July 17, 2020

Craig Altare
Chief, Groundwater Sustainability Plan Review Section
Department of Water Resources
Sacramento, CA
Submitted via SGMA GSP Portal

SUBJECT: Responses to Comments on Groundwater Sustainability Plan for the Chowchilla Subbasin

Dear Mr. Altare,

To assist DWR in the Groundwater Sustainability Plan (GSP) review process for the Chowchilla Subbasin, the four Groundwater Sustainability Agencies (GSAs) have prepared the following responses to comments that were received on the SGMA portal during the recent DWR public review period. The GSAs have organized the comments based on general subject areas, prepared a general summary of the comments in each general subject area, and provided the following responses to comments received in each general subject area.

Please let me know if you have any questions or if there is any other information I can provide.

Sincerely,

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1 COMMENTS RECEIVED

Under the Sustainable Groundwater Management Act (SGMA), the four GSAs, Chowchilla Water District GSA, Madera County - Chowchilla GSA, County of Merced - Chowchilla GSA, and Triangle T Water District GSA for the Chowchilla Subbasin (Subbasin) solicited comments from the public and from other agencies during development of the Groundwater Sustainability Plan (GSP). The Final GSP submitted to DWR on January 29, 2020 was informed by these comments and all comments and responses were included in Appendix 2.C.e. The Final GSP was submitted to DWR on January 29, 2020 and posted on the SGMA Portal[1] for public review on January 31, 2020. The public comment period for the Final GSP submitted to DWR ended on May 15, 2020. Agencies, organizations, and individuals submitting comments on the plan are listed below. The comments are available at: https://sgma.water.ca.gov/portal/gsp/comments/12.

- National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) – 3/17/2020
- California Department of Water Resources (DWR) – 5/14/2020
- San Joaquin River Restoration Program (SJRRP) – 5/15/2020
- Central Valley Flood Protection Board – 5/15/2020
- Clean Water Action/Clean Water Fund, American Rivers, Audubon California, Union of Concerned Scientists, The Nature Conservancy, Local Government Commission – 5/15/2020
- Kristin Dobbin – 5/15/2020
- Delta-Mendota Subbasin Coordination Committee – 5/15/2020
- United States Bureau of Reclamation (USBR) – 5/15/2020
- American Rivers – 5/15/2020
- The Nature Conservancy (TNC) – 5/15/2020

To assist DWR in the GSP review process, the GSAs have organized the comments based on general subject areas, prepared a general summary of the comments in each general subject area, and provided the following responses to comments received in each general subject area.

1.1 Groundwater Dependent Ecosystems

1.1.1 Comment Summary

One comment letter noted that the GSP may not be identifying GDEs in SJRRP Reach 4A, and that the limited GDE monitoring plan would not be able to identify regional pumping impacts on GDEs. Multiple comment letters stated that some potential GDEs were improperly disregarded based on depth to groundwater being greater than 30 feet during a drought period, by using a “net-losing streams” criterion, and by use of data for a year that occurred after the SGMA benchmark date of January 2015. Use of depth to groundwater data from multiple seasons and water year types was recommended.

1.1.2 Response

Comments did not specify what GDEs may be missing from the GSP analysis, and the SJRRP Reach 4A area was evaluated in detail with respect to GDEs. The San Joaquin River Riparian Potential GDE identified in the GSP covers virtually the entire length of SJRRP Reach 4A that is adjacent to the western boundary of Chowchilla Subbasin, and the incorporation of three shallow RMS sites near potential GDEs specifically and intentionally does provide a direct means of monitoring the extent that regional pumping may impact

[1] https://sgma.water.ca.gov/portal/

GDEs. The maps for depth to shallow groundwater used in the GDE evaluation were for Spring 2014 and Spring 2016. While 2014 did occur during a drought period, water budget evaluation of water year 2016 showed above normal amounts of precipitation infiltration and surface water infiltration. Classification of GDEs was based primarily on depth to water and a cut-off depth of 30 feet, and not on the "net-losing stream" condition. As stated in responses provided in the GSP, inclusion of depth to water data for Spring 2016 resulted in more potential GDEs being identified in the GSP, and removal of this data set from the analyses would reduce the number of potential GDEs identified in the GSP. The inclusion of Spring 2014 and Spring 2016 depth to groundwater datasets were meant to incorporate multiple seasons and water year types. However, reliance on wet year depth to groundwater data may be misleading because short-term higher groundwater levels during intermittent wet periods likely do not sustain GDEs through drier periods with lower groundwater levels.

1.2 Surface Water – Groundwater Interaction

1.2.1 Comment Summary

The comments received on the Final GSP regarding surface water – groundwater interaction were generally similar to comments received on the Draft GSP, which were addressed and/or responded to in the Final GSP. Thus, the reader can reference Appendix 2.C.e of the Final GSP for responses to some of the current comments. Additional Final GSP comments received on this topic that are different or supplemental to previous comments are summarized below.

The United States Bureau of Reclamation (USBR) provided a comment letter on the Final GSP and had not previously provided comments. Specifically, USBR evaluated whether the GSPs assumptions about San Joaquin River (SJR) flows were consistent with the "Settlement's assumptions" regarding surface water and groundwater relationships, and to ensure GSP implementation will not negatively impact "Restoration and Water Management Goals." In particular, USBR notes that "Losses in Exhibit B of the Settlement have been routinely exceeded and should be addressed." These losses are streamflow losses due to seepage.

- It was noted that while the Final GSP evaluation of the surface water depletion sustainability criterion may be appropriate, it did not technically follow that evaluation process outlined in DWR's BMP. This BMP guideline suggests that the undesirable result must be numerically defined first and then the GSA can evaluate if that undesirable result occurred before January 2015.
- It was noted it seems inconsistent to say Potential GDEs along the San Joaquin River have at least some potential to be impacted by pumping but surface water in the San Joaquin River does not.
- As was noted in GDE comments, it was stated that a losing reach (in and of itself) is not necessarily a definitive indicator of a lack of interconnected surface water (ISW).

One commenter recognized that SGMA does not require restoration of conditions prior to January 2015, but noted with regard to the disconnection of groundwater with the San Joaquin River prior to 2015:

- This break in GW-SW connection affected downstream "senior water rights holders" in 2015 when curtailments were issued by SWRCB;
- Implementation Period groundwater level declines may exacerbate reduction in surface water flows; and

- Lack of sustainable management criteria for ISW may impact surface water flows in creeks/rivers within Chowchilla Subbasin that are tributary to the San Joaquin River. Another commenter requested clarification of how far groundwater elevations are below the thalweg for the Chowchilla River, Ash Slough, and Berenda Slough, and requested that figures for depth to shallow groundwater be developed for years other than 2014 and 2016.

A commenter stated that a depth to water of 20 to 30 feet does not constitute disconnection from the river.

Other comments stated:

- The definition of hydraulic connection "at any point" has both a spatial and temporal component.
- In addition, one commenter states their analysis of groundwater levels from 2011 to 2018 that indicates interconnection of groundwater with the San Joaquin River, and requested estimates of current/historical surface water depletions for ISWs quantified by reach, season, and water year type.
- It was requested that the GSP better describe potential impacts on environmental users of groundwater.

1.2.2 Response

It appears that Exhibit B seepage losses are based primarily on data from 1996 to 1998, one of the wettest periods in the climatic record. The recent exceedances of streamflow losses allowed under Exhibit B (referenced in the comment letter) are most likely related to greater streamflows that have occurred since 2009 with initiation of the SJRRP. The fact that the San Joaquin River is characterized as a losing and disconnected stream along its entire length below Friant Dam and upstream of and adjacent to Chowchilla Subbasin indicates that recent seepage losses are most directly related to the amount of streamflow in the river, and not related to groundwater pumping in Chowchilla Subbasin. As streamflow increases with greater releases from Millerton Lake, streamflow losses can be expected to increase. The Chowchilla GSAs are not aware of any detailed studies that evaluate how streamflow losses relate to the amount of streamflow in the river; however, it is clear that a losing/disconnected stream will have greater seepage losses with greater streamflows. Exhibit B seepage loss limitations were developed based primarily on data from 1996 to 1998, and thus do not reflect seepage loss conditions that occurred up to and beyond 2015; which include increased streamflows that occurred as a direct result of SJRRP-mandated reservoir releases. Therefore, Exhibit B losses cannot be used as a baseline for evaluating potential influences from other factors on streamflow seepage in the GSP; rather, Exhibit B seepage losses need to be updated first to provide a more accurate and reliable baseline for seepage losses under increased flows due to the San Joaquin River Restoration Program (SJRRP) to allow for potential application to the GSP. Even with such an update of Exhibit B losses, future use of this baseline would require assessment of changes in the SJR flow regime due to the SJRRP to accurately evaluate influence from other sources (i.e., activities other than groundwater pumping).

With regard to the comment about the sustainable management criteria BMP, it is important to recognize that DWR BMPs are not requirements for the GSP, but rather are a set of recommended practices. BMPs provide guidance on analyses at a very high level without consideration of unique local circumstances that may require deviation from the guidance. Therefore, following each and every BMP is not a requirement for a GSP. Regardless, it seems clear that if the conclusion of the analysis is that streams were disconnected from groundwater prior to 2015, then sustainable management criteria (SMC) for this criterion are not applicable to the subbasin.

With regard to perceived inconsistency regarding potential pumping impacts on GDEs vs. surface water, the GDE analysis for the GSP included use of a 30-foot depth to groundwater as one of the criteria. Since a 30-foot depth is below the thalweg of the river, it is possible for groundwater levels to intersect with deep-rooted plants (i.e., trees) that have roots extending well below the stream thalweg. These deep-rooted plants could tap groundwater that does not rise high enough to intersect the stream thalweg.

With regard to using characterization of a stream as losing as evidence for a lack of ISW; the GSP evaluated ISW based on potential for a persistent direct hydraulic connection between the regional groundwater system and surface water, not solely on a losing reach characterization. If groundwater and surface water are hydraulically disconnected, then there is no potential for streams to gain from the regional groundwater system or for pumping in the regional groundwater system to induce surface water depletions. The GSP analysis was based on maps of depth to shallow groundwater as described in the GSP; please see Figures 2-70 and 2-71 and Section 2.2.2.5 (Page 2-41) for more information on groundwater – surface water interactions.

Since surface water - groundwater connections in Chowchilla Subbasin were broken prior to 2015, even if groundwater levels did decline further, this would not affect surface water flows due to the lack of a direct hydraulic connection. In particular, “senior water rights holders” designated by the commenter would not have been affected, because groundwater levels were below the thalweg and would not have impacted seepage losses that were already occurring in the San Joaquin River.

Given the lack of hydraulic connection, surface water flows would not be impacted by potential Implementation Period groundwater level declines.

Available data show that depth to water in the areas traversed by the Chowchilla River, Ash Slough, and Berenda Slough are widely variable but generally range from about 100 to over 300 feet below ground surface (bgs) for the regional aquifer where groundwater pumping occurs. The depth to shallow groundwater maps provided in the GSPs (Figures 2-70 and 2-71) generally show shallow depths to groundwater of greater than 100 feet. A portion of Chowchilla River and Ash Slough are indicated to have shallow groundwater levels ranging from 40 to 100 feet, but groundwater at these depths is perched groundwater that is not impacted by regional groundwater pumping.

The definition of a disconnected stream does not include a minimum separation depth between groundwater levels and the thalweg of the stream, only that they are not connected. SGMA/GSP regulations do not specify that a temporary intersection of the water table with the thalweg during a time of extremely high groundwater elevations should define a surface water - groundwater connection. Regardless, regional groundwater pumping would be at its lowest levels during wet seasons or wet years and therefore, least likely to impact shallow groundwater levels when shallow groundwater levels are at their seasonal and all time highest elevations.

The Chowchilla GSAs' interpretation of the definition of ISW in the regulations is that it refers to spatially "at any point" and does not refer to any point in time[2]. Regardless, the definition in the regulations does not specify that "at any point" includes a temporal element.

The evaluation of ISW provided by one commenter (TNC Appendix G) lacks sufficient documentation of methodology and all the necessary supporting data needed to verify their results, and uses arbitrary cut-offs to define connected vs. disconnected streams. The analysis uses data for four years that occurred after the SGMA benchmark date of January 1, 2015, including the extreme wet year of 2016-17 when extensive flooding occurred. The same commenter provided the following comment on analyses conducted in the GSP, "Please rely on groundwater condition data prior to the SGMA benchmark date," (page 16) yet the commenter utilized four years of data after the SGMA benchmark date in their analysis. Even with the conservative methodology (i.e., use of an extremely wet year with flooding that occurred in 2016-17) applied in the commenter's analysis, their results indicate that over 95% of stream lengths in the subbasin are disconnected. Finally, model results for current/historical surface water seepage quantified by reach, season, and water year type are not very useful in evaluating surface water – groundwater connection because such results are largely driven by the amount of streamflow in the channel as opposed to groundwater pumping.

The GSP does include evaluation of potential impacts to environmental users by incorporating specific and targeted RMS sites with MTs and MOs related to environmental beneficial uses/users (i.e., RMS sites for GDEs). Additionally, in Section 3 of Chowchilla Subbasin GSP (Sustainability Management Criteria) the descriptions of MOs, MTs, and potential impacts and undesirable results include a discussion of how of these relate to GDEs. As an example, see Section 3.2.1 which includes a discussion of how chronic lowering of groundwater levels will potentially affect GDEs in the subbasin.

1.3 Groundwater Levels

1.3.1 Comment Summary

A comment letter expressed concern about impacts to groundwater levels (and storage) in Delta Mendota Subbasin based on sustainable management criteria provided in the Chowchilla Subbasin GSP and expected groundwater level declines during the GSP Implementation Period. Another comment letter noted there is no discussion of groundwater levels related to drinking water needs/access.

1.3.2 Response

The minimum thresholds for the Western Management Area of Chowchilla Subbasin, which is adjacent to Delta Mendota Subbasin, are set at recent historic lows. For more information, please see maps depicting MOs and MTs for RMS sites in Appendix 3.A and groundwater elevation hydrographs in Appendix 2.E. Maintaining these groundwater levels in western Chowchilla Subbasin in the future means there would be no increase in impacts to groundwater level/storage in Delta Mendota Subbasin. Review of groundwater model simulations conducted for the Chowchilla Subbasin GSP indicate that the anticipated

[2] The GSP Regulations (23 CCR § 351(o)) define interconnected surface waters as "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted."

declines in groundwater levels in Chowchilla Subbasin during the Implementation Period would have negligible impacts on Delta-Mendota Subbasin groundwater level/storage.

The GSP includes extensive discussion of groundwater levels relative to drinking water needs/access, particularly related to domestic wells. Domestic well information is provided in hydrographs for RMS wells included in Appendix 3.A regarding historical, current, and anticipated future groundwater levels compared to depths and screen intervals for domestic wells. Domestic wells are discussed throughout the GSP document including in the HCM discussion (Section 2), the Sustainable Management Criteria discussion (Section 3), and in various appendices.

1.4 Subsidence

1.4.1 Comment Summary

One comment letter noted that definition of minimum thresholds for subsidence in the Western Management Area (WMA) and adaptive management for subsidence in the Eastern Management Area (EMA) seem reasonable; however, it is suggested that measurable objectives for subsidence are "too liberal" and may result in the sustainability goal not being met. Another comment stated it is important to ensure subsidence does not impact levee design profiles (i.e., reduction in freeboard) for Ash Slough, Berenda Slough, Fresno River, and Eastside/Chowchilla Bypass. It was requested that flood risk be specifically incorporated in the discussion/definition of undesirable results, MTs and MOs be adjusted as necessary to mitigate increased flood risk from subsidence, and the projects/MA be reviewed/adjusted to address both groundwater sustainability and flood management. Another comment expressed concern that Chowchilla GSP sustainable management criteria do not adequately address impacts of groundwater extraction on subsidence; and specifically mentions the component of the undesirable result definition in the Western Management Area that requires 50% of wells to exceed the MT and the use of adaptive management to set sustainable management criteria in the EMA.

1.4.2 Response

The MOs for land subsidence (and other sustainable management criteria) are the average groundwater levels anticipated to occur when the basin becomes sustainable after 2040; see Sections 3.2.3.1 and 3.2.1.1 for more information. A change in the percentage of wells required to exceed the MTs from 50% to 25% (to define an undesirable result) is inappropriate, in part, because this requires only a relatively small number of wells to exceed MTs before an undesirable result is deemed to have occurred. Utilizing a 25% threshold means very localized depressions can cause the entire WMA to be deemed as having an undesirable result, which could be unrepresentative of prevailing conditions in the WMA overall. Utilizing a 50% threshold is more appropriate to obtain better representation of hydrologic conditions in the overall WMA. The use of a 25% threshold would not establish that lower groundwater levels are a widespread condition that might lead to renewed subsidence, whereas a 50% threshold likely to be more representative of the overall WMA. The adaptive management approach for the Eastern Management Area (EMA) is relatively rigorous and appropriate given the general lack of historical infrastructure impacts in this area; it is described in Sections 3.3. The overall GSP projects/management actions are specifically intended to reduce subsidence risk in the future along with other impacts related to overdraft.

Regarding levee design profiles, it is worth noting that waterways trending northeast to southwest across the subbasin (e.g., Chowchilla River, Ash Slough, Berenda Slough) will have less tendency for their flood flow capacities to be reduced due to occurrence of greater subsidence in downstream portions of these waterways. Nonetheless, future monitoring of conditions related to subsidence will consider levee design profiles and flood capacity.

With regard to flood management issues, the sustainable management criteria for subsidence provided in the GSP are intended to minimize potential future impacts to infrastructure (i.e., levees and flood flow capacity). The highest flood risk infrastructure (i.e., the bypass) occurs in the Western Management Area, which has very strict MTs related to subsidence in the GSP. The MOs presented in the GSP reflect the anticipated average groundwater levels in the subbasin after it achieves sustainability. The proposed projects and management actions address flood risk issues along with groundwater sustainability by increasing groundwater recharge and reducing pumping demands, which should serve to minimize future subsidence and potential associated impacts to flood flow capacities.

1.5 Monitoring Network

1.5.1 Comment Summary

One comment notes that the SJRRP shallow monitoring well network is not designed to operate in perpetuity. Others requested monitoring network improvements related to impacts on GDEs and domestic wells, as well as requesting monitoring for ISWs.

1.5.2 Response

The Chowchilla GSAs will work with SJRRP representatives to keep informed of changes that may occur in the SJRRP monitoring program that may impact SJRRP wells incorporated into the RMS network. With three shallow RMS wells near the GDE, the GSP provides adequate initial monitoring for GDEs. Installation of several nested monitoring well sites, mentioned in the GSP, will provide improved monitoring of GW levels in SDAC areas containing domestic wells. The GSP concluded that ISWs are not applicable to the subbasin; however, with five RMS wells within 0.5 miles of the San Joaquin River (and additional RMS wells in close proximity to other streams), the monitoring network being implemented in the GSP will still provide relevant information related to streamflows and groundwater levels near rivers and streams. Additional monitoring network improvements beyond those described in the GSP are also likely to occur and will be described in future Annual Reports.

1.6 Groundwater Quality

1.6.1 Comment Summary

Multiple commenters suggest that the GSP should take a more proactive approach with respect to groundwater quality. Examples cited included design/selection of groundwater recharge projects to improve areas with degraded water quality as well as increase groundwater elevations, and using the "pump and fertilize" method to reduce nitrate concentrations. An analysis of potential groundwater quality impacts was requested for projects to be implemented in the first five years. It was stated that groundwater quality data from 2015 to 2019 cannot be used for setting measurable objective concentrations because these data occur after the January 1, 2015 SGMA benchmark. It was further stated that significant and unreasonable degraded water quality cannot be defined using MCLs (when existing concentrations are below the MCL) for the key constituents (TDS, nitrate, arsenic), but rather it should be, "…set as 20 percent of the assimilative capacity." For existing concentrations above the MCL, it was requested that significant and unreasonable impact to water quality cannot allow for a 20 percent increase as stated in the GSP, but rather it should be set at a 0 percent increase in concentrations to define a significant and unreasonable result. Additional comments included that GSP recharge activities may accelerate transport of constituents through the vadose zone, groundwater depletion may increase arsenic concentrations, and that GSP recharge activities may result in accelerated movement of contaminants towards drinking water wells.

1.6.2 Response

SGMA does not require GSAs to take a proactive approach to restoration of groundwater quality. Many of the same stakeholders and landowners that are subject to the GSP are also subject to groundwater quality related monitoring and other requirements intended to address groundwater quality issues in the subbasin (e.g., ILRP, CV-SALTS, various RWCQB programs). The GSP is required to and does address the potential for exacerbation of existing groundwater quality issues for key constituents from implementation of GSP projects and management actions; as an example, Section 3.3.1.2 on MTs for Chronic Lowering of Groundwater Levels includes a discussion of how projects and management actions have potential to impact groundwater quality (Page 3-28).

The proposed alternative approach to setting groundwater quality MTs is not feasible because of the need to allow for natural variability in constituent concentrations. In addition, the commenter's proposed approach would result in defining an undesirable result for a key constituent even though the constituent concentration is below the MCL, which is at a level where beneficial uses are not impacted. The proposed approach for a 20 percent increase relative to assimilative capacity when below the MCL would only require very small changes in concentrations to define an undesirable result. For example, the suggested approach would have a finding of exceeding the MT when an existing concentration of 5.0 mg/L nitrate (as N) goes up to 6.1 mg/L, even though the MCL is 10 mg/L. This increase in nitrate concentration is well within natural fluctuations in nitrate and likely within the variability of lab instrumentation (e.g., duplicate samples may show this much variability). MCLs are a critical criterion that should be used in defining MTs for groundwater quality.

With respect to using groundwater quality data from 2015 to 2019 to establish baseline water quality it is important to recognize that the groundwater quality sustainable management criterion is different than others in the GSP. The water quality sustainability indicator only applies to impacts on groundwater quality resulting from the implementation of the GSP, which did not occur until adoption and submittal of the GSP in January 2020. Concentrations of key constituents may be fluctuating/increasing under historical and current conditions in the subbasin, independent of GSP activities that were not initiated until after submittal of the GSP in January 2020. Use of groundwater quality data from 2015 to 2019 (and to some extent, additional data collected after 2019 in areas where GSP projects have not yet been implemented) are critical to establishing the proper baseline from which to evaluate potential impacts from GSP projects and management actions.

It is not feasible to conduct an analysis of potential impacts from potential recharge basins and Flood-MAR at this time because recharge locations have not yet been determined. Long-term monitoring will be the best method for evaluating impacts from recharge projects. The existing RMS monitoring network is currently being supplemented with installation of nested monitoring wells at several sites, which will be available for long-term monitoring of water levels and water quality. The Chowchilla Subbasin GSAs also plan to follow an adaptive management approach, in which projects and management actions will be adjusted as needed over the implementation as more information becomes available, with the objective of balancing long-term groundwater recharge with groundwater demand with consideration of potential impacts to groundwater quality.

2 COMMENT SUBJECT AREA RESPONSES

2.1 San Joaquin River Seepage Estimates

2.1.1 Comment Summary

Comments received from the San Joaquin River Restoration Program manager suggest that the allocation of seepage from the San Joaquin River is not accurate or reflective of surface aquifer gradients along the western boundary of the Chowchilla Subbasin. The comments suggest that the Chowchilla Subbasin likely receives more than half of the boundary seepage from the San Joaquin River, as unconfined groundwater likely flows toward areas of lower groundwater surface elevation in the Chowchilla Subbasin.

2.1.2 Response

Generally, in the unsaturated zone, seepage is considered to move vertically downward under the influence of gravity with limited horizontal movement until it encounters a barrier to vertical movement or reaches the saturated zone (water table), at which point it flows according to the hydraulic gradient in the groundwater system. So, given the hydraulic gradient in the groundwater system, it is likely that at least some of the seepage on the Delta Mendota side of the boundary flows into the Chowchilla Subbasin as groundwater inflows. This is accounted for, not as boundary seepage from the San Joaquin River, but as part of the subsurface groundwater inflows in the water budget. The assumptions used to allocate boundary seepage to the Chowchilla Subbasin are seen as more conservative for estimating groundwater inflows and historical groundwater conditions. While the actual historical boundary seepage from the San Joaquin River is unknown, the total seepage was calculated using the best available information for surface water inflows, soil distribution, and soil infiltration characteristics. The total estimated seepage was then allocated from the view that the Chowchilla Subbasin is adjacent to only one bank of the river, and should only be credited with half of the total seepage. In the future, when groundwater is sustainably managed in the Chowchilla Subbasin and adjacent subbasins, subsurface groundwater inflows are expected to decrease as the groundwater system reaches new equilibrium levels. The assumptions regarding boundary seepage allocation are generally expected to hold under these future conditions.

2.2 Chowchilla Bypass Projected Flows

2.2.1 Comment Summary

Comments regarding the projected flows along Chowchilla Bypass contend that historical surface water supplies along the San Joaquin River system are not a good indicator of future surface water supplies. Comments suggest that the magnitude and frequency of flood flows are expected to decrease, that the San Joaquin River Restoration Program (SJRRP) required flows are planned to significantly increase, and that ongoing updates to the Bay-Delta Water Quality Control Plan will require increased surface water flows to the Delta. Each of these factors is expected to reduce the availability of flood flows along Chowchilla Bypass for GSP projects. Comments from the SJRRP manager request that the GSP clarify if, how, and/or why flows along San Joaquin River (and Chowchilla Bypass, by extension) are expected to differ between historical periods and projected periods.

Comments from American Rivers request that the GSP clarify the extent of coordination between GSAs to confirm whether their proposed water transfers and flood diversion recharge projects "pencil out," or whether they depend on the same water to achieve sustainability. American Rivers also recommends that GSAs consider the use of floodplain projects, such as Flood-MAR projects, to provide groundwater recharge while also reducing flood risk, enhancing habitat, and improving water quality.

2.2.2 Response

Some of these comments suggest a misunderstanding of the procedure that was used to estimate projected, future flows along Chowchilla Bypass. The projected Chowchilla Bypass flows were estimated based on the Friant Water Authority's "Estimate of Future Friant Division Supplies for use in Groundwater Sustainability Plans, California" (Friant Water Authority, 2018), referred to as the Friant Water Authority Report. The Friant Water Authority Report accounts for climate change and is considered the best available estimate of projected Friant releases under SJRRP. Please see Table 2-24 (pg. 2-90) of the Chowchilla Subbasin GSP, entry "Surface Water Inflow – Chowchilla Bypass" for a brief description of this methodology.

The Friant Water Authority Report provides projected flows along San Joaquin River under various climate change scenarios. Projected flows along Chowchilla Bypass, in particular, were estimated using the projected San Joaquin River flows adjusted by 2030 climate change factors. The fraction of these projected San Joaquin River flows expected to enter Chowchilla Bypass was estimated based on the historical ratio of flows along Chowchilla Bypass versus the San Joaquin River. Historical data were only used to estimate this ratio, which was then used as a means for estimating the fraction of projected, future flows along Chowchilla Bypass. The Chowchilla Subbasin GSAs agree that GSAs should coordinate their GSP projects so as not to overstate the water supplies available to them. The Chowchilla Subbasin GSAs did coordinate the development of their water budgets and GSP projects both internally within the Subbasin, and externally through coordination with adjacent subbasins, especially the Madera Subbasin, which is generally upstream of the Chowchilla Subbasin. Nevertheless, there is unavoidable uncertainty in the future availability of surface water supplies. We recognize that water rights will still need to be obtained for several GSP projects, and that there is uncertainty in the exact volume of water that will be extracted in any given year by others upstream of the Chowchilla Subbasin along the San Joaquin River, Kings River, and Chowchilla Bypass. The projects described in the Chowchilla Subbasin GSP utilize the best available estimates of future surface water inflows at the time that the GSP was developed and adopted. In recognition of these uncertainties, the Chowchilla Subbasin GSAs plan to follow an adaptive management approach to adjust projects and management actions as the implementation period progresses with the objective of balancing long-term groundwater recharge with groundwater demand. In this approach, implementation of projects and management actions will be refined as more information becomes available with regard to water supplies and Subbasin conditions.

The Chowchilla Subbasin GSP is the "coordinated Plan for four GSAs that represent the entirety of the Chowchilla Subbasin area" (pg. 1-1). The four GSAs within the Chowchilla Subbasin actively worked together to develop and agree upon all sections of the Chowchilla Subbasin GSP. All four GSAs participated in numerous Chowchilla Subbasin GSP Advisory Committee meetings, joint subbasin meetings, County Advisory Committee meetings, Madera County Farm Bureau Water Forum meetings, and Madera County Regional Water Management Group meetings (see Section 2.1.5 of the Chowchilla Subbasin GSP). Proposed GSP projects, including those that plan to divert and recharge water from the Chowchilla Bypass and other waterways, were reviewed and approved by representatives of all GSAs.

As stated on page ES-2, "The Chowchilla Subbasin GSAs […] met multiple times with GSAs in adjacent subbasins, sharing data and information on GSP projects to ensure that this Plan will not interfere with the ability of adjacent subbasins to also achieve sustainable groundwater management." Furthermore, the Chowchilla Subbasin GSP was developed by the same team that developed the Madera Subbasin Joint GSP, using the same groundwater model spanning both subbasins.[3] During the development of GSP projects, the projected inflows available for Chowchilla Subbasin GSP projects were summarized after accounting for applicable upstream diversions for GSP projects in the Madera Subbasin. Table 2-25 of the GSP, for instance, notes that the reason some projected surface water inflows are different from historical inflows is that GSP projects in the Madera Subbasin are expected to divert water upstream of the Chowchilla Subbasin in some years.

The Chowchilla Subbasin GSAs also agree that Flood-MAR projects are valuable for supplying groundwater recharge and supporting environmental interests. Several Flood-MAR projects are proposed in the Chowchilla Subbasin GSP as potential projects for achieving sustainability:

- ***Section 4.1.2: CWD Flood-MAR (Winter Recharge)***: "During flood releases from Buchanan Dam and Madera Canal, CWD will make water available for flooding cropland under the Flood-MAR program." (pg. 4-10)
- ***Section 4.2.1: Madera County West Recharge,*** and ***Appendix 4.E: Madera County GSA Groundwater Recharge Program Supporting Details***:
    - "Madera County plans to construct recharge basins or work with landowners to develop a Flood Managed Aquifer Recharge (Flood-MAR) program to divert flood flows from waterways and provide percolation into the deep aquifer" (pg. A4.E-1)
    - "Flood flow from the Eastside Bypass and Ash Slough would be diverted into recharge basins or fields during wet and above normal years when water is available" (pg. 4-10)
- ***Section 4.2.2: Madera County East Water Purchase:*** "The water purchase project [would] import CVP 215 water into Madera County East using Madera Canal and deliver that water to recharge ponds, dry wells, or as Flood-MAR on cropland." (pg. 4-24)

[3] The Madera-Chowchilla Groundwater-Surface Water Simulation, or MCSim, was developed based on the fine-grid California Central Valley Groundwater-Surface Water Simulation Model (C2VSim-FG beta). MCSim was used to calculate the overall subbasin water budget in both the Chowchilla and Madera Subbasins. See Appendix 6.D. of the Chowchilla Subbasin GSP for documentation on the development and calibration of MCSim.

2.3 Water Budgets

2.3.1 Comment Summary

2.3.1.1 Drinking Water Demands

Several comments have been received stating that the actual demands for drinking water users are not clearly identified in the water budget. Comments also state that it is not clear whether increased water demand from residential and municipal water users has been factored into projected water budgets.

2.3.1.2 Environmental Demands

Comments have also suggested that evapotranspiration from groundwater by riparian vegetation should be quantified, even if the volume of groundwater use is small, because there are potential GDEs in the Subbasin. Along the San Joaquin River specifically, a comment from the SJRRP manager suggested that evapotranspiration losses should be jointly developed and agreed upon among GSPs adjacent to the river to standardize their impact on groundwater recharge estimations.

2.3.1.3 Climate Change Scenarios

Comments have suggested that the projected water budgets with climate change adjustments, as described in the Chowchilla Subbasin GSP, do not account for climate change effects on subsurface inflows and outflows, or on surface water outflows. Comments have also suggested that the projected water budgets should consider several different scenarios (e.g. 2030, 2070, wet, and dry) to improve the accuracy of the projected water budget.

2.3.1.4 Projected Surface Water Inflows

As with the comments regarding the Chowchilla Bypass projected flows, comments request that the GSP clarify if, how, and/or why the flows along San Joaquin River and related waterways are expected to differ between historical periods and projected periods. These comments suggest that the GSP does not clearly describe the inclusion of SJRRP flows and GDEs in the San Joaquin River inflows and outflows. Comments from the SJRRP manager also warn that increased groundwater recharge due to Restoration Flows should not be used to justify increased groundwater pumping that accelerates losses greater than those assumed in the Settlement.

2.3.2 Response

2.3.2.1 Drinking Water Demands

The Chowchilla Subbasin GSAs agree that drinking water is an important and vital beneficial use of groundwater. Indeed, all water use in urban and residential areas is important and should be taken into account in GSPs and other planning efforts. All municipal and residential water uses, including drinking water demand, are included in the Chowchilla Subbasin GSP water budgets within the “urban” water use sector, as required by GSP Regulations. Urban and residential consumptive water demands are expressed in the Chowchilla Subbasin GSP as evapotranspiration of applied water, or ET_{aw}, for the “urban” water use sector. The “urban” water use sector tabulates all water uses for all land identified as “urban” (including residential, commercial, and industrial areas) and “semiagricultural,” according to DWR county land use survey data and statewide crop mapping (see Appendix 2.A. for information on land use data development).

Per the GSP Regulations[4], ET_{aw} is expressed by water use sector for each GSA in Appendices 2.F.a through 2.F.e (Table 7 in each appendix). The groundwater pumping volumes required to meet these urban water demands are likewise summarized for each GSA in Appendices 2.F.a through 2.F.e (Table 5 in each appendix). The GSP Regulations only require total urban demand be reported, but these groundwater pumping volumes include the water required to satisfy drinking water demands.

As described on pages 2-62 to 2-63 of the Chowchilla Subbasin GSP, urban ET_{aw} was calculated using DWR's Integrated Water Flow Model Demand Calculator (IDC) root zone water budget model:

> "Urban [residential, commercial, industrial, and semiagricultural] water use was computed in the IDC application through the urban land use module. Inputs to the urban module include: annual population estimates for urban and residential areas in the subbasin; groundwater pumping records for City of Chowchilla, or estimates based on annual population records and average per capita water use; fraction of total water used indoors [*including drinking water demand*] versus outdoors; and parameters dictating runoff, evapotranspiration, and infiltration."

Indoor water use, which includes drinking water demand, is included in the urban water balance as water that is supplied based on population estimates. Most water used indoors, including drinking water, returns to the groundwater system through infiltration from water treatment plants and septic systems in the area.

The IDC root zone water budget model provides an accurate accounting of total urban water demand, including drinking water demands. Alternative calculations of historical domestic water use using Well Completion Report (WCR) data only account for reported domestic wells, and may not reflect the total number of existing or historically active wells in the Subbasin.

In the projected water budgets, increased water demand for residential and municipal water users was accounted for based on estimated urban expansion using "2017 land use adjusted for urban area projected growth from 2017 through 2070 (areas were held constant from 2071 through 2090)" (pg. 2-59). Annual rates of urban expansion for all communities in the Chowchilla Subbasin were calculated based on the 10-year population estimates and projections for 2000-2040 from the 2011 City of Chowchilla Sphere of Influence Expansion & Municipal Service Review. These parameters were included in the IDC portion of MCSim for the model runs projected through 2090.

2.3.2.2 Environmental Demands

Page 2-43 of the GSP states that: "The San Joaquin River Riparian GDE Unit is located along the San Joaquin River on the western margin of the Chowchilla Subbasin (Figure 2-72) and is composed of a mix of riparian forest, shrub, and herbaceous habitat types totaling approximately 70 acres." Groundwater beneath the San Joaquin River Riparian GDE Unit was approximately 20–30 feet deep in winter/spring 2014 and 2016. Given the small size of the GDE unit and the lack of flow in the San Joaquin River during

[4] The GSP Regulations require that evapotranspiration and groundwater extraction be summarized by water use sector (23 CCR § 354.18), in which "'water use sector' refers to categories of water demand based on the general land uses to which the water is applied, including urban" (23 CCR § 351(al)).

the summer for most of the water balance period (1989-2014), riparian vegetation was included with native vegetation in the water budgets, as indicated in Table 2-21 (page 2-84 to 2-85). During the water balance period, the total evapotranspiration is predominantly supplied by precipitation, whether from direct precipitation or through residual moisture from precipitation stored in the soil root zone.

Reevaluation of evapotranspiration and groundwater use by riparian vegetation along the San Joaquin River and other riparian corridors and within the San Joaquin River GDE Unit will occur during development of the 2025 model update. Additionally, coordination with other Subbasins bordering the San Joaquin River to align and standardize estimates of groundwater use by riparian vegetation will potentially be pursued.

2.3.2.3 Climate Change Scenarios

Potential climate change effects on water supply and hydrologic conditions in the Chowchilla Subbasin were explicitly accounted for in the groundwater model simulations and projected water budgets "with climate change adjustments." Tables 2-23 and 2-24 of the Chowchilla Subbasin GSP identify the specific climate change adjustments to key model inputs, but other flows in the groundwater simulations were calculated assuming these underlying climate change adjustments. In a water budget, adjustment of one flow path impacts other related flow paths, including the water budget closure term.[5]

Surface water outflows were calculated as the closure term of the Rivers and Streams water budget, and other groundwater inflows/outflows were calculated as part of the groundwater model water budget with inputs adjusted for climate change. Assumptions for the projected water budgets with climate change adjustments are discussed in Appendix 6.D (Sections 3.3.1 and 3.3.2) of the Chowchilla Subbasin GSP:

> "Climate change adjustments were also included in selected projected future scenarios to evaluate the potential influence of climate change on future conditions. The climate change factors applied are from the DWR CalSim II simulated volume projections based on State Water Project (SWP) and Central Valley Project (CVP) operations under the 2030 mean climate change scenario (SGMA Data Viewer)."
>
> "The Projected with Climate Change and Projected with Projects with Climate Change scenarios incorporate the 2030 mean climate change scenario adjustment for precipitation, ET, stream inflows, and surface water diversion volumes. All other model inputs are held constant across projected future scenarios."

As stated in the response to the draft GSP comments: "The intent [of the projected water budget with climate change adjustments] is to show the magnitude of effects on groundwater due to a given reasonably foreseeable scenario of potential climate change impacts on precipitation, evapotranspiration, and surface water supply. The GSP does not evaluate multiple potential climate change scenarios because there are an endless number of possibilities for future climate change." As more information is available in the coming years, the water budget assumptions can be reevaluated to account for changes in conditions. Additionally, the GSAs plan to follow an adaptive management approach to adjust projects

[5] The water budget closure term is a flow path that is calculated as the difference between all other estimated or measured inflows and outflows from the water budget. The closure term accounts for the uncertainty of other inflows and outflows, ensuring that the water budget balances.

and management actions as the implementation period progresses with the objective of balancing long-term groundwater recharge with groundwater demand.

2.3.2.4 Projected Surface Water Inflows

As stated above, the Chowchilla Subbasin GSAs recognize that there is unavoidable uncertainty in the future availability of surface water supplies. The projects described in the Chowchilla Subbasin GSP utilize the best available estimates of future surface water inflows at the time that the GSP was developed and adopted. The Chowchilla Subbasin GSAs also plan to follow an adaptive management approach, in which projects and management actions will be adjusted as needed over the implementation as more information becomes available, with the objective of balancing long-term groundwater recharge with groundwater demand.

As described above, projected inflows along Chowchilla Bypass, the San Joaquin River, and Madera Canal were estimated based on the Friant Water Authority's "Estimate of Future Friant Division Supplies for use in Groundwater Sustainability Plans, California" (Friant Water Authority, 2018), referred to as the Friant Water Authority Report. The Friant Water Authority Report accounts for climate change and is considered the best available estimate of projected Friant releases under SJRRP. Please see Table 2-24 (pg. 2-90) of the Chowchilla Subbasin GSP for a description of the methodologies used to project surface water inflows.

As described on page ES-1, projects and management actions were developed with the goal of bringing the current net recharge from the surface water system into balance. Net recharge from the surface water system is defined as groundwater recharge minus groundwater extraction, and is useful for understanding and analyzing the combined effects of land surface processes on the underlying groundwater system. In the current water budget, infiltration of surface water from rivers and streams is calculated assuming historical average surface water inflows. Thus, the GSP projects and management actions are designed to bring the Subbasin into balance irrespective of future changes in Restoration Flows or riparian water use in GDEs. The planned GSP projects and management actions do not assume, nor anticipate, that pumping could increase as a result of increased groundwater recharge due to Restoration Flows. In fact, the GSAs are planning a management action to decrease ET_{aw} by about 27,000 acre-feet. Implementation of this management action will reduce groundwater pumping by more than 27,000 acre-feet by 2040.