Executive Summary [June 2024 Draft Revision]

ES-1: INTRODUCTION (CHAPTER 1)

Background (Section 1.1)

Section 1 describes the 2014 Sustainable Groundwater Management Act (SGMA) and the purpose of the Groundwater Sustainability Plan (GSP). Section 1 also introduces the management structure of the agencies developing and implementing the GSP.

SGMA was established to provide local and regional agencies the authority to sustainably manage groundwater resources through the development and implementation of GSPs for high and medium priority subbasins (e.g., Butte Valley). In accordance with SGMA, this GSP was developed and will be implemented by the groundwater sustainability agency (GSA) representing the Butte Valley groundwater basin (Basin): the Siskiyou County Flood Control and Water Conservation District.

The California Department of Water Resources (DWR) and the State Water Resources Control Board (SWRCB) provide primary oversight for implementation of SGMA. DWR adopted regulations that specify the components and evaluation criteria for groundwater sustainability plans, alternatives to GSPs, and coordination agreements to implement such plans. To satisfy the requirements of SGMA, local agencies must do the following:

Locally controlled and governed GSAs must be formed for all high- and medium-priority groundwater basins in California.

- GSAs must develop and implement GSPs or Alternatives to GSPs that define a roadmap for how groundwater basins will reach long-term sustainability.
- The GSPs must consider six sustainability indicators defined as: groundwater level decline, groundwater storage reduction, seawater intrusion, water quality degradation, land subsidence, and surface-water depletion.
- GSAs must submit annual reports to DWR each April 1 following adoption of a GSP.
- Groundwater basins should reach sustainability within 20 years of implementing their GSPs.

This GSP was prepared to meet the regulatory requirements established by DWR. The completed GSP Elements Guide is organized according to the GSP Emergency Regulations sections of the California Code of Regulations and is provided in Appendix 1-D.

On January 18, 2024, the GSA received a letter from DWR with the determination that the Butte Valley GSP was determined to be incomplete. The letter documents DWR's review of the GSP, including outlining deficiencies and corrective actions. The GSA hass the opportunity to implement these corrective actions in a 180-day period, ending on July 16, 2024. The determination letter from DWR is included as Appendix 3-D.

The two deficiencies were identified as:

Deficiency 1: The GSP does not include a reasonable assessment of overdraft conditions and reasonable means to mitigate overdraft.

Deficiency 2: The GSP does not establish sustainable management criteria for chronic lowering of groundwater levels in a manner substantially compliant with the GSP regulations.

Specific updates to chapters are discussed in the corresponding sections below.

A completely new version of the original well failure analysis was created and is a vital component of many of these changes. This is included as Appendix 3-C.

Purpose of the Groundwater Sustainability Plan

The Butte Valley GSP outlines a 20-year plan to direct sustainable groundwater management activities that considers the needs of all users in the Basin and ensures a viable groundwater resource for beneficial use by agricultural, residential, industrial, municipal and ecological users. The initial GSP is a starting point towards achievement of the sustainability goal for the Basin. Although available information and monitoring data have been evaluated throughout the GSP to set sustainable management criteria and define projects and management actions, there are gaps in knowledge and additional monitoring requirements. Information gained in the first five years of plan implementation, and through the planned monitoring network expansions, will be used to further refine the strategy outlined in this draft of the GSP. The GSA will work towards implementation of the GSP to meet all provisions of the SGMA using available local, state, and federal resources. It is anticipated that coordination with other agencies that conduct monitoring and/or management activities will occur throughout GSP implementation to fund and conduct this important work. Fees or other means may be required to support progress towards compliance with SGMA.

ES-2: PLAN AREA AND BASIN SETTING (CHAPTER 2)

Chapter 2 provides an overview of the Basin area. This includes descriptions of plan area, relevant agencies and programs, groundwater conditions, water quality, interconnected surface waters (ISWs), and groundwater dependent ecosystems (GDEs). These details inform the hydrogeologic conceptual model and water budget developed for the Basin which will be used to frame the discussion for sustainable management criteria (SMCs; Chapter 3) and projects and management actions (PMAs; Chapter 4).

Description of Plan Area (Section 2.1)

Summary of Jurisdictional Areas and Other Features (Section 2.1.1)

The Basin is a medium priority basin located in Northern California. The Basin is surrounded by several mountain ranges: the Cascade Mountains in the north, south and west, the Mahogany Mountain ridge in the east and Sheep Mountain and Red Rock Valley in the southeast. The major water features in the basin are Meiss Lake and several streams including Butte Creek. The primary communities in Butte Valley are the City of Dorris (population 962) and the smaller communities of Macdoel (population 155) and Mount Hebron (population 81) (DWR 2016b). All three of these populations are classified as severely disadvantaged communities (SDACs), based on annual median household income. The most significant land use in the Basin is for agriculture, accounting for 38.7% of the land in the Basin according to the 2010 County land use survey (DWR 2010) with primary crops of alfalfa, hay, and strawberry.

Water Resources Monitoring and Management Programs (Section 2.1.2)

Section 2.1.2 documents monitoring and management of surface water and groundwater resources in the Basin and their relation to GSP implementation. These include federal, state, and local agencies and their associated activities in Butte Valley.

Land Use Elements or Topic Categories of Applicable General Plans (Section 2.1.3)

Applicable land use and community plans in the Basin are outlined in Section 2.1.3, including the County of Siskiyou General Plan and City of Dorris General Plan.

Additional GSP Elements (Section 2.1.4)

Well policies, groundwater use regulations and the role of land use planning agencies and federal regulatory agencies in GSP implementation are outlined in Section 2.1.4.

Basin Setting (Section 2.2)

Section 2.2 includes descriptions of geologic formations and structures, aquifers, and properties of geology related to groundwater, among other related characteristics of the Basin.

Hydrogeologic Conceptual Model (Section 2.2.1)

The hydrogeologic conceptual model encompasses the Basin setting including its geographical location, climate, geology, soils, land use and water management history, and hydrology (Sections 2.2.1.1 through 2.2.1.9).

Current and Historical Groundwater Conditions (Section 2.2.2)

General Groundwater Flow Conditions of Butte Valley- Overview (Section 2.2.2.1)

This section was added as part of the July 2024 revision to address the deficiencies and corrective actions identified by DWR. Discussion in this section includes the Butte Valley groundwater Basin's position and interactions in the larger groundwater flow system and interactions with neighboring subbasins within this groundwater flow system. Additions were made to provide additional context on the Basin's hydrogeological setting within the broader Upper Klamath Basin and to provide greater detail on groundwater recharge and discharge dynamics within the Basin.

Development of Groundwater Resources (2.2.2.2)

Groundwater as a source of irrigation was vital for the Basin's settlement and development. Lack of major surface water was a major impediment to agricultural development until the first irrigation well was drilled by BVID, in 1929. Development of groundwater resources corresponded to increases in irrigated acres, which more than tripled from 1954 through 2010.

Groundwater Elevation (2.2.2.3)

Groundwater levels in the Basin fluctuate on a short-term scale with a seasonal high in the spring and seasonal low in the fall, and over the long term based on precipitation levels and changes in the amount of total groundwater extraction. Groundwater recharge in the Basin depends on precipitation, which has been in decline since the 1980s. Groundwater levels have decreased around 30 feet from the spring of 1979 to the spring of 2015; the decline in groundwater levels in five wells is shown in Figure 1.

Estimate of Groundwater Storage and Groundwater Storage Changes (2.2.2.3~~2~~)

Groundwater storage and specific yield are difficult to estimate due to the interconnectivity of all confined and unconfined units, and critical data gaps in the main water bearing and recharge unit, the High Cascade Volcanics. For the unconfined units, Lake Deposits, pyroclastic rocks, and Butte Valley Basalt, the weighted average specific yield is calculated to be 9.5% and total groundwater storage capacity is 2,560,000 acre-feet. The High Cascade Volcanics has unknown depth and extent, and a total estimate of storage is based on the Butte Valley Integrated Hydrologic Model (BVIHM; see Section 2.2.3). This section was updated in July 2024 to include a description of the revised method to calculate groundwater storage changes, which uses groundwater elevation change at each well applied to a Thiessen polygon (Voronoi polygon).

Groundwater Quality (Section 2.2.2.4~~3~~)

Based on an evaluation of Basin groundwater quality using available monitoring data (see Appendix 2-B), a list of constituents of interest was generated for the Basin. This list includes

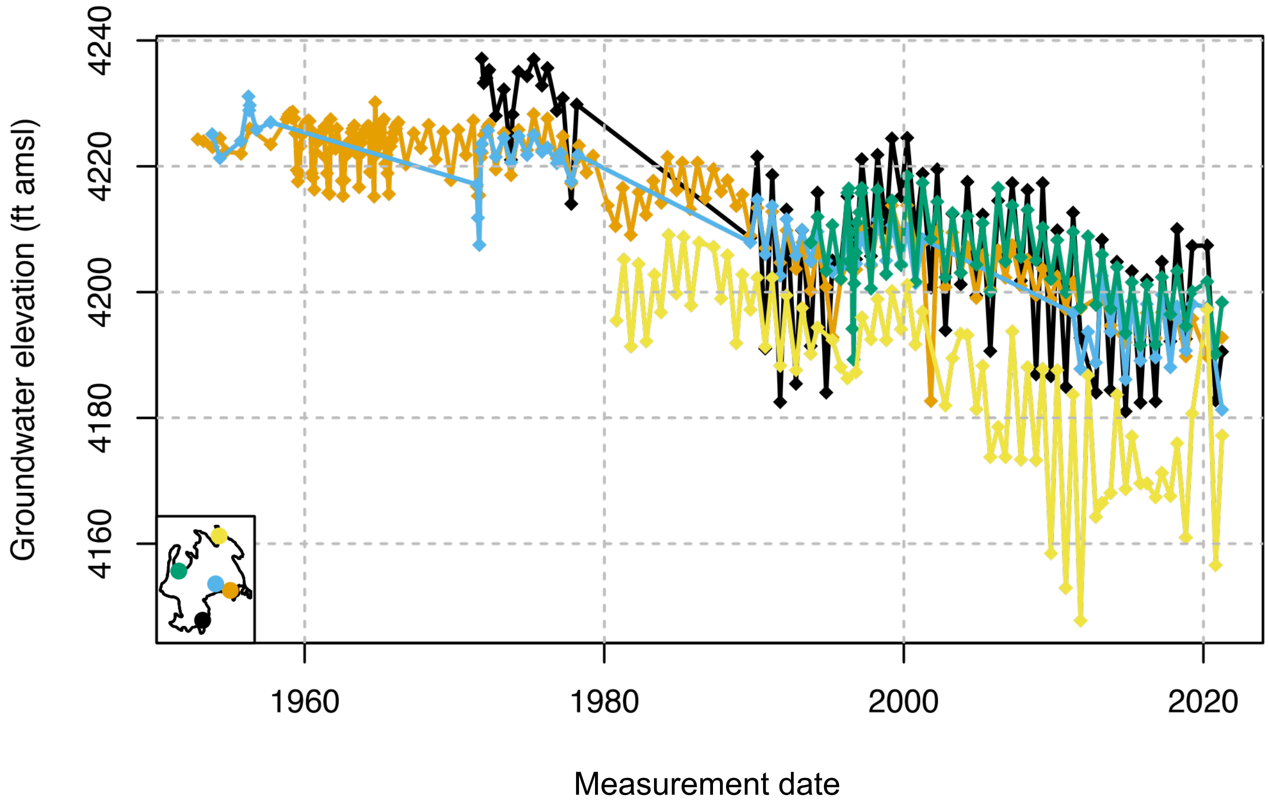

Figure 1: Groundwater elevation measurements over time in five wells, one located in each hydrogeologic zone.

1,2 Dibromoethane, arsenic, benzene, boron, nitrate, and specific conductivity. The known contaminated sites in the Basin include a PCE plume near Dorris, Calzona Tankways, and a former petroleum fueling facility.

Seawater Intrusion (Section 2.2.2.5~~4)~~)

The Basin is located well over 100 miles east of the Pacific Ocean with lowest observed water levels thousands of feet above mean sea level. Seawater intrusion is therefore not an issue of concern.

Land Subsidence Conditions (Section 2.2.2.6~~5~~)

Land subsidence is lowering of the ground surface elevation and is not known to be currently or historically significant in the Basin. The maximum observed subsidence is approximately 0.15 ft (46 millimeters [mm]) between June 2015 to September 2019 in an area west of the City of Dorris. The change in land elevation was likely the result of localized land leveling. Land subsidence will continue to be periodically re-evaluated.

Identification of Interconnected Surface Water Systems (Section 2.2.2.7~~6~~)

ISWs are defined as surface water which is connected to groundwater through a continuous saturated zone. SGMA mandates an assessment of the location, timing, and magnitude of ISW depletions, and to demonstrate that projected ISW depletions will not lead to significant and undesirable results for beneficial uses and users of groundwater.

The Basin is a hydrologically closed basin. No surface water leaves the Basin and the Basin has no major drainage. Surface waters in Butte Valley are limited to Meiss Lake (hydrologically a terminal lake) and five creeks: Butte, Prather, Ikes, Harris, and Musgrave. Many of these waterbodies go dry in the summer and fall. Groundwater elevations near the creeks have been identified as data gaps. Interpolated (i.e., estimated) groundwater levels near the creeks are generally more than 30 feet below these creeks, suggesting losing stream conditions. Lack of streamflow data are also known data gaps. Additional information is required to determine in more detail the interconnections between the surface water bodies in Butte Valley with groundwater and the magnitude and direction of flow exchange.

Identification of Groundwater Dependent Ecosystems (Section 2.2.2.8~~7~~)

SGMA refers to GDEs as “ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.”

The habitat ranges of freshwater species in the Basin with special designations (i.e., endangered, threatened, species of special concern, or on a watch list) were mapped. Riparian vegetation is prioritized for management in the Basin: managing for riparian vegetation addresses the needs of other special-status species in the Basin. These prioritized species are considered throughout the GSP, particularly in setting the sustainability indicators defined in Chapter 3 and identifying projects and management actions identified in Chapter 4. Vegetative GDE identification and classification was conducted through:

- The mapping of potential GDEs.
- Assigning rooting depths based on predominant assumed vegetation type.
- E~~S~~stablishing representations of depth to groundwater.
- Identifying potential areas where depth to groundwater, rooting depth, and presence of potential GDES confirm likely groundwater-dependence.

Potential mapped GDEs were grouped into two categories: potential GDE (where the grid-based analysis showed that the area is likely to be connected to groundwater) or potentially not a GDE (where the grid-based analysis showed that the area is disconnected from groundwater). Based on this analysis, around 10% of the mapped potential GDE area is likely connected to groundwater and assumed to be a GDE (shown in Figure 2, below). The current list of potential GDEs is considered tentative, a data gap, and dependent on collection of additional groundwater level data. An update was made to this section in July 2024, the addition of Figure 2.3.2, which shows rain, stream gage, and groundwater level monitoring added to fill data gaps in areas near potential GDEs.

Water Budget (Section 2.2.3)

This section was updated in July 2024 to present the model BVIHM area and the Basin area to clarify any confusion in the original GSP. The model is currently under further refinement and calibration and will continue to be updated throughout GSP implementation. The historical water budget for the Basin was estimated for the period October 1989 through September 2018, using the Butte Valley Integrated Hydrologic Model (BVIHM). This 29-year model period includes water years ranging from very dry (e.g., 2014) to very wet (e.g., 1999). On an interannual scale, it includes a multi-year wet period in the late 1990s and a multi-year dry period in the late 2000s and mid-2010s.

The water budget is presented as flows into and out of two subsystems of the integrated watershed: the soil zone (land/soil model subsystem) and the groundwater subsystem. The water budget for the entire watershed is also included in this section.

In the historical water budget, inflows include precipitation on the valley floor (to land) and subsurface inflow or mountain front recharge from the surrounding quaternary volcanic underlying the upper watershed (to groundwater). Precipitation input is variable with a median of 86 TAF. With a median of 185 TAF, subsurface inflows are more than twice as large as precipitation. Basin outflows consist of evapotranspiration (from land) and subsurface outflow (from groundwater) with median values of 108 TAF and 169, respectively. Fluxes between the two subsystems include recharge (from land to groundwater) and groundwater pumping for applied water (from groundwater to land). Median recharge to groundwater is 54 TAF, 22 TAF lower than the median groundwater pumping value. This difference between pumping and recharge is made up for though lateral inflows into the Basin.

While soil zone storage shows minimal interannual change, aquifer storage varies, with a long-term trend indicating some groundwater depletion.

Fifty-year future projected water budgets were developed using historical hydroclimate data (for water years 1991 to 2011) and four climate change scenarios were applied to explore potential effects of global warming on the Butte Valley watershed.

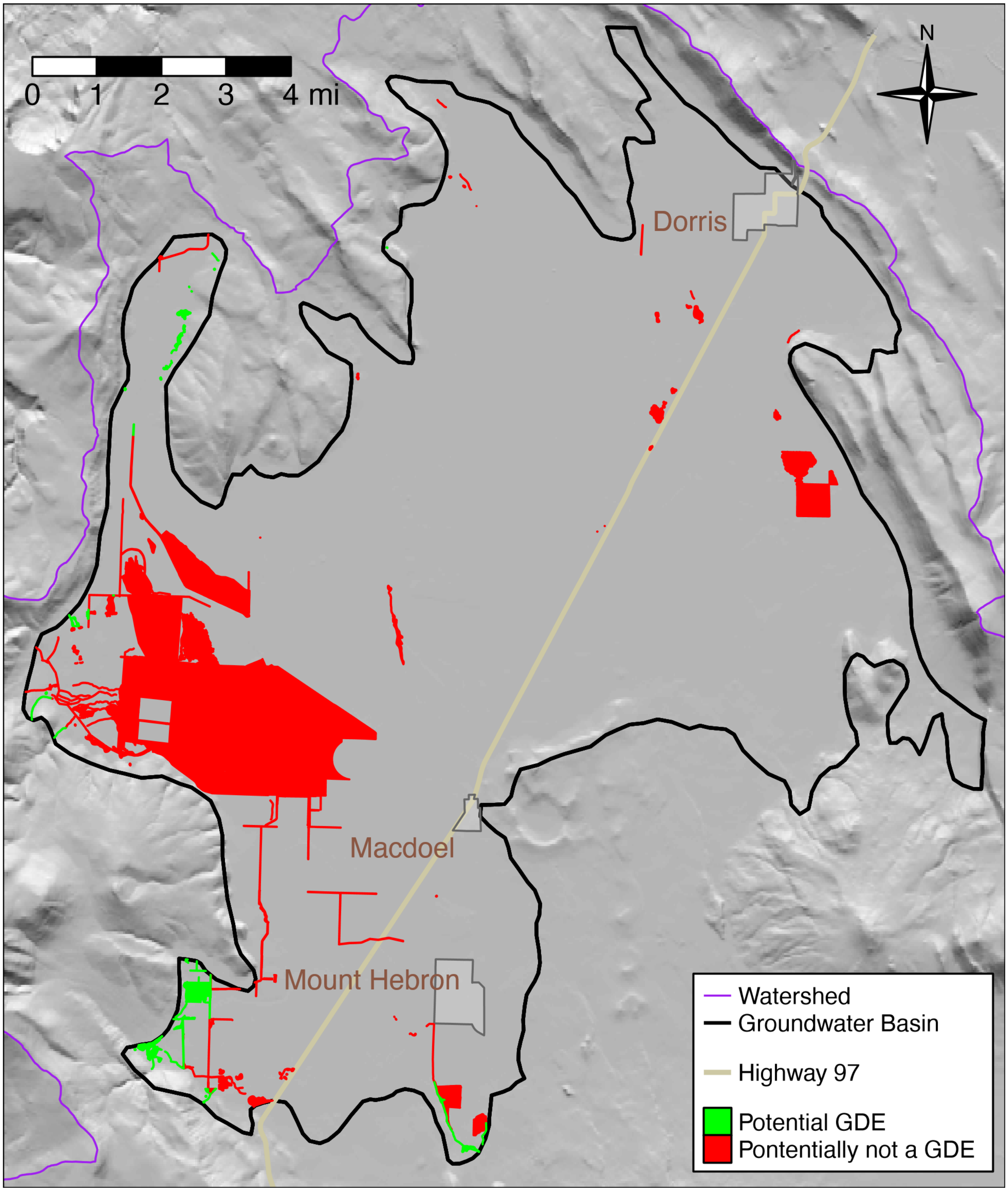

Figure 2: Categorized GDEs for the Basin.

Future Water Budget (Section 2.2.4)

The future projected water budget uses the observed weather parameters to create a hypothetical future period in which climate conditions are the same as this "base case" period. Climate-influenced variables are modified to create four climate change scenarios: a near-future, far-future, far-future with Wet with Moderate Warming, far-future with Dry with Extreme monitoring climates. BVIHM was run for the base case and all four of the climate change projected scenarios are run for 2022 to 2071.

Sustainable Yield

This section was revised in July 2024 to add relevant information on the conceptual basis for estimating sustainable yield and improve understanding of how subsurface outflow from the basin is a critical factor in average groundwater levels within the Basin. A complete discussion on setting the sustainable yield at 65 TAF/ yr is provided.

ES-3: SUSTAINABLE MANAGEMENT CRITERIA (CHAPTER 3)

Chapter 3 builds on the information presented in the previous chapters and details the key sustainability criteria developed for the GSP and associated monitoring networks.

Chapter 3 was revised in July 2024 to address the deficiencies and corrective actions identified by DWR. The primary changes include:

i. Both text and maps in Section 3.3 were updated in July 2024 to show the current monitoring network and record the progress in the work to fill data gaps since GSP submittal.
ii. Section 3.3.2 was amended to include a summary of the updated method to calculate groundwater storage change.
iii. The groundwater level sustainable management criteria were revised, specifically the undesirable result (Section 3.4.1.1) and the definition of minimum thresholds (Section 3.4.1.2). The revised undesirable result definition was based on impacts to beneficial uses and users under undesirable result conditions. Specifically, the number of wells that may be dewatered under undesirable result conditions, and the ability to mitigate these wells is a key component of this definition (Revised well failure analysis in Appendix 3-C). Minimum thresholds for groundwater levels were raised to what was originally the "soft-landing trigger", with wells for which the minimum threshold (MT), the MT is set at 5 ft above the total well depth.

Sustainability Goal and Sustainability Indicators (Section 3.1)

The Sustainability Goal of the Basin is to maintain groundwater resources in ways that best support the continued and long-term health of the people, the environment, and the economy in ~~Shasta~~ Butte Valley for generations to come.

The GSP details six sustainability indicators with a goal of preventing undesirable results to any one of the following sustainability indicators:

1. Chronic Lowering of Groundwater Levels

2. Reduction of Groundwater Storage
3. Degraded Water Quality
4. Depletions of Interconnected Surface Water
5. Seawater Intrusion
6. Land Subsidence

Table 3 defines undesirable results for each sustainability indicator. Quantifiable minimum thresholds (MT), measurable objectives (MO), and interim milestones were also developed as checkpoints that evaluate success in maintaining the sustainability goal and are quantified in Chapter 3 of the GSP. Monitoring wells throughout the basin will be used to assess conditions relevant to each sustainability indicator. Monitoring wells were selected based on well location, monitoring history, well information, and well access.

Table 3: ~~Shasta~~ Butte Valley GSP Sustainability Indicator undesirable results defined

Sustainability Indicator	Undesirable Result Defined
Chronic Lowering of Groundwater Levels	The fall low water level observation ~~in any of the~~in 25% (4/13 wells) representative monitoring sites in the Basin fall~~s~~ below the respective minimum threshold for 2 consecutive years.
Reduction of Groundwater Storage	Same as "Chronic Lowering of Groundwater Levels."
Degraded Water Quality	More than 25% of groundwater quality wells exceed the respective maximum threshold for concentration and/or concentrations in over 25% of groundwater quality wells increase by more than 15% per year, on average over ten years.
Depletions of Interconnected Surface Water	SMCs not developed for this sustainability indicator due to lack of information on interconnectedness of surface water and groundwater in the Basin. Depending on funding and the filling of data gaps, SMCs may be set in a future GSP update.
Seawater Intrusion	Not applicable for the Basin.
Land Subsidence	Groundwater pumping induced subsidence is greater than the minimum threshold of 0.1 ft (0.03 m) in any single year.

Appendix 3-C was revised in July 2024 to address the deficiencies and corrective actions identified by DWR. Changes have been made to both the hydrographs and the well failure analysis sections. The primary change to hydrographs is the update on the SMCs for each RMP. The well failure analysis has been updated and reorganized with primary changes as below:

- Audited well records in OSWCR regarding the best information available for well locations, well construction information, and planned use.
- Replaced the result of fall 2017 in the original well failure analysis with the analysis of fall 2023 to reflect the most recent fall conditions. And added the analysis of well outages risk at minimum threshold across the basin to validate the feasibility of well mitigation at MT
- Clarified the approaches for well outage risk analysis (direct comparison and wet depth trend analysis) with more in-depth discussion and details.

ES-4: PROJECTS AND MANAGEMENT ACTIONS TO ACHIEVE SUSTAINABILITY (CHAPTER 4)

Chapter 4 describes past, current, and future projects management actions (PMAs) used to achieve the Butte Valley sustainability goal.

Chapter 4 was revised in July 2024 to address the deficiencies and corrective actions identified by DWR. The primary changes include addition of three PMAs: a well inventory and mitigation program, a preliminary groundwater allocation program, and a groundwater demand management PMA. Additionally, updates were made to include current work with the addition of the City of Dorris Well Deepening and Pipeline Replacement PMA.

To achieve the sustainability goals for Butte Valley by 2042, and to avoid undesirable results over the remainder of a 50-year planning horizon, as required by SGMA regulations, multiple PMAs have been identified and considered in this GSP.

PMAs are categorized into three different tiers, as follows:

Tier I: Existing PMAs that are currently being implemented and are anticipated to continue to be implemented.

Projects or management actions in the Tier I category include:

- Abandonment of Sam's Neck Flood Control Facility
- City of Dorris Water Conservation
- Well Drilling Permits and County of Siskiyou Groundwater Use Restrictions
- Kegg Meadow Enhancement and Butte Creek Channel Restoration
- Permit required for groundwater extraction for use outside the basin from which it was extracted (Siskiyou County Code of Ordinances)
- Upland Management
- Watermaster Butte Creek Flow Management

Tier II: PMAs ~~planned for near-term initiation~~with initiation and implementation from ~~(~~2022 ~~to~~ through 2027~~)~~ by individual member agencies.

Tier II PMAs include:

- Well Inventory and Mitigation Program
- Preliminary Groundwater Allocation Program
- Groundwater Demand Management
- City of Dorris Well Deepening and Pipeline Replacement
- High Priority PMAs - Data Gaps and Data Collection
  - Butte Valley Integrated Hydrologic Model (BVIHM) Update (High Priority)
  - Drought Year Analysis (High Priority)
  - Expand Monitoring Networks (High Priority)
  - General Data Gaps (High Priority)
  - Groundwater Dependent Ecosystem Data Gaps (High Priority)
  - Interconnected Surface Water Data Gaps (High Priority)
- Avoiding ~~Significant~~ Increase of Total Net Groundwater Use ~~from the Basin~~Above Sustainable Yield
- Management of Groundwater Use and Recharge
- Conservation Easements
- Dorris Water Meter Installation Project
- Irrigation Efficiency Improvements
- Public Outreach
- Voluntary Managed Land Repurposing (not including Conservation Easements)

~~Well Inventory Program~~

- ~~Well Replacement~~

Tier III: Additional PMAs that may be implemented in the future, as necessary (initiation and/or implementation 2027 to 2042).

Tier III PMAs, identified as potential future options, include:

- Alternative, Lower ET Crops
- Butte Creek Diversion Relocation
- Butte Valley National Grassland Groundwater Recharge Project
- Strategic Groundwater Pumping Restriction

Additionally, other management actions are outlined that may be explored during GSP implementation~~ are outlined~~.

ES-5: PLAN IMPLEMENTATION, BUDGET AND SCHEDULE (CHAPTER 5)

Section 5 details key GSP implementation steps and timelines. Cost estimates and elements of a plan for funding GSP implementation are also presented in this section.

Implementation of the GSP will focus on the following several key elements:

1. GSA management, administration, legal and day-to-day operations.
2. Implementation of the GSP monitoring program activities.
3. Technical support, including BVIHM model updates, SMC tracking, and other technical analysis.
4. Reporting, including preparation of annual reports and five-year evaluations and updates.
5. Implementation of PMAs.
6. Ongoing outreach activities to stakeholders.

Annual implementation of the GSP over the 20-year planning horizon is projected to cost between $135,000 and $230,000. The GSA may pursue funding from state and federal sources for GSP implementation. As the GSP implementation proceeds, the GSA will further evaluate funding mechanisms and fee criteria and may perform a cost-benefit analysis of fee collection to support consideration of potential refinements.