



CALIFORNIA DEPARTMENT OF WATER RESOURCES

# SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE

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November 18, 2021

Hicham Eltal  
Merced GSP Plan Manager  
744 W. 20th Street, Merced, CA 95340  
heltal@mercedid.org

RE: Merced Subbasin - 2020 Groundwater Sustainability Plan

Dear Hicham Eltal,

The Merced Irrigation-Urban Groundwater Sustainability Agency (MIUGSA), Merced Subbasin Groundwater Sustainability Agency (MSGSA), and Turner Island Water District Groundwater Sustainability Agency #1 (TIWD GSA-1; collectively, the GSAs) submitted the Merced Groundwater Subbasin (Subbasin) Groundwater Sustainability Plan (GSP) to the Department of Water Resources (Department) for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA).<sup>1</sup>

Department staff have substantially completed an initial review of the GSP and have identified potential deficiencies (see the enclosed document) which may preclude the Department's approval.<sup>2</sup> Department staff have also developed potential corrective actions<sup>3</sup> for each potential deficiency. The potential deficiencies do not necessarily represent all deficiencies or discrepancies that the Department may identify in the GSP but focus on those deficiencies that staff believe, if not addressed, could lead to a determination that the GSP is incomplete or inadequate. This letter initiates consultation between the Department and the GSAs regarding the amount of time needed to address the potential deficiencies and corrective actions. The Department will issue a final determination as described under the GSP Regulations<sup>4</sup> no later than January 28, 2022.

If the Department determines the GSP to be incomplete, the deficiencies precluding approval would need to be addressed within a period not to exceed 180 days from the determination. A determination of incomplete would allow the GSAs to formally address identified deficiencies and submit a revised GSP to the Department for further review and evaluation. Department staff will contact you before making the final determination to discuss the potential deficiencies and the amount of time needed to address the potential corrective actions detailed in the enclosed document.

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<sup>1</sup> Water Code § 10720 *et seq.*

<sup>2</sup> 23 CCR § 355.2(e)(2).

<sup>3</sup> 23 CCR § 355.2(e)(2)(B).

<sup>4</sup> 23 CCR Division 2, Chapter 1.5, Subchapter 2.

Materials submitted to the Department to address deficiencies must be part of the GSP. The GSAs must justify that any materials submitted are part of the revised GSP; this justification is also part of the submittal. To facilitate the Department's review of the revised GSP, the GSAs should also provide a companion document with tracked changes of modifications made to address deficiencies. The GSAs must submit their revised GSP through the DWR SGMA Portal where, as is currently available, interested parties may provide comments on submitted materials to the Department.

Department staff will work expeditiously to review materials submitted to address deficiencies and to evaluate compliance of the revised GSP. The Department will keep a GSP status designated as incomplete during its review of the submitted materials. The Department could subsequently approve an incomplete GSP if the GSAs have taken corrective actions to address deficiencies identified by the Department within a period not to exceed 180 days from the determination. The Department could also issue a determination of inadequate for an incomplete GSP if the Department, after consultation with the State Water Resources Control Board, determines the GSAs have not taken sufficient actions to correct the deficiencies identified by the Department.

If you have any questions regarding this matter, please do not hesitate to contact the Sustainable Groundwater Management Office staff by emailing [sgmps@water.ca.gov](mailto:sgmps@water.ca.gov).

Thank you,

*Paul Gosselin*

Paul Gosselin  
Deputy Director for Sustainable Groundwater Management

Enclosure:

1. Potential Deficiencies and Corrective Actions

2020 Groundwater Sustainability Plan  
Merced Subbasin (Basin No. 5-022.04)

## Potential Deficiencies and Corrective Actions

Department of Water Resources (Department) staff have identified deficiencies regarding the Merced Subbasin (Subbasin) Groundwater Sustainability Plan (GSP) that may preclude the Department's approval. Therefore, consistent with the GSP Regulations, Department staff are considering corrective actions that the Merced Irrigation-Urban Groundwater Sustainability Agency (MIUGSA), Merced Subbasin Groundwater Sustainability Agency (MSGSA), and Turner Island Water District Groundwater Sustainability Agency #1 (TIWD GSA-1; collectively, the GSAs) should review to determine whether and how the deficiencies can be addressed. The deficiencies and potential corrective actions are explained below, including the general regulatory background, the specific deficiencies identified in the GSP, and specific actions to address the deficiencies. The specific actions identified are potential corrective actions until the Department makes a final determination.

### **General Background**

Potential deficiencies identified in the Merced Subbasin GSP relate to the development and documentation of sustainable management criteria, including undesirable results and minimum thresholds that define when undesirable results may occur.

The Department's GSP Regulations describe several required elements of a GSP under the heading of "Sustainable Management Criteria"<sup>5</sup>, including undesirable results, minimum thresholds, and measurable objectives. These components of sustainable management criteria must be quantified so that GSAs, the Department, and other interested parties can monitor progress towards sustainability in a basin consistently and objectively.

A GSA relies on local experience, public outreach and involvement, and information about the basin it has described in the GSP basin setting (i.e., the hydrogeologic conceptual model, the description of current and historical groundwater conditions, and the water budget), among other factors, to develop criteria for defining undesirable results and setting minimum thresholds and measurable objectives.<sup>6</sup>

The Sustainable Groundwater Management Act (SGMA) defines sustainable groundwater management as the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.<sup>7</sup> The avoidance of undesirable results is thus explicitly part of sustainable groundwater management as established by SGMA and critical to the success of a GSP.

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<sup>5</sup> 23 CCR § Article 5, Subarticle 3.

<sup>6</sup> 23 CCR §§ 354.8, 354.10, 354.12 *et seq.*

<sup>7</sup> Water Code § 10721(v).

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The definition of undesirable results is critical to establishing an objective method to define and measure sustainability for a basin. As an initial matter, SGMA provides a qualitative definition of undesirable results as “one or more” of six specific “effects caused by groundwater conditions occurring throughout the basin.”<sup>8</sup>

GSAAs define, in their GSPs, the specific significant and unreasonable effects that would constitute undesirable results and the groundwater conditions that would produce those results in their basins.<sup>9</sup> The GSAAs’ definition must include a description of the processes and criteria relied upon to define undesirable results and describe the effect of undesirable results on the beneficial uses and users of groundwater, surface land uses (for subsidence), and surface water (for interconnected surface water).<sup>10</sup>

SGMA leaves the task of establishing undesirable results and setting thresholds largely to the discretion of the GSAAs, subject to review by the Department. In its review, the Department requires a thorough and reasonable analysis of the groundwater conditions and the associated effects the GSAAs must manage the groundwater basin to avoid, and the GSAAs’ stated rationale for setting objective and quantitative sustainable management criteria to prevent those undesirable conditions from occurring.<sup>11</sup> If a GSP does not meet this requirement, the Department cannot evaluate the GSAAs’ likelihood of achieving their sustainability goal. That does not necessarily mean that the GSP or its objectives are inherently unreasonable; rather, the Department cannot evaluate whether the GSP’s implementation would successfully achieve sustainable management if it is unclear what undesirable conditions the GSAAs seek to avoid.

**Potential Deficiency 1. The GSP lacks sufficient justification for identifying that undesirable results for chronic lowering of groundwater levels, subsidence, and depletion of interconnected surface waters can only occur in consecutive non-dry water year types.**

The first potential deficiency relates to the GSP’s requirement of two consecutive non-dry (i.e., below normal, above normal, or wet) water-year types and the exclusion of dry and critically dry water-year type in the identification of undesirable results for chronic lowering of groundwater levels, land subsidence, and by proxy for depletions of interconnected surface water.

**Background**

SGMA defines the term “Undesirable Result,” in part, as one or more of the following effects caused by groundwater conditions occurring throughout the basin:<sup>12</sup>

<sup>8</sup> Water Code § 10721(x).

<sup>9</sup> California Department of Water Resources, Best Management Practices for the Sustainable Management of Groundwater: Sustainable Management Criteria (Draft), November 2017.

<sup>10</sup> 23 CCR §§ 354.26(b), 354.28(c)(5), 354.28(c)(6).

<sup>11</sup> 23 CCR § 355.4(b)(1).

<sup>12</sup> Water Code § 10721(x).

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- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.
- Significant and unreasonable land subsidence that substantially interferes with surface land uses.
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

### Potential Deficiency Details

The GSP identifies that an undesirable result for chronic lowering of groundwater levels occurs "...when November groundwater levels at greater than 25% of representative monitoring wells (at least 7 of 25) fall below their minimum thresholds for two consecutive years where both years are categorized hydrologically as below normal, above normal, or wet."<sup>13</sup> Department staff find that the water-year type requirement in the definition of the undesirable result for chronic lowering of groundwater levels (i.e. two consecutive non-dry years) is not consistent with the intent of SGMA and could potentially allow for an unmanaged and continued lowering of groundwater levels under certain hydrologic or climatic conditions that have occurred historically. A review of the historical San Joaquin Valley water-year type classifications<sup>14</sup> indicates the potential for dry periods without the occurrence of two consecutive non-dry water years to persist for greater than 10 years. (See e.g., the 11-year period from water years 1985 through 1995, where the lack of concurrent below normal/above normal/wet years would have rendered groundwater level minimum threshold exceedances not applicable by the GSA's definition. Department staff also note that concurrent below-normal, above-normal, or wet years occurred in only five of the last twenty water years from 2001 through 2020.) By requiring minimum thresholds to be exceeded for two consecutive non-dry years to trigger an undesirable result for the Subbasin, it appears that the GSAs in the Subbasin could disregard potential impacts associated with groundwater level declines below minimum thresholds during extended periods of dry years, even if interrupted by below-normal, above-normal, or wet years.

Department staff also find this methodology inconsistent with other portions of the GSP. For example, while describing measurable objectives for groundwater levels, the GSP states "the condition between the measurable objective and the minimum threshold is

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<sup>13</sup> Merced GSP, Sec. 3.3.1, p. 243.

<sup>14</sup> Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices, Water Year 1901 through 2020. California Department of Water Resources, <https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST>.

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known as the margin of operational flexibility. The margin of operational flexibility is intended to accommodate droughts, climate change, conjunctive use operations, or other groundwater management activities.”<sup>15</sup> Based on these statements, it appears that the minimum thresholds are already defined at values that accommodate drought conditions, so it is unclear why minimum threshold exceedances during dry water years would be excluded from the GSP’s definition of undesirable results. (See Potential Corrective Action 1a.)

SGMA states that “overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.”<sup>16</sup> In response to public comments on the draft GSP that questioned the exclusion of dry and critically dry years in the definition of undesirable results, the GSAs provide a response referencing that portion of the law.<sup>17</sup> However, if the GSP intended to incorporate this concept into its definition of the undesirable result for chronic lowering of groundwater levels, the GSP fails to identify specific extraction and groundwater recharge management actions that would be implemented,<sup>18</sup> or otherwise describe how the Subbasin will be managed to offset, by increases in groundwater levels or storage during other periods, dry year reductions of groundwater in storage. The GSP identifies many projects that, once implemented, may lead to the elimination of long-term overdraft conditions in the Subbasin; however, Department staff find that the GSP does not present specific detail for how projects and management actions, in conjunction with the proposed chronic lowering of groundwater levels sustainable management criteria, will offset drought-related groundwater reductions and avoid significant and unreasonable impacts when groundwater levels identified as minimum thresholds are potentially exceeded for an extended period of time in the absence of two consecutive non-dry years. (See Potential Corrective Action 1b.)

The GSP uses a similar approach for land subsidence (i.e., stating that undesirable results occur when of minimum threshold subsidence rates are exceeded at three or more of the four proposed monitoring sites for two consecutive non-dry years<sup>19</sup>), and uses the same approach for depletion of interconnected surface waters, which use the chronic lowering of groundwater level sustainable management criteria as a proxy. However, while SGMA states that overdraft resulting in groundwater level or groundwater storage declines during periods of drought could be managed with increases during other periods, as noted above; SGMA does not extend this premise to land subsidence and depletions

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<sup>15</sup> Merced GSP, Sec. 3.3.3, p. 248.

<sup>16</sup> Water Code § 10721(x)(1).

<sup>17</sup> Merced GSP, Appendix O, p. 1128.

<sup>18</sup> 23 CCR § 354.44(b)(9).

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of interconnected surface water. The greatest impacts to infrastructure from land subsidence and beneficial uses of surface water from depletions of interconnected surface water are likely to occur when groundwater levels are lowest, which would likely be during dry and critically dry water years. (See Potential Corrective Action 1c.)

If, after considering this potential deficiency, the GSA retains minimum thresholds that allow for continued lowering of groundwater levels, then it is reasonable to assume that some groundwater well impacts (e.g., loss of production capacity) may occur (e.g., to the outlier wells mentioned above) during the implementation of the GSP. SGMA requires GSAs to consider the interests of all groundwater uses and users and to implement their GSPs to mitigate overdraft conditions.<sup>20</sup> Implementing specific projects and management actions prevents undesirable results and achieves the sustainable yield of the basin. The GSA should describe how projects and management actions would address drinking water impacts due to continued overdraft between the start of GSP implementation and the achievement of the sustainability goal. If the GSP does not include projects or management actions to address drinking water impacts, the GSP should contain a thorough discussion, with supporting facts and rationale, explaining how and why the GSA determined not to include specific actions to address those impacts that result from continued groundwater lowering below pre-SGMA levels. (See Potential Corrective Action 1d.)

Additionally, related to the groundwater level declines allowed for by the GSA's minimum thresholds, the GSAs have not explained how those groundwater level declines relate to the degradation of groundwater quality sustainability indicator. GSAs must describe, among other items, the relationship between minimum thresholds for a given sustainability indicator (in this case, chronic lowering of groundwater levels) and the other sustainability indicators.<sup>21</sup> The GSAs generally commit to monitoring a wide range of water quality constituents but they have only developed sustainable management criteria for total dissolved solids because they state they have not observed a causal nexus between groundwater management and degradation associated with the other constituents. While Department staff are not aware of evidence sufficient to conclude that the GSAs acted unreasonably by focusing on total dissolved solids, it is clear that the GSAs did not consider, or at least did not document, the potential for degradation to occur due to further lowering of groundwater levels beyond the historic lows. (See Potential Corrective Action 1f.)

### **Potential Corrective Action 1**

- a) Department staff believe the management approach described in the GSP, which couples minimum thresholds and measurable objectives that account for operational flexibility during dry periods with a definition of undesirable results that disregards

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<sup>20</sup> 23 CCR §§ 355.4(b)(4), 355.4(b)(6).

<sup>21</sup> 23 CCR § 354.28(b)(2).

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minimum threshold exceedances in all years except consecutive below normal, above normal, or wet years, to be inconsistent with the objectives of SGMA. Therefore, the GSAs should remove the water-year type requirement from the GSP's undesirable result definition.

- b) The GSP should be revised to include specific projects and management actions the GSAs would implement to offset drought-year groundwater level declines.
- c) The GSA should thoroughly explain how their approach avoids undesirable results for subsidence and depletion of interconnected surface waters, as SGMA does not include an allowance or exemption for those conditions to continue in periods of drought.
- d) The GSAs should revise the GSP to describe how they would address drinking water impacts caused by continued overdraft during the period between the start of GSP implementation and achieving the sustainability goal. If the GSP does not include projects or management actions to address those impacts, the GSP should contain a thorough discussion, with supporting facts and rationale, explaining how and why the GSA determined not to include specific actions to mitigate drinking water impacts from continued groundwater lowering below pre-SGMA levels.
- e) The GSP should be revised to explain how the GSAs will assess groundwater quality degradation in areas where further groundwater level decline, below historic lows, is allowed via the minimum thresholds. The GSAs should further describe how they will coordinate with the appropriate groundwater users, including drinking water, environmental, and irrigation users as identified in the GSP. The GSAs should also discuss efforts to coordinate with water quality regulatory agencies and programs in the Subbasin to understand and develop a process for determining if continued lowering of groundwater levels is resulting in degraded water quality in the Subbasin during GSP implementation.

**Potential Deficiency 2. The GSP does not provide sufficient information to support the selection of chronic lowering of groundwater levels sustainable management criteria.**

The potential deficiency relates to the GSP's lack of sufficient information to support the selection of chronic lowering of groundwater levels sustainable management criteria, particularly for minimum thresholds and undesirable results.

**Background**

The GSP Regulations require that a GSP include a description of the processes and criteria relied upon to define undesirable results applicable to the basin.<sup>22</sup> The criteria to describe undesirable results must be based on a quantitative combination of minimum

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<sup>22</sup> 23 CCR § 354.26(a).



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threshold exceedances that cause significant and unreasonable effects in the basin.<sup>23</sup> The minimum threshold for chronic lowering of groundwater levels must be based on groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Additionally, the consideration of beneficial uses and users of groundwater is a key component of SGMA and the GSP Regulations. Related to this potential corrective action, GSP Regulations require that the description of minimum thresholds include “how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests,”<sup>24</sup> and that the description of undesirable results include “potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.”<sup>25</sup>

### Potential Deficiency Details

The GSP defines an undesirable result as “...sustained groundwater elevations that are too low to satisfy beneficial uses within the basin over the planning and implementation horizon of this GSP.”<sup>26</sup> The GSP also identifies specific “potential undesirable results” that it says were identified by stakeholders, including significant and unreasonable stranding of groundwater infrastructure, reduced groundwater production, increased lift costs, and shallow domestic wells going dry.<sup>27</sup> The GSP defines the minimum threshold for chronic lowering of groundwater levels as equivalent to the construction depth of the shallowest domestic well within a 2-mile radius of a representative monitoring well.<sup>28</sup> In response to public comments, the GSP states that representative wells are intended to represent groundwater level conditions beyond the 2-mile radius.<sup>29</sup>

While the apparent goal of the minimum thresholds, defined by the shallowest domestic well depth, is, at face value, reasonable and consistent with the GSP’s goals, several items have raised concern during review by Department staff. Public comments and publicly available reports analyzing the effects of groundwater-level minimum thresholds on well infrastructure indicate the potential for more than 1,000 domestic wells to go dry at the GSP’s minimum thresholds.<sup>30</sup> It is not entirely clear to Department staff what caused the apparent discrepancy between the objective of the thresholds to protect the

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<sup>23</sup> 23 CCR § 354.26(b)(2).

<sup>24</sup> 23 CCR § 354.28(b)(4).

<sup>25</sup> 23 CCR § 354.26(b)(3).

<sup>26</sup> Merced GSP, Sec. 3.3.1, p. 243.

<sup>27</sup> Merced GSP, Sec. 3.3.1, p. 243.

<sup>28</sup> Merced GSP, Section 3.3.2, p. 246.

<sup>29</sup> Merced GSP, Appendix O, p. 1128.

<sup>30</sup> See public comments submitted to DWR on the SGMA Portal from the State Water Resources Control Board, which concluded between 395 to 1,195 domestic wells outside or above the Corcoran Clay could go dry at the minimum thresholds. A study by a group affiliated with UC Davis found 415 wells could go dry at the minimum threshold (see Table 3 in the paper: Bostic, Darcy; Kristen Dobbin; Rich Pauloo; Jessica Mendoza; Michael Kuo; Jonathon London. 2020. *Sustainable for Whom? The Impact of Groundwater Sustainability Plans on Domestic Wells*. UC Davis Center for Regional Change).

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shallowest wells and the results of those studies indicating potentially significant quantities of domestic wells could go dry. However, several factors, which the GSAs should assess and disclose, may be important. First, based on Department staff's assessment of information in the GSP, approximately 60 percent of the area of the Subbasin is outside of the 2-mile radius of the GSP's 25 representative wells. It is unclear to Department staff how many domestic wells exist outside of the buffer area, but that should be assessed by the GSAs and additional representative monitoring wells to cover these areas should be considered. Second, the GSP describes in a footnote that "outliers" from its domestic well dataset were removed, and it also describes the quantitative rules for the removal. However, the GSP does not describe the number of wells that the outlier analysis ultimately removed from consideration or the characteristics of those wells. Third, the GSP notes that its analysis is based on Merced County's electronic well permitting database,<sup>31</sup> while Department staff's understanding is that others have used well completion reports in the Department's Online System for Well Completion Reports<sup>32</sup> (OSWCR) repository. The GSAs should evaluate and discuss the additional data that may be present in the OSWCR repository, if applicable. To the extent that those, or other factors, led to the apparent discrepancy, then those should be examined by the GSAs and described to better understand the potential impacts of the minimum thresholds on beneficial uses and users of groundwater. (See Potential Corrective Action 2a.)

## Potential Corrective Action 2

- a) As required by the GSP Regulations, the GSP must provide a description of how the minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property.<sup>33</sup> In particular, the GSAs should address the apparent or potential discrepancies between the stated rationale for the minimum thresholds versus the results of multiple studies showing a potentially significant number of well impacts if groundwater levels are operating near those minimum thresholds. Furthermore, the GSAs should explain whether other drinking water users that may rely on shallow wells, such as public water systems and state small water systems, were considered in the GSAs' site-specific thresholds. If not, the GSAs should conduct outreach with those users and incorporate their shallow wells, as applicable, into the site-specific minimum thresholds and measurable objectives.

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<sup>31</sup> Merced GSP, Section 3.3.2, p. 246.

<sup>32</sup> Well Completion Report Map Application. California Department of Water Resources, <https://water.ca.gov/Programs/Groundwater-Management/Wells/Well-Completion-Reports>.

<sup>33</sup> 23 CCR § 354.28(b)(4).

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**Potential Deficiency 3. The GSP does not provide sufficient information to support the selection of land subsidence sustainable management criteria.**

The potential deficiency relates to the GSP’s justification and lack of sufficient information to support the selection of land subsidence sustainable management criteria, particularly for minimum thresholds and undesirable results.

**Background**

The GSP Regulations require minimum thresholds for land subsidence based on the rate and extent of subsidence.<sup>34</sup> The GSP Regulations require that the description of minimum thresholds include “[h]ow minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests,”<sup>35</sup> and that the description of undesirable results include “[p]otential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.”<sup>36</sup> Also, in the development of minimum thresholds for land subsidence, the GSP Regulations require the identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how those uses and interests were determined and considered, and the rationale for establishing minimum thresholds in relations to those effects.<sup>37</sup>

**Potential Deficiency Details**

The GSP describes land subsidence as a significant issue in the southwestern portion of the Subbasin and states that the subsidence is likely a result of groundwater extraction from below the Corcoran Clay.<sup>38</sup> The GSP defines an undesirable result for land subsidence as “[t]he significant and unreasonable reduction in the viability of the use of infrastructure over the planning and implementation horizon...”.<sup>39</sup> The GSP further explains that the Eastside Bypass in the southwest corner of the Subbasin has the largest potential to be damaged due to subsidence.<sup>40</sup> The GSAs identify land subsidence as an area of concern in the Subbasin but do not, at this time, consider land subsidence to have caused a significant and unreasonable reduction in the viability of the use of infrastructure. The GSP states that land subsidence observed over the last 50 years has caused a reduction in freeboard of the Middle Eastside Bypass and caused problems in neighboring subbasins, highlighting the need for further monitoring and management.<sup>41</sup>

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<sup>34</sup> 23 CCR § 354.28(c)(5).

<sup>35</sup> 23 CCR § 354.28(b)(4).

<sup>36</sup> 23 CCR § 354.26(b)(3).

<sup>37</sup> 23 CCR § 354.28(c)(5).

<sup>38</sup> Merced GSP, Section 2.2.5, p. 180.

<sup>39</sup> Merced GSP, Section 3.7.2, p. 256.

<sup>40</sup> Merced GSP, Section 3.7.2, p. 257.

<sup>41</sup> Merced GSP, ES-3, p. 24.

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The GSP includes minimum thresholds and measurable objectives defined as rates of subsidence, but both are poorly supported relative to the requirements of the GSP Regulations. The minimum threshold, defined as 0.75 feet per year of subsidence, is described as “slightly higher” than measured subsidence rates between 2011 and 2018, the effects of which “...did not result in significant and unreasonable effects within the Merced Subbasin.”<sup>42</sup> However, whether or not those historical rates were considered significant and unreasonable is immaterial to a prospective evaluation of sustainability. Rather, the GSAs should be concerned with whether and how future rates of subsidence could interfere with beneficial uses and users of groundwater or surface land uses and property interests. To properly address that concern, the GSAs should understand, through efforts such as coordination and technical studies, the amount of subsidence that would be significant and unreasonable, because it would substantially interfere with groundwater and land surface beneficial uses and users. That understanding would inform not only the selection of sustainable management criteria, but also the types and timing of projects and management actions that would be needed to avoid the significant and unreasonable effects. (See Potential Corrective Action 3a.)

The measurable objective, set to 0.25 feet per year, is described as being “based on recent subsidence rates, which are believed to be reflective of subsidence due to historical dewatering.”<sup>43</sup> The GSP specifically notes that rates of subsidence were between 0.17 and 0.32 feet per year from December 2017 to December 2018. The GSP states that “some level of future subsidence, likely at rates similar to those currently experienced, is likely to be underway already and will not be able to be prevented.”<sup>44</sup> Here, the GSP appears to be referring to residual or delayed compaction, and Department staff do not dispute that some level of residual compaction is expected after groundwater level decline is arrested. However, the GSP contains no evidence to support its conclusion that the 2017-2018 rates would be likely to continue over the planning and implementation horizon of the GSP. Evidence presented by the GSAs<sup>45</sup> and by others<sup>46</sup> has shown that, at least in some areas, compaction rates quickly attenuate following recovery of groundwater levels. The GSAs should substantiate its apparent residual compaction rates with data and analyses or explain how they intend to address this data gap. (See Potential Corrective Action 3b.)

It was the intent of the legislature that implementation of SGMA would avoid or minimize subsidence<sup>47</sup> once basins achieve their sustainability goals. To be consistent with that intent, and in the absence of compelling information as to why additional long-term

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<sup>42</sup> Merced GSP, Section 3.7.2, p. 258-259.

<sup>43</sup> Merced GSP, Section 3.7.3, p. 259.

<sup>44</sup> Merced GSP, Section 3.7.2, p. 258.

<sup>45</sup> Merced GSP, Section 2.2.5, p. 183-186.

<sup>46</sup> Figure 6a and accompanying discussion, Faunt, C.C., Sneed, M., Traum, J. et al. Water availability and land subsidence in the Central Valley, California, USA. *Hydrogeology Journal* **24**, 675–684 (2016), <https://doi.org/10.1007/s10040-015-1339-x>.

<sup>47</sup> Water Code § 10720.1(e).

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subsidence is acceptable for a basin, Department staff suggest that the measurable objective be zero inelastic subsidence and that the minimum thresholds be set commensurate with expected residual subsidence. It may be that those rates are exceeded during the implementation period (i.e., between 2020 and 2040), as projects and management actions are implemented and sustainability is achieved, but that can be acceptable if the GSAs are making adequate progress in implementing their GSP. As stated above, the rates at which projects and management actions are implemented should be consistent with the cumulative subsidence that the GSAs determine need to be avoided, as informed by the understanding of potential impacts or interference to beneficial uses and users of groundwater and surface land uses. (See Potential Corrective Action 3c.)

The GSAs have identified that "...sensitivity of local infrastructure to land subsidence is not well understood..."<sup>48</sup>, that they "...will continue to coordinate efforts with surrounding subbasins to develop regional and local solutions to subsidence occurring in the Merced, Chowchilla, and Delta-Mendota Subbasins..."<sup>49</sup>, and that they will identify a plan, including coordinating with other agencies and developing timelines, to fill data gaps within two years of the GSP being approved by the Department.<sup>50</sup> Department staff agree that all of those items are important and should be implemented immediately, without waiting for approval of the GSP by the Department. However, staff do not believe that the GSP, in a Subbasin with significant historical subsidence and with infrastructure identified as being susceptible to future subsidence, should be recommended for approval without identifying the total cumulative amount of subsidence that can occur without causing significant and unreasonable impacts to beneficial uses and users, surface land uses, and property interests. Department staff recognize that the total allowable cumulative subsidence may be modified as the GSP is implemented, data gaps are filled, and additional analyses are conducted, and therefore Department staff encourage the GSAs to actively evaluate and adjust management criteria as new information and data are acquired.

### Potential Corrective Action 3

- a) The GSAs should identify the amount of subsidence that can be tolerated by critical infrastructure during the implementation of the GSP. This identification should be supported by information on the effects of subsidence on land surface and groundwater beneficial uses and users, and the amount of subsidence that would substantially interfere with those uses and users.
- b) If, pending resolution of this potential corrective action, rates of delayed or residual compaction are used to inform minimum thresholds or measurable objectives, then

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<sup>48</sup> Merced GSP, Section 3.7.2, p. 257.

<sup>49</sup> Merced GSP, Section 3.7.2, p. 259.

<sup>50</sup> Merced GSP, Section 4.9.7, p. 294.

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information should be provided to substantiate those rates, or explanation should be provided for how those rates will be evaluated as a data gap.

- c) The GSAs should revise their minimum thresholds and measurable objectives for land subsidence to reflect the intent of SGMA that subsidence be avoided or minimized once sustainability is achieved. Explain how the implementation of the projects and management actions is consistent both with achieving the long-term avoidance or minimization of subsidence and with not exceeding the tolerable amount of cumulative subsidence (i.e., less than substantial interference).