

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

Groundwater Basin Name: Livermore Valley (Basin No. 2-010)
Submitting Agency: Zone 7 Water Agency
Recommendation: Approve
Date Issued: July 17, 2019

I. Summary

The Zone 7 Water Agency (Zone 7 or Agency) submitted an alternative (Livermore Valley Alternative *or* Alternative) for the Livermore Valley Groundwater Basin (Livermore Valley Basin or Basin) to the Department of Water Resources (Department) for evaluation and assessment as provided by the Sustainable Groundwater Management Act (SGMA).¹ The Livermore Valley Alternative is based on an analysis of basin conditions that demonstrates the basin has operated within its sustainable yield over a period of at least 10 years.² The Livermore Valley Alternative uses information developed previously as part of water resources planning efforts, which are described in other related documents and referenced through the Alternative Report. After a review of the Alternative Report, other related documents, and consideration of public comments submitted to the Department, Department staff find that the Livermore Valley Alternative satisfies the objectives of SGMA and recommends approval of the Alternative.

Zone 7 was established in 1957 to address water supply and flooding in the Livermore Valley and manage the Livermore Valley Basin to reverse the then-existing overdraft condition of the Basin.³ Zone 7 represents one of ten zones in the Alameda County Flood Control and Water Conservation District area within Alameda County. The Agency has been addressing water resources issues since it was established.⁴ The planning documents referenced in the Alternative Report document established goals and implemented projects and management actions by the Agency to address historical overdraft experienced in the early 1900s until the mid-1960s. The Livermore Valley Alternative demonstrates that the Agency has a good understanding of groundwater

¹ Water Code § 10720 *et seq.*

² Water Code § 10733.6(b)(3)

³ Groundwater Management Plan, Section 2.1, p. 2-3

⁴ Groundwater Management Plan, Section 2.1, pp. 2-1 to 2-4

conditions and sustainable management, and has stabilized groundwater levels through importing water, implementation of groundwater management programs, and artificial recharge.

Furthermore, Department staff considers the information that the Agency provided to be sufficient to demonstrate the Basin has been operating within the sustainable yield for at least 10 years. The Agency has accomplished operating within the Basin's sustainable yield by managing to target values for inflows and outflows from the Basin. These target values of inflows were developed in 1992, based on the Agency's approximation of the natural sustainable yield of the Basin, which is the sum of the average amount of natural recharge from percolation of rainfall, natural stream flow, and irrigation waters, and inflow of subsurface water.⁵ The natural sustainable yield of the Basin was then used by the Agency as the basis for allocating pumping amounts to municipal pumpers, which each have an established groundwater pumping quota. In general, this management approach, in addition to artificial recharge by the Agency has kept the Basin from repeating historical overdraft conditions.⁶ The Agency states that use of an established groundwater pumping quota, artificial recharge, and other management actions have maintained operation of the basin within the sustainable yield. The Alternative includes a description of an extensive monitoring program and data enabling the Department and the public to track conditions over time.

The Alternative sufficiently demonstrates that the Livermore Valley Basin has operated within its sustainable yield for a period of at least 10 years. In addition, staff have identified recommended actions that are designed to facilitate the Department's ongoing evaluation and assessment of the Plan including implementation and a determination of whether the Plan continues to satisfy the objectives of SGMA or adversely affects an adjacent basin.

The remainder of this assessment is organized as follows:

- **Section II. Review Principles** describes the legal and other considerations regarding the Department staff's assessment and evaluation of alternatives.
- **Section III. Alternative Materials** describes materials (i.e., plans, reports, data, and other information) submitted by the Agency that, collectively, the Department 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.

⁵ Alternative Report, Section 2.4.4, pp. 2-90 to 2-92

⁶ Alternative Report, Section 2.4.4, pp. 2-90 to 2-92

- **Section VI. Assessment** describes 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 Department has evaluated the Alternative to determine whether it satisfies the objectives of SGMA for the Livermore Valley Basin. To satisfy the objectives of SGMA, an alternative based on an analysis of basin conditions must demonstrate that the basin has been operated within its sustainable yield for a period of at least 10 years.⁷ The SGMA definition of sustainable yield requires the avoidance of undesirable results.⁸ As a result, an alternative based on an analysis of basin conditions must demonstrate that the submitting agency has an understanding of groundwater conditions that would cause undesirable results, as well as analysis in the alternative demonstrating the absence of undesirable results over a 10-year period.

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.⁹ The submitted alternative must also be complete and must cover the entire basin.¹⁰ The GSP Regulations¹¹ 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".¹² 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.¹³ Ultimately, the purpose of the evaluation is to determine whether an alternative satisfies

⁷ Water Code § 10733.6(b)(3)

⁸ Water Code § 10721(w)

⁹ Water Code § 10733.6(c)-(d)

¹⁰ 23 CCR § 358.4(a)

¹¹ 23 CCR § 350 *et seq.*

¹² 23 CCR § 358.4(b) (emphasis added)

¹³ 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.

the objectives of SGMA.¹⁴ The agency must explain how the elements of an 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 an alternative to achieve the objectives of SGMA.¹⁵ The explanation by the agency that elements of an alternative are functionally equivalent to elements of a GSP furthers the objective of demonstrating that an alternative satisfies the objectives of SGMA. Alternatives based on groundwater management plans or historical basin management practices that predate the passage of SGMA or adoption of GSP Regulations, although required to satisfy the objectives of SGMA, are not necessarily expected to conform to the precise format and content of a GSP. The Department’s assessment is thus focused on the ability of an alternative to satisfy the objectives of SGMA as demonstrated by information provided by the agency; it is not a determination of the degree to which an 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 reviews the information provided by and relied upon by the agency for sufficiency, credibility, and consistency with scientific and engineering professional standards of practice.¹⁶ 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 an 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.¹⁷ Staff will recommend that an alternative be approved if staff believe, in light of these factors, that alternative has achieved or is likely to achieve the sustainability goal for the basin.¹⁸

An alternative based on a demonstration that the basin has operated within its sustainable yield over a period of at least 10 years may be approved based on information that demonstrates that objective criteria defining operating standards that governed groundwater management for the basin were established and consistently achieved. Even when staff review indicates that an alternative will satisfy the objective of SGMA, the Department may recommend actions to facilitate future evaluation of that alternative and to allow the Department to better evaluate whether an alternative adversely affects

¹⁴ Water Code § 10733.6(a)). The Department considers the regulatory language in 23 CCR § 358.2(d) (“complies with the objectives of [SGMA]”) to be equivalent to the statutory threshold upon which it is based.

¹⁵ 23 CCR § 358.2(d)

¹⁶ 23 CCR § 351(h)

¹⁷ 23 CCR § 355.4(b)(1), (3), and (5).

¹⁸ 23 CCR § 355.4(b)

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 an 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 an alternative, but simply that Department staff has determined that the assumptions and interpretations relied upon by the submitting agency are supported by adequate, credible evidence, and are scientifically reasonable.

III. Alternative Materials

The Agency submitted an alternative based on an analysis demonstrating the Basin has operated within its sustainable yield for a period of at least 10 years, pursuant to Water Code Section 10733.6(b)(3). The Livermore Valley Alternative includes the following documents:

- Alternative Groundwater Sustainability Plan for the Livermore Valley Groundwater Basin, December 2016 (Alternative Report or Report). The Alternative Report is the primary document relied upon by the Agency to show the Basin operated within its sustainable yield for at least 10 years.
- Groundwater Management Plan for Livermore-Amador Valley Groundwater Basin, 2005 (Groundwater Management Plan).¹⁹ The Groundwater Management Plan was prepared by the Agency to provide the framework for groundwater management planning and has been implemented in coordination with other water management planning efforts since adoption in 2005.
- Annual Report for the Groundwater Management Program, 2015 Water Year (2015 Annual Report). The 2015 Annual Report was completed for the Groundwater Management Program and conveys data for historical and 2015 groundwater elevation monitoring, 2015 surface water flows and quality monitoring, historical and 2015 groundwater quality monitoring, 2015 water level and water quality data from mining area ponds or quarry lakes as part of the Chain of Lakes/Mining Area Monitoring Program, ground surface elevation changes at

¹⁹ The basin name used in the Groundwater Management Plan was the Livermore-Amador Valley Groundwater Basin.

benchmark locations as of 2015 (as part of Land Surface Elevation Monitoring Program), and historical and 2015 climate monitoring.

- Annual Report for the Groundwater Management Program, 2014 Water Year (2014 Annual Report). The 2014 Annual Report was completed for the Groundwater Management Program and conveys data for historical and 2014 groundwater elevation monitoring, 2014 surface water flows and quality monitoring, historical and 2014 groundwater quality monitoring, 2014 water level and water quality data from mining area ponds or quarry lakes as part of the Chain of Lakes/Mining Area Monitoring Program, ground surface elevation changes at benchmark locations as of 2014 (as part of Land Surface Elevation Monitoring Program), and historical and 2014 climate monitoring.
- Salt Management Plan, 2004. The Salt Management Plan was prepared to address the increasing level of total dissolved solids in the main groundwater basin (Main Basin) and provides technical information and analysis that support the Agency's salt management strategy.
- Nutrient Management Plan, Livermore Valley Groundwater Basin, 2015 (Nutrient Management Plan). The Nutrient Management Plan was prepared as an addendum to the Agency's Salt Management Plan and provides an assessment of the existing and future groundwater nutrient concentrations in the Basin and presents planned actions for addressing nutrient loads and high groundwater nitrate concentrations in localized areas of concern.
- 2015 Urban Water Management Plan (UWMP). The UWMP documents the Agency's most recent (as of 2015) water supply planning efforts which address water demand, water supply, and water resource management for the region covered by the urban water suppliers (Dublin San Ramon Services District, Livermore, Pleasanton, and California Water Service Company) in the Livermore-Amador Valley.
- Water Supply Evaluations Update, 2016. The Water Supply Evaluations Update provides an evaluation of Zone 7's long-term water supply and incorporates key assumptions, an approach, an analysis, and results that were vetted with the Livermore-Amador Valley's local water supply retailers.
- Draft Report Well Master Plan, 2003. The Draft Report Well Master Plan presents an understanding of the hydrogeology of the basin through cross sections, compilation of aquifer test data, groundwater modeling, and water quality data. The intent of the document was to identify preferred locations for wells and wellfields, and provide a preliminary guide for well construction, well production rates, total well yield, spacing requirements, design, cost, and potential water quality impacts.
- Historical SqueeSAR Ground Deformation Analysis over Livermore and Pleasanton, (CA) using ERS, ENVISAT and Sentinel Satellites, TRE Altimara, 2016 (Ground Deformation Analysis) (InSAR Report). The InSAR Report

documents an InSAR analysis that was performed using radar data for the 24-year period between 1992 and 2016, from three different satellites, to evaluate ground movement by measuring surface deformation in the areas of Livermore and Pleasanton.

- A Report of the History of Adjusted Values of Bench Marks Located in the Vicinity of the Main Groundwater Basin of the Livermore-Amador Valley, Altamont Land Surveyors, 1994 (Benchmark Report). The Benchmark Report documents a compilation of the available recorded elevations of localized bench marks established and monitored by Federal and Local Government agencies in what is referred to in the report as the main groundwater basin of the Livermore-Amador Valley.

The Agency also submitted an Alternative Elements Guide (Elements Guide) and a notice of exemption from the requirements of the California Environmental Quality Act (CEQA). The Agency has submitted Annual Reports, as required.²⁰ Other information provided to or relied upon by the Department has been posted on the Department's website and includes material submitted by the Agency, public comments, and correspondence.

IV. Required Conditions

An alternative, to be evaluated by the Department, must be submitted by a statutory deadline and be within a basin that complies with Part 2.11 of Division 6 of the Water Code.²¹ The submitted alternative must also be complete and must cover the entire basin.²²

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, 2017.²³

The Agency submitted the Livermore Valley 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,²⁴ which requires that

²⁰ The Annual Report is not part of the Alternative and was not reviewed by the Department for the purpose of approving the Alternative.

²¹ Water Code § 10733.6

²² 23 CCR § 358.6

²³ 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.

²⁴ Water Code § 10733.6(d)

groundwater elevations in all groundwater basins be regularly and systematically monitored and that groundwater elevation reports be submitted to the Department.²⁵ 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.²⁶

SGMA specifies that an alternative does not satisfy the objectives of SGMA if the basin is not in compliance with the requirements of CASGEM.²⁷ The Department confirmed that the Livermore Valley Basin was in compliance with the requirements of CASGEM prior to evaluating this Alternative and confirmed that the Basin 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.²⁸ An alternative submitted pursuant to Water Code Section 10733.6(b)(3) must include an analysis demonstrating the basin has operated within its sustainable yield over a period of at least 10 years. That analysis must include a report prepared by a registered professional engineer or geologist who is licensed by the state, and that report must be submitted under that engineer's or geologist's seal. The alternative must include an explanation of 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.²⁹

The Agency submitted an analysis under the seal of a licensed Professional Geologist along with an Alternative Elements Guide, which includes the Agency's explanation of how the elements of the Alternative are functionally equivalent to the elements of a GSP. The 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.³⁰ An alternative that is intended to cover an 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

²⁵ Water Code § 10920 *et seq.*

²⁶ Stats.2009-2010, 7th Ex.Sess., c. 1 (S.B.6), § 1

²⁷ Water Code § 10733.6(d)

²⁸ 23 CCR § 358.4(a)(3)

²⁹ 23 CCR § 358.4(c)-(d)

³⁰ 23 CCR § 358.4(a)(4)

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 sustainable management of groundwater that does not cause undesirable results, an alternative effectively covers the entire basin if it results in groundwater management that avoids undesirable results.³¹ 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 throughout the basin is sustainably managing that basin even if some part of the basin lies outside the jurisdiction of that agency.

The Alternative addresses the entire area of the Basin as currently defined by the Department. The Agency has jurisdiction over the portion of the basin within Alameda County, which covers most of the basin (Figure 1). For the remaining portion of the basin outside the Agency's jurisdiction that extends into Contra Costa County, the Agency has developed a memorandum of understanding with those agencies with jurisdiction including Contra Costa County, Contra Costa Water Agency, the City of San Ramon, the East Bay Municipal Utility District, and the Dublin San Ramon Services District. The MOU gives the Agency the delegated authority to be the GSA for the portion of the Basin outside of the jurisdiction of the Agency, which is located within the jurisdictions of those agencies listed above.³²

Based on the facts provided, Department staff determined that the Alternative covers the entire Basin.

³¹ Water Code § 10721(v)

³² Alternative Report, Appendix A, PDF p. 229

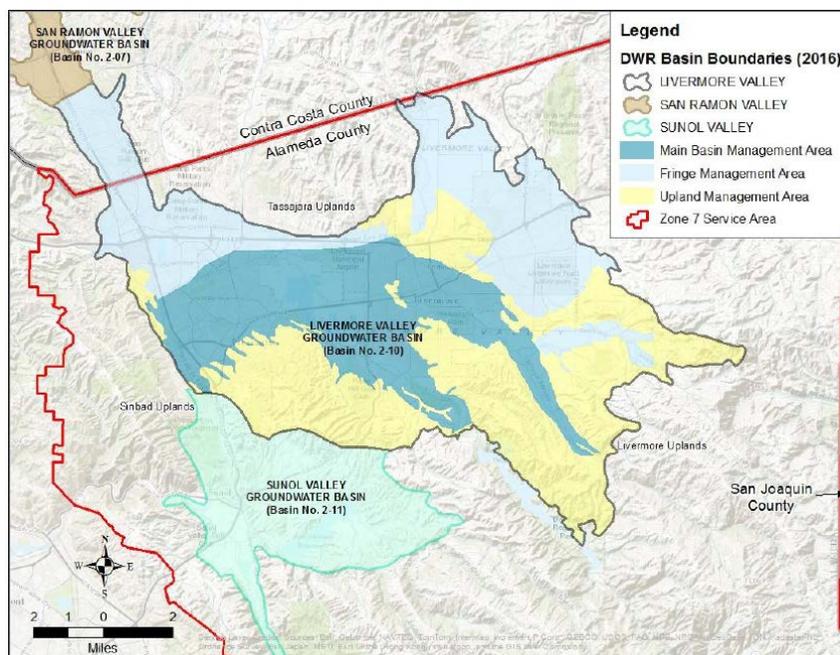


Figure 1. Map of Plan Area, Livermore Valley Groundwater Basin³³

V. Alternative Contents

GSP Regulations require the submitting agency to explain how the elements of an alternative are functionally equivalent to the elements of a GSP as required by Article 5 of the GSP regulations³⁴ and are sufficient to demonstrate the ability of an alternative to achieve the objectives of SGMA.³⁵

As stated previously, alternatives based on historical basin management practices that predate the passage of SGMA or adoption of GSP Regulations, although required to satisfy the objectives of SGMA, are not necessarily 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 an 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 an 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 Alternative Report and related documents provided by the Agency generally follows the elements of a GSP provided in Article 5 of the GSP Regulations. The reference to

³³ Alternative Report, Figure 1-4, p. 1-8

³⁴ 23 CCR § 354-354.44

³⁵ 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.

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.

A. Administrative Information

GSP Regulations require information identifying the submitting agency, describing the plan area, and demonstrating the legal authority and ability of the submitting agency to develop and implement a plan for that area.³⁶

The Alternative Report contains information describing the Agency, which represents one of ten active zones in the Alameda County Flood Control and Water Conservation District (District), and the legal authority of the Agency to implement projects and management actions. SGMA designated the Agency as the exclusive Groundwater Sustainability Agency within its statutory boundaries.³⁷ The Agency's key water resource responsibilities include the following:³⁸

- Serve as the contractor with DWR for the State Water Project
- Manage the local water right on Arroyo Valle
- Procure other water supplies as necessary to meet demands
- Provide wholesale treated water supply
- Provide untreated water for agriculture
- Operate and maintain water treatment and transmission systems
- Manage regional stormwater for public safety and protection of property
- Sustainably manage the Livermore Valley Basin

Under the Agency's Groundwater Management Program, the Agency administers management of the Basin and prevents groundwater overdraft.

The Alternative Report provides a description of the plan area, existing water resource monitoring and management programs, conjunctive use programs, and applicable general plans.³⁹ The Alternative Report states that the Agency involves the public, stakeholders and local agencies in its planning and programs through meetings, data sharing and online media and has memorialized this approach as an operational policy in the Agency's 1987 Statement on Groundwater Management.⁴⁰ The Agency describes

³⁶ 23 CCR § 354.2 et seq.

³⁷ Water Code § 10723 (c)(1)(A)

³⁸ Alternative Report, Section 1.2.2, pp. 1-3 to 1-4

³⁹ Alternative Report, Section 1.3, pp. 1-8 to 1-29

⁴⁰ Alternative Report, Section 1.3.5, pp. 1-27 to 1-28

how they routinely consider other agencies and interested parties in the Basin during management activities.⁴¹

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.⁴²

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.⁴³

The Alternative Report describes the hydrogeologic conceptual model of the Basin, including the geologic and structural setting, basin boundary definitions, and the basin hydrostratigraphy, and identifies principal aquifers and aquitards.⁴⁴ The Alternative Report describes the Livermore Valley Basin as a structural basin bound on the east and west by northwest-southeast trending faults, a thrust fault on the north, and bedrock hills to the south.⁴⁵ The Alternative Report divides the Basin into three areas based on geologic, hydrogeologic, and groundwater conditions.⁴⁶ These three areas include the Main Basin Management Area, the Fringe Management Area, and the Uplands Management Area (see Figure 1, above).⁴⁷ The hydrogeologic conceptual model discusses the conditions of the entire Basin, but the focus is on the Main Basin Management Area. The Main Basin Management Area refers to the central portion of the Basin that produces approximately 93 percent of groundwater in the Basin from a thick alluvial sequence that contains the highest yielding aquifers, the best quality groundwater, and the major municipal wells.⁴⁸ The Agency referred to this portion of the Basin as the central basin between 1980 and 1988 and began using the term Main Basin in 1988.⁴⁹

⁴¹ Outreach effort are listed on the Agency website: <https://www.zone7water.com/>; and Alternative Report, Section 1.3.5, pp. 1-27 to 1-28

⁴² 23 CCR § 354.12 et seq.

⁴³ 23 CCR § 354.14(a)

⁴⁴ Alternative Report, Section 2.2, pp. 2-10 to 2-25

⁴⁵ Alternative Report, Section E-2.2, p. E-4

⁴⁶ Alternative Report, Section E-1.2, p. E-3

⁴⁷ 23 CCR § 351(r) "Management area" refers to an area within a basin for which the Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.

⁴⁸ Alternative Report, Table 2-21 and Table 2-22, p. 2-88; and Table 2-24, p. 2-91. Average demands in the Main Basin, Fringe, and Upland Management Areas are 13,400 acre-feet per acre (93.4 percent), 728 acre-feet per acre (5.1 percent), and 217 acre-feet per acre (1.5 percent), respectively. Groundwater Management Plan, Section 3.1.4, p. 3-4

⁴⁹ Groundwater Management Plan, Section 3.1.4, p. 3-4

The Main Basin is bounded by several subsurface barriers to lateral groundwater movement, including numerous faults, which have been observed and investigated by Zone 7 and others.⁵⁰ The Fringe Management Area is characterized as having thinner alluvium with low groundwater storage, low well yields, and poorer groundwater quality. The Uplands Management Area is underlain by a low-yielding aquifer and, as a result, there are few wells in the area.⁵¹

The Alternative Report incorporates detailed information pertaining to the basin hydrology, geology, aquifers and aquitards, and climatic conditions into the hydrogeologic conceptual model of the Basin. The Agency also maintains a numerical groundwater flow model of the basin for predicting the consequences of proposed groundwater basin management actions.⁵² The active part of the numerical model covers subareas in both the Main Basin Management Area and the northwestern Fringe Management Area and generally uses the understanding of the hydrostratigraphy of the Basin as the basis for groundwater model layers and aquifer parameters.⁵³

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.⁵⁴

The Alternative Report and supporting documentation describe groundwater conditions for the Basin, with emphasis on the Main Basin Management Area (see Figure 1, above).⁵⁵ The Agency relies on data from numerous monitoring locations⁵⁶ primarily located in the Main Basin Management Area and Fringe Management Area to characterize groundwater use, current and historic conditions of groundwater elevation, groundwater in storage, water quality, land subsidence, and surface water-groundwater interaction.⁵⁷ The Agency presents groundwater elevation hydrographs from key wells throughout the Main Basin Management Area and the Fringe Management Area in the Alternative Report.⁵⁸ These hydrographs illustrate that groundwater elevations have

⁵⁰ Groundwater Management Plan, Section 3.1.4, p. 3-4

⁵¹ Alternative Report, Section E-1.2, p. E-3

⁵² Alternative Report, Section 2.6, p. 2-96; and 2015 Annual Report, Section 11.5, p. 11-14

⁵³ Alternative Report, Figure 2-14, p. 2-23; and Section 2.2.3.4, p 2-23 and pp. 2-25 to 2-27

⁵⁴ 23 CCR § 354.16

⁵⁵ Alternative Report, Section 2.3, p. 2-2; 2015 Annual Report, Section 5, p. 5-1; and Section 11, p. 11-1

⁵⁶ Alternative Report, Section 4, p. 4-1; Groundwater Management Plan, Appendix C, PDF p. 137; 2015 Annual Report, Section 2.2, p.2-1; Section 3.2, p. 3-1; Section 4.2, p.4-2; Section 5.2, p. 5-7; Section 6.2, p. 6-5; Section 7.2, p. 7-2; and Section 8.2, p. 8.2

⁵⁷ Alternative Report, Figure 2-17, p. 2-28

⁵⁸ Alternative Report, Figure 2-21, pg. 2-35

generally been stable for the periods of records dating back to the 1970s in most cases, except for drought periods (in the early 1990s and 2012-2015), where groundwater levels in some wells experienced temporary declines. Groundwater elevations recovered in those wells that experienced groundwater elevation declines.⁵⁹ The Agency created groundwater level maps using detailed information from a series of wells distributed through the Main Basin Management Area and Fringe Management Area.⁶⁰ The resulting contour maps are presented in the Alternative Report and present groundwater flow directions and gradients consistent with the hydrogeologic conceptual model.⁶¹

The Agency operates the basin to remain above historic low groundwater levels throughout the Main Basin Management Area.⁶² To quantify these levels, a contour map of historic lows has been prepared by the Agency for management purposes.⁶³ The map of historic low groundwater levels was first generated during the Agency's efforts to produce the Draft Report Well Master Plan.⁶⁴ The historic lows map was generated using a compilation of recorded low groundwater elevations in various wells in the basin typically from the 1960s, 1977, or 1987-1992 drought periods. Outside of the Main Basin Management Area, historic lows have not yet been determined; however, groundwater level hydrographs from various representative wells in the Fringe Management Area indicate that groundwater levels have not fluctuated significantly over time.⁶⁵

The Agency presents the estimated groundwater storage in the Main Basin Management Area from 1974 to 2015 in the Alternative Report and describes how groundwater storage was calculated.⁶⁶ The Agency calculated the Main Basin as having a storage capacity of more than 250,000 acre-feet. The Agency states that when groundwater elevations were at their historic lows, the estimated remaining groundwater in storage was 128,000 acre-feet. The Agency describes groundwater storage of 128,000 acre-feet (when groundwater elevations are at historic lows) or less as "reserve storage" and the additional 126,000 acre-feet above this amount to be "operational storage". The Agency maintains "reserve storage" by operating the basin to keep groundwater levels above historic lows and actively manages the remaining 126,000 acre-feet for supply reliability.⁶⁷ The Alternative Report illustrates that the groundwater storage in the Main Basin Management Area has been within the "operational storage" range for the period reported, from 1974 to 2015.⁶⁸ The Agency estimates the groundwater in storage in the upper alluvial aquifer of the

⁵⁹ Alternative Report, Figure 2-21, p. 2-35

⁶⁰ Alternative Report, Figure 2-17, p. 2-28

⁶¹ Alternative Report, Figure 2-24, p. 2-41; and Figure 2-25, p. 2-26

⁶² Alternative Report, Figure 2-29, p. 2-48; and Section 2.3.6, p. 2-45

⁶³ Alternative Report, Figure 2-23, p. 2-28; Section 2.3.4.2, p. 2-36; and Section 2.3.4.3, p. 2-37

⁶⁴ Draft Report Well Master Plan, Section ES.2, pp. ES-2 to ES-3

⁶⁵ Alternative Report, Figure 2-21, p. 2-35

⁶⁶ Alternative Report, Figure 2-30, p. 2-50

⁶⁷ Alternative Report, Section 2.3.7.1, pp. 2-49 to 2-50

⁶⁸ Alternative Report, Figure 2-30, p. 2-50

Fringe Management Area is about 200,000 acre-feet, but that groundwater is not used for municipal supply or managed groundwater storage in this area, primarily due to poor groundwater production.⁶⁹ The groundwater in storage in the Uplands Management Area was not estimated because the Agency states that it consists of semi-consolidated bedrock of highly-variable specific yields and is of unknown thickness.

The Alternative Report describes the primary groundwater quality issues in the three management areas of the Basin, monitoring networks used for analysis of groundwater quality, and statistical analyses used to evaluate constituents of concern. Primary constituents of concern in the Main Basin Management Area are locally high TDS, hardness, nitrate, organic compounds and naturally occurring boron and chromium. The Alternative Report acknowledges locally elevated levels of these constituents in the Basin and describes the management actions taken to address water quality issues in the Basin.⁷⁰ The Agency conducts routine water quality sampling which is typically analyzed in the Agency's water quality laboratory, monitoring to comply with the Del Valle water rights permits and Title 22 domestic Water Quality and Monitoring Regulations. Monitoring also includes sampling and analysis in accordance with the Salt/Nutrient Management Plan and the Toxic Site Surveillance Program. The Salt Management Plan, which was incorporated into the Agency's Groundwater Management Plan and was designed to identify strategies to stop or offset degradation of salt and mineral buildup from water recycling and wastewater disposal. The Toxic Site Surveillance Program tracks sites where groundwater has been impacted from anthropogenic sources and identifies those that pose a potential threat to drinking water. Management actions taken when water quality conditions at a well exceed or approach the identified threshold, includes blending groundwater with demineralized water from Zone 7's Mocho Groundwater Demineralization Plant to meet water quality thresholds.⁷¹ Other management actions taken by the Agency to offset degradation of salt and mineral buildup include artificial recharge with low TDS imported water (when available), pumping and delivering groundwater to customers (salts are exported as wastewater), and operating groundwater demineralization facilities that export salts as a waste by-product (concentrate/brine).⁷²

The Alternative Report describes that land surface elevations have been monitored for over 60 years in parts of the Basin and that the Agency has found no evidence of inelastic subsidence.⁷³ Data collection over the period captures a range of elastic surface

⁶⁹ Alternative Report, Section 2.3.7.2, pp. 2-50 to 2-51

⁷⁰ Alternative Report, Section 4.6, p. 4-18; Groundwater Management Plan, Section 5.3, p. 5-9; 2015 Annual Report, Section 12, p. 12-1; Nutrient Management Plan, Section 6, p. 63; and Salt Management Plan, Section 7 through Section 12

⁷¹ Alternative Report, Section 5.3.3.3, p. 5-11

⁷² Alternative Report, Section 5.3.3.2, p. 5-10

⁷³ Alternative Report, Section 2.3.9, p. 2-74

elevations that are associated with cycles of elevation gains and losses that mimic dry/wet hydrologic cycles and correlate with groundwater elevation trends. The Agency has observed elastic surface elevation fluctuations in the range of 0.3 feet per cycle.⁷⁴ The Agency has an ongoing monitoring program to collect land surface elevation data semi-annually at more than 60 elevation benchmarks to evaluate subsidence in the Main Basin Management Area.

The Alternative Report describes surface water - groundwater interaction in the Basin and states that groundwater generally does not contribute to baseflow along surface water reaches in the basin. However, the Agency does recognize a surface water-groundwater connection for seasonal springflow in the Springtown Alkali Sink (or Alkali Sink) area and recognizes interaction of groundwater and surface water in gravel mining areas.⁷⁵

The Springtown Alkali Sink is in the Fringe Management Area of the Basin along Altamont Creek, near stream gages on the creek monitored by Zone 7. The Agency describes a hydrologic analysis prepared for the City of Livermore in 1998 to characterize the localized aquifers and groundwater conditions near Springtown Alkali Sink.⁷⁶ Historical springs were present in the Alkali Sink area, caused by high groundwater levels in the underlying shallow aquifer zone. Development in the late 1960s deepened Altamont Creek, which was believed to have created a local drain for shallow groundwater, and a reduction in the presence of significant springs. The Agency reports that as a result, groundwater elevations are lower, which caused the alkali-saline wetland habitat, supported by the springs, to be seasonal.⁷⁷ The relationship of groundwater and surface water in the Alkali Sink area has been investigated with the development of a three-dimensional numerical groundwater flow MODFLOW model and the development of a modeled water budget for the sink. Groundwater in the Alkali Sink is monitored and managed to maintain groundwater levels to avoid surface water depletion.⁷⁸ The Alternative Report acknowledges the presence of groundwater dependent ecosystems in the Springtown Alkali Sink and states that the Sink is habitat to over a dozen federally-listed, state-listed or state-listed-as-sensitive plant and animal taxa and is critical habitat for other species.⁷⁹ As a result, the Springtown Alkali Sink and adjacent creeks are protected either as Preserves of the City of Livermore or conservation easements or are owned and managed by the Agency or the Federal Communications Commission.⁸⁰ In

⁷⁴ Alternative Report, Section 2.3.9, p. 2-74

⁷⁵ Alternative Report, Section 2.3.10, p. 2-76

⁷⁶ Alternative Report, Section 2.1.4, p. 2-7

⁷⁷ Alternative Report, Section 2.1.4, p. 2-8

⁷⁸ Alternative Report, Section 3.3.5.1, p. 3-23

⁷⁹ Alternative Report, Section 2.3.10.2, p. 2-77

⁸⁰ Alternative Report, Section 2.3.10.2, p. 2-77

addition, restoration of the sink is identified as a designated project of the Bay Area Integrated Water Resources Management Plan.⁸¹

The Agency identifies a second possible exception of surface water and groundwater interaction where the water table is exposed in gravel quarries in gravel mining areas. The Agency, in coordination with the two active mining companies in the basin, CEMEX and Vulcan Materials, monitor water levels and water quality in select mining area ponds or quarry lakes to track and document evaporation, circulation, and conveyance of water between pits. The data collected from these monitoring stations factor into the Agency's groundwater elevation maps for the Basin, water budget calculations, groundwater quality assumptions, and groundwater model efforts.⁸² The Agency states that no groundwater-dependent ecosystems exist in the mining area and the quarry pits are not identified for specific beneficial uses in the Basin Plan developed by the Regional Water Quality Control Board.⁸³ The Agency is working closely with the mining companies to develop a quarry reclamation plan in the future to provide groundwater recharge and conveyance through the mining area.⁸⁴

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.⁸⁵

The Alternative Report includes discussion of the current water budget that includes inflows, outflows, change in storage, sustainable yield, operational groundwater storage, surface water supplies, and other factors affecting the Agency's ability to operate the basin within its sustainable yield.⁸⁶ The Agency also discussed their projected water budget and plans for future management.⁸⁷ The information provided in the Alternative Report describes the current methods used by the Agency to calculate water budgets for the Main Basin Management Area, the Fringe Management Area, and the Uplands Management Area.

The Agency has evaluated the water budget in the Main Basin Management Area since 1974 and has documented the water budget in Annual Water Year Reports, published to the Agency's website.⁸⁸ The Agency provides an overview of its methodologies used to

⁸¹ Alternative Report, Section 2.3.10.2, p. 2-77

⁸² Alternative Report, Section 4.4, p. 4-8

⁸³ Alternative Report, Section 2.3.10.3, p. 2-78

⁸⁴ Alternative Report, Section 2.3.10.3, p. 2-77

⁸⁵ 23 CCR § 354.18

⁸⁶ Alternative Report, Section 2.4.2, p. 2-81

⁸⁷ Alternative Report, Section 2.5, p. 2-95

⁸⁸ Alternative Report, Section 2.4.3, p. 2-89

calculate the water budget in the Main Basin Management Area, which includes using two independent methods to estimate the current water budget, one that estimates the inflows and outflows and calculates the change in total groundwater storage (referred to by the Agency as the Hydrologic Inventory), and a second method that uses the groundwater elevation and storage coefficients to estimate the total change in groundwater storage (referred to by the Agency as the Groundwater Elevation method).⁸⁹ The Agency states that these two methodologies have been used for comparison and has allowed periodic re-examination and refinement of water budget computations, which the Agency later describes in the Alternative Report.⁹⁰ Inflows into the Main Basin Management Area using the Hydrologic Inventory method include rainfall recharge, stream recharge, applied water recharge, subsurface groundwater inflow, and pipe leakage. Outflows from the Main Basin Management Area using the Hydrologic Inventory method include municipal pumping, agricultural pumping, mining use, and groundwater basin overflow. The components of the water budget are derived independently, either directly from monitoring program results or calculated using the results of the monitoring program.⁹¹ The Alternative Report presents the results from the calculations of inflows, outflows, and total change in storage for Water Year 1974 through Water Year 2015.⁹² Furthermore, Figure 10-7 of the 2015 Annual Report provides a detailed table that presents the data used to generate Figure 2-40 provided in the Alternative Report.⁹³

The Agency states that the Hydrologic Inventory method was used to estimate the water budget for the Fringe Management Area, using the same inflow and outflow components as described for the Main Basin Management Area, with the addition of a few outflow components specific to the management area (e.g., golf courses, domestic wells, subsurface to streams, subsurface to Main Basin).⁹⁴ The Agency presents a simplified groundwater budget for the Uplands Management Area, identifying rainfall/stream recharge as the inflow component and outflow identified as agricultural pumping and domestic wells.⁹⁵

The Agency acknowledges that approximately 80 percent of the water supply is imported. Therefore, maintaining imported water supplies allows the Agency to operate the Basin within the sustainable yield.⁹⁶ The Agency describes sources of imports and surface water supplies that include supplies from the State Water Project, Lake Del Valle, groundwater banking (including Semitropic and Cawelo), and other water transfers.⁹⁷ The Agency

⁸⁹ Alternative Report, Section 2.4, pp. 2-79 to 2-90

⁹⁰ Alternative Report, Section 2.4.1, pp. 2-79 to 2-81

⁹¹ Alternative Report, Section 2.4.1, p. 2-80

⁹² Alternative Report, Figure 2-40, p. 2-89 and Section 2.4.3, pp. 2-89 to 2-90

⁹³ 2015 Annual Report, Figure 10-7, PDF pp. 182-183

⁹⁴ Alternative Report, Section 2.4.2.5 and Table 2-21, pp. 2-87 to 2-88

⁹⁵ Alternative Report, Section 2.4.2.6, p. 2-88

⁹⁶ Alternative Report, Section 2.4.4.2, p. 2-93

⁹⁷ Alternative Report, Section 2.4.4.2, pp. 2-93 to 2-94

states that imported water is either delivered to Zone 7's retailers and agricultural customers or it is used for artificial recharge in the Main Basin Management Area when surplus surface water is available.⁹⁸

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.⁹⁹

The Agency has identified three management areas: the Main Basin Management Area, the Fringe Management Area, and the Uplands Management Area that are within the Livermore Valley Basin. The Agency defines these management areas based on geologic, hydrogeologic, and groundwater conditions in the Basin. The Main Basin Management Area is described as having the highest yielding aquifers, best quality groundwater, and is where municipal wells are located. Whereas the Fringe Management Area is described as having low yielding aquifers with few wells for domestic, agricultural, and golf course irrigation purposes. The Upland Management Area is described as having low yielding aquifer and few wells used for domestic supply and agricultural purposes.¹⁰⁰

C. Sustainable Management Criteria

GSP Regulations require a sustainability goal that defines conditions that constitute sustainable groundwater management for the basin, the characterization of undesirable results, and establishment of minimum thresholds and measurable objectives for each applicable sustainability indicator, as appropriate.¹⁰¹

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.¹⁰² The sustainability goal for an alternative based on an analysis of basin conditions represents the criteria that allowed the basin to be

⁹⁸ Alternative Report, Section 2.4.4.2, p. 2-93

⁹⁹ 23 CCR § 354.20

¹⁰⁰ Alternative Report, Section E-1.2, p. E-3; and Section 2.3.2, p. 2-32

¹⁰¹ 23 CCR § 354.22

¹⁰² 23 CCR § 354.24. For an alternative based on a demonstration of 10 years of sustainable management, the sustainability goal, or its functional equivalent, would have been developed at some previous time during basin management, and its goals met by the time the Alternative was submitted to the Department.

operated within its sustainable yield for a period of at least 10 years, which includes the avoidance of undesirable results.¹⁰³

The Agency's goal is to continue to operate the Basin within its sustainable yield and to manage groundwater resources to prevent undesirable results.¹⁰⁴ The Agency also has a stated goal of managing the local groundwater resources to provide a reliable supply and to protect the groundwater resources for all beneficial uses.¹⁰⁵

2. Sustainability Indicators

The GSP Regulations specify that an agency define conditions that constitute sustainable groundwater management for a basin, including the characterization of undesirable results and the establishment of minimum thresholds and measurable objectives for each applicable sustainability indicator.¹⁰⁶

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.¹⁰⁷ 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 water¹⁰⁸ – but refer to groundwater conditions that are not, 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.

The sustainability indicators section thus conflates three requirements of the sustainable management criteria set out in the GSP Regulations: 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 discussed for each sustainability indicator. However, a submitting agency is not required to establish criteria for an

¹⁰³ Water Code § 10721(w)

¹⁰⁴ Alternative Report, Section 3.1, p.3-1

¹⁰⁵ Alternative Report, Section 3.1, p. 3-1; and Groundwater Management Plan, Section 4.1, p. 4-1

¹⁰⁶ 23 CCR § 354.22

¹⁰⁷ 23 CCR § 351(ah)

¹⁰⁸ Water Code § 10721(x)

undesirable result when the agency can demonstrate that an undesirable result for that sustainability indicator is not present and is not likely to occur in the basin.¹⁰⁹

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.¹¹⁰

The minimum thresholds for groundwater levels only apply to the Main Basin Management Area and a small portion of the Fringe Management Area. The Agency uses the historical low groundwater level map (see Groundwater Conditions, above), to define the minimum thresholds for the Main Basin Management Area and a small portion of the Fringe Management Area. The Alternative Report uses the historical low groundwater level map, rather than identifying groundwater levels from individual wells in a tabular format, to define the minimum thresholds.

The Agency states that groundwater levels are routinely measured in the Fringe Management Area, and occasionally in the Uplands Management Area.¹¹¹ Groundwater level hydrographs from seven wells in the Fringe Management Area are presented in the Alternative Report, with six presenting data collected extending back to the 1980s and one presenting data collected back to the early 2000s.¹¹² The Agency does not provide information regarding the frequency or timing of when groundwater level data has been collected historically in the Uplands Management Area. The Agency states that if it is determined that wells in areas outside the Main Basin Management Area are experiencing loss of beneficial uses, then the conditions would be reviewed, and a recovery plan would be created.¹¹³

The Agency states that the area with the highest density of wells outside of the Main Basin Management Area, occurs in the Uplands Management Area and is referred to as the Happy Valley Area. This area is unincorporated, unsewered, and relies on domestic wells for water supply. However, due to high nitrate detections in some domestic wells, Alameda County has placed a moratorium on new onsite wastewater treatment system construction in Happy Valley, reducing the potential for additional development. In addition, the Agency states that discussions are underway between City of Pleasanton and Alameda County Local Agency Formation Commission (LAFCO) for the incorporation

¹⁰⁹ 23 CCR § 354.26(d)

¹¹⁰ 23 CCR § 354.28(c)(1)

¹¹¹ Alternative Report, Section 4.5, p. 4-12

¹¹² Alternative Report, Figure 2-21, p. 2-35

¹¹³ Alternative Report, Section 3.3.1.2, p. 3-7

of Happy Valley into the City limits and/or expansion of city water and sewer services to Happy Valley parcels.

The Agency identifies an alternative minimum threshold to account for areas outside the Main Basin Management Area, which requires any new well construction (other than replacement wells) in higher density well areas be evaluated by the Agency. The objective of the Agency's evaluation would be to complete an early assessment of any proposed wells to ensure the construction of proposed wells does not result in over-pumping for any localized area of well clusters.¹¹⁴ Through the Agency's authority permitting new wells within its jurisdiction, the Agency can require that new well permit applications are accompanied by a certified CEQA analysis supporting that the new well would not significantly impact local water levels.¹¹⁵

The Agency describes an undesirable result as the lowering of regional water levels resulting in wells no longer capable of supporting their beneficial uses.¹¹⁶ This undesirable result may be experienced as water levels falling below pump intakes, falling below the top of screens, and/or reduction in well yields. The Agency further explains that for municipal wells, the loss of one well in a wellfield or multiple for a short time might be compensated through a short-term redistribution of pumping or purchase of supplemental supplies.¹¹⁷ The Agency has an ongoing policy in place to re-distribute pumping in areas that experience short-term declines to mitigate local impacts.¹¹⁸ The Agency also focuses artificial recharge efforts near wellfields and plans to establish new wellfields in areas where levels routinely remain above historic lows. The Agency further states that a systemic failure of wellfields or long-term loss of wells would be an undesirable result.¹¹⁹ For rural, domestic wells, the loss of even one well could cause an undesirable result if it leads to the well no longer being able to support its beneficial use.¹²⁰

The Agency describes an undesirable result in areas outside the Main Basin Management Area as over-pumping that could locally impact beneficial uses of private wells, especially in groundwater dependent areas.¹²¹

¹¹⁴ Alternative Report, Section 3.3.1.2, p. 3-9

¹¹⁵ Alternative Report, Section 3.3.1.2, p. 3-9

¹¹⁶ Alternative Report, Section 3.3.1.1, p. 3-5

¹¹⁷ Alternative Report, Section 3.3.1.1, p. 3-5

¹¹⁸ Alternative Report, Section 3.3.1.1, p. 3-5

¹¹⁹ Alternative Report, Section 3.3.1.1, p. 3-5

¹²⁰ Alternative Report, Section 3.3.1.1, p. 3-5

¹²¹ Alternative Report, Section 3.3.1.1, p. 3-5

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.¹²²

The minimum threshold for reduction of groundwater storage is based on the basin storage when groundwater levels throughout the Main Basin Management Area are at historic lows. The Agency uses historical low groundwater levels throughout the Main Basin Management Area to calculate the minimum threshold for basin storage, which is estimated as 128,000 acre-feet.¹²³ Over the last 40 years the Agency has operated the basin within the operational storage range above the minimum threshold (see Groundwater Conditions, above). If an emergency condition were to require the reserve storage to be accessed, the Agency states that they would develop a recovery plan with specific, and time-relevant, recovery actions. The Agency states that loss of storage in the Fringe and Upland Management Areas would not have the same detrimental effect on operational storage as in the Main Basin Management Area.¹²⁴ Minimum thresholds in the Fringe and Uplands management areas are not provided in the Alternative Report.

The Agency defines undesirable results in the Main Basin Management Area as being represented by groundwater levels falling significantly below historic lows across most of the area as well as storage volumes in the area being reduced into the reserve storage in a non-emergency situation.¹²⁵

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.¹²⁶

The Agency states that seawater intrusion is not a relevant issue for this inland basin, and do not identify an objective or sustainability indicator.¹²⁷ The Agency presents information to demonstrate that the Basin is an inland basin that is structurally-bound basin by northwest-southeast trending faults on the east and west, upland bedrock hills on the south, and the Mt. Diablo thrust fault to the north.¹²⁸

¹²² 23 CCR § 354.28(c)(2)

¹²³ Alternative Report, Section 3.3.2.2 and Figure 3-3, pp. 3-10 to 3-11

¹²⁴ Alternative Report, Section 3.3.2.1, p. 3-10; Figure 2-21, PDF p. 96; and Tables 2-21 and 2-22, p. 2-88

¹²⁵ Alternative Report, Section 3.3.2, p. 3-9

¹²⁶ 23 CCR § 354.28(c)(3)

¹²⁷ Alternative Report, Section 3.1 footnote 3, p. 3-1

¹²⁸ Alternative Report, Section E-2.2, p. E-4

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 water supplies or other indicator of water quality as determined by the agency that may lead to undesirable results.¹²⁹

The Agency sets minimum thresholds established at levels required to meet federal and state standards.¹³⁰ The Agency states that trends toward the minimum thresholds triggers management responses in coordination with the Agency's retailers, which could include short-term actions or long-term actions further described in the Alternative Report.¹³¹ The Agency has implemented management actions to address water quality issues like TDS, nitrate, toxic sites, and salt loading (see Groundwater Conditions, above).

The Agency states an undesirable result in the Main Basin Management Area is the loss of beneficial uses as measured at each of the municipal wells in the area caused by degradation of the Lower Aquifer with TDS, key inorganic constituents, and/or toxic substances such that levels in municipal wellfields cannot be blended, treated, or managed to provide drinking water supply.¹³² The Agency states an undesirable result in the Fringe and Upland Management Areas is the loss of beneficial uses due to contamination when treatment is not possible or practicable.¹³³

The Agency has actively responded to numerous groundwater quality issues in the Basin over time. The Agency has been able to address each issue and prevent or reduce significant and unreasonable degradation of groundwater quality in the Basin through management actions. The Agency works adaptively with regulatory agencies to ensure protection of the Basin to meet beneficial uses. Groundwater quality is managed on a regional basis as measured at municipal wells while protecting and improving groundwater quality within the Main Basin Management Area.¹³⁴

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.¹³⁵

¹²⁹ 23 CCR § 354.28(c)(4)

¹³⁰ Alternative Report, Section 3.3.3, p. 3-11

¹³¹ Alternative Report, Section 3.3.3.2, p. 3-18

¹³² Alternative Report, Section 3.3.3.1, p. 3-12

¹³³ Alternative Report, Section 3.3.3.1, p. 3-12

¹³⁴ Alternative Report, Section 3.3.3, p. 3-11

¹³⁵ 23 CCR § 354.28(c)(5)

The Agency uses historical low groundwater levels as minimum thresholds for land subsidence since no inelastic land subsidence occurred when groundwater levels were previously at historic lows.¹³⁶

The Agency states that inelastic subsidence would represent a potential undesirable result in the Basin, with several potential effects on beneficial uses and users of groundwater and on land uses and property interests in this urban area. The Agency further defines what potential effects in detail in the Alternative Report.¹³⁷

The processes defining land subsidence potential throughout the basin were investigated in detail in the Draft Well Master Plan, which included numerical groundwater modeling to evaluate different operational scenarios in the Basin.¹³⁸ The Draft Well Master Plan identified areas in the Basin that would be most prone to groundwater drawdown below historical low groundwater levels and recommended subsidence monitoring in those areas.¹³⁹ The outcome of studies completed for the Well Master Plan resulted in the development of the Agency's detailed land surface elevation monitoring program.¹⁴⁰ The Agency states and provides data from two research efforts, to support the conclusion that no inelastic land subsidence has occurred in the Basin within the 13-year monitoring period between 2002 and 2015.¹⁴¹ The InSAR Report and Benchmark Report, provided as Appendices to the Alternative Report, document the monitoring network, results from the two research efforts, and demonstrate that no undesirable results associated with land subsidence would substantially interfere with surface land uses in the Basin.

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.¹⁴²

According to the Agency, interconnected surface water and groundwater dependent ecosystems are limited in the Basin, with interconnected surface water existing primarily in the Springtown Alkali Sink area, seasonally (see Groundwater Conditions, above).¹⁴³ The Agency sets minimum thresholds to avoid surface water depletion in the Springtown Alkali Sink as the historic low groundwater elevations recorded at two wells located in the

¹³⁶ Alternative Report, Section 3.3.4, p. 3-20

¹³⁷ Alternative Report, Section 3.3.4.1, pp. 3-20 to 3-21

¹³⁸ Alternative Report, Section 2.3.9, p. 2-74; and Draft Report Well Master Plan, Section 2.4, p. 2-7

¹³⁹ Draft Report Well Master Plan, Section 2.4, pp. 2-7 to 2-9

¹⁴⁰ Alternative Report, Section 2.3.9, p. 2-74

¹⁴¹ Alternative Report, Section 2.3.9, p. 2-74; and Section 3.3.4, p. 3-20

¹⁴² 23 CCR § 354.28(c)(6)

¹⁴³ Alternative Report, Section 2.3.10, p. 2-76; and Section 3.3.5, p. 3-22

Springtown Alkali Sink Wetlands.¹⁴⁴ The Agency states that using the lowest recorded groundwater elevation as a proxy provides for a margin of uncertainty and is consistent with the management strategy of using historic low groundwater elevations throughout the Basin.¹⁴⁵

The Agency defines an undesirable result as depletion of surface water in the Springtown Alkali Sink, potentially resulting in adverse effects on the Springtown Alkali Sink ecosystem and protected species.¹⁴⁶

The Agency monitors five wells near the Springtown Alkali Sink. Groundwater level trends in these monitoring wells generally have been steady. The Agency states that maintenance of groundwater levels and flow patterns are criteria for avoiding undesirable results. The Agency states that their role in permitting wells allows the Agency an early assessment of any proposed wells to ensure that they are constructed to account for operating groundwater levels in the basin and do not result in over-pumping for any localized area of well clusters.¹⁴⁷

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 distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions.¹⁴⁸

The Alternative Report relies on a network of monitoring wells and other monitoring sites to gather data on groundwater levels, surface water flow conditions, groundwater and surface water quality, climate, and land surface elevation.¹⁴⁹ The Alternative Report includes the Agency's standard operating procedures as Appendix B, which outlines the protocols followed by the Agency to ensure the quality of data collected for the monitoring program.¹⁵⁰ Data collected from the monitoring networks was used to support the development of a numerical model for the Basin.

The Agency's groundwater elevation monitoring program includes measurement of groundwater levels in about 240 wells across the Main Basin Management Area and a

¹⁴⁴ Alternative Report, Section 3.3.5.2, pp. 3-24 to 3-25

¹⁴⁵ Alternative Report, Section 3.3.5.2, p. 3-25

¹⁴⁶ Alternative Report, Section 3.3.5.1, p. 3-23

¹⁴⁷ Alternative Report, Section 3.3.1.2, p. 3-9; and Section 3.3.5, p. 3-22

¹⁴⁸ 23 CCR § 354.32

¹⁴⁹ Alternative Report, Section 4, p. 4-1; Appendix C, PDF p. 247; 2015 Annual Report, Section 2.2, p. 2-1; Section 3.2, p. 3-1; Section 4.2, p. 4-2; Section 5.2, p. 5-7; Section 6.2, p. 6-5; Section 7.2, p. 7-2; and Section 8.2, p. 8-2

¹⁵⁰ Alternative Report, Appendix B, PDF p. 237

portion of the Fringe Management Area. This network includes nested wells, which are used to determine local vertical groundwater gradients.¹⁵¹ The monitoring and sampling frequency for wells associated with these objectives ranges from continuous to semi-annually.¹⁵² The Agency does not identify wells in the Upland Management Area as part of the monitoring network.

The Agency monitors groundwater quality in more than 230 wells across the Basin as part of the Agency's groundwater quality monitoring program. The Agency's Groundwater Quality Monitoring Program is primarily focused on the Main Basin Management Area, but routinely monitors wells in the Fringe Management Area, and occasionally in the Uplands Management Area. The Groundwater Quality Program has several objectives for Routine Water Elevation Monitoring, Del Valle Water Rights, Municipal Water Supply, Salt Management Plan, Nutrient Management Plan, Dublin San Ramon Services District, and Toxic Site Surveillance. Wells monitored and sampled for the respective objectives are widespread across the Main Basin Management Area and different sampling and frequency associated with those objectives. The monitoring and sampling frequency for wells associated with these objectives ranges from quarterly to annually.

As part of the Agency's surface water monitoring program, the Agency monitors and collects semi-continuous streamflow measurements and periodic water level measurements to track surface water storage. The Agency collects surface water quality at least once per year at 10 recorder sites and quarry ponds.¹⁵³ The Agency's climate monitoring network tracks rainfall and evaporation daily, or every 15 minutes, in the Livermore Valley with climatological stations spread across the basin.¹⁵⁴

The Agency's Land Surface Elevation Monitoring Program includes a network of more than 60 elevation benchmarks locations spanning the Agency's production wellfields in the Main Basin Management Area and includes the collection of semi-annual measurements.

Monitoring sites for groundwater levels and land surface elevation are not reported for the Uplands Management Area. The Agency acknowledges the limited monitoring programs for the Upland Management Area and states that monitoring is done on an issue- or as-needed basis. The Agency states that this management strategy is justified because there is a low number of active wells in the Upland Management Area, with low well yields, and historically low groundwater use in the area.¹⁵⁵

¹⁵¹ Alternative Report, Section 4.5, p. 4-12

¹⁵² Alternative Report, Section 4.5, p. 4-12

¹⁵³ Alternative Report, Section 4.3, p. 4-4

¹⁵⁴ Alternative Report, Section 4.2, p. 4-1; 2015 Annual Report, Figure 2-5, PDF pp. 41-42; and Figure 2-7, PDF p. 44

¹⁵⁵ Alternative Report, Section 4.10, p. 4-27

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.¹⁵⁶

The Agency has over 40 years of experience managing the Basin and implementing plans and programs and identifies numerous on-going and proposed projects whose implementation have helped the Agency operate the Basin for at least 10 years within the Basin's sustainable yield.¹⁵⁷ The ongoing projects and management actions are implemented to ensure the sustainability of the Basin's groundwater supply and groundwater quality out to the planning horizon.

The Agency acknowledges that approximately 80 percent of the Basin's water supply is from imported surface water that is delivered to the Agency's retailers and agricultural customers and is used for artificial recharge in the Main Basin Management Area. The Agency acknowledges the uncertainty of future imported water supplies and describes other projects and management actions that are ongoing or planned to provide water supply reliability, should supplemental supplies be required for supply or recharging the Basin.¹⁵⁸

In addition to the import of surface water, those projects and management actions include allocation of groundwater pumping quotas to municipal pumpers, conjunctive use projects, Draft Well Master Plan, Chain of Lakes Recharge Projects, existing and future recycled water projects, and water conservation.¹⁵⁹ The Agency identifies artificial recharge program as a key component of the Agency's conjunctive use program, which consists of recharging the groundwater basin through release of surface water to dry arroyos. The artificial recharge program is used as a mechanism for improving groundwater storage and as a water quality management tool, managing releases to arroyos when TDS of source water is low.¹⁶⁰ The Well Master Plan was developed in 2003 and has resulted in the construction of several municipal supply wells.¹⁶¹ Projects associated with the Chain of Lakes Recharge Projects have been ongoing, with full implementation not expected before 2050.¹⁶² The Agency's existing recycled water projects include use for landscape irrigation and other minor amounts for dust

¹⁵⁶ 23 CCR § 354.44

¹⁵⁷ Alternative Report, Section 5, p. 5-1; Water Supply Evaluations Update, Section 6 through Section 11; and 2015 Urban Water Management Plan, Section 6 through Section 8

¹⁵⁸ Alternative Report, Section 5.2.1, p. 5-1

¹⁵⁹ Alternative Report, Section 5.2, p. 5-1

¹⁶⁰ Alternative Report, Section 5.2.2, p. 5-3

¹⁶¹ Alternative Report, Section 5.2.3, p. 5-4

¹⁶² Alternative Report, Section 5.2.4, p 5-4

suppression, grading projects, and crop irrigation. Future recycled water projects could include use for groundwater recharge/injection, surface water augmentation, and connection upstream to water treatment plants. The Agency recognizes use of recycled water as a valuable component of water supply portfolio when it is managed under the Salt Management Plan and Nutrient Management Plan.¹⁶³

The Agency identifies several ongoing programs that support maintaining groundwater quality and indirectly support maintaining groundwater supply, which include the Well Ordinance Program, Toxic Site Surveillance Program, Salt Management, Nutrient Management, and Offsite Wastewater Treatment Systems.¹⁶⁴ The Agency identifies the ongoing Well Ordinance Program as providing multiple benefits, with the most notable being protection of the Basin from negative impacts associated with poorly-constructed wells.¹⁶⁵ The Toxic Site Surveillance Program is an ongoing program that informs the Agency by documenting, tracking, and giving priority to sites based on the potential threat to groundwater posed by the site.¹⁶⁶ The 2004 Salt Management Plan is an active, ongoing program and includes strategies to reduce salt loading to groundwater basin and mitigate future salt impacts from planned increased recycled water use in the Main Basin (see Groundwater Conditions, above).¹⁶⁷ One of the strategies identified by the Salt Management Plan, lead to the construction of Zone 7's Mocho Groundwater Demineralization Plant, which is operated to remove salts from the groundwater basin while improving delivered drinking water quality through blending demineralized water with extremely low TDS with groundwater (see Groundwater Conditions, above). The Nutrient Management Plan was developed in 2015 to assess existing and future nutrient contributions from current and planned expansion of recycled water projects and future development in the Livermore Valley. The Nutrient Management Plan identifies best management practices to minimize nitrogen loading in the Basin and identifies ongoing monitoring and future opportunities to add new monitoring wells and/or soil borings.¹⁶⁸ The Alternative Report also describes Offsite Wastewater Treatment System Management, which includes multiple policies established by the Agency and implemented in cooperation with the Alameda County Environmental Health.¹⁶⁹ Further, the Nutrient Management Plan recommends future actions to prevent nutrient loading from increasing in areas of concern.

¹⁶³ Alternative Report, Section 5.2.5, p. 5-6

¹⁶⁴ Alternative Report, Section 5.3, p. 5-8

¹⁶⁵ Alternative Report, Section 5.3.1, p. 5-8

¹⁶⁶ Alternative Report, Section 5.3.2, p. 5-9

¹⁶⁷ Alternative Report, Section 5.3.3, p. 5-9

¹⁶⁸ Alternative Report, Section 5.3.4, p. 5-11

¹⁶⁹ Alternative Report, Section 5.3.5, p. 5-13

V. Assessment

The following describes the evaluation and assessment of the Alternative for the Livermore Valley Basin as determined by Department staff. In undertaking this assessment, Department staff did not conduct geologic or engineering studies, although Department staff may have relied on publicly available geologic or engineering or other technical information to verify claims or assumptions presented in the Alternative.¹⁷⁰ As discussed above, Department staff has determined that the Livermore Valley Alternative satisfied the conditions for submission of an alternative.¹⁷¹ The Alternative was submitted within the statutory period, the Basin was found to be in compliance with the reporting requirements of CASGEM, and staff finds the Alternative to be complete and to cover the entire Basin (see Required Conditions, above). Based on its evaluation and assessment of the Livermore Valley Alternative, as discussed below, Department staff finds that the Agency sufficiently demonstrated that the Basin has operated within its sustainable yield over a period of at least 10 years. Staff recommends that the Livermore Valley Alternative be approved.

A. Evaluation of Alternative Contents

The Alternative Report's description of the Agency's responsibilities and authority under the 2003 Assembly Bill 1125 and provided additional information were adequate to demonstrate the Agency's authority to manage groundwater in the Livermore Valley Basin. The information and descriptions regarding the hydrogeologic conceptual model in the Alternative Report demonstrate a thorough understanding of the Basin and were sufficient for evaluating the Alternative to determine whether the basin has operated within its sustainable yield.

The Agency has sufficiently characterized groundwater use, current and historic conditions of groundwater elevation, groundwater in storage, water quality, land subsidence, and surface water-groundwater interaction. The primary focus of the Alternative Report and existing monitoring networks is the Main Basin Management Area and a part of the Fringe Management Area. The Alternative Report presented groundwater level data from wells in the Fringe Management Area and in the Main Basin Management Area. The Department staff found it reasonable that the primary focus of the Alternative Report is on the Main Basin area because all municipal groundwater pumping and approximately 93 percent of Basin-wide pumping occurs in the Main Basin Management Area, and only minor pumping occurs in the Fringe and Upland management areas. The lack of data and information presented in the Fringe and

¹⁷⁰ Instances where the Department review relied upon publicly available data that was not part of the Alternative are specifically noted in the assessment.

¹⁷¹ 23 CCR § 358.4(a)

Uplands management areas does not preclude the Department staff from making an evaluation of the sustainability of the Basin.

The Department staff finds that the methods used to calculate water budgets are based on sufficient and credible data and use standard practices and methodology for calculations. The Alternative Report describes the current methods used by the Agency to calculate water budgets for the Main Basin Management Area, the Fringe Management Area, and the Uplands Management Area. The calculation method and input datasets are well-documented and appear reasonable for the intended use. Any data gaps identified in the future by the Agency or by Department staff for the Basin or any of the three management areas should be addressed in the annual reports or updates to the Alternative Report.

Department staff find the use of historical low groundwater levels to be a reasonable approach, supported by sufficient and credible information, for defining minimum thresholds for chronic lowering of groundwater levels. The Agency demonstrates that they have established this minimum threshold for groundwater levels and have operated above the historical lows for more than 10 years and that staying above historical groundwater levels has avoided undesirable results in the Basin. However, the Alternative Report relies on a water level surface rather than the water level data for the minimum thresholds. Department staff believe it would facilitate future review and assessment of the Alternative if the water level data for historical lows was provided (see Recommended Action 1).

In addition, the minimum thresholds only cover Main Basin Management Area and a small portion of the Fringe Management Area. The Agency states groundwater levels are routinely measured in the Fringe Management Area, and occasionally in the Uplands Management Area.¹⁷² The Department staff find it reasonable that the Alternative Report lacks minimum thresholds defined for the majority of the Fringe Management Area and the Uplands Management Area because of the lack of groundwater use and looking forward it is unlikely that further development will lead to groundwater declines in these portions of the Basin (see Chronic Lowering of Groundwater Levels, above). However, to facilitate ongoing review and assessment of the Alternative, Department staff recommend developing quantitative thresholds for the Fringe and Uplands Management areas (See Recommended Action 2).

The Department staff find that the Agency provided adequate information to demonstrate that the Basin is not experiencing depletion of groundwater storage and has been operated sustainably for at least 10 years. The Department staff finds that the Alternative Report demonstrates that the Main Basin Management Area will likely continue to be

¹⁷² Alternative Report, Section 4.5, p. 4-12

operated sustainably based on the description of the Agency's basin management. The Agency manages the groundwater within the limits of operational storage to maintain adequate supplies and prevent overdraft, operating within the sustainable yield of the basin. The Agency states that the groundwater in storage in the Main Basin Management Area has remained above 200,000 acre-feet for over 40 years, except for a period during the drought in the 1990s. The groundwater in storage has never reached the minimum threshold of 128,000 AF during the period of historical groundwater management, between 1974 and 2015.

The Agency states that seawater intrusion is not a relevant issue for this inland Basin and is not likely to occur in the Basin. Department staff agree with the Agency's conclusion and consider it to be reasonable that the Agency has not developed criteria for this sustainability indicator, given the physical setting of the basin, as described in the Hydrogeologic Conceptual Model.

The Agency sets minimum thresholds for groundwater quality based on federal and state standards. The Agency states that undesirable results would be experienced if municipal wellfields experience a loss in beneficial uses and groundwater cannot be blended, treated, or managed to provide drinking water supply. The Department staff find this to be a reasonable approach to managing groundwater quality and that the Agency demonstrated that through management actions, water quality sampling pursuant to Title 22 requirements, and implementation of regulatory programs, the Basin has been adaptively managed and has not experienced undesirable results with respect to water quality (see Groundwater Conditions and Projects and Management Actions, above).

The Department staff find that the Agency provides adequate data to demonstrate that the Basin has not experienced undesirable results with respect to inelastic land subsidence in the Basin over the 10 years and provides a reasonable approach for monitoring and documenting changes in land surface elevation in the Basin. Staff also find it reasonable to use historical low groundwater levels as minimum thresholds for land subsidence.

The Agency identifies the Springtown Alkali Sink as a possible location of interconnected surface water in the Basin and establishes the minimum thresholds as the historic low groundwater elevation at two wells in the Alkali Sink Wetlands, consistent with the management strategy used for several other sustainability indicators in the Basin. Department staff find that the Agency's monitoring and management of the Basin has demonstrated that groundwater levels maintained above historic low groundwater elevations in the Basin has avoided undesirable results associated with depletion of surface water near the Springtown Alkali Sink and is reasonably protective of the Springtown Alkali Sink ecosystem and protected species.

The monitoring network provides a comprehensive network of wells and other measuring methods to evaluate the sustainability indicators. The Agency maintains decades of monitoring results and demonstrates detailed knowledge and understanding of the Basin. The Agency actively monitors for changes in groundwater conditions and uses the monitoring data to manage the Basin sustainably. It is noted that the monitoring network identified in the Alternative Report does not designate specific monitoring wells to collect groundwater elevation data or designate benchmark locations for measuring land surface elevation in the Uplands Management Area. Department staff find that the Agency's justification for not including a detailed monitoring network for the Uplands Management Area is reasonable, because of the limited use of groundwater in this portion of the basin, the low production potential, the limited potential for further development due to a moratorium on onsite wastewater treatment systems in the county in high density well areas, and the Agency's oversight in reviewing and issuing well permits (see Recommended Action 4).

Although the description of future Projects and Management actions are not required for this type of analysis, the Alternative Report demonstrated that through the historical implementation of projects and management actions, the Basin has reached a locally-defined level of sustainability and is operating to a sustainable yield.

B. Recommended Actions

The following recommended actions include information that the District may wish to include in the first five-year update of the Alternative to facilitate the Department's ongoing evaluation and assessment of the Alternative as well as recommendations for improvements to the Alternative.

Recommended Action 1.

Staff recommends that in the first update to the Alternative Report, the Agency identify those groundwater levels taken at representative monitoring sites, that are used to define the minimum threshold for the Basin, to facilitate the Department's ongoing responsibility to evaluate the Alternative Report.

Recommended Action 2.

Staff recommends that the Agency should develop quantitative minimum thresholds for the chronic lowering of groundwater levels for the Fringe and Upland management areas to better align with the requirements for management areas and definition of minimum thresholds, as defined in 23 CCR Sections 354.20(b)(2) and 354.28(b)(6).

Recommended Action 3.

Staff recommends that the Agency develop quantitative minimum thresholds for reduction of groundwater storage for the Fringe and Upland management areas to better align with the requirements for management areas and definition of minimum thresholds, as defined in 23 CCR Sections 354.20(b)(2) and 354.28(b)(6).

Recommended Action 4.

Staff recommends that the Agency include monitoring groundwater levels at additional locations in the Uplands Management Area to monitor changes in groundwater conditions and manage the groundwater resources to prevent undesirable results in future updates to the Alternative Report. The Agency should identify the frequency and timing when groundwater levels would be collected at new monitoring stations, and other relevant monitoring well construction information in accordance with the GSP Regulations.