groundwater extractions result in significant depletions of interconnected surface waters in probationary basins.[35] However, under *ELF* and the public trust doctrine, DWR and GSAs have the authority, and the obligation, to take action now.

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[30]ELF, supra, 26 Cal.App.5th at p. 859 ["the determinative fact is the impact of the activity on the public trust resource."]

[31] *ELF, supra,* 26 Cal.App.5th at p. 859-60.

[32] *ELF, supra,* 26 Cal.App.5th at p. 862 [quoting *National Audubon, supra,* 33 Cal.3d 419, 446-47.]

[33] See Wat. Code, § 10727, subd. (x)(6).

[34] See Wat. Code, § 10720.7, subd. (a).

[35] *Ibid.*, § 10735.8, subd. (h).

D. CDFW's Fish & Wildlife Groundwater Planning Considerations.

In 2019, the California Department of Fish & Wildlife (CDFW) published "Fish & Wildlife Groundwater Planning Considerations" specifically to provide guidance to GSA's in their efforts to draft GSPs that adequately address both "Groundwater Dependents Ecosytems" (GDEs) and "Interconnected Surface Waters" (ISW). (Ex 7.) This guide book provides important criteria for judging the Plan's failure to adequately address both issues.

With respect to Interconnected Surface Waters, CDFW's Groundwater Planning Considerations pose three simple questions that GSPs should answer:

> 1. How will groundwater plans document the timing, quantity, and location of ISW [Interconnected Surface Waters] depletions attributable to groundwater extraction and determine whether these depletions will impact fish and wildlife?
> 2. How will GSAs determine if fish and wildlife are being adversely impacted by groundwater management impacts on ISW?
> 3. If adverse impacts to ISW-dependent fish and wildlife are observed, how will GSAs facilitate appropriate and timely monitoring and management response actions?

(Ex 7, p. 5.) These Plans answer none of these questions.

CDFW's Groundwater Planning Considerations provide a detailed description of the factors that must be included in GSPs to evaluate impacts on fish and wildlife stream flow depletion from groundwater pumping, including factors relating to species life cycle (e.g., temporal water needs ["aquatic and terrestrial species require different quantities and qualities of water at different times and for different durations"]; spatial water needs ["similar to temporal water needs, species are sensitive to the location and coverage of ISW and GDE wetland habitat available to them"]; hydrologic variability ["water availability is naturally variable, and many species rely on a degree of hydrologic variability"]; water availability ["CDFW expects groundwater budget projections to include fish and wildlife water needs"]; water quality ["Groundwater quality and ISW quality play a significant role in habitat adequacy. Groundwater pumping can impact many components of water quality..."]) and factors relating to habitat value (e.g., connectivity ["Habitat connectivity is a key ecological attribute of thriving ecosystems"]; heterogeneity ["Habitat heterogeneity, such as vegetation age and diversity, is a key ecological attribute of many functional ecosystems ..."]; groundwater elevation ["Groundwater-dependent habitats, including ISW, are particularly susceptible to changes in the depth of the groundwater"].)[36] (Ex 7, pp. 9-11.)

These Plans do not include any analysis of these factors, nor do any of them propose a plan or protocol to do so in the future..

IV. NORTHERN AND CENTRAL DELTA-MENDOTA REGIONS GSP

CSPA adopts the comments presented by the NMFS in its April 6, 2020, comment letter on this Plan and the other five Delta Mendota Region GSPs (NMFS 4/6/20);[37] and by the CDFW in its March 11, 2020, comment letter on this Plan (CDFW 3/11/20). In all instances where NMFS or CDFW identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water.

Given the critical importance of avoiding harmful stream flow depletion in the subbasin's rivers and stream, one would expect it to be a major topic of investigation, reporting, and planning in development of the Plan over the last five years. Instead, the topic is disposed of a few short paragraphs, as follows:

> 5.3.7.4 Current Conditions
> Historically, most of the San Joaquin River, which forms the great majority of the Delta-Mendota Subbasin's eastern border, was a gaining reach. Snowmelt runoff

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[36] "Lowered water tables that drop beneath root zones can cutoff phreatophyte vegetation from water resources, stressing or ultimately converting vegetated terrestrial habitat. Induced infiltration attributable to groundwater pumping can reverse hydraulic gradients and may cause streams to stop flowing, compromising instream dissolved oxygen and temperature characteristics, and eventually causing streams to go dry. The frequency and duration of exposure to lowered groundwater tables and low-flow or no-flow conditions caused by groundwater pumping, as well as habitat and species resilience, will dictate vulnerability to changes in groundwater elevation. For example, some species rely on perennial instream flow, and any interruption to flow can risk species survival. Impacts caused by changes in groundwater elevation should be considered in the evaluation of groundwater management effects on GDEs and ISW." (Ex 7, p. 11.)

[37] NMFS' letter states: "This letter transmits NMFS' comments specifically regarding the final NCDMR GSP, although these comments generally apply also to the five other final GSPs submitted for the Delta Mendota Subbasin." (NMFS 4/6/20, p. 1.)

> during the spring and early summer resulted in these conditions through a good portion of the year. However, significant decreases in groundwater elevations due to pumping, storage, and upstream diversions on the river have reversed this condition so most reaches are now losing reaches. Some localized gaining reaches still remain on the lower river, such as between the Stanislaus and Merced Rivers, corresponding to the reaches of the San Joaquin River boarding the Northern and Central Delta-Mendota Regions.
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> 5.3.7.5 Estimates of Timing and Quantity of Gains/Depletions Using available data, the quantity of gains and/or depletions from the groundwater at each reach of the San Joaquin River identified along the Northern and Central Delta-Mendota Regions was estimated. Table 5-9 summarizes these estimates. Estimates of the timing of gains and/or depletions were unavailable in related literature, and insufficient data were available to estimate the timing of losses and gains in the Northern and Central Delta-Mendota Regions. Such information will be gathered through future monitoring efforts related to this GSP.

(Plan, p. 5-175.)

In fact, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping. Mr. Kamman's comments describe one such method previously used by the State Water Resources Control Board for mapping areas where groundwater pumping is likely to cause depletion of surface flows, known as Potential Stream Depletion Areas ("PSDA"). (Ex 11.) Mr. Kamman applied this method to the mainstem Stanislaus River watershed between Goodwin Dam and its confluence with the San Joaquin River; and the mainstem Tuolumne River watershed between La Grange Dam/Reservoir and the San Joaquin River (the "PSDA Study Area"). The results include maps using USGS 7.5-minute topographic quadrangle sheets (quad sheets) showing the mainstem river channels. (Final GSP, Appendix 1-I, Public Comments, pdf pp. 598-612.)

These maps cover areas both inside and outside the Plan boundary. They are presented here as an example of a data gathering method that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

This Plan's basin-wide sustainable yield estimate for the Upper Aquifer ranges from 325,000 AF/yr ± 10 percent (no management actions) to 480,000 AF/yr +/- 10 percent (with management actions) (Plan p. 5-237). The basin-wide sustainable yield estimate for the Lower Aquifer is 250,000 AF/yr (Plan p. 5-238). The overdraft reduction estimate is 50,000 AF/yr (total), with 42,000 AF/yr for Upper Aquifer and 8,000 AF/yr for the Lower Aquifer (Plan p. 5-225). These estimates, however, are invalid because they fail to reflect consideration of undesirable results, especially on fish and wildlife species dependent on interconnected surface water.

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letters attached as Exhibits 11 and 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

C. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal because it relies on projects of unknown feasibility to reduce groundwater pumping.

The Plan relies on the implementation of numerous "projects and management actions" to achieve the Plan's sustainability goal, but concedes that these projects and management actions "require further analysis and permitting to determine feasibility and cost effectiveness." (ES-1, ES-9.)[38] The Plan's failure to demonstrate the feasibility of these projects and management

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[38]"The six Delta-Mendota Subbasin GSP Groups will work together in a coordinated fashion to implement projects and management actions within their respective GSP Plan areas in order to achieve sustainability Subbasin-wide. The Northern & Central Delta-Mendota Region GSP has identified projects that can either replace (offset) or supplement (recharge) groundwater to aid in reaching sustainability by 2040. *** The projects and management actions contained in this GSP,

actions means the Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

V. SAN JOAQUIN RIVER EXCHANGE CONTRACTORS GSP.

CSPA adopts the comments presented in NMFS 4/6/20 and by the CDFW in its April 15, 2020, comment letter on this Plan (CDFW 4/15/20). In all instances where CDFW or NMFS identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water.

The Plan recognizes that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors:

> Historically, most of the San Joaquin River, which forms the great majority of the Delta-Mendota Subbasin's eastern border, was a gaining reach. Snowmelt runoff during the spring and early summer resulted in these conditions through a good portion of the year. However, significant decreases in groundwater elevations due to a myriad of factors, including pumping, tile drains, the channelizing of flood flows, and upstream diversions on the river, have reversed this condition so most reaches are now losing reaches. Some localized gaining reaches still remain on the lower river, such as between the Stanislaus and Merced Rivers; however, many reaches along these rivers (and along localized streams) may transition from gaining to losing depending on hydrology.

(Appendix B, Common Chapter, CC-115-116.)

In its comment letter, CDFW emphasizes the need to identify conditions in which groundwater pumping may causes stream flow depletion. (CDFW 4/15/20.) Yet, the Plan fails to establish the metrics required by SGMA, including metrics for undesirable results, minimum thresholds, measurable objectives, and interim milestones. For example, the Plan states:

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along with the projects and management actions implemented by the other five GSP Groups in the Subbasin, are anticipated to bring the Subbasin into sustainability by 2040. These projects and management actions require further analysis and permitting to determine feasibility and cost effectiveness and the project/management action list will be reviewed and revised, as appropriate, during GSP implementation. Projects and management actions are summarized in the table below."

> The SJREC have not proposed to develop measurable objectives and interim milestones to address interconnected surface water and groundwater.

(Plan, p. v [pdf p. 7].) This sounds like a declaration of independence from the will of the legislature as expressed in SGMA rather than an attempt to comply with SGMA.

The Plan then states:

> Rather than developing a plan to mitigate a problem after the problem has presented itself, the SJREC GSP group has proposed to work with the counties to develop well construction standards to fully mitigate the potential for wells installed near the San Joaquin River to have an impact to the surface water flows.

(Plan, p. v [pdf p. 7].) The implication that there are no existing problems that must be evaluated and mitigated is directly contrary to the Common Chapter's admission that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is also directly contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan entirely fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them. Instead, the Plan refers to vague commitments to avoid impacts and to unsupported assertions that certain area are not at risk of surface water depletion as a result of groundwater depletions. (See e.g., Plan p. 106 [pdf p. 130].)

The Plan then states:

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

(Plan p. 106 [pdf p. 130].) This is merely a restatement of what SGMA requires, not an actual minimum threshold based on evaluating environmental conditions.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method described by Mr. Kamman. (Ex 11.) These maps cover areas both inside and outside the Plan boundary. They are presented here as an example of a data gathering method that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The SJREC Plan's sustainable yield estimate is 189,000 AF/year for upper aquifer and 73,000 AF/year for lower aquifer (Plan pp. 96-97.). Its overdraft reduction estimate based on historic water period is -13,000 AF/yr for Upper Aquifer and -10,000 AF/yr for Lower Aquifer (Plan pp. iv). Overdraft estimate from Projected water budget has Upper Aquifer recovering (+12,000 AF/yr) but Lower Aquifer still in deficit (-5,000 AF/yr) (Plan p. 85-87). These estimates, however, are invalid because they fail to reflect consideration of undesirable results, especially on fish and wildlife species dependent on interconnected surface water.

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

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C. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal because it relies on projects of unknown feasibility to reduce groundwater pumping.

The Plan relies on the implementation of numerous "projects and management actions" to achieve the Plan's sustainability goal. (See e.g., Plan pp. 131, 138, 145, 150, 156, 158, 165, 175, 178, 181, 184, 190.) But the Plan confusingly says "these projects are not intended to mitigate Undesirable Results in this plan." (Plan p. 131.) Achieving the sustainability goal is avoiding undesirable results.

The Plan states that several of these projects "have been analyzed for feasibility" but have not cleared environmental review and have not received permits. (Plan, pp. 113-118.) Plus, the Northern and Central Delta Mendota GSP states that:

> The projects and management actions contained in this GSP, along with the projects and management actions implemented by the other five GSP Groups in the Subbasin, are anticipated to bring the Subbasin into sustainability by 2040. These projects and management actions require further analysis and permitting to determine feasibility and cost effectiveness and the project/management action list will be reviewed and revised, as appropriate, during GSP implementation. Projects and management actions are summarized in the table below.

(Northern and Central Delta Mendota GSP, p. ES-9.) The referenced table includes the projects and management actions listed in the SJREC GSP at pp. 113-118. (Northern and Central Delta Mendota GSP, p. ES-10.) Thus, the Northern and Central Delta Mendota GSP throws more doubt on whether these projects and management actions will be successfully implemented. Absent such assurance, the Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

VI. FRESNO COUNTY MANAGEMENT AREA A AND B GSP

CSPA adopts the comments presented in NMFS 4/6/20 or by the CDFW in its April 28, 2020, comment letter on this Plan (CDFW 4/28/20). In all instances where CDFW or NMFS identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water Systems.

The Plan fails to establish the metrics required by SGMA, including metrics for undesirable results, minimum thresholds, measurable objectives, and interim milestones. The Plan's implication that there are no existing problems that must be evaluated and mitigated is contrary to the Common Chapter's admission that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is also contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them. Instead, the Plan refers to vague commitments to avoid impacts and to unsupported assertions that certain area are not at risk of surface water depletion as a result of groundwater depletions.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method described by Mr. Kamman. (Ex 11.) While these maps cover areas outside of the Fresno GSP's boundary, they represent an example of data gathering that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The Fresno Plan does not present an individual sustainable yield estimate; it only presents the basin-wide estimates that are also presented in the Northern and Central Delta Mendota GSP.

(Plan, p. 50).[39] These estimates, however, are invalid because they fail to reflect consideration of undesirable results, especially on fish and wildlife species dependent on interconnected surface water.

The Fresno Plan claims no overdraft is occurring and there is no overdraft reduction estimate (Plan, p. 50). However, Table 3-6 on Plan p. 50 contradicts this assertion, showing an average annual overdraft in the historic water budget data of 1,400 AF/yr. (Ex 12.)

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

Also, the Plan does not explain the discrepancy between, on one hand, its location in a basin prioritized as in critical overdraft by DWR and its use of a basin-wide water budget, and on the other hand, its claim that considering this Plan in isolation, no overdraft is occurring.[40]

VII. FARMERS WATER DISTRICT GSP

CSPA adopts the comments presented in NMFS 4/6/20 or by the CDFW in its March 11, 2020, comment letter on this Plan (CDFW 3/11/20). In all instances where NMFS or CDFW identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water Systems.

The Plan fails to establish the metrics required by SGMA, including metrics for undesirable results, minimum thresholds, measurable objectives, and interim milestones. The Plan's implication that there are no existing problems that must be evaluated and mitigated is contrary to the Common Chapter's admission that current conditions, when compared to historic

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[39]The basin-wide sustainable yield estimate for the Upper Aquifer ranges from 325,000 AF/yr ± 10 percent (no management actions) to 480,000 AF/yr +/- 10 percent (with management actions). The basin-wide sustainable yield estimate for the Lower Aquifer is 250,000 AF/yr. The overdraft reduction estimate is 50,000 AF/yr (total), with 42,000 AF/yr for Upper Aquifer and 8,000 AF/yr for the Lower Aquifer.

[40] "Further investigation of existing data gap areas and development of future projects and management actions will ensure that sustainable conditions are maintained through the planning and implementation horizon (2040 through 2070)." (Plan, ES-5.)

conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is also contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them. Instead, the Plan refers to vague commitments to avoid impacts and to unsupported assertions that certain area are not at risk of surface water depletion as a result of groundwater depletions.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method described by Mr. Kamman. (Ex 11.) While these maps cover areas outside of the Farmers GSP boundary, they represent an example of data gathering that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The Farmers' GSP presents sustainable yield estimates for Historic and Projected conditions: 6700 AF/yr for historic (Plan p. 46) and 9200 AF/yr for Projected upper aquifer and 733 AF/yr for lower aquifer (Plan p. 46). The overdraft reduction estimate is 600 AF/yr for upper aquifer and undetermined for lower aquifer (Plan p. 45).

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

VIII. ALISO WATER DISTRICT GSP

CSPA adopts the comments presented in NMFS 4/6/20 or by the CDFW in its April 28, 2020, comment letter on this Plan (CDFW 4/28/20). In all instances where NMFS or CDFW identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water Systems.

The Plan fails to establish the metrics required by SGMA, including metrics for undesirable results, minimum thresholds, measurable objectives, and interim milestones. The Plan's implication that there are no existing problems that must be evaluated and mitigated is contrary to the Common Chapter's admission that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is also directly contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them. Instead, the Plan refers to vague commitments to avoid impacts and to unsupported assertions that certain areas are not at risk of surface water depletion as a result of groundwater depletions.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method described by Mr. Kamman. (Ex 11.) While these maps cover areas outside of the Aliso GSP's boundary, they represent an example of data gathering that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The Aliso Plan's sustainable yield estimate for combined upper & lower aquifer is 83,600 AF/yr (Plan p. 3-20) and its overdraft reduction estimate is 2,200 AF/yr per Table 3-7 (Plan p. 3-24).

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

C. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal because it relies on projects of unknown feasibility to reduce groundwater pumping.

The Plan relies on the implementation of projects and management actions to achieve the Plan's sustainability goal. As noted above, the Northern and Central Delta Mendota GSP concedes that "The projects and management actions contained in this GSP, along with the projects and management actions implemented by the other five GSP Groups in the Subbasin ... require further analysis and permitting to determine feasibility and cost effectiveness." (Northern and Central Delta Mendota GSP, p. ES-9.) Absent more assurance that the projects and management actions, the Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

IX. GRASSLANDS GSP

CSPA adopts the comments presented by the NMFS in its April 6, 2020, comment letter on all six Delta Mendota Region Plans (NMFS 4/6/20). In all instances where NMFS or CDFW identifies a shortcoming or recommends a change in a Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan.

A. Interconnected Surface Water Systems.

The Plan "assumes ... there is a net inflow from the Grassland Plan Area to the SJR [San Joaquin River], designating it as interconnected and a gaining stream in this section." (Plan, p. 4-9 [pdf 164].) The Plan states:

> The only locations in the area evaluated where groundwater is known to be in direct hydraulic communication with a stream is along a nine-mile-long reach of the San Joaquin River on the north edge of the San Luis NWR (Figure 3-4). A series of shallow monitoring wells have been installed by Reclamation as part of the SJRRP. Water level maps indicate that groundwater in the upper aquifer discharges to the river along this reach. The GGSA has installed a network of shallow (10 to 20 feet deep) observation wells in the District. Monitoring of these wells will provide more definitive information on the relationship between shallow groundwater and streamflow at these same locations.

(Plan, p. 3-39 [pdf 127].)

The Plan quantifies its groundwater pumping as follows:

> Approximately 30,000 - 50,000 AFY of groundwater is pumped and used within the Plan Area. This pumping includes the pumping of state, federal, and private refuge lands as well as the limited agricultural lands in the Plan Area. Historically, GWD's refuge water supply pumping can be up to 28,262 AF in below normal or critical years. Pumping is reduced significantly during wet years when other sources of surface water are available for use in the Plan Area.

(Plan, p. 2-26 [pdf 063].) The Plan also concludes that

> Groundwater pumping in the Grassland Plan Area does not influence surface water depletion. Reduction of interconnected surface water bodies and associated groundwater dependent ecosystems (GDEs) that would require reduction in groundwater pumping (no management activities have depleted interconnected surface water in the Grassland Plan Area within the historical period).

(Plan, p. 4-5 [pdf 160].)

The Plan defines "significant and unreasonable undesirable results of interconnected surface water" as "reduction of interconnected surface waterbodies and associated GDEs that would require reduction in groundwater pumping." (Plan, p. 4-8]pdf 163].)

This definition is circular because it defines the condition to be remedied (i.e., significant and unreasonable undesirable results) by reference to the need to employ the remedy. This circularity omits any reference or metric tied to the environmental resources (e.g., threatened salmonids) that are undesirably impacted by surface water depletions caused by groundwater pumping.

In another location, the Plan states:

> Quantitative Definition of Significant and Unreasonable Undesirable Results: If a twenty percent or greater decrease from the recent historical (2000 to 2019) upper aquifer groundwater level lows are experienced or exceeded at more than fifty percent of the representative monitoring network wells for three consecutive years, then it can be assumed that significant and unreasonable undesirable results have occurred.

(Plan, p. 4-10]pdf 165].) Again, the metric is untethered to at-risk environmental resources.

Similarly, the proposed "interim goals and measurable objectives" outlined in Plan section 4.5.1 do not meet regulatory requirements because they are not tied to the lifecycle and habitat needs of affected species such as threatened salmonids. The Plan bases its "interim goals and measurable objectives" on this description of recent and existing conditions:

> Unlike most GSPs within critically overdrafted basins, the Grassland Plan Area is not projected to significantly deviate from the sustained groundwater levels it has historically experienced. Therefore, the interim goals and measurable objectives are reflective of a sustained system.

(Plan p. 4-25 [pdf p. 180].) Even assuming, arguendo, that the Grassland Plan area continues to experience these conditions in the future, the fact remains that interconnected surface water dependent species are going extinct in this regional ecosytem. The Plan concedes that "Any disruptions to that contribution are best assessed on a regional basis rather than on a site-specific scale." (Plan, p. 4-18 [pdf 173].) But, without conducting any analysis tied to species impacts at either level, the Plan focuses on what it expects to happen within its own boundaries.

This violates SGMA's requirements to coordinate analyses when GSPs are "coordinated" as the six Delta Mendata GSPs are, and SGHMA's requirement to consider impacts in adjacent or hydrologically connected basins.

It would appear that the Grassland GSAs refrained from complying with SGMA with respect to interconnected surface waters because they believe the risk of harm to ISW associated environmental resources is low. The Plan's implication that there are no existing problems that must be evaluated and mitigated is contrary to the Common Chapter's admission that current conditions, when compared to historic conditions represent a significant adverse change in surface water depletions from groundwater pumping and other factors. This conclusion is directly contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Delta Mendota subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10.)

The Plan fails to evaluate how continuing use of groundwater may continue these "undesirable results" conditions or potentially exacerbate them.

The Plan indicates that "the Grassland GSP Technical Working Group and Plan Area participants have decided to use water elevation SMCs as a proxy for interconnected surface water (see Section 5.3.2)." (Plan, p. 4-9 [pdf p. 164].) As stated by NMFS

> SGMA requires that if a proxy metric is used, then significant correlation must be established between the two metrics (CCR § 354.36(b). No correlation or linkage between a "significant increase in the depletion of surface water" and significant, unreasonable adverse impacts on beneficial uses of surface water, is presented in the final GSP. Thus, this threshold is inconsistent with SGMA regulations and guidance, which require consideration of not only the rate or volume of streamflow depletion, but more importantly the impact the depletion may have on beneficial uses of surface water (e.g., meeting habitat requirements for ESA-listed salmonids). As stated earlier, the appropriate method to determine whether pumping is having "significant and unreasonable adverse impacts" on beneficial uses of surface water is to understand the level of impact (i.e., volume of streamflow depletion) and how habitat quality and functionality change because of that impact.

(NMFS 4/6/20, pp. 3-4; see also, CDFW's Groundwater Planning Considerations, Ex 7, pp. 5-11.)

The Plan states that:

> Historically, the SJR is interconnected to the stretch adjacent to the Grassland Plan Area for most of the year during most water years. The Grassland Plan Area's contribution to the interconnection can be quantitatively measured by the upper aquifer groundwater levels across the Plan Area, as the groundwater flow

> trends towards the SJR and contributes a net inflow to the river. Any disruptions to that contribution are best assessed on a regional basis rather than on a site-specific scale.

(Plan, p. 4-18 [pdf 173].) But the Plan does conduct this analysis at either the regional or site-specific level and does not include a plan or protocol to do so.

As discussed above, there are readily available methodologies for identifying stream reaches at risk of groundwater depletion from groundwater pumping, including PSDA method described by Mr. Kamman. (Ex 11.) While these maps cover areas outside of the Grassland GSP's boundary, they represent an example of data gathering that can and should be employed for this plan. GSAs cannot avoid location specific characterizations of the risk of undesirable results because someone else has not already developed the information. The GSAs have spent five years developing a broad range of data pertinent to their basins. They must do the same for interconnected surface waters.

The Plan fails to describe any protocol to obtain usable information to identify areas and times with a high risk of groundwater pumping induced stream flow depletion. The Plan also provides no assurance that the GSAs will gather heretofore unavailable information that would correlate groundwater and surface flow elevations to the life cycle and habitat of listed salmonids at sufficiently fine-grained geographic and temporal scales to evaluate the risk of undesirable results.

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, the PSDA methodology and resulting maps represent the best information available for this purpose. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

B. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

The Grasslands Plan reports no sustainable yield estimate, "as the plan area experiences a positive change in groundwater storage on average." (Plan p. 45). The reported positive annual change in groundwater storage is 3200 AF/yr (Plan p. 149). However, the Plan does report the basinwide sustainable yield estimation for the upper lower aquifers, stating:

> The basinwide analysis resulted in an Upper Aquifer Sustainable Yield estimate ranging from 325,000 AF to 480,000 AF, demonstrating the Subbasin's estimated Upper Aquifer sustainable yield without implementing any projects and management actions (low end of range) and the Subbasin's estimated Upper

> Aquifer sustainable yield considering the implementation of projects and management actions (high end of range).
> The basinwide estimates for the Lower Aquifer sustainable yield are approximately 250,000 AFY over the approximately 750,000-acre Subbasin.

(Plan, p. 3-57 [pdf p. 145] citing section 4.3.4 of the Common Chapter.)

There are numerous problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate calculations (described in detail by Mr. Kamman in his letter attached as Exhibit 12) that preclude it from demonstrating achievement of sustainable groundwater management or the Plan's sustainability goal.

X. CONCLUSION

As noted in connection with the Grassland GSP, individual GSPs in this subbasin must coordinate to assess interconnected groundwater conditions that effect listed species impacts across the entire subbasin. Each Plan cannot myopically focus on its own boundaries.

The groundwater levels sustainable management criteria set by a GSA must be the point that, "if exceeded, may cause undesirable results."[41] Therefore, the Plans' groundwater levels sustainable management criteria must have the purpose of avoiding "significant and unreasonable" impacts on beneficial users caused by declining groundwater levels.[42] The GSAs' determination of what is "significant and unreasonable" must consider the impacts on all types of beneficial users, including fish and wildlife, CSPA and its members, and all who use and are concerned about watershed health in the rivers and streams of California.

The regulations also establish that a failure to consider all beneficial uses and users of groundwater undermines the likelihood that a basin will reach its sustainability goal.[43] For groundwater levels specifically, GSAs must place minimum thresholds for each monitoring site at the level "that may lead to undesirable results."[44] Under the SGMA regulations, the GSP should provide a description of "the information and criteria relied upon to establish minimum thresholds," an explanation of how the proposed minimum thresholds will "avoid undesirable results," and "how minimum thresholds may affect the interests of beneficial uses and users of groundwater."[45]

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[41] 23 CCR § 354.28(a).
[42] 23 CCR § 354.26.
[43] 23 CCR § 355.4(b).
[44] 23 CCR § 354.28.
[45] 23 CCR § 354.28.

Because these Plans do not consider effects on the interests of all the beneficial uses and users of groundwater, it fails to "include[] the information required by [SGMA] and [its accompanying regulations]" and is thus inadequate.[46] Here, the Plans fail to comply with 23 CCR § 355.4(b) ["(1) Whether the assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are reasonable and supported by the best available information and best available science"]; ["(2) Whether the Plan identifies reasonable measures and schedules to eliminate data gaps]; ["(3)Whether sustainable management criteria and projects and management actions are commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Plan"]; and (4) ["Whether the interests of the beneficial uses and users of groundwater in the basin, and the land uses and property interests potentially affected by the use of groundwater in the basin, have been considered"].)

Thus, the Plans are inadequate because they do not "include[] the information required by [SGMA] and [its accompanying regulations]." (23 CCR § 355.4(a)(2).)

Thank you for your attention to this matter.

Very Truly Yours,

Tom Lippe

Thomas N. Lippe

List of Exhibits

1. Proposed Endangered Status for Five ESUs of Steelhead and Proposed Threatened Status for Five ESUs of Steelhead in Washington, Oregon, Idaho, and California. Federal Register/Vol. 61, No. 155/Friday, August 9, 1996/pp. 41541-41561.

2. Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Federal Register/Vol. 71/No. 3/January 5, 2006/pp. 834-862.

3. Proposed Endangered Status for Two Chinook Salmon ESUs and Proposed Threatened Status for Five Chinook Salmon ESUs. Federal Register/Vol. 63, No. 45/March 9, 1998/pp. 11482-11520.

4. Threatened Status for Two Chinook Salmon Evolutionarily Significant Units (ESUs) in

[46] 23 CCR § 355.4(a)(2).

California. Federal Register / Vol. 64, No. 179 / Thursday, September 16, 1999/pp. 50394-50415.

5. Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon (Oncorhynchus tshawytscha) and Steelhead (O. mykiss) in California. Federal Register/Vol. 69, No. 237/Friday, December 10, 2004/Proposed Rules/pp. 71880-72017.

6. Final Critical Habitat Rule for Central Valley steelhead (Oncorhynchus mykiss) and Central Valley spring-run Chinook salmon (O. tshawytscha). Federal Register/Vol. 70, No. 170/September 2, 2005/pp. 52488-52627.

7. Fish & Wildlife Groundwater Planning Considerations. California Department of Fish & Wildlife, 2019.

8. Sustainable Groundwater Management Act - 2019 Basin Prioritization, Process and Results; Department of Water Resources, May 2020.

9. Excerpt from DWR Basin Priority Database for the Delta Mendota Subbasin.

10. Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development (Guidance Document), Department of Water Resources; July 2018.

11. Letter dated May 14, 2020, from Greg Kamman, consulting geologist and hydrologist.

12. Letter dated May 15, 2020, from Greg Kamman, consulting geologist and hydrologist.

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October 11, 2019

San Luis & Delta-Mendota Water Authority
842 6th Street
Los Banos, CA 93635
Via email: andrew.garcia@sldmwa.org

Subject: Review of Public Draft Groundwater Sustainability Plan For the Northern and Central Delta-Mendota Regions

Dear Sir/Madame:

I am a hydrologist with over thirty years of technical and consulting experience in the fields of geology, hydrology, and hydrogeology. I have been providing professional hydrology and geomorphology services throughout California since 1989 and routinely manage and lead projects in the areas of surface- and groundwater hydrology, water supply, water quality assessments, water resources management, and geomorphology. A copy of my resume is attached.

On behalf of the California Sportfishing Protection Alliance, I have been retained by the Law Offices of Thomas N. Lippe, APC to review and evaluate the Public Draft Groundwater Sustainability Plan (GSP) for the Northern and Central Delta-Mendota Regions, especially as it pertains to groundwater interaction with the San Joaquin River. Based on my review, it is my opinion that the GSP is deficient in many areas. The rationale for this opinion is based on the findings presented below.

1. **Page 5-89, Section 5.3, Sentence starting with, "This section..."**
   The current conditions in the GSP is represented by Water Year (WY) 2013 conditions. WY 2013 is out-dated when compared to the year (2020) that this plan represents. Section 354.16 of the GSP Regulations (Groundwater Conditions) states, "Each Plan shall provide a description of current and historical groundwater condition in the basin, including data from January 1, 2015, to current conditions, based on the best available information…" The WY2013 period used in the GSP to represent "current conditions" predates the "current condition" period stipulated in GSP regulations.

2. **Page 5-94, Section 5.3.2.4, Sentence starting with, "Due to insufficient..."**
   Due to insufficient data, groundwater elevation contour maps for the Lower Aquifer for the spring and fall of 2013 could not be prepared. This is another issue with choosing WY 2013 to represent current conditions. A different and preferably more current year should be considered. The GSP fails to fully describe current groundwater conditions.

3. **Page 5-170, Section 5.3.7.2, Sentence starting with, "The San Joaquin..."** Section 354.16 of the GSP Regulations stipulates that each plan describe current and historic groundwater conditions in the basin based on the best available information. With regard to Interconnected Surface Water Systems, I would like you to be aware of a study completed by Kamman Hydrology & Engineering, Inc.[1], which delineates subterranean streams and Potential Stream Depletion Areas (PSDA) along the San Joaquin River. PSDA's are areas where groundwater pumping could potentially cause stream depletion. A link to this report and associated maps is provided in the footnote below for reference and integration into the GSP.

4. **Page 5-170, Section 5.3.7.2, Sentence starting with, "The San Joaquin..."** The GSP only addresses interconnected surface water systems along the San Joaquin River north of Newman, California, where the river is characterized as a gaining stream. This constitutes only 1/3rd of the river length within the Delta-Mendota Subbasin boundary. South (upstream) of Newman, the Nature Conservancy (2016) characterizes groundwater and stream interaction along the San Joaquin River as a mix of gaining and losing reaches, but dominated by gaining reaches. The GSP fails to fully characterize the interconnected surface water conditions along the San Joaquin River within the Subbasin boundary. Understanding and properly managing and protecting these interconnected surface- and groundwater systems is important as there are significant GDE's and associated resources like fish, riparian vegetation and wetlands along the entire length of River in the Subbasin.

5. **Page 5-172, Section 5.3.7.6, Sentence starting with, "The NCCAG dataset..."** The GSP Regulations define "groundwater dependent ecosystem" (GDE) as ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. Section 354.16 of the Regulations stipulate that Plans identify (current and historic) GDEs within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information. As stated on page 5-172, the Natural Communities Commonly Associated with Groundwater (NCCAG) database, developed by DWR, CDFW and The Nature Conservancy (TNC), is used to identify GDEs within the Delta-Mendota Subbasin. The GSP then describes a methodology to further screen available information and establishes the following standards to identify GDEs:

[1] Kamman Hydrology & Engineering, Inc., 2018, Delineating subterranean streams and Potential Stream Depletion Areas, Lower Stanislaus and Tuolumne River Watershed. Draft Technical Memorandum prepared for: Law Offices of Thomas N. Lippe, APC, July 23, 9p. and 15 sheets. https://www.dropbox.com/s/2ser942wkeb5d3v/PSDA-mapping-Tech-Memorandum_v1%2Bquads.pdf?dl=0

(1) Areas with depths to groundwater levels greater than 30 feet were eliminated unless the vegetation identified in those areas were consistent with species with deep root systems (e.g. live oaks);
(2) Seasonally-managed areas and wetlands were eliminated due to their dependence on applied surface water; and
(3) A 100-foot buffer was applied around the San Joaquin River within the Northern Delta-Mendota Region to include all communities in the NCCAG dataset as potential GDEs, except where professional juedement and local knowledge determined GDEs were not present.

A problem with this GDE screening methodology is the failure to acknowledge that GDEs may depend on shallow groundwater regardless of the presence of applied surface water sources. For example, wetlands within or adjacent to irrigated agriculture may not rely on that irrigation for survival; if they did, we would expect to find wetlands growing in all irrigated lands. In addition, the presence and sustainability of perennial surface water in Central Valley Rivers is controlled by many factors (e.g., groundwater inflow, reservoir operations, irrigation drainage, etc.). Information presented in the GSP indicate significant contributions of groundwater flow to "gaining" reaches of the San Joaquin River. The riparian and wetland vegetation bordering these gaining reaches are surely sustained to some degree by this groundwater inflow to the river and the shallow groundwater conditions that likely accompany gaining reaches. The interconnected condition is also likely influenced significantly by seasonal and long-term wet and dry cycles. However, the GSP does not quantify the relative spatial or temporal contributions of groundwater supply to riparian habitats. Instead, the GPS simply dismisses these habitats as GDE's under the assumption that perennial flow is sustained through the summer by agricultural deliveries or tailwater. Therefore, it is my opinion that the process of elimination of GDEs as presented in the GSP is seriously flawed and does not correctly recognize or delineate GDEs in the basin.

6. **Page 5-173, Section 5.3.7.6, Sentence starting with, "As a result..."**
   The GSP states, "*Management and protection of GDEs may require more focus on land use or irrigation activities more than groundwater management*." This is a bizarre statement because the GSP eliminates areas mapped as GDEs if they are, "*seasonally-managed areas and wetlands due to dependence on applied surface water*." Per the GDE screening methodology described above, the "management and protection" practices being suggested for GDEs would eliminate these areas from consideration as a GDE.

7. **Page 5-185, Section 5.4.3, Sentence starting with, "The current water budget..."**
   The GSP states, "*The current water budget year is defined as WY2013. While "current water budget conditions" are defined in the GSP Emergency Regulations §354.18(c)(1) as the year with "the most recent population, land use,*

and hydrologic conditions," WY2015, WY2016 and WY2017 were not thought to be representative of the Delta-Mendota Subbasin under "normal" or "average" conditions. Response to the most recent drought began in WY2014 with some initial fallowing of lands. By WY2015 and WY2016, which are both classified as dry years, more lands were fallowed throughout the Subbasin in response to multiple dry year conditions. Agricultural production was higher in WY2017, compared to WY2015 and WY2016, but the delivery allocations from the Central Valley Project (CVP) came late in the season, so a considerable amount of land was still fallowed. By WY2018, agricultural land production increased and was similar to conditions in WY2013, however complete datasets were not yet available for use in the water budgets. Therefore, the Coordination Committee agreed that WY2013 represents the most recent water year with a complete data set representing typical demands and supplies."

WY 2013 is a critically dry year-type falling within the 2012-2016 recent drought period, which heavily influences the meteorology, hydrology and water operations reflected in the associated "current conditions" water budget. There are more current years reflecting normal or average conditions. For example, Figures 5-84 and 5-85 (page 5-120) indicate that 2017 and 2018 were wet and average year types respectively. During WY2017, there was little change in aquifer storage in both the upper and lower aquifers, suggesting water operations balanced with available supplies. WY2017 also better representative of "current conditions" as it post-dates January 1, 2015 and reflects an average water operational period. WY2018 would also be a suitable when complete datasets become available.

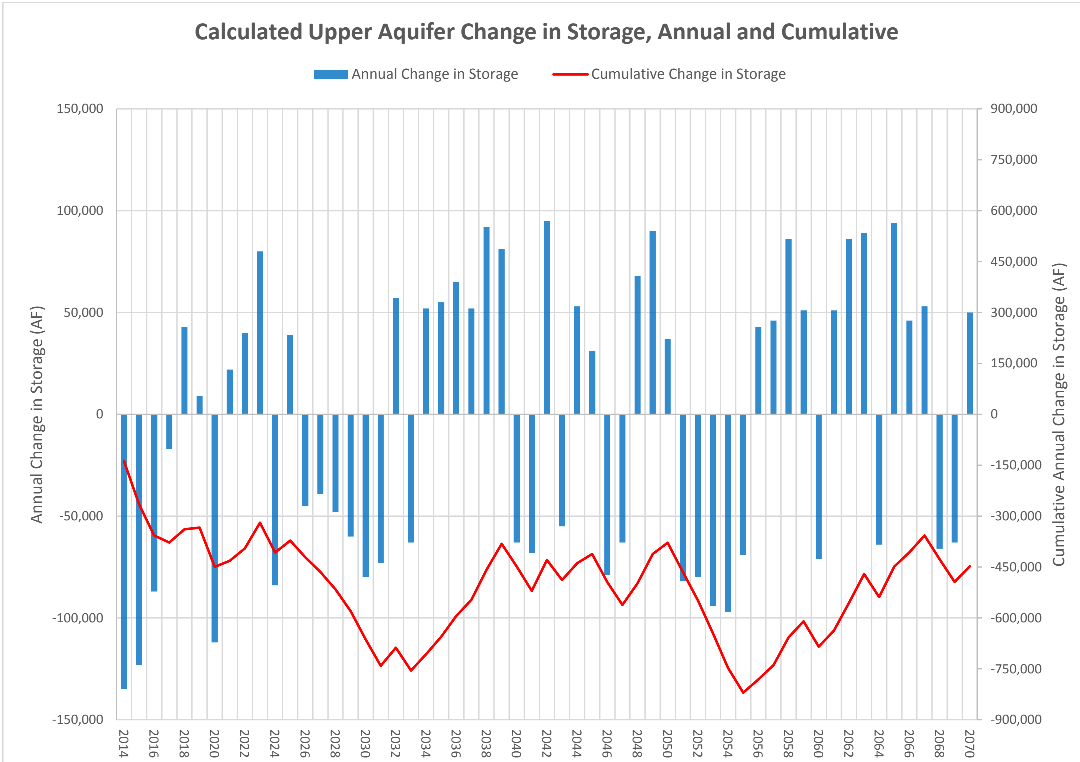
8. **Page 5-186, Section 5.4.3, Sentence starting with, "Streamflow Climate Change..."**
California Department of Water Resources (DWR) has developed a document (July 2018) entitled, Guidance for Climate change *Data Use During Groundwater Sustainability Plan Development* (Guidance Document). This document explains the DWR-provided climate change data, including how the data were developed, the methods and assumptions used for data development, and how they can be used in the development of a projected water budget. DWR has prepared climatological, hydrological and water operations datasets. This Guidance Document also describes tools and processes relevant to perform climate change data analysis (i.e., incorporating climate change analysis into projected water budgets, with and without numerical surface water/groundwater models). The data and methods described in the Guidance Document are optional and other local analysis and methods may be used.

The projected (climate change) water budgets presented in the GSP utilize much of the climatological datasets. However, stream flow climate change factors from DWR were not applied – the proposed GSP considers them out-of-date and considers the result of using them as producing skewed (unreasonable) results for future surface water deliveries. Instead, the GSP states that GSA member agencies provided estimates for anticipated future surface water deliveries that were used in the water budget calculations. However, there is no discussion on the methods and assumptions used for data development, and how climate change was integrated into data values. Therefore, there is no way to evaluate the validity or applicability of these water budget variables with the information provided in the GSP. These information deficiencies should be remedied before approving the GSP.

9. **Page 5-189, Section 5.4.4, Sentence starting with, "The selected alternative..."** The GSP uses a spreadsheet modeling approach for water budget development in lieu of numerical groundwater modeling. The spreadsheet modeling approach does not account for surface water-groundwater interaction and is therefore not an "equally effective method" (see *§354.18(e))* to numerical modeling with respect to identification on interconnected surface water systems and estimating the quantity and timing of depletions of those systems.

10. **Page 5-234, Section 5.4.10, Sentence starting with, "With the addition..."** Based on the results of the Projected Annual Groundwater Budget with Climate Change and Projects & Management Actions, the subbasin should still be considered in a state of overdraft. Although water results indicate a trend of recovery and surplus storage in the Upper Aquifer, the Upper Aquifer displays a long-term trend in storage decline. To better visualize results for this water budget, the annual and cumulative change in storage volumes for the Upper Aquifer, Lower Aquifer and Total (combined Upper and Lower Aquifers) were plotted. These plots are presented below.

    The plot of cumulative change in storage for the Upper Aquifer indicates multi-year periods of large fluctuations in storage, but a long-term trend in declining storage. The GSP states that over the WY2014 to WY2070 period, the average annual change in Upper Aquifer storage is -4,000 AF and the average annual change in Lower Aquifer is +3,000 AF. This statement in itself indicates the Upper Aquifer is in overdraft and long-term decline under this water budget scenario. Based on the graphs below, I estimate that the long-term annual change (deficit) in Upper Aquifer storage is twice as high (-8000 AFY) as that reported in the GSP (-448,000 AF divided by 56 years). I also estimate an annual change in storage in the Lower Aquifer is +6214 AFY (+348,000 AF divided by 56 year) and the total annual change in storage of the Upper and Lower combined is -1785 AFY (-100,000 AF divided by 56 years). Although the proposed Projects and Management Actions presented in the GSP will address overdraft sustainable management of the Lower Aquifer, the GSP has not demonstrated sustainable management for the Upper Aquifer, which provides a much larger percentage of total groundwater supply in the subbasin than the lower aquifer.


Calculated Upper Aquifer Change in Storage, Annual and Cumulative
Annual Change in Storage
Cumulative Change in Storage
Annual Change in Storage (AF)
Cumulative Annual Change in Storage (AF)
150,000
100,000
50,000
0
-50,000
-100,000
-150,000
900,000
750,000
600,000
450,000
300,000
150,000
0
-150,000
-300,000
-450,000
-600,000
-750,000
-900,000
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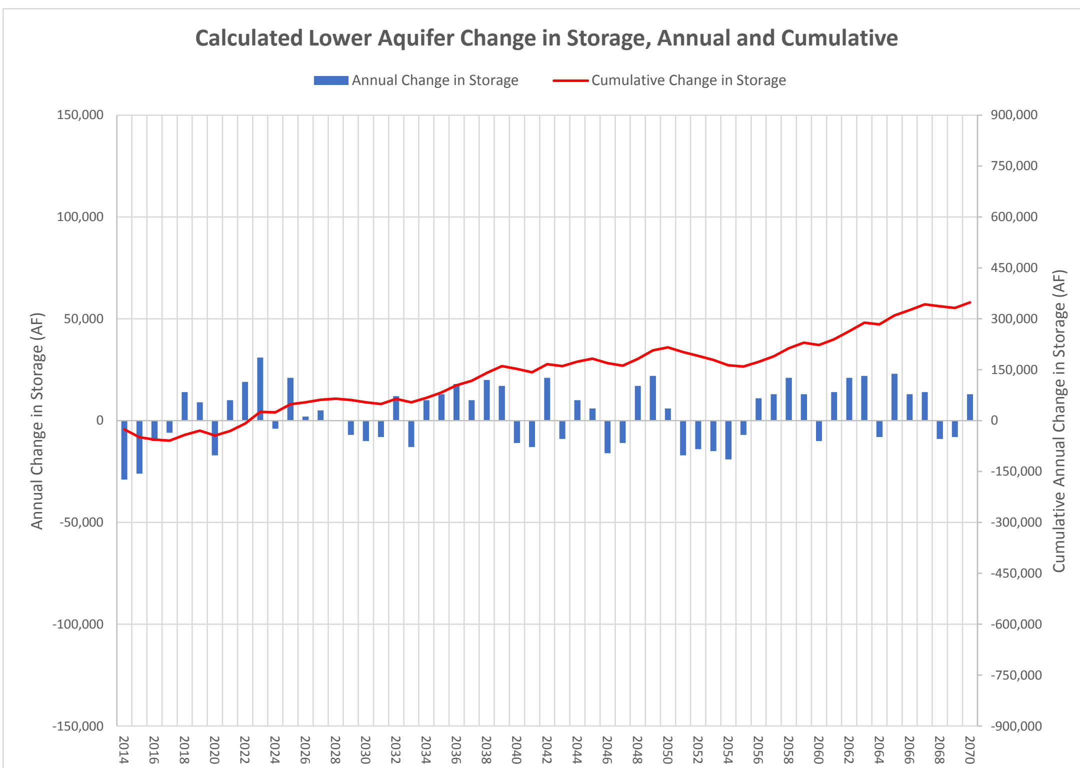
Calculated Lower Aquifer Change in Storage, Annual and Cumulative
Annual Change in Storage
Cumulative Change in Storage
Annual Change in Storage (AF)
Cumulative Annual Change in Storage (AF)
150,000
100,000
50,000
0
-50,000
-100,000
-150,000
900,000
750,000
600,000
450,000
300,000
150,000
0
-150,000
-300,000
-450,000
-600,000
-750,000
-900,000
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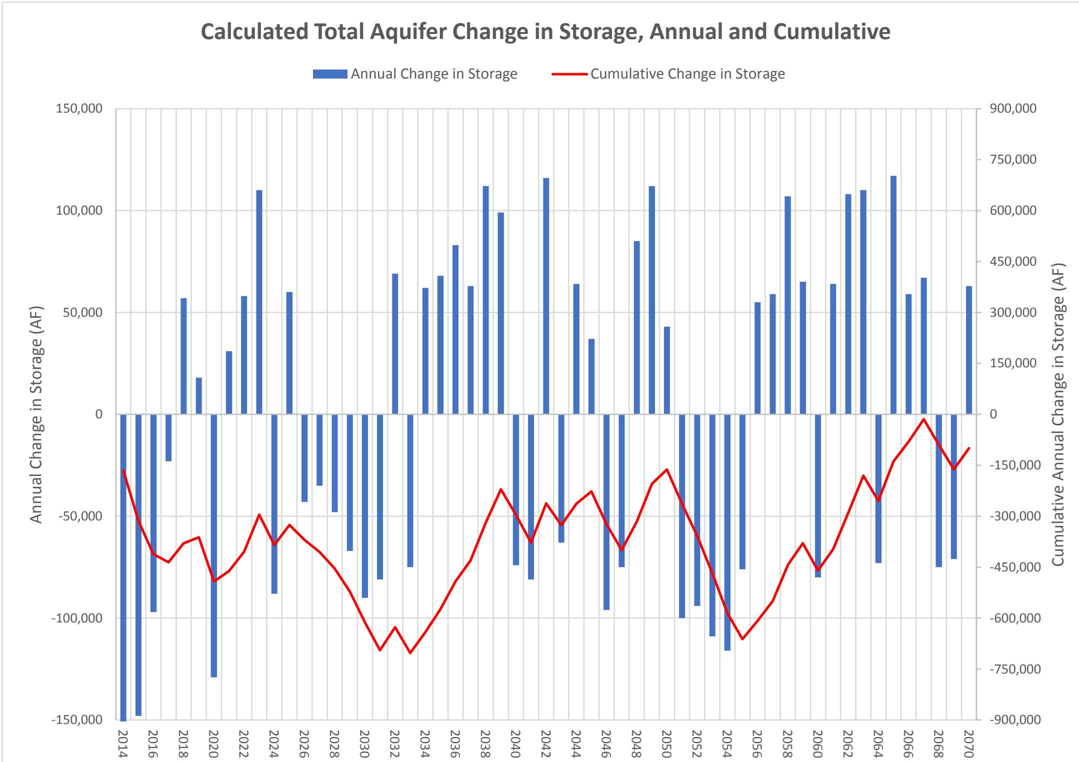

11. **Page 5-235, Section 5.4.11, Sentence starting with, "This analysis resulted..."** The GSP presents a description and formula for estimating sustainable yield. However, the Upper or Lower Aquifer estimates are not reproducible using this formula and the water budget result tables presented earlier in the GSP. Therefore, the draft GSP should be revised to provide more detailed explanation of these calculations, including a sample calculation so the reader can understand and verify how they are quantified, and then recirculated from public comment.

12. **Page 6-12, Section 6.3.2, Sentence starting with, "Reduction of Groundwater"** This section indicates that the GSP uses groundwater levels minimum thresholds as a proxy for the reduction of groundwater storage sustainability indicator. The plots of annual and cumulative annual change in groundwater storage presented above are very helpful in identifying and understanding long-term trends in aquifer storage. I recommend that in lieu of (or in addition to) using groundwater levels as a proxy, water budgets and the resulting annual and cumulative aquifer storage graphics (like those above) should be used as a more meaningful groundwater storage sustainability indicator. The data to maintain current annual water budgets would be required. The existing GSP and future reporting graphs can be used to define and track undesirable results, minimum thresholds, measureable objectives, and interim milestones for the reduction in groundwater

storage. For example, one measureable objective may be positive or neutral trends in long-term cumulative storage. An example minimum threshold may be maintaining a neutral or positive long-term average change in annual storage for both the Upper and Lower Aquifers.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Greg Kamman, PG, CHG
Principal Hydrologist

REGISTERED GEOLOGIST
GREGORY R. KAMMAN
NO. 360
CERTIFIED HYDROGEOLOGIST
12/31/20
STATE OF CALIFORNIA

Attachment - Kamman Resume

Greg Kamman, PG, CHG

Principal Hydrologist

EDUCATION	1989	M.S. Geology - Sedimentology and Hydrogeology Miami University, Oxford, OH
	1985	A.B. Geology Miami University, Oxford, OH
REGISTRATION	No. 360 No. 5737	Certified Hydrogeologist (CHG.), CA Professional Geologist (PG), CA
PROFESSIONAL HISTORY	1997 - Present	Principal Hydrologist/Vice President Kamman Hydrology & Engineering, Inc. San Rafael, CA
	1994 - 1997	Senior Hydrologist/Vice President Balance Hydrologics, Inc., Berkeley, CA
	1991 - 1994	Project Geologist/Hydrogeologist Geomatrix Consultants, Inc., San Francisco, CA
	1989 - 1991	Senior Staff Geologist/Hydrogeologist Environ International Corporation, Princeton, NJ
	1986 - 1989	Instructor and Research/Teaching Assistant Miami University, Oxford, OH

SKILLS AND EXPERIENCE

As a Principal Hydrologist with 30 years of technical and consulting experience in the fields of geology, hydrology, and hydrogeology, Mr. Kamman routinely manages projects in the areas of surface- and ground-water hydrology, stream and wetland habitat restoration, water supply, water quality assessments, water resources management, and geomorphology. Areas of expertise include: stream and wetland habitat restoration; characterizing and modeling basin-scale hydrologic and geologic processes; assessing hydraulic and geomorphic responses to land-use changes in watersheds and causes of stream channel instability; evaluating surface- and ground-water resources and their interaction; and designing and implementing field investigations characterizing surface and subsurface conditions; and stream and wetland habitat restoration feasibility assessments and design. In addition, Mr. Kamman commonly works on projects that revolve around sensitive fishery, wetland, wildlife and/or riparian habitat enhancement. Mr. Kamman performs many of these projects in response to local, state (CEQA) and federal statutes (NEPA, ESA), and other regulatory frameworks. Thus, Mr. Kamman is accustomed to working within a multi-disciplined team and maintains close collaborative relationships with biologists, engineers, planners, architects, lawyers, and resource and regulatory agency staff. Mr. Kamman is a prime or contributing author to over 80 technical publications and reports in the discipline of hydrology – the majority pertaining to ecological restoration. Mr. Kamman routinely teaches courses on stream and wetland restoration through U.C. Berkeley Extension and San Francisco State University's Romberg Tiburon Center.

PROFESSIONAL SOCIETIES & AFFILIATIONS	Groundwater Resources Association of California Society for Ecological Restoration International California Native Plant Society

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Telephone: (415) 491-9600 Fax: (415) 680-1538 Email: greg@khe-inc.com

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Email: Lippelaw@sonic.net

October 11, 2019

Mr. Andrew Garcia
San Luis & Delta-Mendota Water Authority
842 6th Street
Los Banos, CA 93635
Telephone: (209)832-6229
By email to: andrew.garcia@sldmwa.org

Re: California Sportfishing Protection Alliance Comments on the Northern and Central Delta-Mendota Regions - Public Draft Groundwater Sustainability Plan.

Dear Mr. Garcia:

This office represents the California Sportfishing Protection Alliance (CSPA) regarding your review and adoption of the Northern and Central Delta-Mendota Regions - Public Draft Groundwater Sustainability Plan (Plan).

CSPA objects to your adoption of the Plan because it does not meet the requirements of the Sustainable Groundwater Management Act or the GSP Emergency Regulations at Title 23, Cal. Code Regs. section 350 et seq. (GSP Rules), as more fully explained in comments submitted by Hydrogeologist Greg Kamman under separate cover on this date.

The Plan does not satisfy GSP Rule 355.4(b)(1) because the Plan's description of the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable or supported by the best available information and best available science.

The Plan does not satisfy GSP Rule 355.4(b)(3) because the sustainable management criteria and projects and management actions identified in the plan are not commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Plan.

The Plan does not satisfy GSP Rule 355.4(b)(5) because the Plan does not contain or present substantial evidence to conclude that the projects and management actions identified to achieve sustainable yield are effective or feasible or not likely to prevent undesirable results or to ensure that the basin is operated within its sustainable yield.

These deficiencies are described in more detail in Mr. Kamman's October 11, 2019, comments.

For example, Section 354.16 of the GSP Regulations (Groundwater Conditions) states, "Each Plan shall provide a description of current and historical groundwater condition in the basin, including data from January 1, 2015, to current conditions, based on the best available information…."

The Plan improperly uses Water Year 2013 data to represent "current conditions." Per the GSP regulations, the Plan must present data at least as recent as January 1, 2015, and must present data "from January 1, 2015 to" the present where available. The Plan provides no explanation as to why data from 2016, 2017 or 2018 is not presented as required by the regulations. As Mr. Kamman observes, 2013 was a drought year; while 2017 and 2018 were not drought years. Consequently, there was more demand for groundwater in 2013 than in 2017 and 2018.

Also, in addition, the draft Plan's identification of Groundwater Dependent Ecosystems is derived from data from DWR and TNC, but the draft plan then "excludes seasonally-managed areas and wetlands" dependent "on applied surface water." (Plan, p. 5-172.) This exclusion is inconsistent with the Plan's inclusion of the areas mapped by DWR and TNC as long as the area's depth to groundwater is less than 30 feet. If 30-feet depth to groundwater is a reliable criterion for GDE areas that are not seasonally-managed areas or wetlands dependent on applied surface water, it should be a reliable criterion for GDE areas that are seasonally-managed areas/wetlands dependent on applied surface water.

Put another way, the fact that GDE vegetation or wetland features may be partially "dependent" on applied surface water does not mean the GDE is not also partially dependant on groundwater or would not be entirely dependent on groundwater if surface were no longer applied. Indeed, the Plan recognizes that "Management and protection of GDEs may require more focus on land use or irrigation activities more so than groundwater management." (Plan, p. 5-173.) The contemplated use of changing irrigation activities to maintain GDEs reflects the facts that GDEs may be dependent on both groundwater and surface water, and an area's partial dependence on surface water should not exclude it from classification as a GDE.

In addition, section 6.3.2.1.2 states: "Long-term reductions in storage are not anticipated for either principal aquifer so long as groundwater levels are managed above minimum thresholds." (Plan p. 6-13.) This conclusion is directly contradicted by the change in aquifer storage figures for the Upper Aquifer presented by Mr. Kamman, which show long-term downward trend in storage for the Upper Aquifer, even with implementation of proposed Projects and Management Actions.

CSPA urges the Authority to not adopt the Plan in its current form; to revise the draft Plan to remedy these informational deficiencies; and to recirculate the revised Plan for public comment.

Thank you for your attention to this matter.

Very Truly Yours,

Tom Lippe

Thomas N. Lippe

AD002a North Central Delta Mendota.wpd

The Nature Conservancy
Protecting nature. Preserving life.

CALIFORNIA WATER | **GROUNDWATER**

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[916] 449-2850

nature.org
GroundwaterResourceHub.org

October 11, 2019

Andrew Garcia
San Luis & Delta-Mendota Water Authority
842 6th St
Los Banos, CA 93635

Submitted online via: http://deltamendota.org/gsp-summary/

Re: Public Draft Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions

Dear Mr. Garcia,

The Nature Conservancy (TNC) appreciates the opportunity to comment on the Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions being prepared under the Sustainable Groundwater Management Act (SGMA).

TNC as a Stakeholder Representative for the Environment

TNC is a global, nonprofit organization dedicated to conserving the lands and waters on which all life depends. We seek to achieve our mission through science-based planning and implementation of conservation strategies. For decades, we have dedicated resources to establishing diverse partnerships and developing foundational science products for achieving positive outcomes for people and nature in California. TNC was part of a stakeholder group formed by the Water Foundation in early 2014 to develop recommendations for groundwater reform and actively worked to shape and pass SGMA.

Our reason for engaging is simple: California's freshwater biodiversity is highly imperiled. We have lost more than 90 percent of our native wetland and river habitats, leading to precipitous declines in native plants and the populations of animals that call these places home. These natural resources are intricately connected to California's economy providing direct benefits through industries such as fisheries, timber and hunting, as well as indirect benefits such as clean water supplies. SGMA must be successful for us to achieve a sustainable future, in which people and nature can thrive within the Northern and Central Delta-Mendota Regions and California.

We believe that the success of SGMA depends on bringing the best available science to the table, engaging all stakeholders in robust dialog, providing strong incentives for beneficial outcomes and rigorous enforcement by the State of California.

Given our mission, we are particularly concerned about the inclusion of nature, as required, in GSPs. The Nature Conservancy (TNC) has developed a suite of tools based on best available science to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders efficiently incorporate nature into GSPs. These tools and resources are available online at

GroundwaterResourceHub.org. TNC's tools and resources are intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Addressing Nature's Water Needs in GSPs

SGMA requires that all beneficial uses and users, including environmental users of groundwater, be considered in the development and implementation of GSPs (Water Code § 10723.2).

The GSP Regulations include specific requirements to identify and consider groundwater-dependent ecosystems (GDEs) [23 CCR §354.16(g)] when determining whether groundwater conditions are having potential effects on beneficial uses and users. GSAs must also assess whether sustainable management criteria may cause adverse impacts to beneficial uses and users, which include environmental uses, such as plants and animals. TNC has identified each part of GSPs where consideration of beneficial uses and users are required. That list is available here: https://groundwaterresourcehub.org/importance-of-gdes/provisions-related-to-groundwater-dependent-ecosystems-in-the-groundwater-s. Please ensure that environmental beneficial users are addressed accordingly throughout the GSP. Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decision, and using data collected through monitoring to revise decisions in the future. Over time, GSPs should improve as data gaps are reduced and uncertainties addressed.

To help ensure that GSPs adequately address nature as required under SGMA, TNC has prepared a checklist (**Attachment A**) for GSAs and their consultants to use. TNC believes the following elements are foundational for 2020 GSP submittals. For detailed guidance on how to address the checklist items, please also see our publication, *GDEs under SGMA: Guidance for Preparing GSPs*[1].

1. Environmental Representation

SGMA requires that GSAs consider the interests of all beneficial uses and users of groundwater. To meet this requirement, we recommend actively engaging environmental stakeholders by including environmental representation on the GSA board, technical advisory group, and/or working groups. This could include local staff from state and federal resource agencies, nonprofit organizations and other environmental interests. By engaging these stakeholders, GSAs will benefit from access to additional data and resources, as well as a more robust and inclusive GSP.

2. Basin GDE and ISW Maps

SGMA requires that GDEs and interconnected surface waters (ISWs) be identified in the GSP. We recommend using the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) provided online[2] by the Department of Water Resources (DWR) as a starting point for the GDE map. The NC Dataset was developed through a collaboration between DWR, the California Department of Fish and Wildlife (CDFW) and TNC. We also recommend using GDE Pulse, which is also available on the internet at https://gde.codefornature.org/#/home. We also recommend using the California Natural

[1] GDEs under SGMA: Guidance for Preparing GSPs is available at: https://groundwaterresourcehub.org/public/uploads/pdfs/GWR_Hub_GDE_Guidance_Doc_2-1-18.pdf

[2] The Department of Water Resources' Natural Communities Commonly Associated with Groundwater dataset is available at: https://gis.water.ca.gov/app/NCDatasetViewer/

Diversity Database (CNDDB) data set provided by CDFW to look up species occurrences within your area.

3. Potential Effects on Environmental Beneficial Users

SGMA requires that potential effects on GDEs and environmental surface water users be described when defining undesirable results. In addition to identifying GDEs in the basin, TNC recommends identifying beneficial users of surface water, which include environmental users. This is a critical step, as it is impossible to define "significant and unreasonable adverse impacts" without knowing *what* is being impacted. We acknowledge and appreciate your inclusion of TNC's freshwater species list for the Northern and Central Delta-Mendota Region in your GSP. Our hope is that this information will help your GSA better evaluate the impacts of groundwater management on environmental beneficial users of surface water. We recommend that after identifying which freshwater species exist in your basin, especially federal- and state-listed species, that you contact staff at CDFW, United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Services (NMFS) to obtain their input on the groundwater and surface water needs of the organisms on the GSA's freshwater species list. We also refer you to the Critical Species Lookbook[3] prepared by TNC and partner organizations for additional background information on the water needs and groundwater reliance of critical species. Since effects to plants and animals are difficult and sometimes impossible to reverse, we recommend erring on the side of caution to preserve sufficient groundwater conditions to sustain GDEs and ISWs.

4. Biological and Hydrological Monitoring

If sufficient hydrological and biological data in and around GDEs is not available in time for the 2020/2022 plan, data gaps should be identified along with actions to reconcile the gaps in the monitoring network.

TNC has reviewed the Northern and Central Delta-Mendota Regions Draft GSP and acknowledges and appreciates the use of some our relevant resources in addressing GDE-related topics. However, we consider it to be **inadequate** under SGMA since key environmental beneficial uses and users are not adequately identified and considered. In particular, ISWs and GDEs are not adequately identified and evaluated for ecological importance or adequately considered in the basin's sustainable management criteria. **Please present a more thorough analysis of the identification and evaluation of ISWs and GDEs in subsequent drafts of the GSP**. **Once GDEs are identified, they must be considered when defining undesirable results and evaluated for further monitoring needs**.

Our specific comments related to the Northern and Central Delta-Mendota Regions GSP are provided in detail in **Attachment B** and are in reference to the numbered items in **Attachment A. Attachment C** describes six best practices that GSAs and their consultants can apply when using local groundwater data to confirm a connection to groundwater for DWR's NC Dataset. **Attachment D** provides an overview of a new, free online tool (i.e., GDE Pulse) that allows GSAs to assess changes in GDE health using satellite, rainfall, and groundwater data.

Thank you for fully considering our comments as you develop your GSP.

[3] Available online at: https://groundwaterresourcehub.org/sgma-tools/the-critical-species-lookbook/

Best Regards,

Sandi Matsumoto
Associate Director, California Water Program
The Nature Conservancy

Attachment A

Environmental User Checklist

The Nature Conservancy is neither dispensing legal advice nor warranting any outcome that could result from the use of this checklist. Following this checklist does not guarantee approval of a GSP or compliance with SGMA, both of which will be determined by DWR and the State Water Resources Control Board.

GSP Plan Element*		GDE Inclusion in GSPs: Identification and Consideration Elements	Check Box
Admin Info	**2.1.5 Notice & Communication** *23 CCR §354.10*	**Description of the types of environmental beneficial uses of groundwater that exist within GDEs and a description of how environmental stakeholders were engaged throughout the development of the GSP.**	1
Planning Framework	**2.1.2 to 2.1.4 Description of Plan Area** *23 CCR §354.8*	**Description of jurisdictional boundaries, existing land use designations, water use management and monitoring programs; general plans and other land use plans relevant to GDEs and their relationship to the GSP.**	2
		Description of instream flow requirements, threatened and endangered species habitat, critical habitat, and protected areas.	3
		Summary of process for permitting new or replacement wells for the basin, and how the process incorporates any protection of GDEs	4
Basin Setting	**2.2.1 Hydrogeologic Conceptual Model** *23 CCR §354.14*	**Basin Bottom Boundary:** Is the bottom of the basin defined as at least as deep as the deepest groundwater extractions?	5
		Principal aquifers and aquitards: Are shallow aquifers adequately described, so that interconnections with surface water and vertical groundwater gradients with other aquifers can be characterized?	6
		Basin cross sections: Do cross-sections illustrate the relationships between GDEs, surface waters and principal aquifers?	7
	2.2.2 Current & Historical Groundwater Conditions *23 CCR §354.16*	**Interconnected surface waters:**	8
		Interconnected surface water maps for the basin with gaining and losing reaches defined (included as a figure in GSP & submitted as a shapefile on SGMA portal).	9
		Estimates of current and historical surface water depletions for interconnected surface waters quantified and described by reach, season, and water year type.	10
		Basin GDE map included (as figure in text & submitted as a shapefile on SGMA Portal).	11

		If NC Dataset *was* used:	Basin GDE map denotes which polygons were kept, removed, and added from NC Dataset (Worksheet 1, can be attached in GSP section 6.0).	12
			The basin's GDE shapefile, which is submitted via the SGMA Portal, includes two new fields in its attribute table denoting: 1) which polygons were kept/removed/added, and 2) the change reason (e.g., why polygons were removed).	13
			GDEs polygons are consolidated into larger units and named for easier identification throughout GSP.	14
		If NC Dataset *was not* used:	Description of why NC dataset was not used, and how an alternative dataset and/or mapping approach used is best available information.	15
		Description of GDEs included:		16
		Historical and current groundwater conditions and variability are described in each GDE unit.		17
		Historical and current ecological conditions and variability are described in each GDE unit.		18
		Each GDE unit has been characterized as having high, moderate, or low ecological value.		19
		Inventory of species, habitats, and protected lands for each GDE unit with ecological importance (Worksheet 2, can be attached in GSP section 6.0).		20
	2.2.3 Water Budget *23 CCR §354.18*	Groundwater inputs and outputs (e.g., evapotranspiration) of native vegetation and managed wetlands are included in the basin's historical and current water budget.		21
		Potential impacts to groundwater conditions due to land use changes, climate change, and population growth to GDEs and aquatic ecosystems are considered in the projected water budget.		22
Sustainable Management Criteria	**3.1 Sustainability Goal** *23 CCR §354.24*	**Environmental stakeholders/representatives were consulted.**		23
		Sustainability goal mentions GDEs or species and habitats that are of particular concern or interest.		24
		Sustainability goal mentions whether the intention is to address pre-SGMA impacts, maintain or improve conditions within GDEs or species and habitats that are of particular concern or interest.		25
	3.2 Measurable Objectives *23 CCR §354.30*	**Description of how GDEs were considered and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.**		26
	3.3 Minimum Thresholds *23 CCR §354.28*	**Description of how GDEs and environmental uses of surface water were considered when setting minimum thresholds for relevant sustainability indicators:**		27
		Will adverse impacts to GDEs and/or aquatic ecosystems dependent on interconnected surface waters (beneficial user of surface water) be avoided with the selected minimum thresholds?		28
		Are there any differences between the selected minimum threshold and state, federal, or local standards relevant to the species or habitats residing in GDEs or aquatic ecosystems dependent on interconnected surface waters?		29
	3.4 Undesirable Results *23 CCR §354.26*	**For GDEs, hydrological data are compiled and synthesized for each GDE unit:**		30
		If hydrological data *are available* within/nearby the GDE	Hydrological datasets are plotted and provided for each GDE unit (Worksheet 3, can be attached in GSP Section 6.0).	31
			Baseline period in the hydrologic data is defined.	32

			GDE unit is classified as having high, moderate, or low susceptibility to changes in groundwater.	33
			Cause-and-effect relationships between groundwater changes and GDEs are explored.	34
		If hydrological data *are not available* within/nearby the GDE	Data gaps/insufficiencies are described.	35
			Plans to reconcile data gaps in the monitoring network are stated.	36
		For GDEs, biological data are compiled and synthesized for each GDE unit:		37
		Biological datasets are plotted and provided for each GDE unit, and when possible provide baseline conditions for assessment of trends and variability.		38
		Data gaps/insufficiencies are described.		39
		Plans to reconcile data gaps in the monitoring network are stated.		40
		Description of potential effects on GDEs, land uses and property interests:		41
		Cause-and-effect relationships between GDE and groundwater conditions are described.		42
		Impacts to GDEs that are considered to be "significant and unreasonable" are described.		43
		Known hydrological thresholds or triggers (e.g., instream flow criteria, groundwater depths, water quality parameters) for significant impacts to relevant species or ecological communities are reported.		44
		Land uses include and consider recreational uses (e.g., fishing/hunting, hiking, boating).		45
		Property interests include and consider privately and publicly protected conservation lands and opens spaces, including wildlife refuges, parks, and natural preserves.		46
Sustainable Management Criteria	**3.5 Monitoring Network** *23 CCR §354.34*	Description of whether hydrological data are spatially and temporally sufficient to monitor groundwater conditions for each GDE unit.		47
		Description of how hydrological data gaps and insufficiencies will be reconciled in the monitoring network.		48
		Description of how impacts to GDEs and environmental surface water users, as detected by biological responses, will be monitored and which GDE monitoring methods will be used in conjunction with hydrologic data to evaluate cause-and-effect relationships with groundwater conditions.		49
Projects & Mgmt Actions	**4.0. Projects & Mgmt Actions to Achieve Sustainability Goal** *23 CCR §354.44*	Description of how GDEs will benefit from relevant project or management actions.		50
		Description of how projects and management actions will be evaluated to assess whether adverse impacts to the GDE will be mitigated or prevented.		51

* In reference to DWR's GSP annotated outline guidance document, available at:
https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/GD_GSP_Outline_Final_2016-12-23.pdf

Attachment B

TNC Evaluation of the
Northern and Central Delta-Mendota Regions Groundwater Sustainability Plan,
Public Review Draft

A complete draft of the Northern and Central Delta-Mendota Regions was provided for public review on September 9, 2019. TNC has previously provided comments on GSP Draft Section 5.2 (Hydrogeologic Conceptual Model) in a letter dated April 3, 2019. This attachment summarizes our comments on the complete public draft GSP and includes any initial review comments from our April 3, 2019 letter that have not yet been addressed. Comments are provided in the order of the checklist items included as Attachment A.

<u>Checklist Item 1 - Notice & Communication (23 CCR §354.10)</u>

[Section 4.1 Description of Beneficial Uses and Users in Plan Area (p. 4-1-4-3)]

- The California Water Code §1305(f) defines that beneficial uses of waters of the State include "preservation and enhancement of fish, wildlife, and other aquatic resources and preserves" (p. 4-1). Table 4-1 lists beneficial uses and user stakeholder groups (p. 4-2 to 4-3) and includes federal and state lands and facilities; environmental agencies and groups; rivers, creeks, and recreational and wildlife refuges; and recreational areas in addition to the direct users of groundwater and surface water. The GSP noted further refinement of the Table 4-1 list will be made by 2025. **Please describe whether other beneficial uses and users of groundwater in the Subbasin are present: Protected Lands, including conservation areas and other protected lands; and Public Trust Uses including wildlife, aquatic habitat, fisheries, and recreation.**
- The types and locations of environmental uses, species and habitats supported, and the designated beneficial environmental uses of surface waters that may be affected by groundwater extraction in the Subbasin should be specified. **Please identify environmental users, and refer to the following:**
    - Natural Communities Commonly Associated with Groundwater dataset (NC Dataset) - https://gis.water.ca.gov/app/NCDatasetViewer/
    - The list of freshwater species located in the Delta-Mendota Subbasin in Table 5-10 of the GSP. Please take particular note of the species with protected status.

<u>Checklist Items 2 to 4 - Description of general plans and other land use plans relevant to GDEs and their relationship to the GSP (23 CCR §354.8)</u>

[Section 2.2.1 General Plans in Plan Area (p. 2-42 to 2-66)]

- Figure 2-26 (p. 2-43) shows the area covered by city, community, and county general plans. There are five county plans, one city plan, and three community plans that cover a portion of the Northern and Central Delta-Mendota Regions. The plans should be modified to include a discussion of General Plan goals and policies related to the protection and management of GDEs and aquatic resources that could be affected by groundwater withdrawals. **Please include a discussion of how implementation of the GSP may affect and be coordinated with General Plan policies and procedures regarding the protection of wetlands, aquatic resources and other GDEs and ISWs.**

- In general the plans seek to protect riparian habitat. This section should identify Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) within the Subbasin and if they are associated with critical, GDE or ISW habitats. **Please identify all relevant HCPs and NCCPs within the Subbasin and address how GSP implementation will coordinate with the goals of these HCPs or NCCPs.**
- Please refer to the Critical Species Lookbook[4] to review and discuss the potential groundwater reliance of critical species in the basin. **Please include a discussion regarding the management of critical habitat for these aquatic species and its relationship to the GSP.**

[Section 2.1.2.2 Major Water-Related Infrastructure (p. 2-10 to 2-12)]

- The GSP provides a description of the major water infrastructure projects including the Central Valley Project, the State Water Project, and the Tracy Fish Collection Project, however there is no discussion of any in-stream flow requirements. **Please describe any current or planned in-stream flow requirements of the San Joaquin and Merced Rivers or any of the westside creeks.**

[Section 2.3.2 County Well Construction/Destruction Standards and Permitting (p. 2-77)]

- Table 2-7 (p. 2-78) summarizes well permitting requirements and county ordinances for the counties of Fresno, San Benito, Merced, Stanislaus, and San Joaquin. The counties have ordinances that limit groundwater export and several counties have ordinances that minimize unsustainable groundwater extraction. **Please include a discussion of the following in this section:**
    - Future well permitting must be coordinated with the GSP to assure achievement of the Plan's sustainability goals.
    - The State Third Appellate District recently found that Counties have a responsibility to consider the potential impacts of groundwater withdrawals on public trust resources when permitting new wells near streams with public trust uses (ELF v. SWRCB and Siskiyou County, No. C083239). The need for well permitting programs to comply with this requirement should be stated in the text.

<u>Checklist Items 5, 6, and 7 – Hydrogeologic Conceptual Model (23 CCR §354.14)</u>

[Section 5.2.5.2 Definable Bottom of Basin (p. 5-12)]

- Defining the bottom of Subbasin based on geochemical properties is a suitable approach for defining the base of freshwater, however, as noted on page 9 of DWR's

[4] Available online at: https://groundwaterresourcehub.org/sgma-tools/the-critical-species-lookbook/

Hydrogeologic Conceptual Model BMP (https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_HCM_Final_2016-12-23.pdf) "the definable bottom of the basin should be at least as deep as the deepest groundwater extractions". **Thus, groundwater extraction well depth data should also be included in the determination of the basin bottom.** This will prevent the possibility of extractors with wells deeper than the basin boundary (defined by the base of freshwater) from claiming exemption of SGMA due to their well residing outside the vertical extent of the basin boundary.

[Section 5.2.6.1 Principal Aquifers (p. 5-12 to 5-14)]

- The very shallow unconfined groundwater falls under DWR's definition of a principal aquifer, which is defined as "aquifer or aquifer system that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems" [*23 CCR §351(aa)*]. **Thus, disregarding this shallow groundwater as a principal aquifer due to its "shallow nature and high salinity" is inadequate.** This is especially true in the places where projects to develop the shallow groundwater may be considered for use on more salt-tolerant crops. SGMA requires GSAs to sustainably manage groundwater resources in all aquifers, especially if groundwater use and management can result to impacts on beneficial uses and users. Please refer to Best Practice #1 in Attachment C for further explanation and accompanying graphics.

[Section 5.2.6.2 Aquifer Properties p. 5-14 to 5-31]

- Regional basin-wide geologic cross sections are provided in Figures 5-7 through 5-16 (p. 5-15 to 5-27). These cross-sections do not include a graphical representation of the manner in which the very shallow groundwater or perched water may interact with ISWs or GDEs that would allow the reader to understand this topic. **Please include example near-surface cross section details that depict the conceptual understanding of shallow groundwater and stream interactions at different locations, including the perched aquifer and the Upper Aquifer**.
- The two-aquifer system is separated primarily by the Corcoran Clay, which has a variable depth as shown on Figure 5-17 (p. 5-28). The Corcoran Clay is absent in the far western parts of the Subbasin. There is also a Very Shallow unconfined groundwater zone, and perched water is sometimes present due to fine-grained clay layers. **Please provide a map showing where the Very Shallow groundwater zone and the perched aquifers are located.**

[Section 5.3.2.4 Groundwater Trends (p. 5-92 to 5-118)]

- Data gap areas for the Upper Aquifer, Lower Aquifer, or both are shown in Figure 5-64 (p. 5-96). Much of the data gaps area is located within the Northern and Central Delta-Mendota Regions. There are very few wells screened in the Upper Aquifer shown in the groundwater contour map in Spring 2013 and Fall 2013, as shown on Figures 5-80 and 5-81, within the Northern and Central Delta-Mendota Regions. **Please explain how these data gaps will be filled, or refer to a section later in the GSP.**

- Well hydrographs are shown for wells screened in the Very Shallow Groundwater in Figure 5-67 (p. 5-99). **Please indicate which of these wells are located within the Northern and Central Delta-Mendota Regions.**
- The GSP states (p. 5-94) that vertical gradients are restricted by the Corcoran Clay. In the western part of the Subbasin, interfingering clay layers minimize downward gradients, except where the clay has been compromised by the construction of composite wells. **Please provide data or analysis to explain and substantiate the vertical gradients noted in the text.**

Checklist Items 8, 9, and 10 – Interconnected Surface Waters (ISW) (23 CCR §354.16)

[Section 5.3.7 Interconnected Surface Water Systems (p. 5-170 to 5-172)]

- The regulations [23 CCR §351(o)] define interconnected surface waters (ISW) as "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted". "At any point" has both a spatial and temporal component. Even short durations of interconnections of groundwater and surface water can be crucial for surface water flow and supporting environmental users of groundwater and surface water. ISWs can be either gaining or losing. The text states (p. 5-170) "Streams stemming from the west side of the Delta-Mendota Subbasin are ephemeral in nature, and only two of these creeks reach the San Joaquin River (Del Puerto Creek and Orestimba Creek). These creeks lose their flows to the underlying vadose zone (net-losing streams) and therefore do not represent areas of potential GDEs." No evidence is provided in the Plan that states that these streams are not connected to the Upper Aquifer along some portion of the drainage for some time period. **Please provide data or analysis to back up the statement that these westside streams do not represent areas of potential GDEs. Please reconcile data gaps (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP to improve ISW mapping in future GSPs**.
- **Please provide more detail on how the quantity of gains and/or depletions from the groundwater at each reach of the San Joaquin River was determined.** For example, were the values taken from the cited literature sources or determined from further analysis or modeling? Please provide or refer to a map that shows the designated reaches listed in Table 5-9.

Checklist Items 11 to 15, Identifying and Mapping GDEs (23 CCR §354.16)

[Section 5.3.7.6 Groundwater Dependent Ecosystems (p. 5-172)]

- The text states (p. 5-172): "To further screen available information regarding GDEs, the following standards were set for identifying GDEs in the Northern and Central Delta-Mendota Regions: (1) areas with depths to groundwater levels greater than 30 feet were eliminated unless the vegetation identified in those areas were consistent with species with deep root systems (e.g. live oaks); (2) seasonally-managed areas and wetlands were eliminated due to their dependence on applied surface water; and (3) a 100-foot buffer was applied around the San Joaquin River within the Northern Delta-Mendota Region to include all communities in the NCCAG dataset as potential GDEs, except where professional judgement and local knowledge determined GDEs were not present." The three standards are discussed in turn below.

- The following comments apply to *Standard (1): Areas with depth to groundwater greater than 30 feet in Spring 2015, unless the vegetation identified in those areas were consistent with species with deep root systems (e.g. live oaks).*
  - While depth to groundwater levels within 30 feet are generally accepted as being a proxy for confirming that polygons in the NC dataset are connected to groundwater, it is highly advised that seasonal and interannual groundwater fluctuations in the groundwater regime are taken into consideration. Utilizing groundwater data from one point in time (e.g., Spring 2015) can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Based on a study we recently submitted to Frontiers in Environmental Science Journal, we've observed riparian forests along the Cosumnes River to experience a range in groundwater levels between 1.5 and 75 feet over seasonal and interannual timescales. Seasonal fluctuations in the regional water table can support perched groundwater near an intermittent river that seasonally runs dry due to large seasonal fluctuations in the regional water table. While perched groundwater itself cannot directly be managed due to its position in the vadose zone, the water table position within the regional aquifer (via pumping rate restrictions, restricted pumping at certain depths, restricted pumping around GDEs, well density rules) and its interactions with surface water (e.g., timing and duration) can be managed to prevent adverse impacts to ecosystems due to changes in groundwater quality and quantity under SGMA. **We highly recommend using depth to groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) to determine the range of depth to groundwater around NC dataset polygons. Please refer to Attachment C of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer. If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network. Additionally, Spring 2015 is after the SGMA benchmark date of January 1, 2015. Please include groundwater condition data prior to the SGMA benchmark date in the analysis.**
  - **Please confirm that wells screened in the Upper Aquifer (or very shallow groundwater where present) are being used to verify whether NCCAGs are actual GDEs, given the significant data gap areas noted on Figure 5-64 (page 5-96).** Using "depth to groundwater" measurements from confined aquifers is mapping piezometric head of the confined aquifer and not detecting groundwater conditions in the principal aquifers of the unconfined aquifer that are supporting the ecosystem. If there

is insufficient groundwater level data in the Upper Aquifer, then the NCCAGs in these areas should be included as GDEs in the GSP until data gaps are reconciled in the monitoring network.

- **Please provide depth to groundwater contour maps and note the following best practices for doing so.**
  - i) Are the wells used for interpolating depth to groundwater sufficiently close (<5km) to NC Dataset polygons to reflect local conditions relevant to ecosystems?
  - ii) Are the wells used for interpolating depth to groundwater screened within the surficial unconfined aquifer and capable of measuring the true water table (see comment b above)?
  - iii) Is depth to groundwater contoured using groundwater elevations at monitoring wells to get groundwater elevation contours across the landscape? This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM) to estimate depth-to-groundwater contours across the landscape. This will provide much more accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found. Depth to groundwater contours developed from depth to groundwater measurements at wells assumes that the land surface is constant, which is a poor assumption to make. It is better to assume that water surface elevations are constant in between wells, and then calculate depth to groundwater using a DEM of the land surface to contour depth to groundwater.
- **Please use care when considering rooting depths of vegetation. Please list the species in each GDE, and whether the GDE was eliminated or retained based on the 30-foot standard, and provide evidence for the decision.** While Valley Oak (Quercus lobata) have been observed to have a max rooting depth of ~24 feet (https://groundwaterresourcehub.org/gde-tools/gde-rooting-depths-database-for-gdes/), rooting depths are likely to spatially vary based on the local hydrologic conditions available to the plant. Also, max rooting depths do not take capillary action into consideration, which will vary with soil type and is an important consideration since woody phreatophytes generally do not prefer to have their roots submerged in groundwater for extended periods of time, and hence can access groundwater at deeper depths.

- The following comment applies to *Standard (2): Habitat areas with supplemental water*. The application of supplemental water to managed wetlands <u>does not preclude</u> the possibility that NC polygons could be accessing groundwater in addition to the supplied water. In the scientific literature, it is generally acknowledged that GDEs can rely on groundwater for <u>some or all</u> of their requirements. GDEs can rely on multiple water sources simultaneously and at different temporal/spatial scales (e.g., precipitation, river water, reservoir water, soil moisture in the vadose zone, groundwater, applied water, treated wastewater effluent, urban stormwater, irrigated return flow). SGMA defines GDEs as "ecological communities and species that depend on groundwater <u>emerging from aquifers</u> or on groundwater <u>occurring</u>

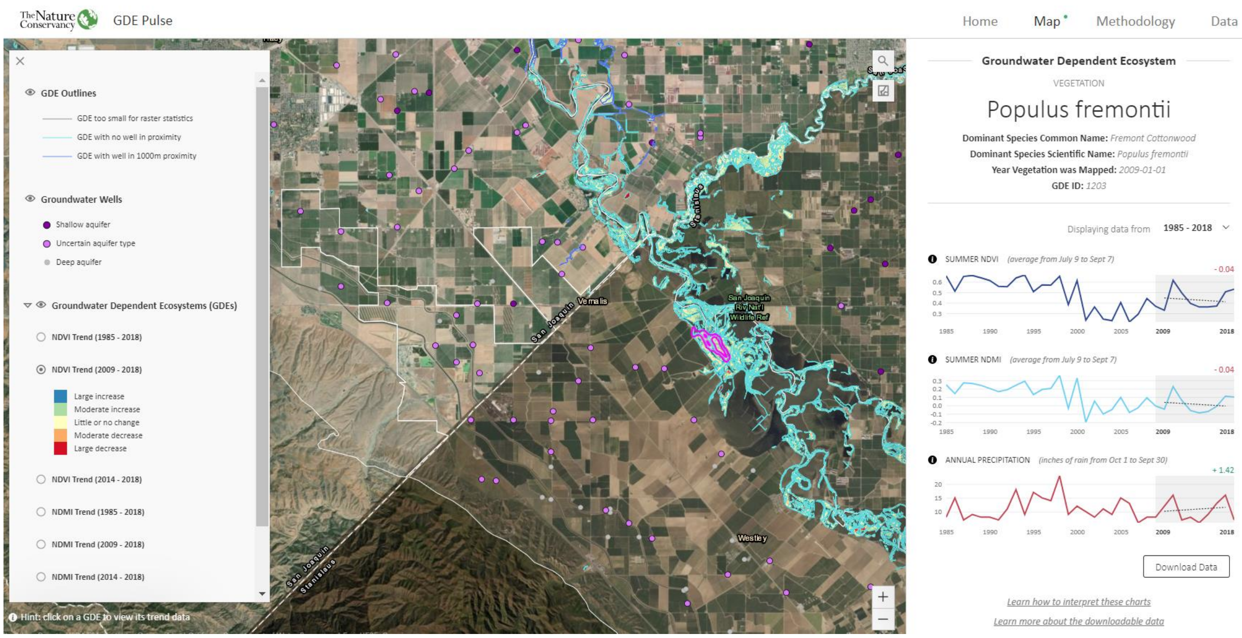
<u>near</u> the ground surface". **Hence, we recommend that depth to groundwater contour maps are used to identify whether a connection to groundwater exists for the managed wetlands in the Northern and Central Delta-Mendota Regions. Please refer to Attachment C of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer.**

- The following comment applies to *Standard (3): 100-foot buffer area applied around the San Joaquin River.* **We disagree with the use of an arbitrary 100-foot cutoff. In addition to "professional judgement and local knowledge" please explain how this criterion is supported by groundwater level and plant physiological data to exclude potential GDEs near the river.**
- On p. 5-173 the GSP states, "Possible GDEs have also been identified along streams originating from the Coast Range; however, these areas are topographically disconnected from the Subbasin's principal aquifers and are located in areas of de minimus or zero groundwater use and are therefore are unmanageable through the Sustainable Groundwater Management Act (SGMA)." **Please provide further information on the analysis of GDEs on westside streams, including citing field studies or modeling studies that show the disconnected nature of these streams. Indicate on which streams GDE polygons were excluded and on which streams GDE polygons were retained. Identify any data gaps and ensure that GDE polygons are retained <u>until</u> data gaps are reconciled.**
- The NC Dataset comprises 4,852 acres of potential GDEs for the Northern and Central Delta Mendota Regions. On Figures 5-118 and 5-119, it is difficult to distinguish the colors underneath the hatching, and thus see which removal categories apply to the Northern and Central Delta-Mendota Regions. **Please consider changing the hatching pattern or supplying a map for just the Northern and Central Delta-Mendota Regions. Please be more specific when denoting "mapping error". The basin's GDE shapefile, which is submitted via the SGMA Portal, should also include two new fields in its attribute table denoting: 1) which polygons were kept/removed/added, and 2) the change reason (e.g., why polygons were removed). In addition, in the text please cite the acreage of GDEs retained and removed.**

<u>Checklist Items 16 to 20, Describing GDEs (23 CCR §354.16)</u>

[Section 5.3.7.6 Groundwater Dependent Ecosystems (p. 5-172)]

- **Please provide information on the historical or current groundwater conditions in the GDEs or the ecological conditions present**. Refer to GDE Pulse (https://gde.codefornature.org; See Attachment D of this letter for more details) or any other locally available data (e.g., leaf area index, evapotranspiration or other data) to describe depth to groundwater trends in and around GDE areas, as well as trends in plant growth (e.g., NDVI) and plant moisture (e.g., NDMI). Below is a screenshot example of data available in GDE Pulse for NC dataset polygons found in the Northern and Central Delta-Mendota Regions.



- **Please provide an ecological inventory (see Appendix III, Worksheet 2 of the GDE Guidance) for all potential GDEs that includes the vegetation types or habitat types and rank the GDEs as having a high, moderate or low value; and what characterizes the rank.**
- **Please identify whether any endangered or threatened freshwater species of animals and plants, or areas with critical habitat were found in or near any of the GDEs since some organisms rely on uplands and wetlands during different stages of their lifecycle**. Please refer to the list of species included as Table 5-10 of the GSP, the Critical Species Lookbook, and CDFW's CNDDB database.

<u>Checklist Items 21 and 22 – Water Budget (23 CCR §354.18)</u>

[Section 5.4 Water Budgets (p. 5-181 to 5-235)]

- Evapotranspiration is included as an outflow category in the land surface budget, however it is not split between type of evapotranspiration. **Please separate this term by land-use type (for example, agricultural; municipal and domestic; and native and riparian).**
- Groundwater outflow to ET does not appear to be identified as a groundwater budget component. **Since GDEs (including wetlands, riparian vegetation, phreatophytes and other communities) are recognized as beneficial users of groundwater in the Northern and Central Delta-Mendota Regions, it is appropriate to include them in these calculations.**

<u>Checklist Item 23-26 Sustainability Goal (23 CCR §354.24)</u>

[Section 6.2 Sustainability Goal (p. 6-2)]

- **Since GDEs are present within the Subbasin (please see comments under checklist items 16-20) they should be recognized as beneficial users of groundwater and should be included in the Sustainability Goal. In addition, a statement about any intention to address pre-SGMA impacts to GDEs and ISWs should be included here and within the interim milestones and measurable objectives.**
- **We request that the connectivity of GDEs and ISWs to each aquifer (including the very shallow groundwater, where present) be made clear. If connectivity to the very shallow surficial aquifer exists, please establish its current and/or future management to determine if it is a principal aquifer. If it is a principal aquifer, it should be included in the sustainability goal and sustainability criteria. If it isn't a principal aquifer, please include text that states the future protection of GDEs would be incorporated into the 5-year update as future management plans are developed.**
- The GSP states that there are time periods of ISW connectivity along the San Joaquin River on the northern end of the basin. **Please include protection of ISWs as a part of the Sustainability Goal.**
- GDEs are dependent, in part, on suitable water quality; however, this GSP only considers water quality for irrigation and domestic use. **Since GDEs may also be affected by water quality they should be included in the Sustainability Goal.**

<u>Checklist Item 26 – Measurable Objectives (23 CCR §354.30)</u>

[Section 6.3.1.3 Measurable Objectives for Groundwater Levels (p. 6-10)]

- This Measurable Objective does not consider GDEs. **Please include GDEs (see comments under Checklist Items 16-20) in this section and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.**

[Section 6.5.3 Measurable Objectives for Water Quality (p. 4-29)]

- This Measurable Objective does not consider water quality needs of GDEs. **Please modify this section to specifically address degraded water quality from total dissolved solids (TDS), arsenic (As), boron (B), and other potential constituents of concern to wildlife and vegetation communities of GDEs**.

[Section 6.3.6.3 Measurable Objectives and Interim Milestones (for Interconnected Groundwater Surface Water Systems) (p. 6-35)]

- The GSP states that depletions will be considered from monitoring data collected in 2020 to 2025 and proposes a qualitative statement of no increased depletions. Based on statements made in Chapter 5, Sections 5.3.7 (pp. 5-170 to 5-173), this GSP only considers gaining and losing reaches of the San Joaquin River as being potentially interconnected (See Table 5-9 on p. 5-172). There are several ephemeral streams that may reach the San Joaquin in a given year that are dismissed because they are not regularly connected and, or flow is ephemeral. Streams that are not continuously connected spatially and, or temporally, or are ephemeral in nature, are still potential ISWs and should not be excluded from this GSP. Ephemeral water courses in the basin include Orestimba Creek, Del Puerto Creek, Mercy Creek, Hospital Creek, Inghram Creek Salado Creek, and Cow Creek. For example, on page 4-7 in the *Stanislaus County Hydrologic Model: Development and Forecast Modeling* (Stanislaus County, California) it states "data from nearby calibration wells suggests that in fact Orestimba Creek is groundwater connected and gaining in its middle and lower reaches". **Because the question of ISWs is a data gap, it needs to be acknowledged and a plan to reconcile the data gap specified. Even though the streams may not be continuously connected, they may still be ISWs, and should be included in the Measurable Objectives.**

<u>Checklist Item 27-29 – Minimum Thresholds (23 CCR §354.28</u>)

[Sections 6.3.1.2 Minimum Thresholds for Groundwater Levels (p. 6-5)]

- The GSP states that environmental use was considered when establishing the groundwater level minimum threshold; however, the criteria used was not included in the narrative. In addition, Table 6-1 (p. 6-9) does not identify which DMS ID corresponds to GDEs and, or ISWs. **Please update this section to provide detail on criteria used to evaluate minimum thresholds for GDEs and ISWs, and to establish proposed thresholds, or a process for establishing thresholds in regards of protecting GDEs and ISWs.**

[Section 6.3.3.2 Minimum Thresholds for Water Quality (p. 6-16)]

- Although agricultural water quality concerns were articulated, similar concerns were not identified for GDEs. **Please include a discussion about GDEs and water quality, and how the minimum thresholds and interim milestones will help achieve the sustainability goal as it pertains to the environment.**

[Sections 6.3.6.2 Minimum Thresholds for Interconnected Groundwater Surface Water Systems (p. 6-35)]

- The GSP states that depletions will be analyzed to determine the location, timing, and quantity of depletions from monitoring data collected between 2020 to 2025, and proposes a qualitative statement of no increased depletions. **Please modify this section of the GSP to provide a statement that quantifies gains and, or losses similar to those shown in Table 5-9 (p. 5-172) as they relate to the 2015 conditions.**

<u>Checklist Item 30-46 – Undesirable Results (23 CCR §354.26)</u>

[Section 6.3.1.1 Undesirable Results (for chronic lowering of groundwater levels) (p. 6-3)]

- This section only describes undesirable results relating to human beneficial uses of groundwater and neglects environmental beneficial uses that could be adversely affected by chronic groundwater level decline. **Please add "potential adverse impacts to GDEs and ISWs" to the list of potential undesirable results presented in Section 6.3.1.1.**

[Section 6.3.1.1.2 Identification of Undesirable Results (for chronic lowering of groundwater levels) (p. 6-4)]

- This section states that "..conditions are deemed significant and unreasonable, when groundwater elevations drop below the site-specific minimum threshold of 25% of representative monitoring wells in a principal aquifer…..in a given year". **Please describe how a drop below the site-specific minimum threshold of 25% of representative monitoring wells in a principal aquifer relates to undesirable results.** A specific threshold should be provided for monitoring wells that measure groundwater levels near GDEs.

- The GDE Pulse web application developed by TNC provides easy access to 35 years of satellite remote sensing data to view trends of vegetation metrics, groundwater depth (where available), and precipitation data. This satellite imagery can be used to observe trends for NC dataset polygons within and near the GSA. Over the past 10 years (2009-2018), some NC dataset vegetation polygons have experienced adverse impacts to vegetation growth and moisture along the San Joaquin River. An example screen shot from the GDE Pulse tool is presented under Checklist Items 11-15 above.

    - **For each identifiable GDE unit with supporting hydrological datasets please include the following:**
        - Plot and provide hydrological datasets for each GDE.
        - Define the baseline period in the hydrologic data.
        - Classify GDE units as having high, moderate, or low susceptibility to changes in groundwater.
        - Explore cause-and-effect relationships between groundwater changes and GDEs.

    - **For each identifiable GDE unit without supporting hydrological datasets please describe data gaps and/or insufficiencies.**

    - **Compile and synthesize biological data for each GDE unit by including:**
        - Plots of biological datasets for each GDE unit, and when possible provide baseline conditions for assessment of trends and variability.
        - Describe data gaps/insufficiencies.

    - **Description of potential effects on GDEs, land uses, and property interests, including:**
        - Cause-and-effect relationships between GDE and groundwater conditions.

- Impacts to GDEs that are considered to be "significant and unreasonable".
- Report known hydrological thresholds or triggers (e.g., instream flow criteria, groundwater depths, water quality parameters) for significant impacts to relevant species or ecological communities.
- Land uses include and consider recreational uses (e.g., fishing/hunting, hiking, boating).
- Property interests include and consider privately and publicly protected conservation lands and opens spaces, including wildlife refuges, parks, and natural preserves.

[Section 6.3.3.1.2 Identification of Undesirable Results (for degraded water quality) (p. 6-15)]

- This Section discusses MCLs and WQOs but does not include metrics for GDEs. **Please modify this section to specifically address degraded water quality from TDS, As, B and other constituents that could pose a threat to wildlife and / or vegetative communities associated with GDEs and ISWs. Although As and CrVI are mentioned in this section, please add a statement addressing that overpumping and dewatering of aquitards has been identified as a potential source of elevated As concentrations above drinking water standards in San Joaquin Valley aquifers.** The following is a link to a paper by Smith, Knight and Fendorf (2018) titled "Overpumping leads to California groundwater arsenic threat": (https://www.nature.com/articles/s41467-018-04475-3.

[Sections 6.3.6 Depletions of Interconnected Surface Water (p. 6-34)]

- The GSP states that depletions will be considered from monitoring data collected between 2020 to 2025. At a minimum the GSP should maintain the current level of ISWs until additional information is collected and measurable objectives and minimum thresholds can be more precisely defined. For example, Table 5-9 (p. 5-172) estimates the quantity of gains and depletions for reaches of the San Joaquin River only. This type of information should be used to support the statement of undesirable results and should be expanded to other streams that are potential ISWs. **Please modify this section of the GSP to include a statement that there will be no increase in depletions for confirmed and potential ISWs, at least until data gaps are filled.**

Checklist Items 47, 48 and 49 – Monitoring Network (23 CCR §354.34)

[Section 7.2.5.1 Groundwater Level Monitoring Network (p. 7-35)]

- The GSP proposes to use groundwater level monitoring for tracking chronic groundwater level and as a proxy for groundwater storage and depletion of interconnected surface waters. A set of representative wells has been selected in six subregions, shown in Figure 7-2 (p. 7-33). The representative wells to be used for monitoring groundwater levels in the semi-confined Upper Aquifer and the confined Lower Aquifer are shown in Figure 7-3 (p. 7-39) and Figure 7-4 (p. 7-40). Areas with spatial data gaps have been identified and are shown on both maps. The potential locations for wells for monitoring both aquifers are shown in Figures 7-5 and 7-6 (p. 7-47 and 7-48). Tables 7-6 and 7-7 (p. 7-37 and 7-38) indicate that some wells are missing key information, e.g. status, well depth or screened interval. Although a list of criteria including "adequate construction information" were listed on page 7-41, it appears that not all criteria were met in all the wells. A plan to fill these data gaps is included in Section 7.2.5.6.6 (Plan to Fill Data Gaps) that includes obtaining video logs of some wells and drilling new wells. **Please emphasize in the text the importance of using dedicated monitoring wells with complete construction information in order to accurately monitor single aquifers.**

- The GSP states on p. 7-45: "Not all wells included in these networks are dedicated monitoring wells, as recommended by DWR's Monitoring Networks and Identifications of Data Gaps BMP (2016a)." The GSP noted that an effort would be made to replace pumping wells with dedicated monitoring wells. **Please discuss the importance of using dedicated monitoring wells instead of pumping wells at all locations.**
- The GSP states on p. 7-45: "For the purpose of monitoring depletions of interconnected surface water, where groundwater levels are used as a proxy, four additional wells with tentative locations have been identified that would also be included in the groundwater level monitoring network. These wells are located within three miles of the San Joaquin River within the Northwestern Delta-Mendota GSA and Patterson Irrigation District GSA." **Consideration should be given to using wells closer to the river, or installing new wells. Please discuss how the data will be used to verify ISWs and quantify depletions of stream flow due to groundwater extraction.**

[Section 7.2.5.6 Depletions of Interconnected Surface Water Monitoring Network (p. 7-67)]

- At present there are only two wells located within 3 miles of the San Joaquin River in the ISW area. Locations of four clustered wells have been identified and other stream gauging sites proposed as shown in Figure 7-11 (p. 7-73). **Please expand on the discussion of how the new well and stream data will be used to improve ISW mapping and inform an adequate analysis. Please discuss how the data will be used to verify possible GDEs and reaches that include ISWs.**
- As stated above in the comments for Checklist Items 8-10, **please reconcile data gaps (shallow monitoring wells, stream gauges, and nested/clustered wells) along westside ephemeral streams in this section of the GSP to improve ISW mapping in future GSPs**.

<u>Checklist Items 50 and 51 – Projects and Management Actions to Achieve Sustainability Goal (23 CCR §354.44)</u>

[Section 7.1 Projects and Management Actions (p. 7-1)]

- The Subbasin includes many potential GDEs and ISWs (see our comments under Checklist Items 8-10 and 16-20 above) that are beneficial uses and users of groundwater and may include sensitive resources and protected lands. Environmental resource protection needs should be considered in establishing project priorities. In addition and consistent with existing grant and funding guidelines for SGMA-related work, priority should be given to multi-benefit projects that can address water quantity and quality as well as providing environmental benefits or benefits to disadvantaged communities.
    - Although Table 7-2 (p. 7-5) provides information on how each project supports ISWs there are no criteria provided on how GDEs and ISWs were considered in project selection. **Please include criteria considered for project selection as it relates to GDEs and ISWs.**
    - In Section 7.1.1.1.1 (p. 7-9), the narrative supporting the Los Banos Creek Recharge and Recovery Project states that project beneficiaries are groundwater users but there is no discussion about how environmental users (i.e., GDEs and ISWs) will specifically benefit. **Please update the environmental benefits and multiple benefits as criteria for assessing project priorities and articulate how project monitoring will support GDEs and ISWs.**
    - Table 7-2 (pp. 7-5 to 7-8) identifies many important projects; however, the descriptions of objectives for each sustainability indicator for these projects only identify benefits to water level and storage. Since maintenance or recovery of groundwater levels, or construction of recharge facilities, may have potential environmental benefits in many cases it would be advantageous to demonstrate these multiple benefits from a funding and prioritization perspective. **For the projects already identified, please consider stating how ISWs and GDEs will benefit or be protected, or what other environmental benefits will accrue.**
    - **If ISWs will not be adequately protected or enhanced by those listed, please include and describe additional management actions and projects targeted for protecting known and potential ISWs.**
    - Recharge ponds, reservoirs and facilities for managed stormwater recharge can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. In some cases, such facilities have been incorporated into local Habitat Conservation Plans (HCPs) and Natural Community Conservation Plans (NCCPs), more fully recognizing the value of the habitat that they provide and the species they support. In addition, incorporating HCPs, NCCPs, and managed wetlands into recharge projects may effectively tie into the project's permitting strategy described in Section 7.1.5. For projects that construct recharge ponds, **please update Table 7-4 (p. 7-21) to identify if there are multi-benefit opportunities that can incorporate habitat components into project designs and how the recharge ponds will be managed to benefit environmental uses and users.**

- For examples of case studies on how to incorporate environmental benefits into groundwater projects, please visit our website: https://groundwaterresourcehub.org/case-studies/recharge-case-studies/

[Section 7.1.1.2 Tier 1 Management Actions (p. 7-12)]

- This section discusses the Management Actions for GSP implementation and SGMA compliance; however, these actions are focused on meeting groundwater level and storage measures and do not include support for GDEs or ISWs. **Please modify the Management Actions to include education and outreach for GDEs, ISWs and the sensitive habitats they support. Please update Section 7.1.1.2 Tier 1 Management Actions (p. 7-12) and Section 7.1.1.4 Tier 2 Management Actions (p. 7-15) to include GDEs and ISWs.**

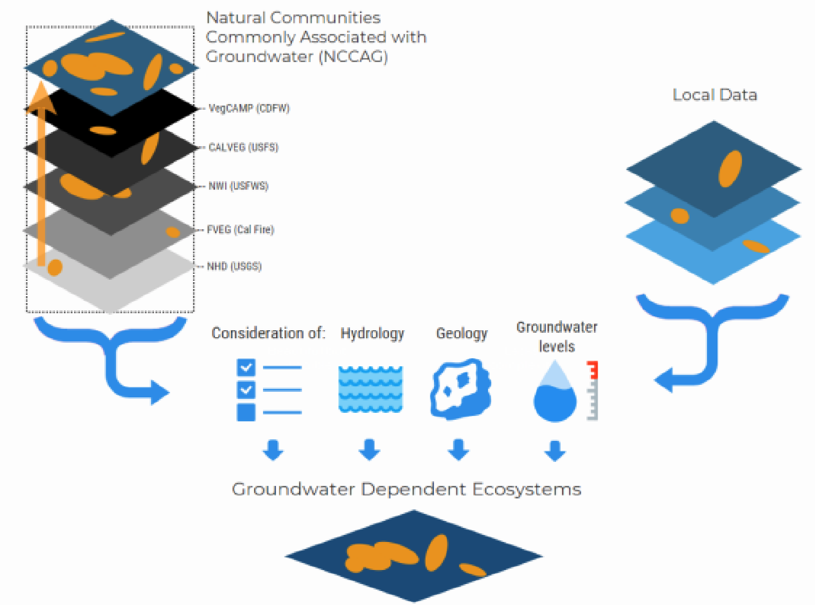
Attachment C

July 2019

IDENTIFYING GDEs UNDER SGMA

Best Practices for using the NC Dataset

The Sustainable Groundwater Management Act (SGMA) requires that groundwater dependent ecosystems (GDEs) be identified in Groundwater Sustainability Plans (GSPs). As a starting point, the Department of Water Resources (DWR) is providing the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) online[5] to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders identify GDEs within individual groundwater basins. To apply information from the NC Dataset to local areas, GSAs should combine it with the best available science on local hydrology, geology, and groundwater levels to verify whether polygons in the NC dataset are likely supported by groundwater in an aquifer (Figure 1)[6]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.



[5] *NC Dataset Online Viewer: https://gis.water.ca.gov/app/NCDatasetViewer/*

[6] California Department of Water Resources (DWR). 2018. Summary of the "Natural Communities Commonly Associated with Groundwater" Dataset and Online Web Viewer. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document.pdf

The NC Dataset identifies vegetation and wetland features that are good indicators of a GDE. The dataset is comprised of 48 publicly available state and federal datasets that map vegetation, wetlands, springs, and seeps commonly associated with groundwater in California[7]. It was developed through a collaboration between DWR, the Department of Fish and Wildlife, and The Nature Conservancy (TNC). TNC has also provided detailed guidance on identifying GDEs from the NC dataset[8] on the Groundwater Resource Hub[9], a website dedicated to GDEs.

BEST PRACTICE #1. Establishing a Connection to Groundwater

Groundwater basins can be comprised of one continuous aquifer (Figure 2a) or multiple aquifers stacked on top of each other (Figure 2b). In unconfined aquifers (Figure 2a), using the depth-to-groundwater and the rooting depth of the vegetation is a reasonable method to infer groundwater dependence for GDEs. If groundwater is well below the rooting (and capillary) zone of the plants and any wetland features, the ecosystem is considered disconnected and groundwater management is not likely to affect the ecosystem (Figure 2d). However, it is important to consider local conditions (e.g., soil type, groundwater flow gradients, and aquifer parameters) and to review groundwater depth data from multiple seasons and water year types (wet and dry) because intermittent periods of high groundwater levels can replenish perched clay lenses that serve as the water source for GDEs (Figure 2c). Maintaining these natural groundwater fluctuations are important to sustaining GDE health.

Basins with a stacked series of aquifers (Figure 2b) may have varying levels of pumping across aquifers in the basin, depending on the production capacity or water quality associated with each aquifer. If pumping is concentrated in deeper aquifers, SGMA still requires GSAs to sustainably manage groundwater resources in shallow aquifers, such as perched aquifers, that support springs, surface water, domestic wells, and GDEs (Figure 2). This is because vertical groundwater gradients across aquifers may result in pumping from deeper aquifers to cause adverse impacts onto beneficial users reliant on shallow aquifers or interconnected surface water. The goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits. While groundwater pumping may not be currently occurring in a shallower aquifer, use of this water may become more appealing and economically viable in future years as pumping restrictions are placed on the deeper production aquifers in the basin to meet the sustainable yield and criteria. Thus, identifying GDEs in the basin should done irrespective to the amount of current pumping occurring in a particular aquifer, so that future impacts on GDEs due to new production can be avoided. A good rule of thumb to follow is: *if groundwater can be pumped from a well - it's an aquifer*.

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[7] *For more details on the mapping methods, refer to: Klausmeyer, K., J. Howard, T. Keeler-Wolf, K. Davis-Fadtke, R. Hull, A. Lyons. 2018. Mapping Indicators of Groundwater Dependent Ecosystems in California: Methods Report. San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/iGDE_data_paper_20180423.pdf*

[8] "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at: https://groundwaterresourcehub.org/gde-tools/gsp-guidance-document/

[9] *The Groundwater Resource Hub: www.GroundwaterResourceHub.org*

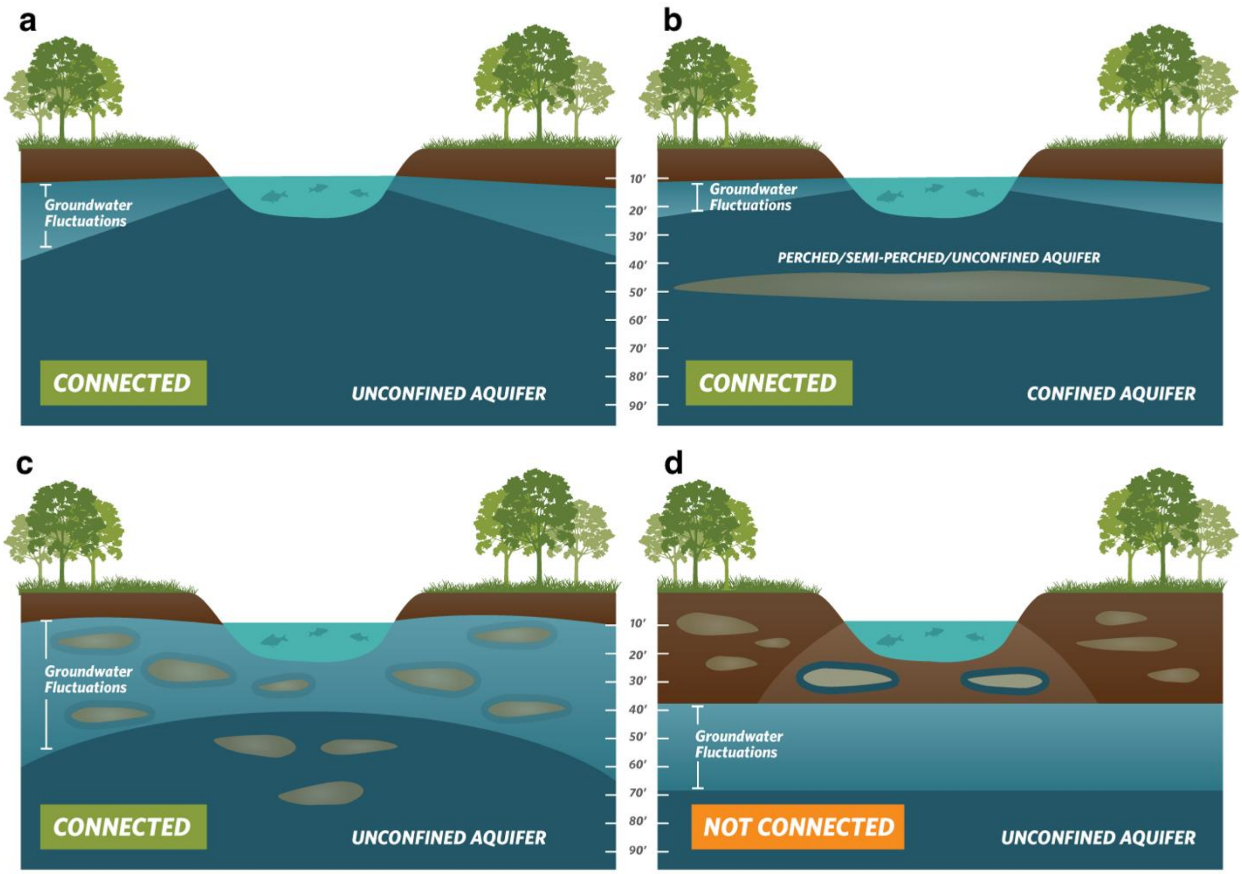

Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(b)** Depth-to-groundwater in the shallow aquifer is connected to overlying ecosystem. Pumping predominately occurs in the confined aquifer, but pumping is possible in the shallow aquifer. **Bottom: (c)** Depth-to-groundwater fluctuations are seasonally and interannually large, however, clay layers in the near surface prolong the ecosystem's connection to groundwater. **(d)** Groundwater is disconnected from surface water, and any water in the vadose (unsaturated) zone is due to direct recharge from precipitation and indirect recharge under the surface water feature. These areas are not connected to groundwater and typically support species that do not require access to groundwater to survive.

BEST PRACTICE #2. Characterize Seasonal and Interannual Groundwater Conditions

SGMA requires GSAs to describe current and historical groundwater conditions when identifying GDEs [23 CCR §354.16(g)]. Relying solely on the SGMA benchmark date (January 1, 2015) or any other single point in time to characterize groundwater conditions (e.g., depth-to-groundwater) is inadequate because managing groundwater conditions with data from one time point fails to capture the seasonal and interannual variability typical of California's climate. DWR's Best Management Practices document on water budgets[10] recommends using 10 years of water supply and water budget information to describe how historical conditions have impacted the operation of the basin within sustainable yield, implying that a baseline[11] could be determined based on data between 2005 and 2015. Using this or a similar time period, depending on data availability, is recommended for determining the depth-to-groundwater.

GDEs depend on groundwater levels being close enough to the land surface to interconnect with surface water systems or plant rooting networks. The most practical approach[12] for a GSA to assess whether polygons in the NC dataset are connected to groundwater is to rely on groundwater elevation data. As detailed in TNC's GDE guidance document[4], one of the key factors to consider when mapping GDEs is to contour depth-to-groundwater in the aquifer that is supporting the ecosystem (see Best Practice #5).

Groundwater levels fluctuate over time and space due to California's Mediterranean climate (dry summers and wet winters), climate change (flood and drought years), and subsurface heterogeneity in the subsurface (Figure 3). Many of California's GDEs have adapted to dealing with intermittent periods of water stress, however if these groundwater conditions are prolonged, adverse impacts to GDEs can result. While depth-to-groundwater levels within 30 feet[4] of the land surface are generally accepted as being a proxy for confirming that polygons in the NC dataset are supported by groundwater, it is highly advised that fluctuations in the groundwater regime be characterized to understand the seasonal and interannual groundwater variability in GDEs. Utilizing groundwater data from one point in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Time series data on groundwater elevations and depths are available on the SGMA Data Viewer[13]. However, if insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP <u>until</u> data gaps are reconciled in the monitoring network (see Best Practice #6).

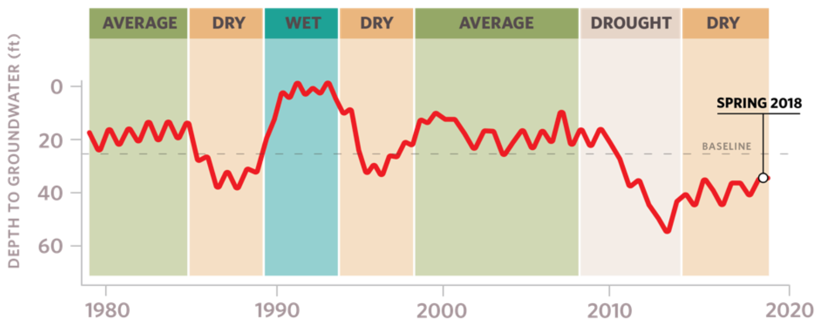

Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so adverse impacts are avoided.

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[10] DWR. 2016. Water Budget Best Management Practice. Available at: https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

[11] *Baseline is defined under the GSP regulations as "historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin." [23 CCR §351(e)]*

[12] Groundwater reliance can also be confirmed via stable isotope analysis and geophysical surveys. For more information see The GDE Assessment Toolbox (Appendix IV, GDE Guidance Document for GSPs[4]).

[13] *SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer*

BEST PRACTICE #3. Ecosystems Often Rely on Both Groundwater and Surface Water

GDEs are plants and animals that rely on groundwater for all or some of its water needs, and thus can be supported by multiple water sources. The presence of non-groundwater sources (e.g., surface water, soil moisture in the vadose zone, applied water, treated wastewater effluent, urban stormwater, irrigated return flow) within and around a GDE does not preclude the possibility that it is supported by groundwater, too. SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" [23 CCR §351(m)]. Hence, depth-to-groundwater data should be used to identify whether NC polygons are supported by groundwater and should be considered GDEs. In addition, SGMA requires that significant and undesirable adverse impacts to beneficial users of surface water be avoided. Beneficial users of surface water include environmental users such as plants or animals[14], which therefore must be considered when developing minimum thresholds for depletions of interconnected surface water.

GSAs are only responsible for impacts to GDEs resulting from groundwater conditions in the basin, so if adverse impacts to GDEs result from the diversion of applied water, treated wastewater, or irrigation return flow away from the GDE, then those impacts will be evaluated by other permitting requirements (e.g., CEQA) and may not be the responsibility of the GSA. However, if adverse impacts occur to the GDE due to changing groundwater conditions resulting from pumping or groundwater management activities, then the GSA would be responsible (Figure 4).

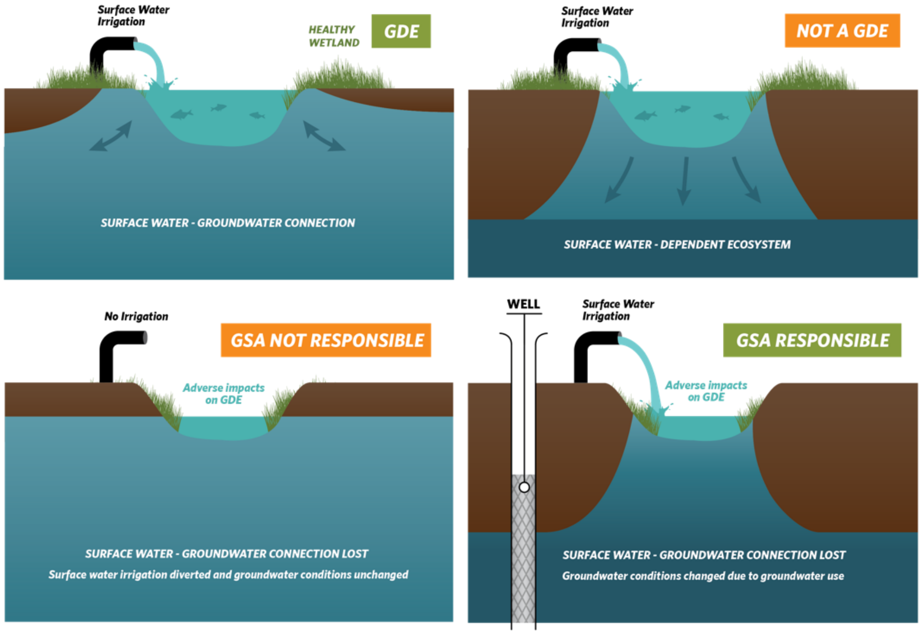


Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. **Bottom: (Left)** An ecosystem that was once dependent on an interconnected surface water, but loses access to groundwater solely due to surface water diversions may not be the GSA's responsibility. **(Right)** Groundwater dependent ecosystems once dependent on an interconnected surface water system, but loses that access due to groundwater pumping is the GSA's responsibility.

[14] *For a list of environmental beneficial users of surface water by basin, visit: https://groundwaterresourcehub.org/gde-tools/environmental-surface-water-beneficiaries/*

BEST PRACTICE #4. Select Representative Groundwater Wells

Identifying GDEs in a basin requires that groundwater conditions are characterized to confirm whether polygons in the NC dataset are supported by the underlying aquifer. To do this, proximate groundwater wells should be identified to characterize groundwater conditions (Figure 5). When selecting representative wells, it is particularly important to consider the subsurface heterogeneity around NC polygons, especially near surface water features where groundwater and surface water interactions occur around heterogeneous stratigraphic units or aquitards formed by fluvial deposits. The following selection criteria can help ensure groundwater levels are representative of conditions within the GDE area:

- Choose wells that are within 5 kilometers (3.1 miles) of each NC Dataset polygons because they are more likely to reflect the local conditions relevant to the ecosystem. If there are no wells within 5km of the center of a NC dataset polygon, then there is insufficient information to remove the polygon based on groundwater depth. Instead, it should be retained as a potential GDE until there are sufficient data to determine whether or not the NC Dataset polygon is supported by groundwater.

- Choose wells that are screened within the surficial unconfined aquifer and capable of measuring the true water table.

- Avoid relying on wells that have insufficient information on the screened well depth interval for excluding GDEs because they could be providing data on the wrong aquifer. This type of well data should not be used to remove any NC polygons.

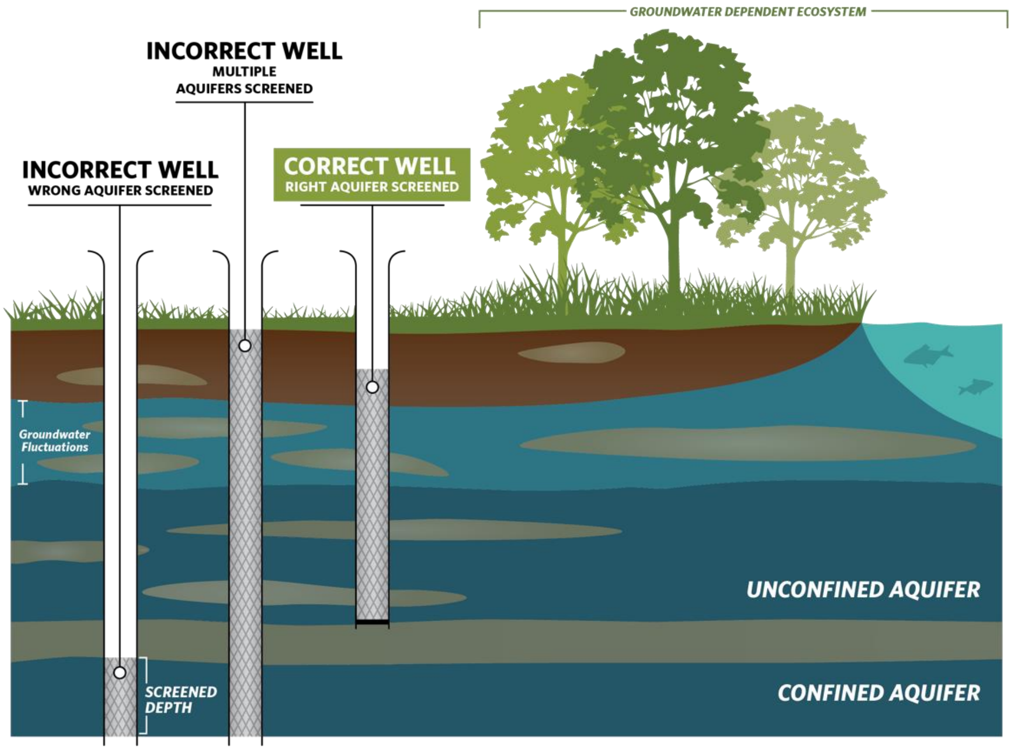


Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

BEST PRACTICE #5. Contouring Groundwater Elevations

The common practice to contour depth-to-groundwater over a large area by interpolating measurements at monitoring wells is unsuitable for assessing whether an ecosystem is supported by groundwater. This practice causes errors when the land surface contains features like stream and wetland depressions because it assumes the land surface is constant across the landscape and depth-to-groundwater is constant below these low-lying areas (Figure 6a). A more accurate approach is to interpolate **groundwater elevations** at monitoring wells to get groundwater elevation contours across the landscape. This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM)[15] to estimate depth-to-groundwater contours across the landscape (Figure b; Figure 7). This will provide a much more accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.

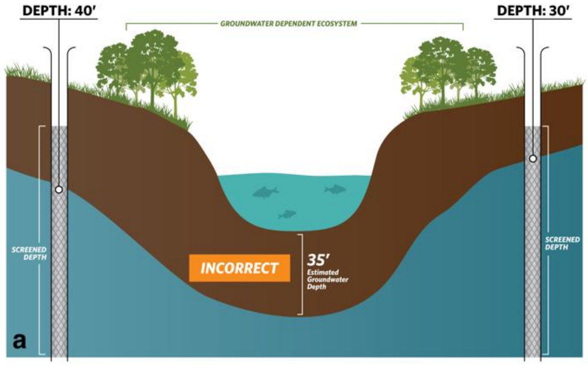


Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. **(b)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

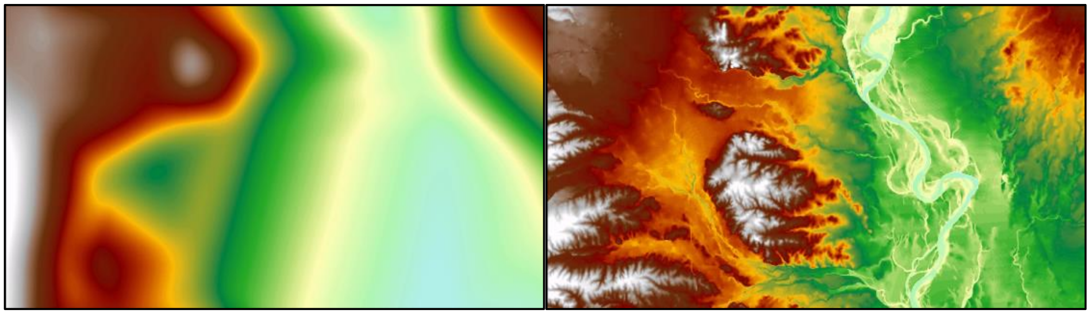


Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation from DEM spatial data to generate depth-to-groundwater contours. The image on the right shows a more accurate depth-to-groundwater estimate because it takes the local topography and elevation changes into account.

[15] USGS Digital Elevation Model data products are described at: https://www.usgs.gov/core-science-systems/ngp/3dep/about-3dep-products-services and can be downloaded at: https://iewer.nationalmap.gov/basic/

BEST PRACTICE #6. Best Available Science

Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decisions, and using the data collected through monitoring programs to revise decisions in the future. In many situations, the hydrologic connection of NC dataset polygons will not initially be clearly understood if site-specific groundwater monitoring data are not available. If sufficient data are not available in time for the 2020/2022 plan, **The Nature Conservancy strongly advises that questionable polygons from the NC dataset be included in the GSP until data gaps are reconciled in the monitoring network.** Erring on the side of caution will help minimize inadvertent impacts to GDEs as a result of groundwater use and management actions during SGMA implementation.

KEY DEFINITIONS

Groundwater basin is an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom. *23 CCR §341(g)(1)*

Groundwater dependent ecosystem (GDE) are ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. *23 CCR §351(m)*

Interconnected surface water (ISW) surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. *23 CCR §351(o)*

Principal aquifers are aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. *23 CCR §351(aa)*

ABOUT US

The Nature Conservancy is a science-based nonprofit organization whose mission is *to conserve the lands and waters on which all life depends*. To support successful SGMA implementation that meets the future needs of people, the economy, and the environment, TNC has developed tools and resources (www.groundwaterresourcehub.org) intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

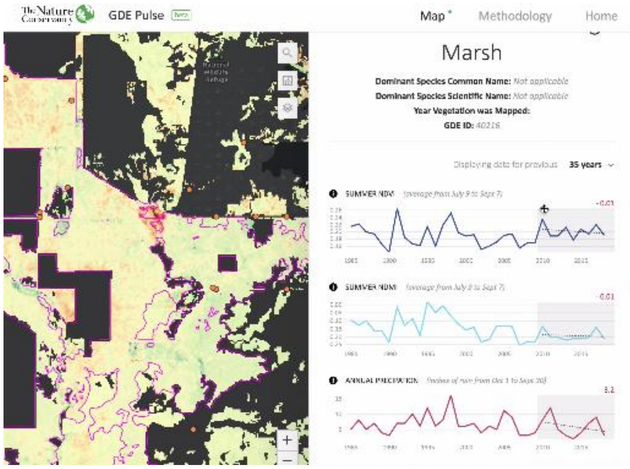
Attachment D

GDE Pulse

A new, free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data.

The Nature Conservancy
Protecting nature. Preserving life.

Visit
https://gde.codefornature.org/



Remote sensing data from satellites has been used to monitor the health of vegetation all over the planet. GDE pulse has compiled 35 years of satellite imagery from NASA's Landsat mission for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset[16]. The following datasets are included:

Normalized Difference Vegetation Index (NDVI) is a satellite-derived index that represents the greenness of vegetation. Healthy green vegetation tends to have a higher NDVI, while dead leaves have a lower NDVI. We calculated the average NDVI during the driest part of the year (July - Sept) to estimate vegetation health when the plants are most likely dependent on groundwater.

Normalized Difference Moisture Index (NDMI) is a satellite-derived index that represents water content in vegetation. NDMI is derived from the Near-Infrared (NIR) and Short-Wave Infrared (SWIR) channels. Vegetation with adequate access to water tends to have higher NDMI, while vegetation that is water stressed tends to have lower NDMI. We calculated the average NDVI during the driest part of the year (July–September) to estimate vegetation health when the plants are most likely dependent on groundwater.

Annual Precipitation is the total precipitation for the water year (October 1st – September 30th) from the PRISM dataset[17]. The amount of local precipitation can affect vegetation with more precipitation generally leading to higher NDVI and NDMI.

Depth to Groundwater measurements provide an indication of the groundwater levels and changes over time for the surrounding area. We used groundwater well measurements from nearby (<1km) wells to estimate the depth to groundwater below the GDE based on the average elevation of the GDE (using a digital elevation model) minus the measured groundwater surface elevation.

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[16] The Natural Communities Commonly Associated with Groundwater Dataset is hosted on the California Department of Water Resources' website: https://gis.water.ca.gov/app/NCDatasetViewer/#

[17] The PRISM dataset is hosted on Oregon State University's website: http://www.prism.oregonstate.edu/