

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

Groundwater Basin Name: Tahoe Valley – Tahoe South (Basin No. 6-005.01)  
Submitting Agency: South Tahoe Public Utility District  
Recommendation: Approve  
Date Issued: July 17, 2019

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## I. Summary

The South Tahoe Public Utility District (District) submitted an alternative (Tahoe South Subbasin Alternative *or* Alternative) for the Tahoe Valley Groundwater Basin - Tahoe South Subbasin (Tahoe South Subbasin *or* Subbasin) to the Department of Water Resources (Department) for evaluation and assessment as provided by the Sustainable Groundwater Management Act (SGMA).<sup>1</sup> The District submitted an existing plan,<sup>2</sup> which relies primarily on the *Tahoe Valley South Basin (6-5.01) 2014 Groundwater Management Plan* (Groundwater Management Plan *or* Plan).

The South Tahoe Public Utility District has the legal authority and financial means through a Groundwater Management Ordinance and Memorandum of Understanding between the District and the El Dorado County Water Agency to implement the Groundwater Management Plan. The District has demonstrated a commitment to engaging with and collaborating with the stakeholders in the Subbasin through the establishment of a Stakeholder Advisory Group. The Groundwater Management Plan demonstrates that the District has a reasonable and sufficient understanding of the geology and hydrology of the Subbasin, the historical and current groundwater elevations, historical and current groundwater production, and future water demand projections. The District monitors the groundwater levels and adjusts its water supply operations to maintain groundwater levels within the range of historical data. The District also demonstrates a commitment to maintain and protect the groundwater quality of the Subbasin through the Groundwater Management Plan's detailed discussion of the various water quality regulatory programs applicable to the Subbasin. This District has conducted a preliminary analysis determining the connection between surface water and groundwater and acknowledges the need to further evaluate whether depletions of interconnected surface water caused by

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

<sup>2</sup> Water Code § 10733.6(b)(1)

groundwater pumping have an adverse impact on the beneficial uses of the surface water. Department staff believe that the District's focus on operating within historical ranges is sufficient to avoid undesirable results in the Subbasin and, thus, that the Plan satisfies the objectives of SGMA.

Based on its review of the Plan, other related documents, and consideration of public comments, Department staff believe that the Alternative satisfies the objectives of SGMA for the Subbasin and recommend approval of the Alternative. Staff consider the information provided by the District to be sufficient and credible, and that implementation of the Plan is reasonably likely to lead to sustainable groundwater management<sup>3</sup> of the Subbasin. However, Department staff have identified recommended actions for the District that are designed to facilitate the Department's ongoing evaluation of the Plan's implementation.

The remainder of this assessment is organized as follows:

- **Section II. Review Principles** describes the legal and other considerations regarding the Department's assessment and evaluation of alternatives.
- **Section III. Alternative Materials** describes materials (i.e., reports, data, and other information) submitted by the District that, collectively, the Department staff considered as the Alternative.
- **Section IV. Required Conditions** describes whether the Alternative satisfies each of the four conditions required for the Department to review an alternative.
- **Section V. Alternative Contents** describes the information contained in the Alternative submittal.
- **Section VI. Assessment** describes the Department staff's evaluation of the Alternative, whether it satisfies the objectives of SGMA, and, if applicable, describes recommended actions proposed for the first five-year update.

## II. Review Principles

The South Tahoe Public Utility District submitted an alternative based on a groundwater management plan to the Department for evaluation and assessment to determine whether it satisfies the objectives of SGMA for the Tahoe South Subbasin.

To satisfy the objectives of SGMA, an alternative based on a groundwater management plan prepared pursuant to Part 2.75 of Division 6 of the Water Code<sup>4</sup> or a plan developed pursuant to another law authorizing groundwater management must demonstrate that implementation of the plan has led to or will lead to sustainable groundwater

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<sup>3</sup> Water Code § 10721(v). See also discussion in Section II. Review Principles. Sustainable groundwater management is achieved by meeting the basin's sustainability goal.

<sup>4</sup> Water Code § 10750 *et seq.*

management, which means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.<sup>5</sup> Undesirable results are defined quantitatively by the managing agency.<sup>6</sup>

An alternative, to be evaluated by the Department, must be submitted by the statutory deadline and be within a basin that complies with Part 2.11 of Division 6 of the Water Code.<sup>7</sup> The submitted alternative must also be complete and must cover the entire basin.<sup>8</sup> The Department's Groundwater Sustainability Plan (GSP) Regulations<sup>9</sup> require the Department to evaluate an Alternative "in accordance with Sections 355.2, 355.4(b), and Section 355.6, *as applicable*, to determine whether the Alternative complies with the objectives of the Act".<sup>10</sup> The elements of the cited sections are not all applicable to alternatives. Some provisions apply to GSPs and alternatives alike, to alternatives only prospectively, or do not apply to alternatives at all.<sup>11</sup> Ultimately, the purpose of the evaluation is to determine whether the alternative satisfies the objectives of SGMA.<sup>12</sup> The agency must explain how the elements of the alternative are "functionally equivalent" to the elements of a GSP required by Articles 5 and 7 of the GSP Regulations and are sufficient to demonstrate the ability of the alternative to achieve the objectives of SGMA.<sup>13</sup> The explanation by the agency that elements of an alternative are functionally equivalent to elements of a GSP furthers the objective of demonstrating that the alternative satisfies the objectives of SGMA. Alternatives that predate the passage of SGMA or adoption of GSP Regulations are not expected to conform to the precise format and content of a GSP. The Department's assessment is thus focused on the ability of the alternative to satisfy the objectives of SGMA as demonstrated by information provided by the agency; it is not

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<sup>5</sup> Water Code § 10721(v)

<sup>6</sup> 23 CCR § 354.26

<sup>7</sup> Water Code § 10733.6(c)-(d)

<sup>8</sup> 23 CCR § 358.4(a)

<sup>9</sup> 23 CCR § 350 *et seq.*

<sup>10</sup> 23 CCR § 358.4(b) (emphasis added)

<sup>11</sup> Procedural requirements, including submissions by the agency, posting by the Department, and the public comment period, apply equally to plans and alternatives (23 CCR § 355.2(a)-(c)). The periodic review of Plans (23 CCR § 355.6(a)) applies to alternatives prospectively but does not apply to initial submissions. Other regulatory provisions are inapplicable to alternatives, including the two-year review period (23 CCR § 355.2(e)), which is based on the statutory time-frame that applies to Plans but not alternatives (Water Code § 10733.4(d)); the "incomplete" status that allows the agency to address "one or more deficiencies that preclude approval, but which may be capable of being corrected by the Agency in a timely manner" (23 CCR § 355.2(e)(2)), which applies to plans undergoing development, but not alternatives that purportedly satisfy the objectives of SGMA at the time of their submission (Water Code § 10733.6(a)); and, for the same reason, corrective actions to address deficiencies in plans (23 CCR § 355.4(a)(4)), which applies to plans developed after the adoption of SGMA, but is inapplicable to alternatives that predate SGMA.

<sup>12</sup> 23 CCR § 358.2(d), based on the statutory threshold of "whether the alternative satisfies the objectives of [SGMA] for the basin" (Water Code § 10733.6(a)).

<sup>13</sup> 23 CCR § 358.2(d)

a determination of the degree to which the alternative matched the specific requirements of the GSP Regulations.

When evaluating whether an alternative satisfies the objectives of SGMA and thus is likely to achieve the sustainability goal for the basin, staff review the information provided by and relied upon by the agency for sufficiency, credibility, and consistency with scientific and engineering professional standards of practice.<sup>14</sup> The Department's review considers whether there is a reasonable relationship between the information provided and the assumptions and conclusions made by the agency, whether sustainable management criteria and projects and management actions described in the alternative are commensurate with the level of understanding of the basin setting, and whether those projects and management actions are feasible and likely to prevent undesirable results.<sup>15</sup> Staff will recommend that an alternative be approved if staff believe, in light of these factors, that the alternative has achieved or is likely to achieve the sustainability goal for the basin.<sup>16</sup>

An alternative that relies on an existing plan may be approved based on information that demonstrates the basin is being or will be managed sustainably based on groundwater management pursuant to that plan, including any related projects and management actions, as necessary. Even when staff review indicates that a plan will satisfy the objective of SGMA, the Department may recommend actions to facilitate future evaluation of the alternative. Recommended actions may include the quantification of thresholds, improvement of monitoring networks, and other modifications as required to facilitate future evaluation of whether the alternative has achieved goals and objectives set out by the agency in the groundwater management plan, as well as any information necessary to evaluate whether the alternative adversely affects adjacent basins. DWR proposes that recommended actions be addressed by the submission date for the first periodic evaluation.

Staff assessment of an alternative involves the review of information presented by the agency, including models and assumptions, and an evaluation of that information based on scientific reasonableness. The assessment does not require Department staff to recalculate or reevaluate technical information provided in the alternative or to perform its own geologic or engineering analysis of that information. The staff recommendation to approve an alternative does not signify that Department staff, were they to exercise the professional judgment required to develop a plan for the basin, would make the same assumptions and interpretations as those contained in the alternative, but simply that

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<sup>14</sup> 23 CCR § 351(h)

<sup>15</sup> 23 CCR § 355.4(b)(1), (3), and (5).

<sup>16</sup> 23 CCR § 355.4(b)

Department staff have determined that the assumptions and interpretations relied upon by the submitting agency are reasonable.

### III. Alternative Materials

The District submitted an alternative based on a groundwater management plan pursuant to Water Code Section 10733.6(b)(1). The Alternative thus relies primarily upon the following document:

- *Tahoe Valley South Basin (6-5.01) 2014 Groundwater Management Plan (Groundwater Management Plan)*

The District submitted the following additional plans, reports, and other documents that the Department has determined to be sufficiently related to the Groundwater Management Plan to warrant their consideration as part of the Alternative:

- Bergsohn, I. (Mar. 11, 2016). South Tahoe Public Utility District: Tahoe Valley South Basin (6-5.01) Annual Report – 2015 Water Year. (2015 Water Year Report). The 2015 Water Year Report was prepared by the District to track progress on the implementation of the Groundwater Management Plan through an assessment of the groundwater supplies and conditions, review of monitoring data, and progress reporting on implementation of Basin Management Objectives (BMOs).
- Carrol, R. W.H., Pohll, G., & Rajagopal, S. (Feb. 25, 2016). Desert Research Institute: South Lake Tahoe Groundwater Model. (DRI Phase 1 Memo). The DRI Phase 1 Memo was prepared at the request of the District to develop a numerical groundwater model to calculate a water budget for the water years 1983 to 2014 for the Tahoe South Subbasin. Refinement of a groundwater model is included in the implementation plan for the Groundwater Management Plan and addresses one of the District's BMOs.
- Carrol, R. W.H., Pohll, G., & Rajagopal, S. (Aug. 26, 2016). Desert Research Institute: South Lake Tahoe Groundwater Model Update. (DRI Phase 2 Memo). The DRI Phase 2 Memo was prepared at the request of the District to extend the numerical groundwater model through water year 2015 for the Tahoe South Subbasin.
- J. Crowley Group, ECORP Consulting, Inc. (Jun. 2016), South Tahoe Public Utility District: 2015 Urban Water Management Plan. (Urban Water Management Plan). The Urban Water Management Plan was prepared at the request of the District and is used by the District in the Groundwater Management Plan for future water demand projections for the Tahoe South Subbasin.

The District also submitted an Alternative Elements Guide and has submitted Annual Reports.<sup>17</sup> Other material submitted by the District, public comments, other documents submitted by third parties, correspondence, and other information provided to or relied upon by the Department have been posted on the Department's website. Copies of the 2015 Water Year Report, DRI Model Phase 1 Memo, DRI Model Phase 2 Memo, and Urban Water Management Plan were submitted in a single document uploaded to the Department's website<sup>18</sup> as "0\_C1\_ Cover Letter with Attachments (GWMP Alternative).pdf." Department staff refer to this document as "Cover Letter with Attachments" and provides PDF page references in the footnotes.

## IV. Required Conditions

An alternative, to be evaluated by the Department, must be submitted by the statutory deadline and be within a basin that complies with Part 2.11 of Division 6 of the Water Code.<sup>19</sup> A submitted alternative must also be complete and must cover the entire basin.<sup>20</sup>

### A. Submission Deadline

SGMA requires that an alternative for a basin categorized as high- or medium-priority as of January 31, 2015, be submitted no later than January 1, 2017.<sup>21</sup>

The District submitted its Alternative on December 29, 2016, before the statutory deadline.

### B. Part 2.11 (CASGEM) Compliance

SGMA requires that the Department assess whether an alternative is within a basin that is in compliance with Part 2.11 of Division 6 of the Water Code,<sup>22</sup> which requires that groundwater elevations in all groundwater basins be regularly and systematically monitored and that groundwater elevation reports be submitted to the Department.<sup>23</sup> To manage its obligations under this law, the Department established the California Statewide Groundwater Elevation Monitoring (CASGEM) Program. The acronym CASGEM is used in this document to denote both the program and the groundwater monitoring law.<sup>24</sup>

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<sup>17</sup> The Annual Report is not part of the Alternative and was not reviewed by the Department for the purpose of approving the Alternative.

<sup>18</sup> <https://sgma.water.ca.gov/portal/#alt>

<sup>19</sup> Water Code § 10733.6(c)-(d)

<sup>20</sup> 23 CCR § 358.4(a)

<sup>21</sup> Water Code § 10733.6(c). Pursuant to Water Code § 10722.4(d), a different deadline applies to a basin that has been elevated from low- or very low-priority to high- or medium-priority after January 31, 2015.

<sup>22</sup> Water Code § 10733.6(d)

<sup>23</sup> Water Code § 10920 *et seq.*

<sup>24</sup> Stats.2009-2010, 7th Ex.Sess., c. 1 (S.B.6), § 1

SGMA specifies that an alternative does not satisfy the objectives of SGMA if the basin is not in compliance with the requirements of CASGEM.<sup>25</sup> The Department staff confirmed that the Tahoe South Subbasin was in compliance with the requirements of CASGEM prior to evaluating this Alternative and confirmed that the Subbasin remained in compliance with CASGEM through the last reporting deadline, prior to issuing this assessment.

### C. Completeness

GSP Regulations specify that the Department shall evaluate an alternative if that alternative is complete and includes the information required by SGMA and the GSP Regulations.<sup>26</sup> An alternative submitted pursuant to Water Code Section 10733.6(b)(1) must include a copy of the groundwater management plan and an explanation of how the elements of the Alternative are functionally equivalent to the elements of a Plan required by Articles 5 and 7 of the GSP Regulations and are sufficient to demonstrate the ability of the Alternative to achieve the objectives of SGMA.<sup>27</sup>

The District submitted the Groundwater Management Plan for the Tahoe South Subbasin and a number of complementary documents, as indicated above, along with an Alternative Elements Guide, which includes the District's explanation of how the elements of the Alternative are functionally equivalent to the elements of a GSP. Department staff found the Alternative to be complete and containing the required information, sufficient to warrant an evaluation by the Department.

### D. Basin Coverage

An alternative is required to cover the entire basin.<sup>28</sup> An alternative that is intended to cover the entire basin may be presumed to do so if the basin is fully contained within the jurisdictional boundaries of the submitting agency. However, an alternative submitted by an agency whose jurisdictional boundaries do not include all areas of the basin may nevertheless be found to effectively cover the entire basin. Because the intent of SGMA is to provide for the sustainable management of groundwater basins,<sup>29</sup> with sustainability defined as the management and use of groundwater that does not cause undesirable results,<sup>30</sup> an alternative effectively covers the entire basin if it results in groundwater management that avoids undesirable results. An alternative that cannot avoid undesirable results is not sustainably managing the basin even if the entire basin is within the jurisdiction of the managing agency, but an alternative that avoids undesirable results

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<sup>25</sup> Water Code § 10733.6(d)

<sup>26</sup> 23 CCR § 358.4(a)(3)

<sup>27</sup> 23 CCR § 358.2(c)-(d)

<sup>28</sup> 23 CCR § 358.4(a)(4)

<sup>29</sup> Water Code § 10720.1(a)

<sup>30</sup> Water Code § 10721(v)

throughout the basin is sustainably managing that basin even if some part of the basin lies outside the jurisdiction of that agency.

The service area jurisdictions of South Tahoe Public Utility District do not cover the entire Tahoe South Subbasin. However, per Water Code Section 10750.8, the District manages groundwater outside of its service area jurisdiction pursuant to a memorandum of understanding with El Dorado County, which does have jurisdiction in the entire Tahoe South Subbasin.<sup>31</sup> Furthermore, the Groundwater Management Plan analysis covers the entire Tahoe South Subbasin and the District submitted the Alternative to the Department for the entire Subbasin and stated that implementation of the Plan has been effective in sustainably managing the groundwater resources in Tahoe South Subbasin, as required by SGMA.<sup>32</sup>

## V. Alternative Contents

GSP Regulations require the submitting agency to explain how the elements of the alternative are functionally equivalent to the elements of a GSP required by Articles 5 of the GSP Regulations<sup>33</sup> and are sufficient to demonstrate the ability of the alternative to achieve the objectives of SGMA.<sup>34</sup>

As stated previously, alternatives based on plans and studies that predate the passage of SGMA or adoption of GSP Regulations are not expected to conform to the precise format and content of a GSP, and the criteria for adequacy of an alternative is whether the Department is able to determine that the alternative satisfies the objectives of SGMA. Department staff rely on the submitting agency's determination of functional equivalence of alternative elements to facilitate its evaluation and assessment of the alternative (see Assessment, below). Although the exact components of a GSP are not required for an alternative, for organizational purposes the discussion of information contained in the Groundwater Management Plan and related documents provided by the District follows the elements of a GSP provided in Article 5 of the GSP Regulations. The reference to requirements of the GSP Regulations at the beginning of each section is to provide context regarding the nature of the element discussed but is not meant to define a strict standard applicable to alternatives.

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<sup>31</sup> Cover Letter with Attachments, PDF p. 2

<sup>32</sup> Cover Letter with Attachments, PDF p. 1

<sup>33</sup> 23 CCR § 354-355.44

<sup>34</sup> 23 CCR § 358.2(d). The requirements pertaining to Article 7 of the GSP Regulations (23 CCR § 356-356.4) relate to annual reports and periodic evaluation and are not applicable to review of the initial alternative.



## A. Administrative Information

GSP Regulations require information identifying the submitting agency, describing the GSP area, and demonstrating the legal authority and ability of the submitting agency to develop and implement a GSP for that area.<sup>35</sup>

The Groundwater Management Plan states that the legal authority of the District to develop and implement the Plan is pursuant to Water Code Section 10753(a).<sup>36</sup> A groundwater management ordinance was developed and adopted by the District to provide the District a mechanism to regulate and protect the groundwater resources with an emphasis on protecting groundwater quality. A copy of the adopted groundwater management ordinance is included in the Plan.<sup>37</sup> The District collaborated with the other water purveyors, governmental agencies, and authorities in the Tahoe South Subbasin and convened a Stakeholder Advisory Group to receive input from the public, local and state agencies, and business owners for the development and implementation of the Plan.<sup>38</sup> The Plan, specifically the groundwater management ordinance, describes mechanisms for passing the costs to customers through charges and taxes.

## B. Basin Setting

GSP Regulations require information about the physical setting and characteristics of the basin and current conditions of the basin, including a hydrogeologic conceptual model, a description of historical and current groundwater conditions, and an assessment of the water budget.<sup>39</sup>

### 1. Hydrogeologic Conceptual Model

The GSP Regulations require a descriptive hydrogeologic conceptual model of the basin that includes a written description supported by cross sections and maps.<sup>40</sup>

Information related to the hydrogeologic conceptual model for the Tahoe South Subbasin is contained in the Groundwater Management Plan. The Plan describes the delineation of the Tahoe South Subbasin boundaries, regional geology, structural setting, bounding faults, basin geology, and aquifer system description. The Plan states the alluvial basin is comprised of glacial outwash, fluvial, and lacustrine deposits ranging from about 100-foot thick to over 1,000-foot thick and provides cross sections of the subsurface.<sup>41</sup> The Plan explains that at least 26 water-bearing zones were identified in the basin-fill aquifer

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<sup>35</sup> 23 CCR § 342.2-342.19

<sup>36</sup> Groundwater Management Plan, PDF p. 17

<sup>37</sup> Groundwater Management Plan, PDF p. 333

<sup>38</sup> Groundwater Management Plan, PDF p. 19

<sup>39</sup> 23 CCR § 354.12 et seq.

<sup>40</sup> 23 CCR § 354.14(a)

<sup>41</sup> Groundwater Management Plan, Figures 2-4 and 2-5

using lithologic and geophysical logs. The 26 water-bearing zones were correlated by high and low permeability to divide the basin-fill into 11 layers. Laterally continuous fine-grained lake-bed deposits form local confining layers (aquitards) that affect groundwater flow between the water-bearing zones. The shallowest water-bearing zones occur in the upper 200 feet of the subsurface and are the zones that interact most with surface water systems in the Tahoe South Subbasin. Up to five of the water-bearing zones occurring in the Tahoe South Subbasin have been identified as practical for groundwater management; these water-bearing zones have been given informal designations based on the local geographic area and the stratigraphic order.<sup>42</sup> For example, the four water-bearing zones underlying the Christmas Valley area are designated as CVZ<sub>1</sub>, CVZ<sub>2</sub>, CVZ<sub>3</sub>, and CVZ<sub>4</sub>, with CVZ<sub>1</sub> being the deepest water-bearing zone and CVZ<sub>4</sub> being the shallowest water-bearing zone. The Plan also provides qualitative descriptions of the physical properties of the aquifer system and the DRI Phase 1 Memo<sup>43</sup> provides estimated values of the aquifer properties for the Subbasin. The Plan also identifies recharge zones and areas of groundwater-surface water interaction.<sup>44</sup> The DRI Phase 1 Memo characterizes the development of the numerical model based on the hydrogeologic conceptual model information and research referenced in the Plan.<sup>45</sup>

## 2. Groundwater Conditions

The GSP Regulations require a description of historical and current groundwater conditions in the basin that includes information related to groundwater elevations, groundwater storage, seawater intrusion, groundwater quality, subsidence, and interconnected surface water, as applicable. The GSP Regulations also require an identification of groundwater dependent ecosystems.<sup>46</sup>

Groundwater conditions are described in the Groundwater Management Plan and accompanying 2015 Water Year Report.<sup>47</sup> For the groundwater levels, the District collects groundwater elevation measurements in November and May, coinciding with the seasonal low and high, and presents readings from 2001 through 2013 in hydrographs provided in the Plan.<sup>48</sup> The 2015 Water Year Report submitted with the Groundwater Management Plan, presents readings from 2004 to 2015.<sup>49</sup> The Plan describes the general water elevation trends, horizontal and vertical flow directions, and pumping induced effects observed from the groundwater elevation data to characterize the

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<sup>42</sup> Groundwater Management Plan, PDF p. 50

<sup>43</sup> Cover Letter with Attachments, PDF p. 79

<sup>44</sup> Groundwater Management Plan, Figure 6-3

<sup>45</sup> Cover Letter Attachment, PDF p. 82

<sup>46</sup> 23 CCR § 354.16

<sup>47</sup> Cover Letter Attachment, PDF p. 120

<sup>48</sup> Groundwater Management Plan, Figures 5-3 through 5-13

<sup>49</sup> Cover Letter Attachment, PDF p. 127

groundwater conditions.<sup>50</sup> The general groundwater level pattern observed by the District is that higher groundwater levels occur along the Subbasin margins where runoff from the surrounding mountains recharges the Subbasin and the lowest groundwater elevations occur along the south shore of Lake Tahoe which is the primary discharge area for groundwater to surface water.<sup>51</sup> The District provides groundwater elevation hydrographs for 2001 to 2015 from wells across the Tahoe South Subbasin and states that the hydrographs show that the long-term trend is relatively stable.<sup>52</sup> The Plan provides context for important trends shown on the hydrographs with discussions of corresponding groundwater management actions. For example, the hydrograph for the Valhalla Well, an active production well, shows a declining trend from 2000 through 2008, and a rising trend since 2008 which corresponds to when the District restricted production from the well to sustain the aquifer.<sup>53</sup>

The Groundwater Management Plan provides groundwater contour maps depicting average groundwater elevations from all the monitoring wells in the network for November 2013 (which represents drought conditions) and May 2011 (which represents wet conditions) to represent the maximum range in groundwater levels.<sup>54</sup> For groundwater storage, the District provides estimates of the cumulative and annual change in groundwater storage for an approximately 30-year period in the 2015 Water Year Report based on groundwater level information and the MODFLOW-NWT model (Tahoe Valley South Basin Model or TVS Model) (See Water Budget, below).<sup>55</sup>

The Groundwater Management Plan identifies interconnected surface water systems as stream channels along much of the Upper Truckee River and Trout Creek where baseflow accounts for a substantial portion of the streamflow during the late summer and fall.<sup>56</sup> The Groundwater Management Plan also identifies that a potential consequence of pumping groundwater is the reduction of baseflow to stream channels that have identified Stream Environment Zones. The locally-defined term, Stream Environment Zone, is used to denote perennial, intermittent and ephemeral streams and drainages that possess the characteristics of riparian or hydric vegetation, alluvial, hydric soils, and/or presence of surface water or near-surface groundwater at least part of the year.<sup>57</sup> The District describes the analysis that was conducted on municipal supply wells that are located near major streams to investigate the effect of pumping on the surface water system.<sup>58</sup> The Groundwater Management Plan explains that results of the analysis indicate that six of

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<sup>50</sup> Groundwater Management Plan, PDF p. 50

<sup>51</sup> Groundwater Management Plan, PDF p. 55

<sup>52</sup> Groundwater Management Plan, PDF p. 53

<sup>53</sup> Groundwater Management Plan, PDF p. 54

<sup>54</sup> Groundwater Management Plan, PDF p. 55 and Figure 5-12 and 5-13

<sup>55</sup> Cover Letter with Attachments, PDF p. 134

<sup>56</sup> Groundwater Management Plan, PDF p. 56

<sup>57</sup> Groundwater Management Plan, PDF p. 27

<sup>58</sup> Groundwater Management Plan, PDF p. 56

the nine wells in close proximity to surface water bodies are screened in confined zones hydraulically disconnected from the shallow aquifer and the surface water body. The Plan explains that the analysis shows the wells have varying levels of connection to the surface water bodies, including one well that indicates depletion up to 10 percent.<sup>59</sup> The Plan does not describe the effects of these interconnections on the Stream Environment Zones, but a project to assess how water supply activities effect environmental conditions is identified as an area for further study in the Groundwater Management Plan's implementation plan.<sup>60</sup>

The Groundwater Management Plan provides an assessment of the potential for subsidence in the Tahoe South Subbasin. The document explains that subsidence is unlikely to occur because much of the basin-fill consists of coarse glacial deposits that are not subject to subsidence. The fine-grained layers that are present, are likely to have been already compacted due to the glacial history of the Subbasin and deep declines in groundwater levels would have to occur to allow for compaction. The Plan states that subsidence is not likely to occur given the stable groundwater levels in Tahoe South Subbasin.<sup>61</sup>

The Groundwater Management Plan provides extensive information of known groundwater quality issues that affect the beneficial uses of groundwater and provides maps of the groundwater cleanup sites and source protection areas. Groundwater quality issues in the Tahoe South Subbasin include primary maximum contaminant level (MCL) exceedances for arsenic, radioactive constituents, and regulated industrial and commercial chemicals.<sup>62</sup> The District has removed public water supply wells from service, and in some instances, destroyed wells due to arsenic, uranium, petroleum hydrocarbon compounds, and chlorinated hydrocarbon compounds. Several methyl tert-butyl ether (MTBE) and tetrachloroethylene (PCE) plumes have been identified and are being remediated.<sup>63</sup> The Plan identifies various agencies and programs that regulate and respond to groundwater quality concerns in the Tahoe South Subbasin including the Lahontan Regional Water Quality Control Board, State Water Resources Control Board, California Environmental Protection Agency, El Dorado County Department of Environmental Management, El Dorado County Hazardous Materials Emergency Response Program, Tahoe Regional Planning Agency, and Nevada Department of Environmental Protection.<sup>64</sup> The Plan does not identify water quality concerns that are not regulated by other programs.

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<sup>59</sup> Groundwater Management Plan, PDF p. 58

<sup>60</sup> Groundwater Management Plan, PDF p. 111

<sup>61</sup> Groundwater Management Plan, PDF p. 61

<sup>62</sup> Groundwater Management Plan, PDF p. 63

<sup>63</sup> Groundwater Management Plan, PDF p. 68-74

<sup>64</sup> Groundwater Management Plan, Appendix B, PDF p. 219

### 3. Water Budget

GSP Regulations require a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions, and the change in the volume of water stored, as applicable.<sup>65</sup>

Groundwater is the primary source of drinking water in the Subbasin and accounts for more than 95 percent of the potable water supply.<sup>66</sup> The Groundwater Management Plan provides information related to the water budget that includes estimated average groundwater withdrawals due to pumping, average groundwater recharge as a percentage of precipitation, average natural discharge due to groundwater outflow to Lake Tahoe, stream-aquifer interaction, and evapotranspiration from meadows and riparian areas.<sup>67</sup> The District developed a groundwater model, called the TVS Model, as planned in the Groundwater Management Plan. The TVS Model was used to calculate the water budget components for the years 1983 to 2014 for the Subbasin using observed groundwater elevations.<sup>68</sup> In 2016, an update to the TVS Model was completed to extend the model through 2015.<sup>69</sup> The TVS Model estimated that the Subbasin experienced a mean reduction in storage of 2,300 acre-feet per year over the simulation period (1983 to 2015) (See Assessment section for Department staff's assessment of the groundwater storage calculation).<sup>70</sup> For projected water budget conditions, the Plan uses estimates from a 2010 Urban Water Management Plan to project a decreasing water demand from 5,353 to 4,701 acre-feet per year for the years 2015 to 2035, respectively.<sup>71</sup> The 2015 Urban Water Management Plan, which was submitted as an accompaniment to the Alternative, indicates an increasing water demand for 2020 to 2035 of 6,019 to 6,373 acre-feet per year, respectively.<sup>72</sup>

### 4. Management Areas

GSP Regulations authorizes, but does not require, an agency to define one or more management areas within a basin if the agency has determined that creation of management areas will facilitate implementation of the GSP.<sup>73</sup>

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<sup>65</sup> 23 CCR § 354.18

<sup>66</sup> Groundwater Management Plan, PDF p. 30

<sup>67</sup> Groundwater Management Plan, PDF p. 59

<sup>68</sup> Cover Letter with Attachments, PDF p. 80

<sup>69</sup> Cover Letter with Attachments, PDF p. 107

<sup>70</sup> Cover Letter with Attachments, PDF p. 109

<sup>71</sup> Groundwater Management Plan, PDF p. 31

<sup>72</sup> Cover Letter with Attachments, PDF p. 237

<sup>73</sup> 23 CCR § 354.20

The District has not identified management areas or defined management strategies that are functionally equivalent to management areas within the Tahoe South Subbasin.

## C. Sustainable Management Criteria

GSP Regulations require a sustainability goal that defines conditions that constitute sustainable groundwater management for the basin, characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator, as appropriate.<sup>74</sup>

### 1. Sustainability Goal

GSP Regulations require that sustainable management criteria include a sustainability goal that culminates in the absence of undesirable results within the appropriate timeframe, and includes a description of the sustainability goal, describes information used to establish the goal for the basin, describes measures that will be implemented to ensure the basin operates within its sustainable yield, and contains an explanation of how the sustainability goal will be met.<sup>75</sup>

The Groundwater Management Plan developed BMOs to provide a flexible approach that can be adapted to changing local conditions and help increase understanding of the groundwater resources in the Subbasin.<sup>76</sup> The District defined the following eight BMOs for the Subbasin to maintain a sustainable long-term groundwater supply (BMO 1); maintain and protect groundwater quality (BMO 2); strengthen collaborative relations with local water purveyors, governmental agencies, businesses, private property owners, and the public (BMO 3); integrate groundwater quality protection into local land use planning activities (BMO 4); assess the interaction of water supply activities with environmental conditions (BMO 5); convene an ongoing stakeholder advisory group as a forum for future groundwater issues (BMO 6); conduct technical studies to assess future groundwater needs and issues (BMO 7); and identify and obtain funding for groundwater projects (BMO 8).<sup>77</sup> The Plan provides a discussion of measures that will be implemented to improve understanding of the groundwater Subbasin and monitoring programs and data sources that will be used to manage the Subbasin sustainably.<sup>78</sup>

### 2. Sustainability Indicators

GSP Regulations specify that an agency define conditions that constitute sustainable groundwater management for the basin, including the characterization of undesirable

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<sup>74</sup> 23 CCR § 354.22

<sup>75</sup> 23 CCR § 354.24

<sup>76</sup> Groundwater Management Plan, PDF p. 89

<sup>77</sup> Groundwater Management Plan, PDF p. 89

<sup>78</sup> Groundwater Management Plan, PDF p. 90 - 105

results and the establishment of minimum thresholds and measurable objectives for each applicable sustainability indicator.<sup>79</sup>

Sustainability indicators are defined as any of the effects caused by groundwater conditions occurring throughout the basin that, *when significant and unreasonable*, cause undesirable results.<sup>80</sup> Sustainability indicators thus correspond with the six undesirable results – chronic lowering of groundwater levels indicating a depletion of supply if continued over the planning and implementation horizon, reduction of groundwater storage, seawater intrusion, degraded water quality, including the migration of contaminant plumes that impair water supplies, land subsidence that substantially interferes with surface land uses, and depletions of interconnected surface water that have adverse impacts on beneficial uses of the surface water<sup>81</sup> – but apply to groundwater conditions that are not necessarily, in and of themselves, significant and unreasonable. Rather, sustainability indicators refer to the effects caused by changing groundwater conditions that are monitored, and for which criteria in the form of minimum thresholds are established by the agency to define when the effect becomes significant and unreasonable, producing an undesirable result.

This section thus consolidates three facets of sustainable management criteria: undesirable results, minimum thresholds, and measurable objectives. Information pertaining to the processes and criteria relied upon to define undesirable results applicable to the basin, as quantified through the establishment of minimum thresholds, are addressed for each sustainability indicator. However, a submitting agency is not required to establish criteria for undesirable results that the agency can demonstrate are not present and are not likely to occur in a basin.<sup>82</sup>

#### *a. Chronic Lowering of Groundwater Levels*

GSP Regulations specify that the minimum threshold for chronic lowering of groundwater levels be based on groundwater elevations indicating a depletion of supply that may lead to undesirable results.<sup>83</sup>

The Groundwater Management Plan indicates maintaining groundwater levels within historical range would avoid undesirable results related to chronic lowering of groundwater levels in the Subbasin. However, quantitative metrics indicating where chronic lowering of groundwater levels may cause undesirable effects in the Subbasin were not identified in the Plan. BMO 1 states that the purpose of the measure is to manage the groundwater levels to track long-term sustainability and reliability of water

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<sup>79</sup> 23 CCR § 354.22

<sup>80</sup> 23 CCR § 351(ah)

<sup>81</sup> Water Code § 10721(x)

<sup>82</sup> 23 CCR § 354.26(d)

<sup>83</sup> 23 CCR § 354.28(c)(1)

supply in the Subbasin.<sup>84</sup> If long-term groundwater levels show a consistent declining trend that falls below the historical range, it would be indicative of potential overdraft conditions.<sup>85</sup> If excessive groundwater pumping is found to be the cause of historical low groundwater levels, then measures would be taken to either redistribute the pumping, or reduce pumping at the implicated well(s).<sup>86</sup> Historical ranges of groundwater elevations are graphically depicted in various hydrographs (see Groundwater Conditions, above).

### *b. Reduction of Groundwater Storage*

GSP Regulations specify that the minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results.<sup>87</sup>

The DRI Phase 1 and Phase 2 Memos<sup>88</sup> and 2015 Water Year Report<sup>89</sup>, submitted with the Alternative, document the annual groundwater storage change analysis for the Tahoe South Subbasin. The analysis estimated the annual change in groundwater storage in the Subbasin and the mean change in storage over the simulation period with the use of the TVS Model (see Water Budget, above). The Plan does not identify a quantitative metric for avoidance of undesirable results related to reductions in groundwater storage. BMO 1 does include tracking groundwater pumping volumes and maintaining groundwater levels within the historical range.

### *c. Seawater Intrusion*

GSP Regulations specify that the minimum threshold for seawater intrusion be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results.<sup>90</sup>

The Tahoe South Subbasin is located close to 6,250 feet above sea level in the Sierra Nevada and the closest source of saltwater is nearly 200 miles away.<sup>91</sup> The District contends that undesirable results related to this sustainability indicator is not applicable because seawater intrusion is not present and is not likely to occur in the Subbasin.

### *d. Degraded Water Quality*

GSP Regulations specify that the minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair

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<sup>84</sup> Groundwater Management Plan, PDF p. 89

<sup>85</sup> Groundwater Management Plan, PDF p. 89

<sup>86</sup> Groundwater Management Plan, PDF p. 89

<sup>87</sup> 23 CCR § 354.28(c)(2)

<sup>88</sup> Cover Letter with Attachments, PDF p. 79 and 107

<sup>89</sup> Cover Letter with Attachments, PDF p. 120

<sup>90</sup> 23 CCR § 354.28(c)(3)

<sup>91</sup> Cover Letter with Attachments, PDF p. 11



water supplies or other indicator of water quality as determined by the agency that may lead to undesirable results.<sup>92</sup>

The Plan identifies groundwater quality concerns impacting the Subbasin<sup>93</sup>, discusses actions the District is taking to mitigate the concerns<sup>94</sup>, and describes ongoing monitoring to maintain and protect groundwater quality.<sup>95</sup> The District's BMO 2 discusses water quality goals related to human-caused contaminants and indicates that all groundwater supply wells will meet drinking water standards as defined by the State Water Resources Control Board, Division of Drinking Water, and that water quality will not be impaired such that it affects beneficial uses of current or future groundwater.<sup>96</sup> The Plan provides lists of regulated constituents for drinking water including their MCLs and detections in monitoring locations. Several MCL exceedances are tabulated, but the District explains that wells with the exceedances are not being operated.<sup>97</sup> BMO 2 also indicates that water quality will be monitored, and actions will be taken if MCLs are exceeded, including additional monitoring, groundwater remediation, or well destruction and abandonment. Since pumping in the Tahoe South Subbasin is for domestic and municipal use, these water quality objectives are covered under the California State Water Resources Control Board, Division of Drinking Water and United States Environmental Protection Agency standards. The Plan does not identify water quality concerns that are not regulated by other programs.

#### *e. Land Subsidence*

GSP Regulations specify that the minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.<sup>98</sup>

The Plan states that the basin-fill consists primarily of coarse glacial deposits that would not be subject to subsidence. However the fine-grained lacustrine layers may have been susceptible to subsidence, but due to the glacial history in the Tahoe South Subbasin, those layers would likely have already been compacted and further compaction is not anticipated.<sup>99</sup> BMO 1 indicates that the District will monitor groundwater levels as the primary tool for identifying potential land subsidence.<sup>100</sup> The District has not developed separate minimum thresholds and measurable objectives for subsidence.

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<sup>92</sup> 23 CCR § 354.28(c)(4)

<sup>93</sup> Groundwater Management Plan, PDF p. 63

<sup>94</sup> Groundwater Management Plan, PDF p. 70

<sup>95</sup> Groundwater Management Plan, PDF p. 101

<sup>96</sup> Groundwater Management Plan, PDF p. 91

<sup>97</sup> Groundwater Management Plan, PDF p. 65, 66, and 69

<sup>98</sup> 23 CCR § 354.28(c)(5)

<sup>99</sup> Groundwater Management Plan, PDF p. 61

<sup>100</sup> Groundwater Management Plan, PDF p. 91 and 102

### *f. Depletion of Interconnected Surface Water*

GSP Regulations specify that the minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results.<sup>101</sup>

The District has not developed minimum thresholds and measure objectives for avoidance of undesirable results caused by depletion of interconnected surface water. BMO 1 indicates that the District will operate the Subbasin within the historical groundwater level range and BMO 5 indicates that the District will assess the effects of groundwater pumping on habitats in lakes, streams, and wetlands.<sup>102</sup> The Groundwater Management Plan does state that water supply operations in the Tahoe South Subbasin may both affect environmental conditions or be affected by changes in the environment. Groundwater-surface water interactions with Lake Tahoe and the rivers and streams serve as both groundwater discharge and recharge locations depending on the location and the time of year.<sup>103</sup> The Plan explains that a potential consequence of the connection between groundwater and surface water systems is that pumping from drinking water production wells has the potential of reducing baseflow to streams, which could affect Stream Environment Zones and the aquatic and biologic resources dependent on the habitats.<sup>104</sup> The Plan documents an analysis conducted by the District to determine the impact of groundwater withdrawals on surface water systems. The analysis indicates that that pumping in close proximity to Upper Truckee River, Trout Creek, and Bijou Creek is largely disconnected from the streams due to confining zones between the well screens and the shallow aquifer, with a few exceptions. Pumping from well SUT #3 may result in a depletion of 10 percent of baseflow in the fall,<sup>105</sup> Al Tahoe and Palmoa Wells could cause two to three-foot declines in shallow groundwater elevations underlying the Upper Truckee Marsh if production hypothetically increased by 50 percent,<sup>106</sup> and Bayview Well appears to be hydraulically connected to Lake Tahoe.<sup>107</sup>

## D. Monitoring Networks

GSP Regulations require that each basin be monitored, and that a monitoring network include monitoring objectives, monitoring protocols, and data reporting requirements be developed that shall promote the collection of data of sufficient quality, frequency, and

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<sup>101</sup> 23 CCR § 354.28(c)(6)

<sup>102</sup> Groundwater Management Plan, PDF p. 96

<sup>103</sup> Groundwater Management Plan, PDF p. 95

<sup>104</sup> Groundwater Management Plan, PDF p. 56

<sup>105</sup> Groundwater Management Plan, PDF P. 57

<sup>106</sup> Groundwater Management Plan, PDF p. 58

<sup>107</sup> Groundwater Management Plan, PDF p. 58

distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions.<sup>108</sup>

The Groundwater Management Plan relies upon a network of monitoring wells, stream gages, and other data sources to define groundwater levels, groundwater quality, and surface water flow.<sup>109</sup> The District collects groundwater elevation data from 30 observation wells and 17 supply wells located throughout the Tahoe South Subbasin to assess seasonal and long-term trends in groundwater elevation.<sup>110</sup> Of the 30 observation wells, 13 are equipped with dataloggers that measure and record elevation data twice a day; the remaining wells are measured semi-annually.<sup>111</sup> The wells used to monitor groundwater levels are screened at various depths which provides groundwater elevation data for different water bearing zones.<sup>112</sup> The Plan acknowledges that data gaps exist in the Taylor Creek and Tallac Creek watersheds.<sup>113</sup> The District collects samples and assesses groundwater quality from 15 production and monitoring wells on an annual basis.<sup>114</sup> The District, which is the largest groundwater pumper in the Subbasin, tracks and monitors its extraction volumes through meters for each of its production wells.<sup>115</sup> The Plan and DRI Phase 1 and Phase 2 Memos rely on groundwater data collected from the monitoring network to characterize the groundwater quality, develop hydrographs to demonstrate long-term groundwater elevation trends, and support development and calibration of the TVS Model used to calculate the water budget. The BMOs described in the Groundwater Management Plan include ongoing monitoring as a component of ensuring the long-term sustainability of groundwater through collection and tracking of groundwater levels, groundwater pumping, and groundwater quality.<sup>116</sup>

## E. Projects and Management Actions

GSP Regulations require a description of the projects and management actions the submitting agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.<sup>117</sup>

Management actions that the District will implement are described in the Plan.<sup>118</sup> Actions described are standing procedures and on-going practices, short-term and long-term

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<sup>108</sup> 23 CCR § 354.32

<sup>109</sup> Groundwater Management Plan, PDF p. 106

<sup>110</sup> Groundwater Management Plan, PDF p. 267

<sup>111</sup> Groundwater Management Plan, PDF p. 101

<sup>112</sup> Groundwater Management Plan, PDF p. 269

<sup>113</sup> Groundwater Management Plan, PDF p. 268

<sup>114</sup> Groundwater Management Plan, PDF p. 101

<sup>115</sup> Groundwater Management Plan, PDF p. 102

<sup>116</sup> Groundwater Management Plan, PDF p. 89

<sup>117</sup> 23 CCR § 354.44

<sup>118</sup> Groundwater Management Plan, PDF p. 107

actions, and efforts that will require outside funding. Standing procedures and on-going practices include continued collection and review of groundwater levels, continued monitoring and review of groundwater quality data, and water conservation measures. Short-term actions include collecting and tracking groundwater pumping volumes, renewed investigations, and clean-up of groundwater contamination. Long-term actions include assessing the effects of changes to drinking water standards on groundwater supply and coordinating with regulatory agencies on remediation and closure of contaminated sites. Efforts that will require outside funding include assessing the effects of groundwater pumping on habitats in lakes, streams, and wetlands; assessing effects of climate change on groundwater conditions; and expanding the monitoring well network to evaluate recharge areas. These actions are designed to provide on-going monitoring to identify impacts to groundwater conditions that require additional assessment and address data gaps.

## VI. Assessment

The following describes the evaluation and assessment of the Alternative for the Tahoe South Subbasin as determined by Department staff. In undertaking this assessment, Department staff do not conduct geologic or engineering studies, although Department staff may rely on publicly available geologic or engineering or other technical information to verify claims or assumptions presented in the Alternative.<sup>119</sup> As discussed above, Department staff have determined that the Tahoe South Subbasin Alternative satisfied the conditions for submission of an alternative.<sup>120</sup> The Alternative was submitted within the statutory period, the Tahoe South Subbasin was found to be in compliance with the reporting requirements of CASGEM, and staff find the Alternative to be complete and to cover the entire Subbasin (see Required Conditions, above). Based on its evaluation and assessment of the Tahoe South Subbasin Alternative, as discussed below, Department staff find that the Alternative satisfies the objectives of SGMA.<sup>121</sup>

### A. Evaluation of Alternative Contents

Information provided in the Groundwater Management Plan supports the conclusion that the District has the legal authority and financial means, through the collection of fees, to implement the management actions described in the Plan. Additionally, the Plan was developed and is implemented through a process that includes participation from a wide range of interests representing the beneficial uses and users of groundwater through the

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<sup>119</sup> Instances where the Department review relied upon publicly available data that was not part of the Alternative are specifically noted in the assessment.

<sup>120</sup> 23 CCR § 358.4(a)

<sup>121</sup> Water Code § 10733.6(a); 23 CCR § 358.4(b)

Stakeholder Advisory Group and opportunities for public comments prior to the adoption of the Plan.

A high level of understanding of the basin setting is demonstrated in the detailed hydrogeologic conceptual model description included in the Plan. The hydrogeologic conceptual model is consistent with Department staff's understanding of the formation of the alluvial basin. The Groundwater Management Plan refers to the glacial history of the Subbasin in its qualitative assessment of the potential for subsidence in the Tahoe South Subbasin. Department staff agree that subsidence is not likely to be triggered due to the historical glacial loading and relatively stable groundwater levels demonstrated in the Plan.

Although a concise water budget discussion was not provided in the Plan, Department staff found the historical and current information presented in the DRI Phase 1 and Phase 2 Memos to provide sufficient and credible estimates of the inflows and outflows to the regional aquifer system and contributing watershed area. The DRI Phase 1 Memo provides numerical values for mean conditions from the model simulation period (1983-2014) and the DRI Phase 2 Memo includes a graphical water budget for each year in the simulation period (1983-2015). The simulation includes one inflow to the groundwater system (recharge) and three outflows (pumping, baseflow, and subsurface outflow to Lake Tahoe). On an annual basis, the natural outflows are subsurface outflow directly to Lake Tahoe and baseflow to interconnected surface water. There is no adjacent groundwater basin, so all subsurface outflow is expected to discharge to Lake Tahoe. This information provides the basic components of the water budget for the Subbasin; but a tabular water budget for each year was not provided in the model memos or the Groundwater Management Plan (see Recommended Action 1).

The Groundwater Management Plan does not directly include a projected water budget. It includes a discussion of expected climate change trends over the next century including a shift from precipitation as snow to rain under the warmer conditions. The Urban Water Management Plan provides projected water demands and supplies through 2035 in the Tahoe South Subbasin. However, the Urban Water Management Plan indicates that climate change does not appear to cause detrimental effects on the Subbasin. As a result, climate change does not appear to be accounted for in the projected water supply calculations (see Recommended Action 2). Furthermore, the District has identified contradictory projections for future water demands (see Water Budget, above). Department staff recognize that projections of water demands and supplies change over time, but the two projections show conflicting trends which is not reconciled in the Groundwater Management Plan (see Recommended Action 3). The water budget components provided are reasonable for the first submittal because of the relatively small anticipated changes in future demand and the ability for adaptive management.

The District has defined BMOs that are high-level goals with related operational practices designed to guide the management of groundwater in the Subbasin. BMO 1 establishes that the District will implement measures to manage groundwater for long-term sustainability and reliability by tracking groundwater levels to sustain the levels within the range of historical data. The other BMOs establish that the District will implement measures to maintain and protect groundwater quality, integrate groundwater quality protection with land-use planning, strengthen stakeholder participation and coordination with local agencies to manage groundwater, incorporate environmental stewardship as a part of groundwater management, conduct studies on emerging groundwater conditions and issues, and identify funding for groundwater projects and actions. Department staff find that, collectively, the District's BMOs define a reasonable sustainability goal for the TVS Subbasin.

The District presents a sufficient understanding of groundwater levels across the Subbasin informed by hydrographs from wells that are reasonably distributed through the Subbasin in relation to pumping patterns and include screened intervals from varying depths. Water levels in the majority of wells appear to be fairly stable and the District provides explanations for the cases where deviations from the stable trend have occurred. These deviations demonstrate that the District altered its operations in order to maintain the groundwater levels within historical range.<sup>122</sup> The Plan demonstrates the Subbasin has operated within historical ranges as identified by hydrographs and historical water demand data and is not experiencing chronic lowering of groundwater levels. However, the District does not quantify specific water levels that define the historical ranges at which the Subbasin will be operated. To facilitate the Department's future assessment of the Plan's implementation, Department staff recommend providing the specific water levels to better define what the District will be operating to (see Recommended Action 7).

Department staff find the management of the Subbasin within historical groundwater levels to also be protective of groundwater storage. Although the District uses the Subbasin's groundwater elevation data and the TVS Model to estimate a mean reduction in storage of 2,300 acre-feet per year over the simulation period (1983 to 2015), Department staff believe this calculated storage number is likely to be incorrect due to the limitations of the TVS Model and the assumptions the model is based on (see Recommended Action 4). Department staff find the groundwater levels demonstrated by the District to be indicative of stable groundwater conditions; therefore, this potential model discrepancy can be further studied, the model refined, and the storage conditions reevaluated in the five-year update. To facilitate the Department's future assessment of the Plan's implementation, Department staff also recommend that the District establish specific quantitative metrics for Subbasin storage (see Recommended Action 7).

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<sup>122</sup>Groundwater Management Plan, PDF p. 54

Department staff find the District's approach to managing groundwater quality in the Subbasin sufficient and reasonable. Groundwater contamination due to arsenic, radioactive constituents, petroleum hydrocarbon compounds, and chlorinated hydrocarbon compounds impacting the beneficial use of groundwater is well documented in the Subbasin. The Groundwater Management Plan demonstrates that the District, in collaboration with various regulating programs, manages the Subbasin to avoid adverse impacts to the Subbasin's water supply due to degraded groundwater quality by actively monitoring and cleaning the active contamination sites and changes its operations to avoid pumping contaminated water. The Groundwater Management Plan does not address how groundwater pumping may impact plume migration (see Recommended Action 5). However, through the identification of drinking water well source water protection areas, the District demonstrates an understanding of how long it would take for a water supply well to be impacted by potential contamination.<sup>123</sup>

The District conducted an analysis of the effect of groundwater pumping near surface water bodies in the Tahoe South Subbasin. The analysis indicates that many production wells in close proximity to surface water bodies are disconnected from the Subbasin's water bearing zones. As such, it appears to be a reasonable assessment that at the basin-level, Tahoe South Subbasin is not currently experiencing adverse impacts related to interconnected surface water. However, it also identified four wells that appear to be somewhat connected to surface water and could cause impacts to surface water flows if groundwater production operations were to change. The environment along these surface water flows are identified as Stream Environment Zones by the District in Figure 2-10.<sup>124</sup> Department staff find the identification of Stream Environment Zones, as defined in the Groundwater Management Plan, a reasonable surrogate of groundwater dependent ecosystems. While the discussion of interconnected surface water explains a limited interaction between certain production wells in close proximity to the major streams in the Tahoe South Subbasin, it does not provide an estimate of the quantity or timing of the depletion (see Recommended Action 6). This has been deemed acceptable for the first submittal because it was developed utilizing the best available information and appears reasonable given the uncertainty and level of understanding in the Subbasin; and is identified as an area for future study in the Groundwater Management Plan's implementation plan. To ensure that continued groundwater use in the Subbasin does not cause adverse impacts, Department staff recommend the District develop quantitative criteria for undesirable results related to depletion of interconnected surface water (see Recommended Action 7).

The Alternative submittal demonstrates the existence of an adequate monitoring network that provides an appropriate level of data for development and initial implementation of a

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<sup>123</sup> Groundwater Management Plan, PDF p. 181

<sup>124</sup> Groundwater Management Plan, PDF p. 139

plan to continue operating the Subbasin within historical groundwater levels. The groundwater elevation monitoring network provides the necessary data for the District to monitor groundwater levels as a proxy for monitoring reduction of groundwater storage, land subsidence, and depletion of interconnected streams. The District also identified data gaps that will help better assess groundwater elevations in an area that is identified in the Plan to have Stream Environment Zones, but states there are currently no plans or funding to install dedicated monitoring wells. While it is clear there is adequate monitoring information for plan development and initial implementation, the District should to address how the data gaps will be filled (see Recommended Action 8).

Projects and management actions described in the Plan are appropriately informed by and are commensurate and compatible with the level of understanding of Subbasin conditions documented in the Plan. Specifically, the projects and management actions are designed to continue monitoring and assess whether the long-term conditions in the Tahoe South Subbasin remain within historical ranges, thereby ensuring a sustainable groundwater supply. The District identifies important future studies to fill data gaps, such as assessment of the effects of groundwater pumping on habitats in lakes, streams, and wetlands. Although the District appears to have the authority to collect fees to fund projects, it prefers to look for outside funding sources instead (see Recommended Action 8).

The Groundwater Management Plan for the Tahoe South Subbasin intends to implement BMOs to manage groundwater supplies, protect groundwater quality, and foster stakeholder involvement for long-term sustainability and reliability of the water supply for all users within the Subbasin and is consistent with Water Code Section 106.3, which establishes the State policy that “every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes.” Department staff consider that the Groundwater Management Plan, which is expected to avoid adverse impacts related to interconnected surface waters, to also be consistent with the public trust doctrine.

## B. Recommended Actions

The following recommended actions include both information that should be included in the first five-year update of the Alternative to facilitate the Department’s ongoing evaluation of the Alternative and whether implementation of the Alternative is achieving the sustainability goal, and recommendations for improvements to the Alternative.

### Recommended Action 1.

Staff recommend that the District provide water budget information in tabular form for the historical, current, and projected water budgets.



## Recommended Action 2.

Staff recommend that the District provide a projected water budget incorporating climate change over the planning and implementation horizon of 50 years. The first five-year update should address the apparent discrepancy between the Groundwater Management Plan indicating a shift from snow to rain and the Urban Water Management Plan indicating no detrimental effects on the Subbasin.

## Recommended Action 3.

Staff recommend the District reconcile the differing future water demand trend projections between the Groundwater Management Plan, Urban Water Management Plan, and incorporate the reconciliation into the projected water budget.

## Recommended Action 4.

Staff recommend that in order to understand the change in groundwater storage for the Subbasin, the water budget calculated by the TVS Model should be calculated within the Subbasin boundary rather than the surrounding watershed area inclusive of the Subbasin. Recharge that becomes baseflow prior to entering the Subbasin should not be included in the TVS Model water budget calculations. In addition, storage outside of the Subbasin should not be included in the TVS Model water budget calculations. While these terms may cancel out on an annual basis, the offset between supply and demand may misrepresent the change in groundwater storage annually.

## Recommended Action 5.

The Alternative demonstrates the District's management of the Subbasin to avoid causing undesirable results to water supply related to degraded groundwater quality. However, Department staff recommend that additional explanation be provided in the first five-year update for how pumping may impact plume migration or cause degraded water quality.

## Recommended Action 6.

Department staff recommend that the District provide estimates of the quantity and timing of depletions of interconnected surface water and further define what would cause depletions to become significant and unreasonable for the Subbasin.

## Recommended Action 7.

Staff recommend that the District define quantitative criteria for groundwater levels, storage, and depletion of interconnected surface water that can be used to objectively determine compliance of the Plan with the objectives of SGMA on an ongoing basis. The District may consider using groundwater levels as a proxy for the other sustainability indicators.

## Recommended Action 8.

Staff recommend that in the first five-year update, the District provide a description of how the data gaps identified will be addressed; specifically, the projects identified in Table 10-1 for BMO 5 that are dependent upon the District obtaining outside funding.