

Appendix I

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December 6, 2019

Fresno County
Water and Natural Resources Division
2220 Tulare Street 6th Floor
Fresno, CA 93721

Submitted via email to: waterandnaturalresources@fresnocountyca.gov

Re: Fresno County Management Areas A & B Groundwater Sustainability Plan (GSP)

Dear Basin Representatives,

The Nature Conservancy (TNC) appreciates the opportunity to comment on the Fresno County Management Areas A & B (FCMA) Groundwater Sustainability Plan (GSP) 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 FCMA 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 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 groundwater sustainability agencies (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 online² 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 Department of Fish and Wildlife and TNC. We also recommend using GDE Pulse, which is also available on the internet at <https://gde.codefornature.org/#/home>.

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. For your convenience, we've provided a

¹GDEs 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/>

list of freshwater species within the boundary of the Delta-Mendota Subbasin (Subbasin) in **Attachment C**. 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 the California Department of Fish and Wildlife (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 Lookbook³ 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 Fresno County Management Areas A & B Draft GSP and appreciates the work that has gone into the preparation of various elements of this plan. However, we consider it to be **incomplete** under SGMA since key environmental beneficial uses and users are not adequately identified and considered. Specifically, GDEs are not 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 GDEs in subsequent drafts of the GSP. Additionally, they must be considered when defining Sustainable Management Criteria and evaluated for further monitoring needs.**

Our specific comments related to the FCMA GSP are provided in detail in **Attachment B** and are in reference to the numbered items in **Attachment A**. **Attachment C** provides a list of the freshwater species located in the Delta-Mendota Subbasin. **Attachment D** 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 E** 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.

Best Regards,



Sandi Matsumoto
Associate Director, California Water Program
The Nature Conservancy

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

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 <i>not</i> 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 <i>available</i> 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 <i>are not available</i> 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 Fresno County Management Areas A & B Groundwater Sustainability Plan, Public Review Draft

A complete draft of the Fresno County Management Areas A & B Groundwater Sustainability Plan (GSP) was provided for public review in September 2019. This attachment summarizes our comments on the complete public draft GSP. Comments are provided in the order of the checklist items included as Attachment A.

Checklist Item 1 - Notice & Communication (23 CCR §354.10)

[Section 2.5.1 Description of Beneficial Uses and Users of Groundwater (p.16)] 1-1

- Beneficial uses are listed as agricultural, domestic and environmental. There are no municipal beneficial users in FCMA. The Fresno County A & B GSP notes that the CDFW owns and operates the Mendota Wildlife Area (MWA). CDFW was contacted regarding the development of the GSP and to obtain access to construct new monitoring wells. There are no further descriptions of the environmental uses until GSP Section 3.1.7, Surface Water Features (p. 25), which describes the Mendota Pool, Fresno Slough, and the canal system near the Mendota Wildlife Area, but does not discuss the wildlife species that inhabit the areas. **Besides the Mendota Wildlife Area, please identify whether or not the following beneficial uses and users of groundwater in the Subbasin are present: Protected Lands, including refuges, conservation areas, and recreational areas; and Public Trust Uses, including wildlife, aquatic habitat, fisheries, and recreation.**
- The types and locations of environmental uses, species and habitats supported, instream flow requirements, and other designated beneficial environmental uses of surface waters that may be affected by groundwater extraction in FCMA should be specified. **To identify environmental users, please refer to the following:**
 - The NC Dataset (<https://gis.water.ca.gov/app/NCDataSetViewer/>) which identifies potential presence of groundwater dependent ecosystems.
 - The list of freshwater species located in the Delta-Mendota Subbasin in Attachment C of this letter. Please take particular note of the species with protected status.
 - CDFW's California Natural Diversity Database (CNDDDB) - <https://www.wildlife.ca.gov/Data/CNDDDB>
 - USFWS's IPAC report for the FCMA - <https://ecos.fws.gov/ipac/>

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).

[Section 2.2 Water Resources Monitoring and Management Programs (p. 12)] 1-2

- The GSP states (p. 12): “The [Mendota Pool Group] MPG Monitoring Program was established in 1999, and over the past two decades of annual reporting has created an extensive record of groundwater, surface water, and geologic data. Some of the MPG monitoring data applicable to the FCMA GSP effort will be used to develop and implement the GSP for FCMA. Existing monitoring location (e.g. Wells, Extensometers, Surface Water Sampling Locations) will be incorporated, as necessary, into the Subbasin and FCMA monitoring network.” **Please explain the relationship of existing stream flow monitoring to the protection of ISWs and GDEs.**

[Section 2.3.1 Fresno County General Plan (p. 13-14)]

1-3

- The Fresno County General Plan was adopted in 2000, prior to the formation of the GSA. FCMA is designated as “Agricultural” or “Open Space”, which refers to The Mendota Wildlife Area. There are limits to the number of residential units that can be built in those areas. In this section, please 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.** A
- 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 any relevant HCPs and NCCPs within the Subbasin, and address how GSP implementation will coordinate with the goals of these HCPs or NCCPs.** B
- Please refer to the Critical Species Lookbook⁴ 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.** C

[Section 2.4.4 Well Construction, Well Destruction, Abandonment (p. 13)]

1-4

- The county of Fresno has the authority to require permits for well abandonment, construction of new wells, reconstruction, repair, and deepening existing wells. Well permitting is currently handled by the Fresno County Environmental Health Department. The DWR well construction/destruction standards are followed (Bulletin 74-81 and 74-90). **Please include a discussion of how future well permitting will 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 vs.

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

SWRCB and Siskiyou County, No. C083239). **Compliance of well permitting programs with this requirement should be stated in the GSP.**

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

[Section 3.1.2 Local Geologic Setting (p. 19-22)]

1-5

- The basin-wide cross sections modified from Miller et al. (1971) (Figures 3-4 through 3-5) are regional, and do not include a graphical representation of the manner in which shallow groundwater may interact with ISWs or GDEs that would allow the reader to understand this topic. **Please include an example near-surface cross section that depicts the conceptual understanding of the interaction of shallow groundwater with the Fresno Slough, as well as any potential GDEs and ISWs.**

[Section 3.1.6 Definable Bottom of Basin (p. 25)]

1-6

- In the FCMA, the base of the usable aquifer corresponds with the base of freshwater, generally defined as groundwater with total dissolved solids (TDS) of 2,000 mg/L (Page, 1973), consistent with other GSAs in the Delta-Mendota Subbasin. As noted on page 9 of DWR's 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.** Properly defining the bottom of the basin will prevent the possibility of extractors with wells deeper than the basin boundary from claiming exemption from SGMA due to their well residing outside the vertical extent of the basin boundary.

[Section 3.1.3 Principal Aquifers and Aquitards (p. 22-24)]

1-7

- The GSP states (p. 22): "DWR Bulletin 118 defines three water-bearing zones within the Subbasin. These include the lower zone (defined as the Lower Aquifer), which contains confined fresh water in the lower section of the Tulare Formation, an upper zone (defined as the Upper Aquifer) which contains confined, semi-confined, and unconfined water in the upper section of the Tulare Formation and younger deposits, and a Shallow Zone which contains unconfined water within about 25 feet of the land surface (Davis 1959). This GSP defines two principal aquifers. The Lower Aquifer which is defined as the lower zone in Bulletin 118, and the Upper Aquifer which consists of the upper zone." **Please clarify in this section that the Upper Aquifer as referred to in this GSP consists of the upper zone and the shallow zone from DWR Bulletin 118, if that is the intended meaning. This seems to be confirmed in the following Section of the GSP (3.1.3.1 Upper Aquifer) but should be clearly stated in the first paragraph of Section 3.1.3 Principal Aquifers and Aquitards.**

[Section 3.1.7 Surface Water Features (p. 25-26)]

1-8

- The GSP states (p. 26): "There are not any naturally occurring springs, seeps, or wetlands in FCMA or within the model domain." This sentence seems inconsistent with other parts of the GSP, particularly section 3.2.7 Identification of Groundwater Dependent Ecosystems, which refers to wetland GDEs on the banks of the Fresno Slough. **Please revise the text to clarify the presence of wetlands, distinguishing between natural and managed wetlands if necessary.**

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

[Section 3.2.6 Interconnected Surface Water Systems (p. 35)]

1-9

- The GSP confirms that the Fresno Slough is an ISW. The GSP states (p. 35): "Water levels in the Slough are controlled by the SJREC and USBR in coordination with the San Luis Delta-Mendota Water Authority (SLDMWA)." Table 3-2 provides seepage rates from the Fresno Slough to the Upper Aquifer. **Please state whether seepage rates have been quantified by reach or season and present these if known, based on the cited source [LSCE and KDSA (2000)] or other sources.**

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

[Section 3.2.7 Identification of Groundwater Dependent Ecosystems (p. 35-37)]

1-10

- The GSP states (p. 35): "GSP regulation (§ 351 m) defines GDEs as ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring within 30 feet of the ground surface." However, the exact text of the regulation is: "Groundwater dependent ecosystem refers to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface." **Please revise the GSP text to correctly reflect the text of the regulation.** A
- The GSP states (p. 36): "For the vegetation data set, GDEs were first evaluated by using depth to water (DTW) measurements from Spring 2015 from Shallow Zone wells (screened above the A-Clay). Based on a water level threshold of 30 ft below ground surface (ft bgs), areas with water levels greater than 30 ft bgs were removed as containing GDEs, and areas with water levels shallower than the threshold were kept as GDEs." We have the following comments on this methodology:
 - **Please provide more details on how the depth to groundwater contours shown on Figure 3-37 were developed:** B
 - Are the wells used for interpolating depth to groundwater sufficiently close (<5km) to NC Dataset polygons to reflect local conditions relevant to ecosystems?
 - 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.

- Spring 2015 is after the SGMA benchmark date of January 1, 2015. **Please ensure that groundwater condition data prior to the SGMA benchmark date of January 1, 2015 is included in the analysis.** C
- 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. **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 D 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.** D
- **Please provide rationale for the 30-foot criteria cited in the text.** In TNC's GDE Guidance, the depth criteria of 30 feet is presented as a criterion for inclusion, not a standalone criterion for exclusion. In other words, if groundwater is within 30 feet of the ground surface, then a GDE can be identified. If it is not, then further analysis must be conducted (see Appendix III of the GDE Guidance, Worksheet 1, for other indicators of GDEs). **Please indicate what vegetation is present in the possible GDEs. The actual rooting depth of vegetation growing in the area should be a consideration, and this will vary by species dominance and habitats present.** For example, some phreatophytes can root to 120-feet deep in more arid and drought stressed environments. Furthermore, rooting depths are likely to spatially vary based on the local hydrologic conditions available to the plant. Maximum 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. E
- The GSP states (p. 36): "For the wetland's dataset, the areas of the Fresno Slough that were continually saturated based on historic imagery were designated as GDEs. The Fresno Slough runs through the entire FCMA. The banks of the Fresno Slough were classified as GDEi [sic] in the wetlands data set. Based on historic imagery these areas are only saturated during wet years such as 2011 and 2017. These areas

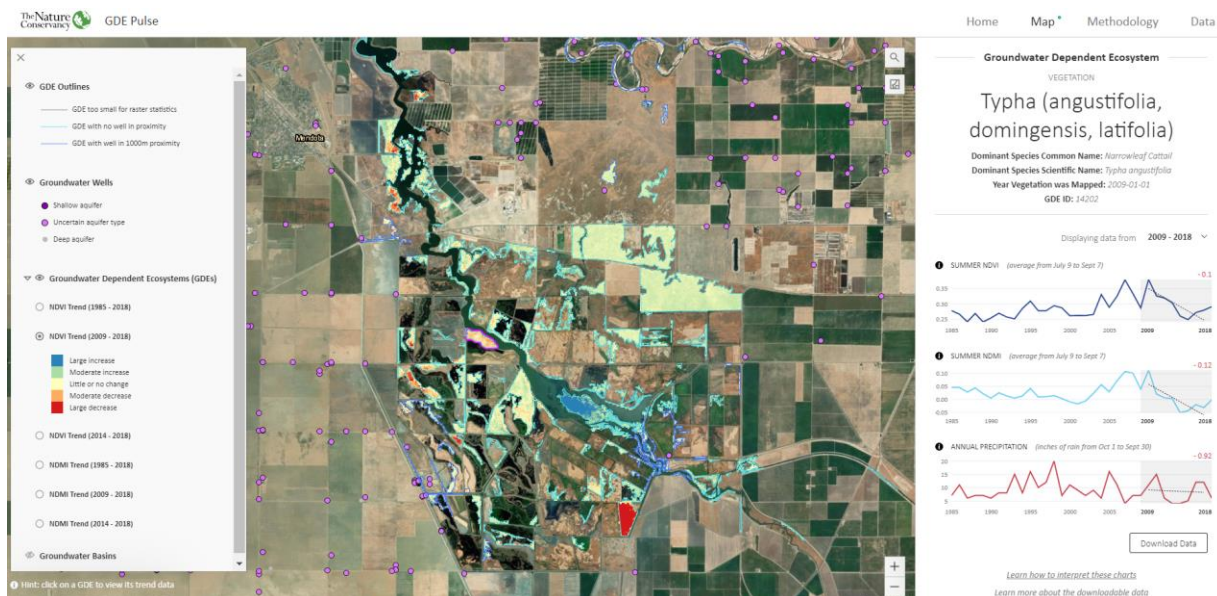
were removed as GDEs." SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface". GDEs can rely on multiple water sources simultaneously and at different temporal/spatial scales (e.g., precipitation, river water, reservoir water, soil moisture in the vadose zone, groundwater, applied water, treated wastewater effluent, urban stormwater, irrigated return flow). **Hence, we recommend that depth to groundwater (and not the level of inundation on aerial photography) be used to identify if a connection to groundwater exists. 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.**

- **On Figure 3-37, please provide separate colors for Vegetation and Wetland GDEs removed, as was presented on Figure 2-9, and provide the removal reason. In the text or on the Figure, please cite the acreage of GDEs retained and removed. The basin's GDE shapefile, which is submitted via the SGMA Portal, should 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).**
- The GSP states (p. 37): "There is also significant seepage from the Mendota Pool to the Shallow Zone of the Upper Aquifer which helps maintain GDEs (Table 3-3)."
Please correct the text to refer to Table 3-2 and seepage from the Fresno Slough.

Checklist Items 16 to 20, Describing GDEs (23 CCR §354.16)

[Section 3.2.7 Identification of Groundwater Dependent Ecosystems (p. 35-37)] 1-11

- In Section 3.2.7.2, the GSP discusses mapped critical habitat of the endangered Fresno Kangaroo Rat as shown in Figure 3-38. However, this is only a very limited evaluation of ecological conditions and assessment of conservation value of GDEs. **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 refer to GDE Pulse (<https://gde.codefornature.org>; See Attachment E of this letter for more details) or any other locally available 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 FCMA:**



[Section 3.2.7.3 Impacts to GDEs (p. 37)]

1-12

- The evaluation of impacts to GDEs is to be performed when defining undesirable results in the Sustainable Management Criteria section of GSP, not the Basin Setting section. **Please consider moving this discussion and consolidating it with Section 4.4 Undesirable Results.**

Checklist Items 21 and 22 – Water Budget (23 CCR §354.18)

[Section 3.3.6 Quantification of Current, Historic, and Projected Water Budget (p. 44-45)]

1-13

- The water budget was calculated with the USGS MODFLOW-NWT model (Niswonger et al., 2011) for an area larger than the boundaries of FCMA, as shown on Figure 3-39. **Please explain how the extended area affects the accuracy of the model projections for the FCMA.**
- Appendix I (p. 19-20) states: "Crop coefficients for different land surface characteristics, including non-irrigated lands such as bare ground, barren/fallow lands and natural vegetation, were calculated based on the UC Davis Basic Irrigation Scheduling (BIS) application developed by Snyder et al. (2000, 2008) at monthly frequency." **Please clarify whether the term "natural vegetation" includes riparian vegetation for evapotranspiration for the historical, current, and future water budgets.**
- The term "Other Direct Recharge" is not defined, and although it is shown in Current and Historic Groundwater Budget (Table 3-8), it is not included in the Projected Budget (Table 3-9). **Please explain how this term is derived and what it represents.**

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B

C

Checklist Items 23 to 25 – Sustainability Goal (23 CCR §354.24)

[Section 4.1 Sustainability Goal (p. 51)]

1-14

- The GSP states the Sustainability Goal as (p. 51): “FCMA will manage groundwater resources in a manner that results in the absence of undesirable results for the Upper Aquifer by the year 2040.” The sustainability goal does not specifically mention beneficial uses or users of groundwater, including environmental users. **Please rephrase the Sustainability Goal to specifically call out beneficial uses and users of groundwater, including environmental users. Please state how the sustainability of environmental uses will be protected. In addition, a statement about any intention to address pre-SGMA impacts should be included.**

Checklist Item 26 – Measurable Objectives (23 CCR §354.30)

1-15

[Section 4.2.1 Measurable Objectives for Chronic Lowering of Water Levels (p. 52)]

- The description of Measurable Objectives does not explain how GDEs were considered. **Please include GDEs in this section and explain how the Measurable Objectives and Interim Milestones will help achieve the Sustainability Goal as it pertains to the environment.**

[Section 4.2.4 Measurable Objectives for Degraded Water Quality (p. 55)]

1-16

- The description of Measurable Objectives does not consider how water quality needs of GDEs were considered. **Please include a discussion about GDEs and water quality and whether the Measurable Objectives and Interim Milestones will help achieve the Sustainability Goal as it pertains to the environment.**
- This section describes how for this sustainability indicator, MAA and MAB are designated as separate management areas, based on existing groundwater quality studies and regulatory guidelines. **Please incorporate discussion of the management areas into the explanation of how GDEs will be protected by the Sustainable Management Criteria for this sustainability indicator.**

[Section 4.2.5 Measurable Objectives for Interconnected Surface Waters (p. 57)]

1-17

- The GSP states (p. 57): “This area has been designated as a management area because it has no control over water levels in the Fresno Slough. FCMA will prevent undesirable results to surrounding areas by managing groundwater elevations to sustainable levels.” **Please describe the regulatory requirements that effect surface water deliveries to the Fresno Slough, and describe the conditions under which Undesirable Results *could* occur, even if outside of the control of FCMA.**

Checklist Item 27-29 – Minimum Thresholds (23 CCR §354.28)

[Section 4.3.1 Minimum Thresholds for Chronic Lowering of Groundwater Levels (p. 59)]

1-18

- The discussion of Minimum Thresholds does not consider GDEs. **Please include a discussion of GDEs and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.** A
- The GSP states (p. 60): "For most of the FCMA, there was either no groundwater elevation data present where GDEs are present, primarily the MWA, or groundwater elevations were at a depth that exceeded the 30 ft threshold which was used to identify GDEs," and goes on to state (p. 61): "If water levels are ever to drop to MT levels, which is not projected to occur, further analysis of the vertical gradient in the Shallow Zone of the Upper Aquifer will be necessary to better understand the potential impacts to GDEs." **Please specifically cite the data gap in shallow groundwater levels across FCMA in this section, and state how the data gap will be reconciled or refer to a subsequent section of the document.** B

[Section 4.3.4 Minimum Thresholds for Groundwater Quality (p. 63)] 1-19

- The GSP states (p. 65): "The impact high salinity in groundwater could have on freshwater aquatic plants and animals is not well understood in the San Joaquin Valley (USBR, 2018)." **Please further discuss the possible impacts to environmental users from the Minimum Thresholds for TDS proposed in Table 4-10, in the context of information provided in USBR, 2018 and other sources.**

Checklist Item 30-46 – Undesirable Results (23 CCR §354.26) 1-20

[Section 4.4.1.1 Description of Undesirable Results for Groundwater Elevation (p. 69)]

- The GSP states (p. 69): "Undesirable results occur when more than 25% of wells in the Upper Aquifer exceed the established MT value for two consecutive years." The use of 25 percent to define an undesirable result does not allow for the occurrence of low water levels in one area, such as near a GDE, to be an Undesirable Result. Damage to GDEs can occur within a relatively short period of time and can be irreversible, leading to a permanent loss. A percentage violation trigger is therefore an insufficient method to prevent undesirable results to environmental users of groundwater. **Please consider the use of separate management areas for the GDE Units, so that Sustainable Management Criteria protective of GDEs can be established for the GDE Units. Please elaborate on how the exceedance criteria would be applied in a way that is protective of significant and unreasonable harm to GDEs.** A
A procedure could be included for violation of minimum thresholds that includes early identification of potential GDE impacts and appropriate response actions. This could be accomplished efficiently and cost-effectively using remote sensing tools, such as GDE Pulse.
- **Please provide more specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact to GDEs.** The definition of 'significant and unreasonable' is a qualitative statement that is used to describe when undesirable results would occur in the basin, such that a minimum threshold can be quantified. Potential B

effects on all beneficial users of groundwater in the basin need to be taken into consideration. According to the California Constitution Article X, §2, water resources in California must be “put to beneficial use to the fullest extent of which they are capable”. **Please identify appropriate biological indicators that can be used to monitor potential impacts to environmental beneficial users due to groundwater conditions. Refer to Appendix E of this letter for an overview of a free, new online tool for monitoring the health of GDEs over time.**

C

[Section 4.4.1.4 Description of Undesirable Results for Groundwater Quality (p. 69)]

1-21

- The GSP states (p. 69): “Undesirable Results occur when more than 25% of wells in MAA or MAB exceed the established MT for two consecutive years.” As stated above, the use of 25 percent to define an undesirable result does not allow for the occurrence of low water levels in one area, such as near a GDE, to be an Undesirable Result. Damage to GDEs can occur within a relatively short period of time and can be irreversible, leading to a permanent loss. A percentage violation trigger is therefore an insufficient method to prevent undesirable results to environmental users of groundwater. **Please consider the use of separate management areas for the GDE Units, so that Sustainable Management Criteria protective of GDEs can be established for the GDE Units. Please elaborate on how the exceedance criteria would be applied in a way that is protective of significant and unreasonable harm to GDEs.** A procedure could be included for violation of minimum thresholds that includes early identification of potential GDE impacts and appropriate response actions. This could be accomplished efficiently and cost-effectively using remote sensing tools, such as GDE Pulse.

[Section 4.4.1.5 Description of Undesirable Results for Interconnected Surface Water (p. 70)]

1-22

- The GSP states (p. 70): “Undesirable results occur when stage values drop below the MT for two consecutive years. Undesirable results for interconnected surface waters will not trigger any management action as FCMA has no control over water levels in the Fresno Slough.” The cause-effect relationship between surface water levels and the biological responses that could result in significant and unreasonable impacts to ISWs and GDEs depends on a number of factors, and this relationship is not characterized or discussed. **Please describe what Undesirable Results could be expected when stage values drop below the MT for two consecutive years.**

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

[Section 4.5.2 Groundwater Elevation Monitoring Network (p. 73)]

1-23

- **Please incorporate the discussion of data gaps presented in Section 3.1.8 (p. 27) into the Monitoring Network section.** As discussed on page 27, there are no wells in the Mendota Wildlife Area and the GSA has been unsuccessful in working with CDFW to obtain well construction information on existing wells or to obtain access to construct a new well. This is a data gap for which the GSA states that they

A

will continue to work with DWR, CDFW and private duck clubs to obtain access to construct a new well.

- The five wells that are proposed for monitoring groundwater levels are shown in Figure 4-1. The single well for the Lower Aquifer, USGS 31J6, is located outside of the FCMA. The GSP states that there is no known pumping in the FCMA from the Lower Aquifer, and that the FCMA is not expected to extract groundwater from the Lower Aquifer. Lower Aquifer conditions will be monitored and managed in coordination with other entities that utilize the Lower Aquifer as a source of groundwater. **Please consider the installation of a nested well to study the impact of pumping from the Lower Aquifer in areas adjacent to FCMA to shallow groundwater levels in FCMA. Despite no current pumping from the Lower Aquifer in FCMA, pumping from this aquifer could occur in the future.** B
- Per the GSP Regulations (23 CCR §354.34 (a) and (b)), monitoring must address trends in groundwater *and related surface conditions* (emphasis added). Groundwater level monitoring alone may be insufficient to establish a linkage between groundwater extraction and potentially resulting impacts to environmental resources associated with GDEs and ISWs. The Mendota Pool staff gage will continue to be measured; it is the only monitoring that is planned for the ISWs. The cause-effect relationship between groundwater levels and the biological responses that could result in significant and unreasonable impacts to ISWs and GDEs depends on a number of factors, and this relationship is not characterized or discussed. **As such, it is not possible to determine whether the proposed monitoring is sufficiently protective to ensure significant and unreasonable impacts to GDEs and ISWs will be prevented. Please expand the discussion of the monitoring program to discuss how ISWs and GDEs will be protected.** C

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

[Section 5 Projects and Management Actions to Achieve Sustainability Goal (p. 80)]

1-24

- The GSP states that no PMAs (Projects and Management Actions) have been formally developed for FCMA. **If and when future projects are planned, please include environmental benefits and multiple benefits as criteria for assessing project priorities.** Environmental users and uses should be considered in establishing new projects. In addition, consistent with existing grant and funding guidelines for SGMA-related work, consideration may be given to multi-benefit projects that can address water quantity as well as providing environmental benefits or benefits to disadvantaged communities.
- **Please consider adding Management Actions which include education and outreach for protection of GDEs and ISWs.**

Attachment C

Freshwater Species Located in the Delta-Mendota Subbasin

To assist in identifying the beneficial users of surface water necessary to assess the undesirable result “depletion of interconnected surface waters”, Attachment C provides a list of freshwater species located in the Delta-Mendota Subbasin. To produce the freshwater species list, we used ArcGIS to select features within the California Freshwater Species Database version 2.0.9 within the GSA’s boundary. This database contains information on ~4,000 vertebrates, macroinvertebrates and vascular plants that depend on fresh water for at least one stage of their life cycle. The methods used to compile the California Freshwater Species Database can be found in Howard et al. 2015⁵. The spatial database contains locality observations and/or distribution information from ~400 data sources. The database is housed in the California Department of Fish and Wildlife’s BIOS⁶ as well as on TNC’s science website⁷.

Scientific Name	Common Name	Legally Protected Status		
		Federal	State	Other
BIRD				
Agelaius tricolor	Tricolored Blackbird	Bird of Conservation Concern	Special Concern	BSSC - First priority
Plegadis chihi	White-faced Ibis		Watch list	
Vireo bellii pusillus	Least Bell's Vireo	Endangered	Endangered	
Actitis macularius	Spotted Sandpiper			
Aechmophorus clarkii	Clark's Grebe			
Aechmophorus occidentalis	Western Grebe			
Aix sponsa	Wood Duck			
Anas acuta	Northern Pintail			
Anas americana	American Wigeon			
Anas clypeata	Northern Shoveler			
Anas crecca	Green-winged Teal			
Anas cyanoptera	Cinnamon Teal			
Anas discors	Blue-winged Teal			
Anas platyrhynchos	Mallard			
Anas strepera	Gadwall			
Anser albifrons	Greater White-fronted Goose			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			
Aythya affinis	Lesser Scaup			
Aythya americana	Redhead		Special Concern	BSSC - Third priority
Aythya collaris	Ring-necked Duck			
Aythya marila	Greater Scaup			
Aythya valisineria	Canvasback		Special	

⁵ Howard, J.K. et al. 2015. Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. PLoS ONE, 11(7). Available at: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710>

⁶ California Department of Fish and Wildlife BIOS: <https://www.wildlife.ca.gov/data/BIOS>

⁷ Science for Conservation: <https://www.scienceforconservation.org/products/california-freshwater-species-database>

Botaurus lentiginosus	American Bittern			
Bucephala albeola	Bufflehead			
Bucephala clangula	Common Goldeneye			
Butorides virescens	Green Heron			
Calidris alpina	Dunlin			
Calidris mauri	Western Sandpiper			
Calidris minutilla	Least Sandpiper			
Chen caerulescens	Snow Goose			
Chen rossii	Ross's Goose			
Chlidonias niger	Black Tern		Special Concern	BSSC - Second priority
Chroicocephalus philadelphia	Bonaparte's Gull			
Cistothorus palustris palustris	Marsh Wren			
Cygnus columbianus	Tundra Swan			
Cypseloides niger	Black Swift	Bird of Conservation Concern	Special Concern	BSSC - Third priority
Dendrocygna bicolor	Fulvous Whistling-Duck		Special Concern	BSSC - First priority
Egretta thula	Snowy Egret			
Empidonax traillii	Willow Flycatcher	Bird of Conservation Concern	Endangered	
Fulica americana	American Coot			
Gallinago delicata	Wilson's Snipe			
Gallinula chloropus	Common Moorhen			
Geothlypis trichas trichas	Common Yellowthroat			
Grus canadensis	Sandhill Crane			
Haliaeetus leucocephalus	Bald Eagle	Bird of Conservation Concern	Endangered	
Himantopus mexicanus	Black-necked Stilt			
Icteria virens	Yellow-breasted Chat		Special Concern	BSSC - Third priority
Limnodromus scolopaceus	Long-billed Dowitcher			
Lophodytes cucullatus	Hooded Merganser			
Megaceryle alcyon	Belted Kingfisher			
Mergus merganser	Common Merganser			
Mergus serrator	Red-breasted Merganser			
Numenius americanus	Long-billed Curlew			
Numenius phaeopus	Whimbrel			
Nycticorax nycticorax	Black-crowned Night-Heron			
Oxyura jamaicensis	Ruddy Duck			
Pandion haliaetus	Osprey		Watch list	
Pelecanus erythrorhynchos	American White Pelican		Special Concern	BSSC - First priority
Phalacrocorax auritus	Double-crested Cormorant			

Phalaropus tricolor	Wilson's Phalarope			
Pluvialis squatarola	Black-bellied Plover			
Podiceps nigricollis	Eared Grebe			
Podilymbus podiceps	Pied-billed Grebe			
Porzana carolina	Sora			
Rallus limicola	Virginia Rail			
Recurvirostra americana	American Avocet			
Riparia riparia	Bank Swallow		Threatened	
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			
Tringa melanoleuca	Greater Yellowlegs			
Tringa semipalmata	Willet			
Tringa solitaria	Solitary Sandpiper			
Vireo bellii	Bell's Vireo			
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		Special Concern	BSSC - Third priority
CRUSTACEAN				
Branchinecta conservatio	Conservancy Fairy Shrimp	Endangered	Special	IUCN - Endangered
Branchinecta longiantenna	Longhorn Fairy Shrimp	Endangered	Special	IUCN - Endangered
Branchinecta lynchi	Vernal Pool Fairy Shrimp	Threatened	Special	IUCN - Vulnerable
Lepidurus packardii	Vernal Pool Tadpole Shrimp	Endangered	Special	IUCN - Endangered
Linderiella occidentalis	California Fairy Shrimp		Special	IUCN - Near Threatened
Artemia franciscana	San Francisco Brine Shrimp			
Branchinecta lindahli	Versatile Fairy Shrimp			
FISH				
Oncorhynchus mykiss irideus	Coastal rainbow trout			Least Concern - Moyle 2013
Pogonichthys macrolepidotus	Sacramento splittail		Special Concern	Vulnerable - Moyle 2013
Oncorhynchus mykiss - CV	Central Valley steelhead	Threatened	Special	Vulnerable - Moyle 2013
Acipenser medirostris ssp. 1	Southern green sturgeon	Threatened	Special Concern	Endangered - Moyle 2013
Acipenser transmontanus	White sturgeon		Special	Vulnerable - Moyle 2013
Archoplites interruptus	Sacramento perch		Special Concern	Endangered - Moyle 2013
Catostomus occidentalis occidentalis	Sacramento sucker			Least Concern - Moyle 2013
Cottus asper ssp. 1	Prickly sculpin			Least Concern - Moyle 2013
Entosphenus tridentata ssp. 1	Pacific lamprey		Special	Near-Threatened - Moyle 2013
Gasterosteus aculeatus microcephalus	Inland threespine stickleback		Special	Least Concern - Moyle 2013

<i>Hysterocarpus traskii traskii</i>	Sacramento tule perch		Special	Near-Threatened - Moyle 2013
<i>Lampetra ayersi</i>	River lamprey		Special Concern	Near-Threatened - Moyle 2013
<i>Lampetra hubbsi</i>	Kern brook lamprey		Special Concern	Vulnerable - Moyle 2013
<i>Lampetra richardsoni</i>	Western brook lamprey			Near-Threatened - Moyle 2013
<i>Lavinia exilicauda exilicauda</i>	Sacramento hitch		Special	Near-Threatened - Moyle 2013
<i>Lavinia symmetricus symmetricus</i>	Central California roach		Special Concern	Near-Threatened - Moyle 2013
<i>Mylopharodon conocephalus</i>	Hardhead		Special Concern	Near-Threatened - Moyle 2013
<i>Oncorhynchus tshawytscha</i> - CV fall	Central Valley fall Chinook salmon	Species of Special Concern	Special Concern	Vulnerable - Moyle 2013
<i>Oncorhynchus tshawytscha</i> - CV late fall	Central Valley late fall Chinook salmon	Species of Special Concern		Endangered - Moyle 2013
<i>Orthodon microlepidotus</i>	Sacramento blackfish			Least Concern - Moyle 2013
<i>Ptychocheilus grandis</i>	Sacramento pikeminnow			Least Concern - Moyle 2013
HERP				
<i>Actinemys marmorata marmorata</i>	Western Pond Turtle		Special Concern	ARSSC
<i>Ambystoma californiense californiense</i>	California Tiger Salamander	Threatened	Threatened	ARSSC
<i>Anaxyrus boreas boreas</i>	Boreal Toad			
<i>Rana boylei</i>	Foothill Yellow-legged Frog	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
<i>Rana draytonii</i>	California Red-legged Frog	Threatened	Special Concern	ARSSC
<i>Spea hammondi</i>	Western Spadefoot	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
<i>Thamnophis gigas</i>	Giant Gartersnake	Threatened	Threatened	
<i>Thamnophis sirtalis sirtalis</i>	Common Gartersnake			
<i>Pseudacris regilla</i>	Northern Pacific Chorus Frog			
<i>Thamnophis atratus atratus</i>	Santa Cruz Gartersnake			Not on any status lists
<i>Thamnophis elegans elegans</i>	Mountain Gartersnake			Not on any status lists
<i>Thamnophis hammondi hammondi</i>	Two-striped Gartersnake		Special Concern	ARSSC
INSECT & OTHER INVERTEBRATES				

Aeshnidae fam.	Aeshnidae fam.			
Anax junius	Common Green Darner			
Brillia spp.	Brillia spp.			
Callicorixa spp.	Callicorixa spp.			
Chironomus spp.	Chironomus spp.			
Coenagrionidae fam.	Coenagrionidae fam.			
Corisella spp.	Corisella spp.			
Cricotopus spp.	Cricotopus spp.			
Ischnura cervula	Pacific Forktail			
Ischnura denticollis	Black-fronted Forktail			
Paraleptophlebia associata	A Mayfly			
Paratanytarsus spp.	Paratanytarsus spp.			
Phaenopsectra spp.	Phaenopsectra spp.			
Procladius spp.	Procladius spp.			
Psectrocladius spp.	Psectrocladius spp.			
Tanytus spp.	Tanytus spp.			
Tipulidae fam.	Tipulidae fam.			
Trichocorixa spp.	Trichocorixa spp.			
Capnia hitchcocki	Arroyo Snowfly			
Mesocapnia bulbosa	Bulbous Snowfly			
MAMMAL				
Castor canadensis	American Beaver			Not on any status lists
Lontra canadensis canadensis	North American River Otter			Not on any status lists
Neovison vison	American Mink			Not on any status lists
Ondatra zibethicus	Common Muskrat			Not on any status lists
Anodonta californiensis	California Floater		Special	
Margaritifera falcata	Western Pearlshell		Special	
Pyrgulopsis diablensis	Diablo Range Pyrg		Special	E
PLANT				
Chloropyron molle hispidum			Special	CRPR - 1B.1
Chloropyron palmatum	NA	Endangered	Special	CRPR - 1B.1
Eryngium racemosum	Delta Coyote-thistle		Endangered	CRPR - 1B.1
Eryngium spinosepalum	Spiny Sepaled Coyote-thistle		Special	CRPR - 1B.2
Navarretia prostrata	Prostrate Navarretia		Special	CRPR - 1B.1
Puccinellia simplex	Little Alkali Grass			
Alopecurus saccatus	Pacific Foxtail			
Ammannia coccinea	Scarlet Ammannia			
Anemopsis californica	Yerba Mansa			
Arundo donax	NA			
Azolla filiculoides	NA			
Azolla microphylla	Mexican mosquito fern		Special	CRPR - 4.3
Baccharis salicina				Not on any status lists

Bacopa eisenii	Gila River Water-hyssop			
Bidens laevis	Smooth Bur-marigold			
Bolboschoenus glaucus	NA			Not on any status lists
Bolboschoenus maritimus paludosus	NA			Not on any status lists
Callitriche marginata	Winged Water-starwort			
Ceratophyllum demersum	Common Hornwort			
Cotula coronopifolia	NA			
Crassula aquatica	Water Pygmyweed			
Crypsis vaginiflora	NA			
Cyperus erythrorhizos	Red-root Flatsedge			
Cyperus squarrosus	Awned Cyperus			
Downingia bella	Hoover's Downingia			
Downingia pulchella	Flat-face Downingia			
Echinodorus berteroi	Upright Burhead			
Elatine brachysperma	Shortseed Waterwort			
Elatine californica	California Waterwort			
Eleocharis acicularis acicularis	Least Spikerush			
Eleocharis atropurpurea	Purple Spikerush			
Eleocharis coloradoensis				Not on any status lists
Eleocharis macrostachya	Creeping Spikerush			
Eleocharis montevidensis	Sand Spikerush			
Eleocharis quadrangulata	NA			
Elodea canadensis	Broad Waterweed			
Epilobium cleistogamum	Cleistogamous Spike-primrose			
Eragrostis hypnoides	Teal Lovegrass			
Eryngium castrense	Great Valley Eryngo			
Eryngium vaseyi vallicola				Not on any status lists
Eryngium vaseyi vaseyi	Vasey's Coyote-thistle			Not on any status lists
Euthamia occidentalis	Western Fragrant Goldenrod			
Hydrocotyle verticillata verticillata	Whorled Marsh-pennywort			
Juncus acuminatus	Sharp-fruit Rush			
Juncus xiphioides	Iris-leaf Rush			
Lasthenia ferrisiae	Ferris' Goldfields		Special	CRPR - 4.2
Lasthenia fremontii	Fremont's Goldfields			
Lemna aequinoctialis	Lesser Duckweed			
Lemna gibba	Inflated Duckweed			
Lemna minor	Lesser Duckweed			
Lepidium jaredii jaredii	Jared's Pepper-grass		Special	CRPR - 1B.2
Lepidium oxycarpum	Sharp-pod Pepper-grass			
Limnanthes douglasii douglasii	Douglas' Meadowfoam			

<i>Limosella acaulis</i>	Southern Mudwort			
<i>Lipocarpus micrantha</i>	Dwarf Bulrush			
<i>Ludwigia peploides peploides</i>	NA			Not on any status lists
<i>Ludwigia repens</i>	Creeping Seedbox			
<i>Lythrum californicum</i>	California Loosestrife			
<i>Marsilea vestita vestita</i>	NA			Not on any status lists
<i>Mimulus cardinalis</i>	Scarlet Monkeyflower			
<i>Mimulus guttatus</i>	Common Large Monkeyflower			
<i>Montia fontana fontana</i>	Fountain Miner's-lettuce			
<i>Myosurus minimus</i>	NA			
<i>Myosurus sessilis</i>	Sessile Mousetail			
<i>Myriophyllum aquaticum</i>	NA			
<i>Najas guadalupensis guadalupensis</i>	Southern Naiad			
<i>Navarretia heterandra</i>	Tehama Navarretia			
<i>Navarretia leucocephala leucocephala</i>	White-flower Navarretia			
<i>Neostapfia colusana</i>	Colusa Grass	Threatened	Endangered	CRPR - 1B.1
<i>Panicum dichotomiflorum</i>	NA			
<i>Paspalum distichum</i>	Joint Paspalum			
<i>Persicaria hydropiperoides</i>				Not on any status lists
<i>Persicaria lapathifolia</i>				Not on any status lists
<i>Persicaria maculosa</i>	NA			Not on any status lists
<i>Persicaria pensylvanica</i>	NA			Not on any status lists
<i>Phacelia distans</i>	NA			
<i>Phyla lanceolata</i>	Fog-fruit			
<i>Phyla nodiflora</i>	Common Frog-fruit			
<i>Pilularia americana</i>	NA			
<i>Plagiobothrys acanthocarpus</i>	Adobe Popcorn-flower			
<i>Plagiobothrys greenei</i>	Greene's Popcorn-flower			
<i>Plagiobothrys humistratus</i>	Dwarf Popcorn-flower			
<i>Plagiobothrys leptocladus</i>	Alkali Popcorn-flower			
<i>Plantago elongata elongata</i>	Slender Plantain			
<i>Pluchea odorata odorata</i>	Scented Conyza			
<i>Pogogyne douglasii</i>	NA			
<i>Pogogyne zizyphoroides</i>				Not on any status lists
<i>Potamogeton diversifolius</i>	Water-thread Pondweed			
<i>Potamogeton foliosus foliosus</i>	Leafy Pondweed			
<i>Potamogeton nodosus</i>	Longleaf Pondweed			
<i>Potamogeton pusillus pusillus</i>	Slender Pondweed			

<i>Psilocarphus brevissimus</i> <i>brevissimus</i>	Dwarf Woolly-heads			
<i>Psilocarphus oregonus</i>	Oregon Woolly-heads			
<i>Psilocarphus tenellus</i>	NA			
<i>Ranunculus sceleratus</i>	NA			
<i>Rorippa curvisiliqua</i> <i>curvisiliqua</i>	Curve-pod Yellowcress			
<i>Rorippa palustris palustris</i>	Bog Yellowcress			
<i>Rotala ramosior</i>	Toothcup			
<i>Ruppia cirrhosa</i>	Widgeon-grass			
<i>Ruppia maritima</i>	Ditch-grass			
<i>Sagittaria longiloba</i>	Longbarb Arrowhead			
<i>Sagittaria montevidensis</i> <i>calycina</i>				Not on any status lists
<i>Salix exigua exigua</i>	Narrowleaf Willow			
<i>Salix gooddingii</i>	Goodding's Willow			
<i>Schoenoplectus acutus</i> <i>occidentalis</i>	Hardstem Bulrush			
<i>Schoenoplectus americanus</i>	Three-square Bulrush			
<i>Sinapis alba</i>	NA			
<i>Sparganium eurycarpum</i> <i>eurycarpum</i>				
<i>Stuckenia pectinata</i>				Not on any status lists
<i>Typha domingensis</i>	Southern Cattail			
<i>Typha latifolia</i>	Broadleaf Cattail			
<i>Veronica americana</i>	American Speedwell			
<i>Wolffiella lingulata</i>	Tongue Bogmat			
<i>Zannichellia palustris</i>	Horned Pondweed			

Attachment D

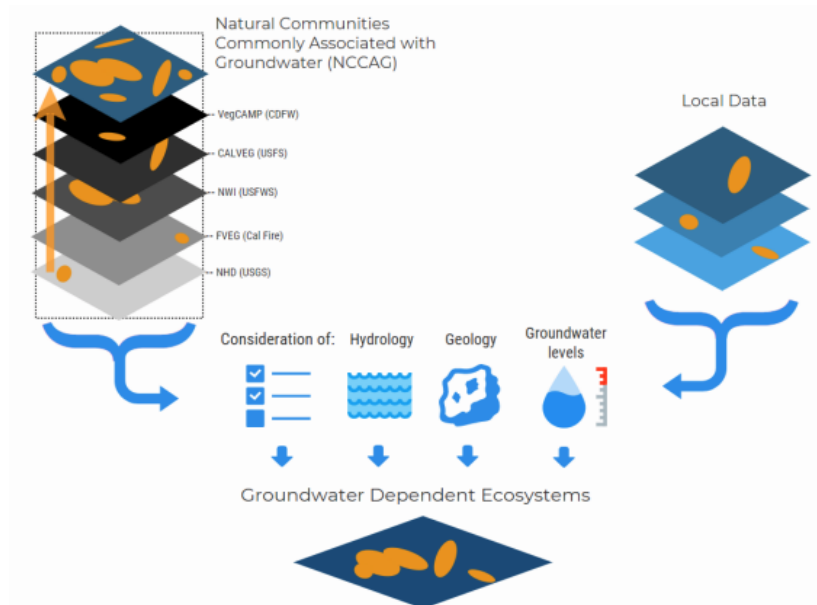


July 2019



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) online⁸ 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)⁹. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.



⁸ NC Dataset Online Viewer: <https://gis.water.ca.gov/app/NCDatasetViewer/>

⁹ 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 California¹⁰. 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 dataset¹¹ on the Groundwater Resource Hub¹², 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 be 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*.

¹⁰ 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

¹¹ "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at: <https://groundwaterresourcehub.org/qde-tools/qsp-guidance-document/>

¹² The Groundwater Resource Hub: www.GroundwaterResourceHub.org

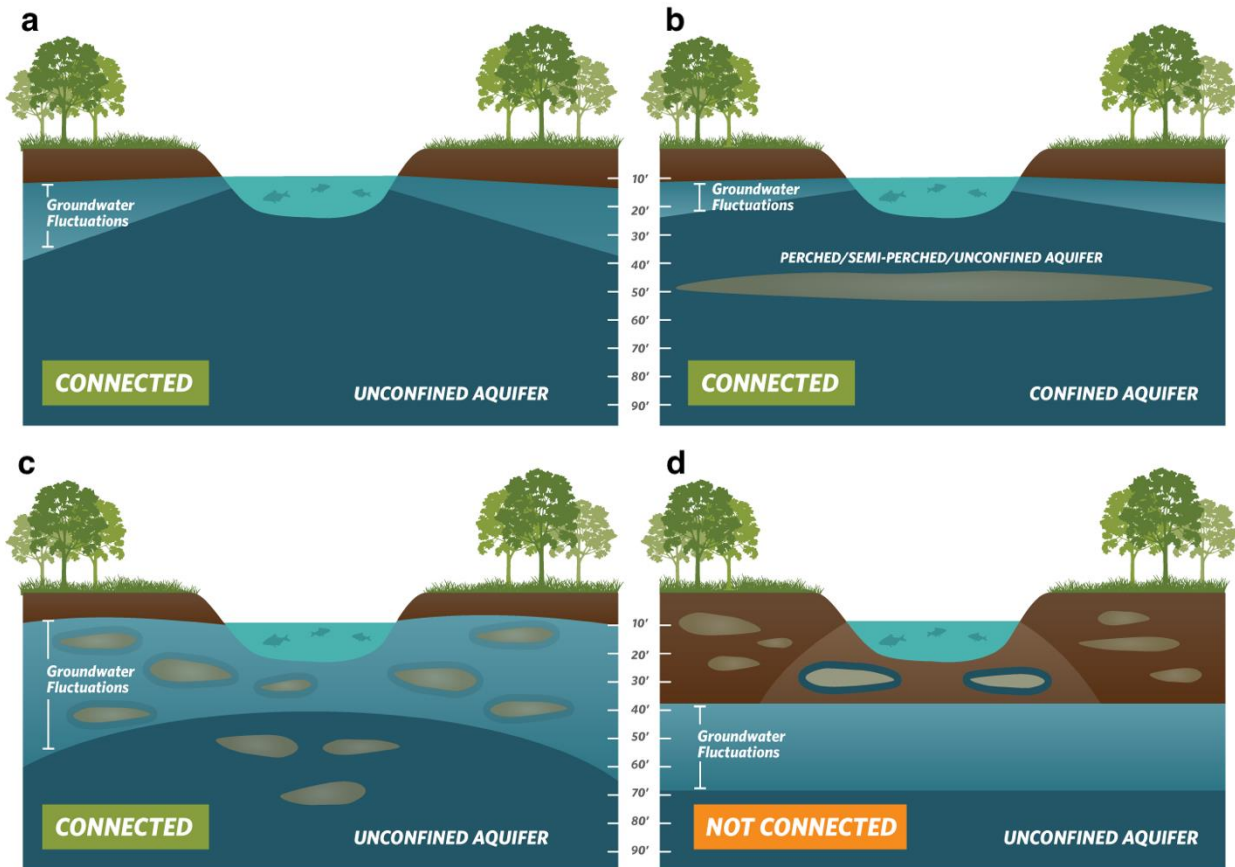


Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(b)** Depth-to-groundwater in the shallow aquifer is connected to overlying 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 budgets¹³ 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 baseline¹⁴ 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 approach¹⁵ 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 document⁴, 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 feet⁴ 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 Viewer¹⁶. However, 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 (see Best Practice #6).

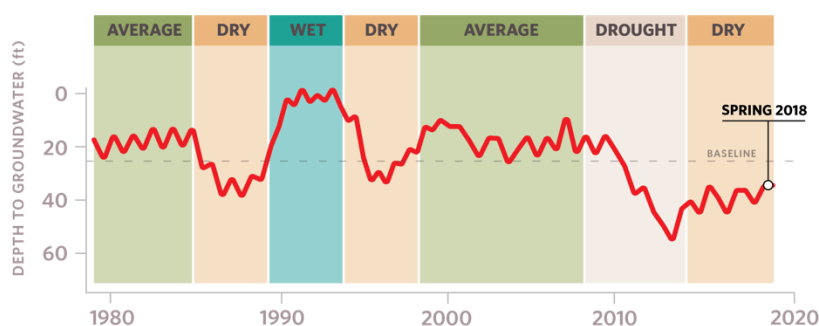


Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so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

¹³ DWR. 2016. Water Budget Best Management Practice. Available at:

https://water.ca.gov/LegacyFiles/groundwater/sqm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

¹⁴ 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)]

¹⁵ 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 GSPs⁴).

¹⁶ SGMA Data Viewer: <https://sgma.water.ca.gov/webqis/?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 animals¹⁷, 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).

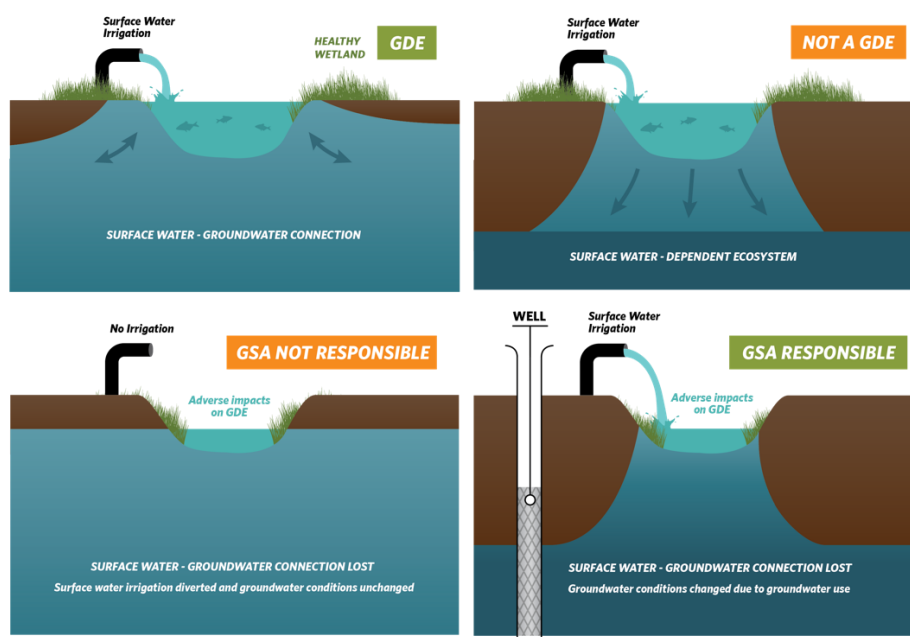


Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. **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.

¹⁷ 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.

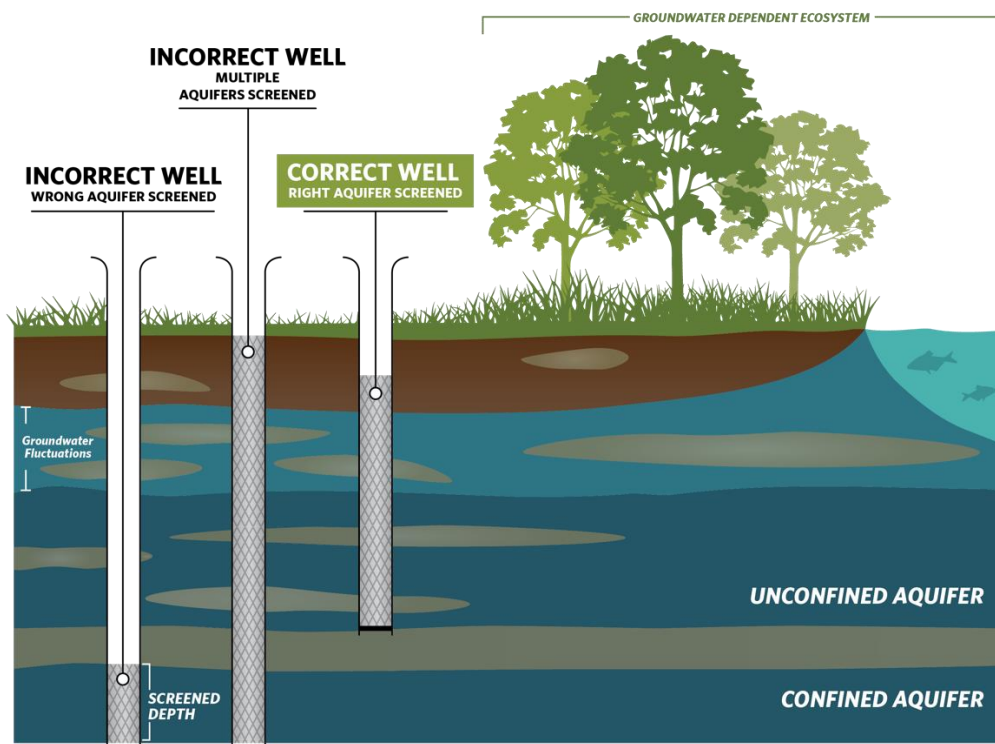


Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

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)¹⁸ 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.

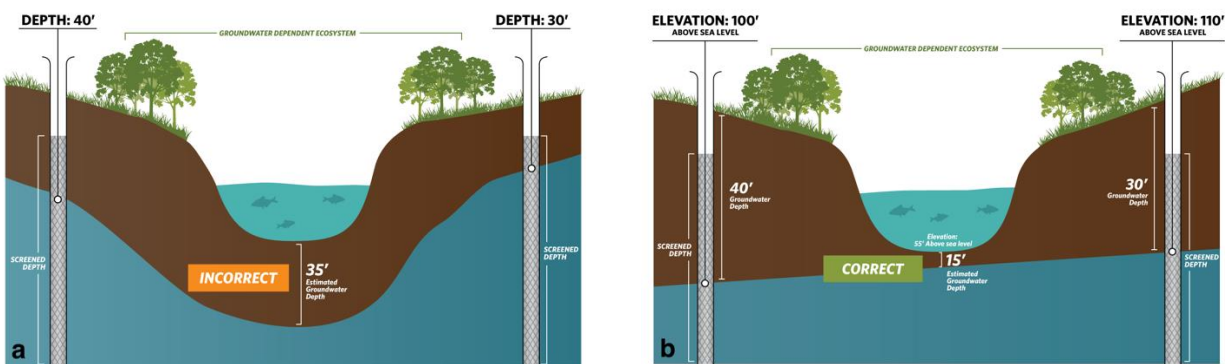


Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. **(b)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

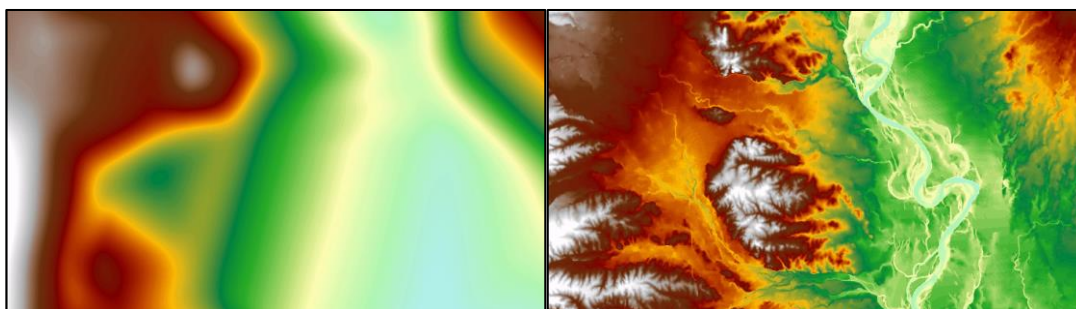


Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation 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.

¹⁸ 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://viewer.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 E

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.



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 Dataset¹⁹. 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 dataset²⁰. 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.

¹⁹ 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/#>

²⁰ The PRISM dataset is hosted on Oregon State University's website: <http://www.prism.oregonstate.edu/>



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GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



December 4, 2019

Via Mail and Electronic Mail

Christina Guzman, Planner
Department of Public Works and Planning
Water and Natural Resources
Fresno County Management Areas A and B GSP
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Fresno, California 93721
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**Subject: Comments on the Fresno County Management Areas A and B
Groundwater Sustainability Plan**

Dear Ms. Guzman:

The California Department of Fish and Wildlife (Department) Central Region is providing comments on the Fresno County Management Areas A and B Draft Groundwater Sustainability Plan (GSP) prepared by the Fresno County Management Area (FCMA) Groundwater Sustainability Agency for its area at the southern portion of the Delta-Mendota Subbasin (GSP Area), pursuant to the Sustainable Groundwater Management Act (SGMA). As trustee agency for the State's fish and wildlife resources, the Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of such species (Fish & G. Code §§ 711.7 and 1802).

Development and implementation of Groundwater Sustainability Plans under SGMA represent a new era of California groundwater management. The Department has an interest in the sustainable management of groundwater, as many sensitive ecosystems and species depend on groundwater and interconnected surface waters. SGMA and its implementing regulations afford ecosystems and species specific statutory and regulatory consideration, including the following as pertinent to Groundwater Sustainability Plans:

- Groundwater Sustainability Plans must identify and consider impacts to groundwater dependent ecosystems (GDEs), pursuant to 23 CCR § 354.16(g) and Water Code § 10727.4(l); and
- Groundwater Sustainability Agencies must consider all beneficial uses and users of groundwater, including environmental users of groundwater pursuant to Water Code § 10723.2 (e); and Groundwater Sustainability Plans should identify and consider potential effects on all beneficial uses and users of groundwater,

pursuant to 23 CCR §§ 354.10(a), 354.26(b)(3), 354.28(b)(4), 354.34(b)(2), and 354.34(f)(3); and

- Groundwater Sustainability Plans must establish sustainable management criteria that avoid undesirable results within 20 years of the applicable statutory deadline, including depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water, pursuant to 23 CCR § 354.22 *et seq.* and Water Code §§ 10721(x)(6) and 10727.2(b) and describe monitoring networks that can identify adverse impacts to beneficial uses of interconnected surface waters pursuant to 23 CCR § 354.34(c)(6)(D); and
- Groundwater Sustainability Plans must account for groundwater extraction for all Water Use Sectors including managed wetlands, managed recharge, and native vegetation, pursuant to 23 CCR §§ 351(a) and 354.18(b)(3).

Accordingly, the Department values SGMA groundwater planning that carefully considers and protects GDEs, fish and wildlife beneficial uses, and users of groundwater and interconnected surface waters.

COMMENT OVERVIEW

The Department supports ecosystem preservation in compliance with SGMA and its implementing regulations based on Department expertise and best available information and science.

The Department recommends that the GSP provide additional information and analysis that considers all environmental beneficial uses and users of groundwater in its sustainability management criteria and better characterize or consider surface water-groundwater connectivity. The Department is providing additional comments and recommendations below.

GSP COMMENTS AND RECOMMENDATIONS

1. **Comment #1. Plan Area.** Chapter 2 Description of Plan Area. Section 2.2 Water Resources Monitoring and Management Programs, Subsection 2.2.1 Mendota Pool Group (page 12). 2-1

The Mendota Pool Group is a United States Bureau of Reclamation (USBR) project established in 1999 that exchanges freshwater from the Central Valley Project for more saline groundwater that is pumped into the Mendota Pool and Fresno Slough. Fresno Slough crosses through the Department's Mendota Wildlife Area (WA) and serves as the WA's only water delivery system. Mendota

WA Level 2 and Level 4 allocations from the Central Valley Project freshwater surface water supply are included in the groundwater exchange, and since 2002, monitoring of supply water to the Mendota WA has shown significantly increased salinity concentrations during periods of increased groundwater pumping. The Department has previously recommended and requested that the groundwater pumping cease during the fall flood up season from mid-August through October, to allow fresh surface water to be delivered to Mendota WA inlets.

- 2. Comment #2. Water Quality.** Chapter 3 Basin Setting. Section 3.1 Hydrogeologic Conceptual Model, Subsection 3.1.4 General Groundwater Quality (page 24). Section 3.2 Current and Historic Groundwater Conditions, Subsection 3.2.3 Groundwater Quality (pages 31 to 32).

2-2

As stated in Comment #1, the Mendota WA has recorded a significant increase in salinity in the wildlife area's water supply as a result of groundwater pumping into the Mendota Pool.

- 3. Comment #3. Data Gaps.** Chapter 3 Basin Setting. Section 3.1 Hydrogeologic Conceptual Model, Subsection 3.1.8 Data Gaps (page 27).

2-3

Stakeholders from the Delta-Mendota Subbasin have contacted the Department's Central Region numerous times about installing a monitoring well in the Mendota WA, and the Central Region has remained consistent with denying these requests. The Central Region has not granted access onto Department property for the following reasons:

- a) Providing access would require a Memorandum of Understanding (MOU), which is equivalent to issuing a permit and would trigger California Environmental Quality Act (CEQA) compliance. The Central Region lacks the funding and staff to prepare a CEQA document and MOU.
- b) A well drilling project on State property is considered a "public works project," which would add other regulatory requirements and require prevailing wages compliance. Because this is a public works project, other California state control agencies would require a complete review and approval of the project.
- c) The Department's Central Region is reluctant to accept the liabilities associated with the drilling activities required for well installation or the legal and logistical responsibilities connected with non-Department entities accessing State lands to monitor and maintain the wells.

- d) Currently, there is only one shallow domestic water well on the Mendota WA that supplies water to one Department building (Hunter Check Station) during the dove and waterfowl hunting seasons and there are no future plans to increase groundwater extractions. Mendota WA is one of a few net contributors to groundwater within the GSP Area, and the Central Region has concerns that adding monitoring wells within the Mendota WA would skew groundwater recharge and availability within the GSP Area. The Central Region does not foresee any benefits from entering into this arrangement and encourages the Delta-Mendota Subbasin stakeholders to explore other private land options in the general vicinity of the Mendota WA.

4. Comment #4. Subsidence. Chapter 3 Basin Setting. Section 3.2 Current and Historic Groundwater Conditions, Subsection 3.2.5 Subsidence (pages 33 to 34).

2-4

Mendota WA has experienced substantial subsidence issues both north and south of its boundaries; this subsidence has impacted water deliveries to the Mendota WA. The GSP uses subsidence data from 1999 to present.

- a. *Issues:* Subsidence has resulted in lowering of the Mendota Pool Dam elevation and an associated lowered water level. This adverse impact was later compounded when the California Department of Water Resources (CDWR), Division of Safety of Dams determined that the water levels at the Mendota Pool had to be lowered further to maintain the integrity of the dam. This has resulted in the reduced ability to back water up the Fresno Slough to the Department's water inlets in the Mendota WA. Because of these two incidents, Mendota WA's ability to deliver water using gravity flow have impacted its lift pump sites. During the recent drought, neighboring landowners to the south pumped groundwater, and increased subsidence along the southern portion of the Mendota WA has been observed. As a result, water flows backwards within the Mendota WA, affecting habitat management operations.

Within the GSP, a majority of land subsidence is attributed to the extraction of water in aquifers beneath the Corcoran Clay outside of the GSP Area, and the GSP acknowledges that minimal amounts of subsidence are occurring at shallower depths above the Corcoran Clay. Within the Basin Setting (Chapter 3), the GSP provides a description of the geologic materials encountered beneath the ground surface and provides a number of geologic cross sections depicting the hydrogeologic framework. Within these cross sections, the GSP identifies a number of confining layers (A & C clay layers) above the Corcoran Clay. The GSP describes that these clays act as semi-confining layers and uses these

clay members to divide the sediments within the upper aquifer into a shallow and deep zone. These clay layers act as confining beds and restrict the movement of groundwater.

The lowering of groundwater levels within the upper aquifer provides the potential to create groundwater-level-induced stresses that can promote subsidence. The GSP provides records for Yearout Extensometer station located just north of the GSP Area, and indicates that from 2003 to 2013 (Historic/Current Water Budget Period), total inelastic compaction of the upper aquifer was approximately 0.08 feet; however, when considering the total available record as provided on Figure 3-33, total compaction between the years of 1999 to 2017 is approximately 0.30 feet. Additional historic extensometer data was reviewed for the Yearout Extensometer station as provided by the USGS online database (https://www.usgs.gov/centers/ca-water-ls/science/extensometers-and-compaction?qt-science_center_objects=0#qt-science_center_objects). Records indicate that between the years of 1966 and 1983, approximately 0.30 feet of compaction in the upper aquifer was recorded. The GSP describes groundwater levels within the upper aquifer currently as being stable; however, compaction within the upper aquifer is occurring and increased during drought conditions as shown on Figure 3-33. When pumping induces groundwater levels to drop below critical head, preconsolidation stresses are surpassed and compaction of fine-grained materials occurs, resulting in subsidence.

- b. *Recommendation:* The Department recommends that the GSP include a review of earlier historic subsidence data from before 1999; as stated above, the Mendota Pool Dam elevation has decreased since the late 1950s (USBR 2008). To avoid additional “significant and unreasonable” conditions within the Mendota WA, the Department recommends that the GSP and neighboring Groundwater Sustainability Plans include Mendota WA as a “subsidence management area” with a zero feet subsidence criterion that no longer reduces the ability to deliver surface water supplies to and within the wildlife area.

5. Comment #5. Interconnected Surface Waters. Chapter 3 Basin Setting. Section 3.2 Current and Historic Groundwater Conditions, Subsection 3.2.6 Interconnected Surface Water Systems (page 35).

2-5

The interconnected surface water narrative lacks a clear description of surface water-groundwater interaction.

- a. *Issue:* To fall within SGMA's consideration for depletions of interconnected surface water, a surface water system must be "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)]. This means that even if groundwater elevation is lower than streambed elevation and the surface water body is 'losing,' there may still be hydraulic communication between the aquifer and the surface water if there is a saturated layer connecting the two, and pumping from a hydrologically connected aquifer may yet cause surface water depletion (Barlow and Leake 2012). The GSP notes that the Fresno Slough is a 'losing,' interconnected surface body of water and historically the Fresno Slough and Mendota Pool maintained consistent surface water elevations, but in recent years the Mendota Pool has demonstrated a gradual decline in surface water elevation as measured at the Mendota Pool Staff Gage (page 35, Figure 3-36, Figure 4-23). There is no discussion on how groundwater extraction in the shallow zone of the upper aquifer may impact this surface water decline, and the interconnected surface water narrative lacks specific estimations of the quantity and timing of streamflow depletions as specified in 23 CCR § 354.16(f).
- b. *Recommendations:* The Department recommends that the GSP better characterize the relationship between shallow groundwater management and surface water levels in the Fresno Slough and Mendota Pool and identify the estimated quantity and timing of surface water depletions in the Delta-Mendota Subbasin attributable to groundwater pumping. If this information is not available, the Department recommends identifying an expeditious and specific path to estimating these values.

6. Comment #6. Groundwater-Dependent Ecosystems. Chapter 2 Description of Plan Area. Section 2.4 Additional GSP Elements, Subsection 2.4.8 Impacts on Groundwater Dependent Ecosystems (page 15 and Figures 2-8 and 2-9). Chapter 3 Basin Setting. Section 3.2 Current and Historic Groundwater Conditions (pages 35 to 37 and Figures 3-37 and 3-38).

2-6

The GDE identification section, pursuant to 23 CCR § 354.16 (g), is based on limited information to demonstrate exclusion of ecosystems that may depend on groundwater.

- a. *Issue:* Methods applied to the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset to identify potential GDEs are not robust.

- i. Depth to Groundwater: The removal of areas with a depth to groundwater greater than 30 feet in Spring 2015 relies on a single-point-in-time baseline hydrology, specifically a point in time that is several years into a historic drought when groundwater levels were trending significantly lower due to reduced surface water availability. Exclusion of potential GDEs based on this singular groundwater elevation measurement is questionable because it does not consider representative climate conditions (i.e., seasons and a range of water type years).
- b. *Recommendations*: The Department recommends that the GSP consider the following for information gathering related to GDEs:
 - i. Depth to Groundwater: Develop a hydrologically robust baseline that includes areas with a depth to groundwater greater than 30 feet that relies on multiple, climatically representative years of groundwater elevation and that accounts for the inter-seasonal and inter-annual variability of GDE water demand.
 - ii. Include additional references for evaluation: The Department recognizes that NCCAG (Klausmeyer et al. 2018) provided by CDWR and use of the U.S. Department of Agriculture's National Agricultural Imagery (NAIP) were good starting references for GDEs; however, the Department recommends that the GSP include additional resources for evaluating GDE locations. The Department recommends consulting other references, including but not limited to the following tools and other resources: the California Department of Fish and Wildlife (CDFW) Vegetation Classification and Mapping Program (VegCAMP) (CDFW 2019A); the CDFW California Natural Diversity Database (CNDDDB) (CDFW 2019B); the California Native Plant Society (CNPS) Manual of California Vegetation (CNPS 2019A); the CNPS California Protected Areas Database (CNPS 2019B); the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (USFWS 2018); the USFWS online mapping tool for listed species critical habitat (USFWS 2019); the U.S. Forest Service CALVEG ecological grouping classification and assessment system (USFS 2019); and other publications by Klausmeyer et al. (2019), Rohde et al. (2018), The Nature Conservancy (TNC) (2014, 2019), Naumburg et al. (2005), and Witham et al. (2014).

SMC acknowledge high uncertainty around impacts to, as well as potential harm to, environmental beneficial uses and users of groundwater but do not explicitly address how to prevent or mitigate potential negative impacts.

a. Issues:

- i. The GSP acknowledges multiple times that Minimum Thresholds (MTs) may have uncertain or negative impacts on environmental beneficial users of groundwater:
 1. "The impact of MTs for groundwater elevation on the environmental beneficial users of groundwater (i.e. GDEs) are not well understood but could potentially have negative affects if MT levels are sustained or exceeded for an extended period of time" (page 60).
 2. "If water levels are ever to drop to MT levels, which is not projected to occur, further analysis of the vertical gradient in the Shallow Zone of the Upper Aquifer will be necessary to better understand the potential impacts to GDE" (page 61).
 3. "MT values for interconnected surface waters could impact the environmental beneficial uses of groundwater if MT values remain for an extended period of time along with decline groundwater elevations" (page 67).
 4. "For environmental beneficial uses of groundwater in FCMA [Fresno County Management Area], the most significant undesirable results subsidence and interconnected surface waters. Continued subsidence in the FCMA area will restrict the ability to flood areas in the MWA. Interconnected surface waters also are important to the beneficial uses of groundwater, but stage levels in the Mendota Pool have not historically show significant decline" (page 71).

The GSP mentions that it "will not implement any projects or management actions in the event of interconnected surface waters undesirable results" (page ES-12), and instead focuses on undefined coordination with neighboring Groundwater Sustainability Agencies and subbasins to address any SMC concerns (page 81). Absent agreed-upon specifics as to how this coordination will work (e.g., what conditions will trigger mitigation, who will undertake mitigation, etc.), the SMC

provide no actionable protections for environmental beneficial uses and users of groundwater.

- ii. The Delta-Mendota Subbasin is designated as 'Critically Overdrafted,' meaning "continuation of present water management practices [in the basin] would probably result in significant adverse overdraft-related environmental, social, or economic impacts" (CDWR 2019). The GSP identifies minimum groundwater elevation thresholds for representative monitoring wells, each of which serves as a threshold beyond which significant and unreasonable effects (i.e., undesirable results) are expected when 25% of representative monitoring sites exceed MTs for two consecutive years (page 50). These MTs are established by subtracting the magnitude of the largest continual decline in groundwater elevation between 2011 and 2016 from the Measurable Objectives (page 59), which are the seasonal groundwater elevation highs in Spring 2015 – several years into a historic drought (page 50). These MTs, though moderate in the magnitude of groundwater decline they allow, suggest that groundwater elevations at representative wells can decrease from historically low drought groundwater elevations without witnessing undesirable results. At the same time, the GSP acknowledges that the potential to impact GDEs (see above) that can experience adverse impacts and threshold effects with marginal decreases in groundwater elevation, especially when sustained (Naumburg 2005). Furthermore, Figure 4-9 presents groundwater elevation data and SMC for well USGS 31J6. This well, presumably screened in the lower aquifer per Table 4-1, but cited as an 'upper aquifer deep zone' well in Figure 3-25, has a MT that accommodates an approximate 70-foot groundwater elevation decline before unreasonable results would be realized. Continued groundwater elevation decreases in either the upper aquifer deep zone or the lower aquifer will likely exacerbate subsidence (see Comment #4), and if USGS well 31J6 is screened in the upper aquifer deep zone, this groundwater elevation decline may also impact shallow groundwater elevations due to the vertical hydraulic gradient between the shallow and deep zones of the upper aquifer (page 29). Based on subsidence alone, it appears that undesirable results are already occurring. Therefore, the GSP's MTs that allow for continued groundwater table decline, mirroring the historical trends that led to the Delta-Mendota Subbasin's Critically Overdrafted status, may not protect against undesirable results. Conceptually, there is a disconnect between the Delta-Mendota Subbasin's 'Critically Overdrafted' designation and sustainable

management criteria the allow for continued groundwater level decline.

b. Recommendations: The Department recommends that the GSP reevaluate SMC with the following suggestions:

- i. Implement environmental monitoring to improve the understanding of SMC impacts on GDEs (page 15), identify actionable paths to mitigating potential adverse impacts if detected or anticipated, and revise SMC to prevent undesirable results for environmental beneficial users of groundwater.
- ii. Clarify historical groundwater trends by showing available data prior to 2003 within the figures that capture groundwater elevation SMC (Figures 4-5 through 4-9) and confirm in which aquifer well USGS 31J6 is screened. Revise sustainable management criteria to reflect a 'Critically Overdrafted' subbasin designation by seeking to slow or reverse recent negative trends in groundwater elevation such as those reflected in Figure 4-9.

8. Comment #8 Project and Management Actions. Chapter 5 Project and Management Actions (PMAs) to Achieve Sustainability Goal (starting page 80).

2-8

The Project and Management Actions do not identify actionable paths to avoiding undesirable results for surface water depletions within Fresno County Management Areas A and B.

- a. *Issue:* The Department appreciates the demand management focus of the targeted pumping reductions mentioned as a possible management action in Section 5. However, the PMA chapter lacks specifics on when pumping restrictions would be triggered and how they would be implemented, citing that there has been no formal development of PMAs, because the FCMA Groundwater Sustainability Agency is projected to be sustainable throughout implementation (page 81). The GSP specifies that no PMAs have been formally developed, apart from continued coordination with neighboring Groundwater Sustainability Agencies and subbasins (page 81). Furthermore, the GSP explicitly states that undesirable results for interconnected surface waters will not trigger implementation of any management actions (page 70, 82). Earlier in the document the GSP states, "FCMA will not implement any projects or management actions in the event of undesirable results for interconnected surface waters but instead will manage groundwater elevations to sustainable levels" (page ES-12). These self-imposed management restrictions may prevent the

management area from addressing unsustainable surface water depletions and avoiding undesirable results (see Comment #7). Managing groundwater to sustainable levels may require project and management actions and may be a means to managing surface water depletions under circumstances of interconnectivity, such as those identified in the GSP (page 35) (see Comment #5). The FMCA comprises a management area specifically identified for the interconnected surface water sustainability indicator (pages ES-1, 48). Accordingly, the FMCA Groundwater Sustainability Agency may be positioned to manage groundwater to avoid undesirable surface water depletions, despite its abdicating PMA responsibility for interconnected surface waters.

- b. *Recommendation:* The Department recommends clarifying the relationship between groundwater pumping in GSP Area and surface water depletions [23 CCR § 354.16(f)] and determining explicitly if/when surface water depletions should trigger pumping reductions in the GPS Area or for neighboring Groundwater Sustainability Agencies accordingly.

OTHER COMMENTS: Implementation of Future Project Actions Related to SGMA

SGMA exempts the preparation and adoption of GSPs from the California Environmental Quality Act (CEQA) (WC §10728.6); however, SGMA specifically states that implementation of project actions taken pursuant to SGMA are not exempt from CEQA (WC §10728.6). The Department is California's Trustee Agency for fish and wildlife resources and holds those resources in trust by statute for all the people of the State (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; CEQA Guidelines § 15386, subd. (a)). The Department, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species (*Id.*, § 1802). Similarly, for purposes of CEQA, the Department is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

The Department is also a Responsible Agency under CEQA (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381), and the Department expects that it may need to exercise regulatory authority as provided by the Fish and Game Code for implementation of projects related to the GSP that are also subject to CEQA. These projects may be subject to the Department's lake and streambed alteration regulatory authority (i.e., Fish & G. Code, § 1600 et seq.). Notification pursuant to Fish and Game Code § 1602 is warranted if a project will (a) substantially divert or obstruct the natural flow of any river, stream, or lake; (b) substantially change or use any material from the bed, bank, or channel of any river, stream, or lake (including the removal of riparian

vegetation); and/or (c) deposit debris, waste or other materials that could pass into any river, stream, or lake. Likewise, to the extent that implementation of any project may result in "take" as defined by State law of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.), related authorization as provided by the Fish and Game Code will be required. The Department is required to comply with CEQA in its issuance of a Lake or Streambed Alteration Agreement or an Incidental Take Permit.

The implementation of SGMA does not alter or determine surface or groundwater rights (WC § 10720.5). It is the intent of SGMA to respect overlying and other proprietary rights to groundwater, consistent with section 1200 of the Water Code (Section 1(b)(4) of AB 1739). The capture of unallocated stream flows to artificially recharge groundwater aquifers are subject to appropriation and approval by the State Water Resources Control Board (SWRCB) pursuant to Water Code § 1200 et seq. The Department, as Trustee Agency, is consulted by SWRCB during the water rights process to provide terms and conditions designed to protect fish and wildlife prior to appropriation of the State's water resources. Certain fish and wildlife are reliant upon aquatic and riparian ecosystems, which in turn are reliant upon adequate flows of water. The Department therefore has a material interest in assuring that adequate water flows within streams for the protection, maintenance and proper stewardship of those resources. The Department provides, as available, biological expertise to review and comment on environmental documents and impacts arising from project activities.

CONCLUSION

In conclusion, the GSP needs to address all SGMA statutes and regulations, and the Department recommends that the GSP seriously consider fish and wildlife beneficial uses and interconnected surface waters. The Department recommends that the GSP consider the above comments before the GSP is submitted to CDWR. The Department appreciates the opportunity to provide comments on the GSP. If you have any further questions, please contact Dr. Andrew Gordus, Staff Toxicologist, at Andy.Gordus@wildlife.ca.gov or (559) 243-4014 extension 239.

Sincerely,



Julie A. Vance
Regional Manager, Central Region

Enclosures (Literature Cited)

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Fresno Management A and B Areas GSP
December 4, 2019
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Literature Cited

- Barlow, P.M. and S.A. Leake. 2012. *Streamflow depletion by wells—Understanding and managing the effects of groundwater pumping on streamflow*. U.S. Geological Survey Circular 1376.
- California Department of Fish and Wildlife (CDFW). 2019A. Vegetation Classification and Mapping Program. Available from <https://www.wildlife.ca.gov/Data/VegCAMP>
- CDFW. 2019B. CNDDDB (California Natural Diversity Database). Rarefind Version 5. Internet Application. CDFW, Sacramento, California.
<https://www.wildlife.ca.gov/Data/CNDDDB/Maps-and-Data>
- CDFW. 2019C. Biogeographic Information and Observation System (BIOS).
<https://www.wildlife.ca.gov/Data/BIOS>. Accessed 18 October 2019.
- CDFW. 2019D. Pleasant Valley Ecological Reserve – History.
<https://www.wildlife.ca.gov/Lands/Places-to-Visit/Pleasant-Valley-ER#10772135-history>. Accessed 18 October 2019.
- California Department of Water Resources (CDWR). 1997. Tulare basin resources assessment - preliminary report. Memorandum report. State of California The Resources Agency, San Joaquin District. 58 pp.
- CDWR. 2019. Critically Overdrafted Basins.
<https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118/Critically-Overdrafted-Basins>
- California Native Plant Society (CNPS). 2019A. A Manual of California Vegetation, online edition. <http://www.cnps.org/cnps/vegetation/>
- CNPS. 2019B. California Protected Areas Database. (CPAD). Sacramento, California.
<https://www.calands.org/cpad/>
- Naumburg E., R. Mata-Gonzalez, R.G. Hunter, T. McLendon, and D. Martin. 2005. Phreatophytic vegetation and groundwater fluctuations: a review of current research and application of ecosystem response modeling with an emphasis on great basin vegetation. *Environmental Management*. 35(6):726-40
- Klausmeyer, K., J. Howard, T. Keeler-Wolf, K. Davis-Fadtke, R. Hull, and A. Lyons. 2018. Mapping indicators of groundwater dependent ecosystems in California.
<https://data.ca.gov/dataset/natural-communities-commonly-associated-groundwater>

Klausmeyer, K. R., T. Biswas, M. M. Rohde, F. Schuetzenmeister, N. Rindlaub, and J.K. Howard. 2019. GDE pulse: taking the pulse of groundwater dependent ecosystems with satellite data. San Francisco, California. Available at <https://gde.codefornature.org>. (Same as: TNC. 2019. GDE pulse. Interactive map. Website. <https://gde.codefornature.org/#/home>)

Rohde, M. M., S. Matsumoto, J. Howard, S. Liu, L. Riege, and E. J. Remson. 2018. Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans. The Nature Conservancy, San Francisco, California.

The Nature Conservancy (TNC). 2014. Groundwater and stream interaction in California's Central Valley: insights for sustainable groundwater management. Prepared by RMC Water and Environment.

TNC. 2019. The Critical Species LookBook. Groundwater Resource Hub. <https://groundwaterresourcehub.org/sgma-tools/the-critical-species-lookbook/>

United States Bureau of Reclamation (USBR). 2008. Conveyance of Refuge Water Supply South San Joaquin Valley Study Area Mendota Wildlife Area Final Environmental Assessment – Initial Study. Prepared by U.S. Department of the Interior, USBR Mid-Pacific Region Sacramento, California and Central California Irrigation District, Los Banos, California. Final – May 2008. 147 pp.

U.S. Forest Service. 2019. Landsat-based classification and assessment of visible ecological groupings, USDA Forest Service (March 2007). <https://www.fs.fed.us/r5/rsi/projects/classification/system.shtml>

U.S. Fish and Wildlife Service (USFWS). 2018. National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. <http://www.fws.gov/wetlands/>

USFWS. 2019. Threatened & Endangered Species Active Critical Habitat Report: online mapping tool. <https://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77>

Witham, C. W., R. F. Holland, and J. E. Vollmar. 2014. Changes in the Distribution of Great Valley Vernal Pool Habitats from 2005 to 2012. Prepared for CVPIA Habitat Restoration Program, U.S. Fish and Wildlife Service, Sacramento, CA. USFWS Grant Agreement No.F11AP00169 with Vollmar Natural Lands Consulting. October 14.



December 06, 2019

Christina Guzman, Planner
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Water and Natural Resources
Fresno County Management Areas A and B GSP
2220 Tulare Street. 6th Floor
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Sent via email to waterandnaturalresources@fresnocountyca.gov

Re: Comments on Draft Groundwater Sustainability Plan for County of Fresno Groundwater Sustainability Agency's Management Areas A and B.

Dear Ms. Guzman,

Audubon California appreciates the opportunity to provide public comment on the draft Groundwater Sustainability Plan (GSP) for the County of Fresno Groundwater Sustainability Agency's (GSA) Management Area A and Management Area B (MAB), together referred to as Fresno County Management Areas (FCMA) within the Delta-Mendota Subbasin.

Audubon California is a statewide nonprofit organization with a mission to protect birds and the places they need. Our organization has a long history of solutions-focused work in the Central Valley in collaboration with state and federal agencies, water districts, non-profits, and landowners. We are commenting on draft GSPs to provide technical information and to identify areas of opportunity to partner with landowners or GSAs to achieve groundwater and wildlife habitat benefits. Audubon is engaged in the Tulare Basin planning region, including Fresno County, as a member of the Central Valley Joint Venture.

Audubon California is reviewing GSPs as a stakeholder for the environment with a particular focus on wetlands. Over 90 percent of historic wetlands in the Central Valley have been replaced with agriculture or urban development. The remaining wetlands are a critical component of the Pacific Flyway, supporting millions of migratory waterfowl, hundreds of thousands of shorebirds, and listed species like the Tricolored Blackbird. Central Valley wetlands are part of California's commitment to national and international Pacific Flyway agreements and provide significant public trust benefits, including habitat for migratory birds, recharge of overdrafted aquifers, carbon sequestration, and recreation opportunities for birders, hunters, and disadvantaged communities.

Reflecting the critical importance of wetlands in the Tulare Basin planning region that includes Fresno County Management Areas, the Central Valley Joint Venture set a wetland restoration target of 11,000 acres to sustain waterfowl populations. The Central Valley Joint Venture, a collaboration of 19 public and private entities, including Audubon, sets science based bird population and habitat restoration objectives to support the goals of an international treaty between the United States, Canada, and Mexico, the North American Waterfowl Management Plan. The habitat restoration goals in the Tulare Basin planning region point to an already existing habitat deficit to supply the food energy needed for waterfowl populations. Any loss of managed wetlands will undermine Central Valley Joint Venture goals and only increase the existing habitat deficit.

The effects of groundwater overdraft, including subsidence and reduced water quality, have considerable negative impacts to the wetlands in this management region, mainly the Mendota Wildlife Area (MWA) owned and operated by the California Department of Fish and Wildlife. Disconnected from natural water sources as a consequence of surface water diversions and groundwater overpumping, wetland management now depends on unreliable surface water deliveries or increasingly poor quality groundwater to provide flooded habitat. Protecting these managed wetlands from further impacts will ensure they continue to provide public trust benefits, including habitat for migratory waterfowl, shorebirds, and listed species like the Tricolored Blackbird. Not only do these lands provide important habitat for waterbirds and wildlife, they provide multiple benefits to the basin such as recharge and water filtration.

Comment 1: In this draft plan, groundwater quality is identified as not being caused by human-based activities (3.2.3 Groundwater Quality, p 31-32). However, the Mendota Wildlife Area is known to show increasingly poor water quality during periods of increased groundwater pumping. Continued water quality degradation greatly diminishes the ability for these wetlands to function the way they were designed and provide the resources that are critical for waterbird and wildlife survival. This draft GSP does not clearly identify management actions to reduce poor water quality impacts. It is imperative that water quality be more closely evaluated and assigned a minimum threshold that is appropriately monitored, then acted on if conditions are further degraded. Please provide details for an actionable process that addresses water quality in the MWA, and FCMA as a whole, to minimize the risk of increasing poor water quality. 3-1

Comment 2: In the FCMA, subsidence is considered to have not occurred at significant levels to negatively impact the management areas (3.2.5 Subsidence, p 33-34). Though the amount of subsidence is reported at only 0.08 feet, this has still resulted in the sinking of the Mendota Pool Dam. As a result, the sinking of the dam has lowered water levels throughout Fresno Slough, the main conveyance for water to reach the MWA turnouts, impacting the ability of wetland managers to access water and effectively manage wetlands across the MWA. To ensure uncertain or negative impacts do not occur to the MWA it is recommended that subsidence goals are included in this plan, they be set to net-zero reduction, and project and management actions be identified to minimize the risk of further impacts. 3-2

Comment 3: This draft GSP identifies areas with several data gaps and highlights the challenges in acquiring the needed information to make informed decisions, in particular within the Mendota Wildlife Area (3.1.8 Data Gaps, p 27). We encourage the GSA to continue engaging with stakeholders to find common ground and work towards filling these data gaps. This will not only help the GSA move towards reaching sustainability but will ensure the wetlands in the management area will continue to provide the multiple benefits to birds, wildlife, and people. 3-3

Thank you for your consideration of Audubon California's comments. If you would like to discuss any of our comments in more detail, please do not hesitate to contact me at (916) 737-5707 or via email at sarthur@audubon.org.

Sincerely,



Samantha Arthur
Working Lands Program Director
Audubon California



SPRECKELS SUGAR COMPANY, INC.

October 31, 2019

Mr. Augustine Ramirez
County of Fresno
Department of Public Works and Planning
2220 Tulare Street,
Sixth Floor, Fresno, CA 93721

Mr. Ramirez,

Enclosed are comments in response to our review of the Draft *Groundwater Sustainability Plan (GSP): County of Fresno GSA's Delta-Mendota Subbasin Management Area A & Management Area B* dated September 2019, prepared by Luhdorff and Scalmanini.

Section 1.1.1.1: "The plume of saline-impacted water is migrating in a northerly direction." 4-1

Comment: This statement oversimplifies the direction of groundwater flow and plume migration in the vicinity of MAA. Elsewhere in the document (section 3.2.1.1.1 and 3.2.1.1.2), it is stated that groundwater generally flows to the northeast in both the shallow and deep zones of the upper aquifer, which is generally consistent with available information specific to MAA. Groundwater flow in the area, however, is complicated by several artificial conditions such as the presence of shallow zone extraction wells to the west, deep zone pumping wells to the north and east, and water banking activities at MAA. Absent of these artificial conditions, the shallow water table is generally anticipated to mimic the ground surface topography and flow towards the Fresno Slough located west of MAA (USGS, 1999).

Section 3.1.2: "The extent of the A-Clay, or its equivalent, is shown on Figure 3-8. The depth to the top of the A-Clay ranges from about 80 to 120 ft bgs." Figure 3-8 shows an estimated depth of about 110 feet bgs at the Site. 4-2

Comment: Based on our information, the top of the A-Clay layer is present at the site at an average depth of around 70 feet bgs.

Section 3.2.1.1.2: in a discussion about the deep zone of the upper aquifer: "A mound of groundwater is also present in the central-northern portion of FCMA potentially due to recharge from the Meyers Water Bank." 4-3





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Comment: Based on site-specific information, mounding is also present in the shallow zone of the upper aquifer. Should this be mentioned in section 3.2.1.1.1?

Section 3.4.1.1: "A CAO has been issued to the Spreckels Sugar Company and the current status of addressing the groundwater quality degradation is in the development of a "Site Assessment" report which will define the extent of the Steffens plume in the Upper Aquifer in 2019. Within 180 days of its submittal, a "Feasibility and Remedial Options Evaluation" is to be submitted to the Regional Board. Within 120 days of that, a "Cleanup Plan" is to be submitted." 4-4

Comment: This statement accurately summarizes requirements identified in the CAO.

Section 3.4.2.1: "The selection of wells to serve as monitoring sites were based on the historic movement of the Spreckels Plume which is discussed in section 3.2.5." 4-5

Comment: Section 3.2.5 is on Subsidence, not groundwater flow.

Section 4.3.4.1: "Wells located in MAA were assigned MT values based on the maximum observed TDS concentration." 4-6

Comment: The executive summary states that MT values were based on background concentrations established by LSCE. Please confirm that Section 4.3.4.1 is correct. a

Comment: Laboratory analytical results available for 2019 include a maximum value of 1,100 mg/L for PW-12 (current MT is 1,000 mg/L). b

Section 4.2.4.1: "MOs were developed in MAA based on the background concentration listed in the Spreckels CAO (Regional Board, 2018). These values were developed in a comment letter for the Steffen's Ponds Closure Plan (LSCE, 2009)." 4-7

Comment: Background values are based on whether monitoring points are in the west, central, or eastern portion of the Site. How were individual monitoring points determined to be in the western, central, or eastern areas?

Comments on Appendix I: Numerical Flow Model Report, in Draft Groundwater Sustainability Plan (GSP)

General comment: Appendix I is not a stand-alone document; therefore, cross reference should be made to the relevant figures and discussion in the main report or other appendices. For example, the discussion of pumping wells in Appendix I, section 4.2, should refer the reader to 4-8





SPRECKELS SUGAR COMPANY, INC.

Figures 2-5, 2-6, and 2-7 in the main report, because Appendix I does not include a figure showing pumping well locations.

Section 1, paragraph 2: “The modeling approach was developed to effectively quantify key hydrologic processes related to SGMA sustainability indicators that may occur or have occurred in FCMA: 4-9

1. Lowering of Groundwater Levels
2. Reduction of Groundwater Storage”

Comment: Given that potential past or future lowering of groundwater levels is of interest, why were groundwater level data not used as drawdown targets in model calibration?

Comment: Appendix I should include discussion of changes in groundwater levels and storage or reference to such discussion in other parts of the GSP.

Section 2.3, paragraph 1: “Parameter estimation was conducted using UCODE 2014 (Poeter et al., 2014).” Section 6, paragraph 1: “The groundwater flow model was calibrated largely by manually adjusting assigned aquifer parameters to achieve an agreeable fit between simulated and observed water levels at wells located in the model domain.” 4-10

Comment: These statements should be reconciled to accurately convey the calibration technique(s).

Section 2.3, paragraph 2: “As part of the parameter estimation process, the sensitivity of the simulated values is calculated (Hill and Tiedman, 2007). The sensitivity of all (or groups) simulated parameters are summarized by the “composite scaled sensitivity” (CSS). The CSS is used to determine which parameters are most sensitive (those with higher CSS influence the model results to a greater degree) and provides a statistically robust approach to model sensitivity analysis (Hill and Tiedman, 2007).” 4-11

Comment: Parameter sensitivities are not discussed in Section 6 and sensitivity analysis was not included in this report. This paragraph suggests a more rigorous approach was used than is described in subsequent sections of the document.

Section 3.1, paragraph 1: “Each grid cell is a 440 ft x 440 ft square.” 4-12





SPRECKELS SUGAR COMPANY, INC.

Comment: The uniform grid spacing and cell size is appropriate for the model's uses presented in the draft GSP, but additional refinement will be needed if the model is used to evaluate local-scale groundwater flow directions or drawdown.

Section 3.1, paragraph 2: "The top elevation of Layer 3 was estimated based on the top elevation of the A-clay, which generally occurs between 20 and 80 ft, above mean sea level (msl) or up to 125 ft bgs as determined by DWR Well Completion Reports, geophysical logs, and land surface elevations (Figure 3-3)." 4-13

Comment: Figure 3-3 shows the A-Clay depth as greater than 110 ft bgs, except along the eastern boundary of the FCMA. Based on our information, the A-Clay depth is approximately 70 ft bgs near Steffen's Ponds. Transmissivity of the unit above A-Clay could be overestimated by the model if the hydraulic conductivity of the unit is accurately represented and the thickness is overestimated.

Section 4, paragraph 2: "Climatic observations of 1979 through 2017 and 1965 through 1978 were sequentially used to represent expected conditions of 2018 through 2056 and 2057 through 2070, respectively (Table 4-1)." 4-14

Comment: Was any analysis completed to evaluate whether predictions of reductions in groundwater levels or storage are sensitive to the sequence of water years simulated (for example, if a prolonged wet period follows a dry period instead of preceding it)?

Section 4.3, paragraph 1: "Components of recharge that were simulated included recharge from precipitation, irrigation, and recharge facilities in the Meyers Water Bank, New Columbia Ranch, and Terra Linda Farms." 4-15

Comment: What is the distribution of recharge in the model? A figure showing modeled recharge from a single year, such as current conditions year 2013 would be helpful.

Comment: Based on our knowledge, the Steffen's Ponds should be represented in the model as areas of low recharge.

Section 5.2, paragraph 4: "The compressibility of water ($1.4 \times 10^{-6}/\text{ft}$) estimated from previous studies (Faunt et al, 2009), was scaled with respect to the porosity of each model layer and assigned to all model layers as a specific storage." 4-16

Comment: What porosities were assumed?

Section 6.1.1, paragraph 1 and Table 6-1: "Calibrated vertical hydraulic conductivity in the A and C clays was 1.7×10^{-3} ft/day." 4-17





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Comment: Is no vertical anisotropy in A-clay and C-clay reasonable for the properties of these units?

Section 6.2.1, paragraph 1: “A total of 6,403 measured groundwater levels at 117 dedicated monitoring and production wells were used as the primary source of information used to calibrate the groundwater flow model.”

4-18

Comment: Was spatial distribution of groundwater level residuals reviewed?

Section 6.1.2, paragraph 2: “Calibrated vertical hydraulic conductivity of SJR streambed was 0.25 ft/day while that of the other canals was 5.0×10^{-3} ft/day (Table XX).”

Comment: Sentence refers to Table 6-2.

Please contact me at (760) 344-3110 ext. 107 or Raymond.Kellner@spreckelssugar.com with any questions.

Regards,

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