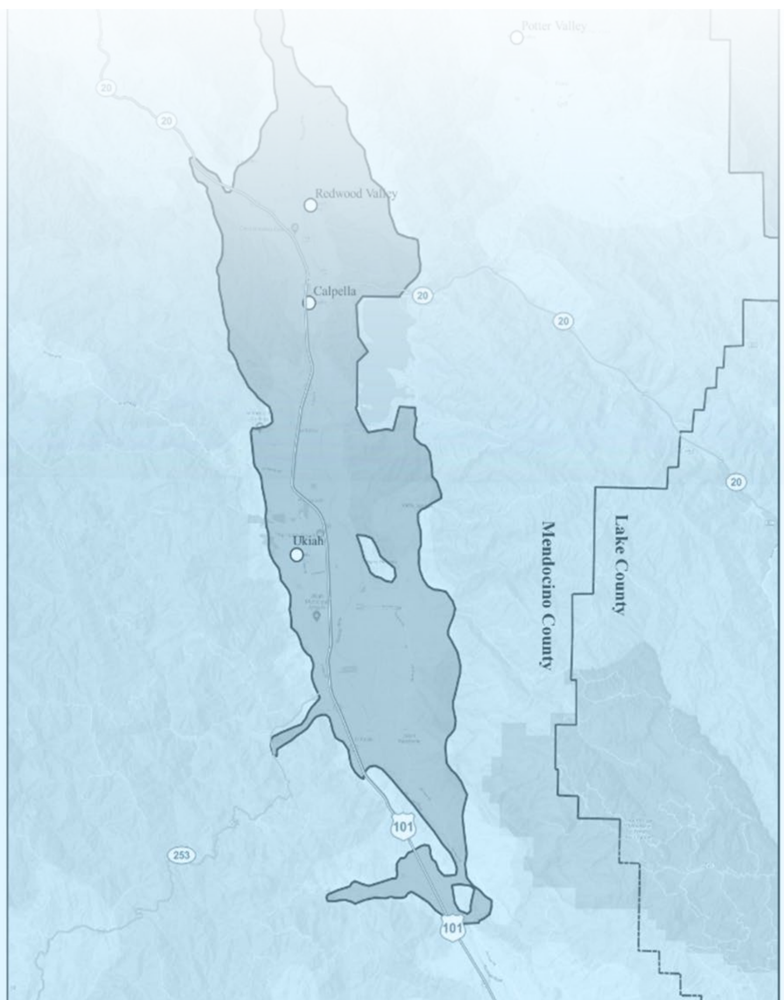
AUGUST 2021

CHAPTER 4: PROJECTS AND MANAGEMENT ACTIONS

UKIAH VALLEY BASIN GROUNDWATER SUSTAINABILITY AGENCY

Ukiah Valley Groundwater Sustainability Plan

PUBLIC DRAFT REPORT



UKIAH VALLEY BASIN GROUNDWATER SUSTAINABILITY AGENCY
UKIAH VALLEY BASIN GROUNDWATER SUSTAINABILITY PLAN
(Public Draft)

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Suggested Citation: Ukiah Valley Basin Groundwater Sustainability Agency, Ukiah Valley Basin Groundwater Sustainability Plan (Public Draft), August 2021.

Contents

List of Acronyms

Abb	Explanation
ACS	American Community Survey, U.S. Census Bureau
ALDP	Agricultural Lands Discharge Program
amsl	above mean sea level
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CCD	Census county division
CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
CDP	Census designated place
CDPH	California Department of Public Health
CDPR	California Department of Pesticide Regulation
CIWQS	California Integrated Water Quality System
CLSI	California Land Stewardship Institute
CW3E	Center for Western Weather and Water Extremes
DAC	Disadvantaged community
DDW	Division of Drinking Water
DWR	California Department of Water Resources
ft	Foot/feet
GAMA	Groundwater Ambient Monitoring and Assessment Program
GDE	Groundwater dependent ecosystem
GIS	Geographic information system
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GW	Groundwater
HCM	Hydrogeologic Conceptual Model
iGDEs	Indicators of groundwater dependent ecosystem
IHCM	Initial hydrogeologic conceptual model
InSAR	Interferometric Synthetic Aperture Radar
JPA	Joint Powers Authority
km	Kilometer/kilometers
LUST	Leaking underground storage tank
m	Meter/meters
MCRCD	Mendocino County Resource Conservation District

(continued)

Abb	Explanation
MCWA	Mendocino County Water Agency
MHI	Median household income
mm	Millimeter
MRP	Monitoring and Reporting Plan
msl	Mean sea level
NCCAG	Natural Communities Commonly Associated with Groundwater
NCRWQCB	California North Coast Regional Water Quality Control Board
NPDES	National Pollutant Discharge Elimination System
NWS	National Weather Service
OSWCR	Online Systems for Well Completion Reports
PG&E	Pacific Gas & Electric
PLSS	Public Land Survey System
PMC	Pacific Municipal Consultants
POC	Point of contact
PVP	Potter Valley Project
QA/QC	Quality Assurance and Quality Control
R3MP	Russian River Regional Monitoring Program
RRFCD	Russian River Flood Control and Water Conservation Improvement District
SDAC	Severely disadvantaged community
SGMA	Sustainable Groundwater Management Act
SMUD	Sacramento Municipal Utility District
SW	Surface Water
SW/GW	Surface Water/Groundwater
SWRCB	California State Water Resources Control Board
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Load
TSS	Technical Support Services
U.S.	United States
URRWA	Upper Russian River Water Agency
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency

(continued)

Abb	Explanation
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UVAP	Ukiah Valley Area Plan
UVBGSA	Ukiah Valley Basin Groundwater Sustainability Agency
UWMP	Urban Water Management Plan
WCR	Well Completion Report
WDMP	Water Demand Management Program
WDR	Waste Discharge Requirements
WWTP	Wastewater Treatment Plant

4. PROJECTS AND MANAGEMENT ACTIONS

4.1 Introduction and Overview

To achieve this Plan's sustainability goal by 2042 and avoid undesirable results as required by SGMA regulations, multiple projects and management actions (PMAs) have been designed for evaluation and possible implementation by the GSA, in partnership with other entities and agencies active in the Basin, such as the RCD. PMAs are described in accordance with §354.42 and §354.44 of the SGMA regulations. Projects generally refer to infrastructure features and other capital investments, their planning, and their implementation, whereas management actions are typically programs or policies that do not require capital investments, but are geared toward engagement, education, outreach, changing groundwater use behavior, adoption of land use practices, monitoring, etc.

PMAs discussed in this section will help achieve and maintain the sustainability goals and measurable objectives, and avoid the undesirable results identified for the Basin in **Section 3**. These efforts will be periodically assessed during the GSP implementation period. As planning is at varying early stages of development, complete information on construction requirements, operations, costs, permitting requirements, and other details are not uniformly available. A conceptual description of the operation of PMAs as part of the overall GSP is provided in this section and in **Section 5**. In developing PMAs, priorities for consideration include minimizing impacts to the Basin's economy, maximizing external funding, and prioritizing voluntary and incentive-based programs over mandatory programs.

In Ukiah Valley, the PMAs are designed to achieve the following objectives related to the SMC: to achieve the thresholds and objectives for the interconnected surface water sustainability indicator (**Section 3.9**), to provide sufficient capacity for conjunctive use of groundwater and surface water to prevent water shortage during periods of low surface water availability, and to prevent the lowering of groundwater levels to protect wells from outages, preserve groundwater dependent ecosystems, and avoid additional stresses on interconnected surface waters and their habitat.

PMAs included in this GSP will not only be important for the above SMC related objectives, but can represent a critical tool to develop water resiliency in the Basin: the current critical drought conditions are demonstrating the need to develop a new, integrated framework that can support the County and all the water agencies in responding to future drought conditions.

The identified PMAs reflect a range of options to achieve the goals of the GSP and will be completed through an integrative and collaborative approach with other agencies, organizations, landowners, and beneficial users. The GSA considers itself to be one of multiple parties collaborating to achieve overlapping, complementary, and multi-benefit goals across the integrated water and land use management nexus in the Basin. Furthermore, PMAs related to water quality, interconnected surface waters, and groundwater-dependent ecosystems will be most successful if implemented to meet the multiple objectives of collaborating partners. For many of the PMAs, the GSA will enter into informal or formal partnerships with other agencies, NGOs, or individuals. These partnerships may take various forms, from GSA participation in informal technical or information exchange meetings, to collaboration on third-party proposals, projects, and management actions, to the lead agency on proposals and the subsequent implementation of PMAs.

The GSA and individual GSA partners will have varying but clearly identified responsibilities with respect to permitting and other specific implementation oversight. These responsibilities may vary from PMA to PMA or even within individual phases of a PMA. Inclusion of a PMA in this GSP does not forego any obligations under local, state, or federal regulatory programs. Inclusion in this GSP also does not assume any specific project governance or role for the GSA. While the GSA does have an obligation to oversee progress towards groundwater sustainability, it is not the primary regulator of land use, water quality, or environmental project compliance. It is the responsibility of the respective implementing, lead agency to collaborate with appropriate regulatory agencies to ensure that the PMAs for which the lead agency is responsible are in compliance with all applicable laws. The GSA may choose to collaborate with regulatory agencies on specific overlapping interests such as water quality monitoring and oversight of projects developed within the Basin.

PMAs are classified under three main categories: 1) supply augmentation, including conjunctive use, 2) demand management and water conservation, and 3) other management actions. Furthermore, PMAs are organized into two tiers, explained in **Section 4.2** and **Section 4.3**, that are reflective of their timeline for implementation:

1. TIER I: Existing PMAs that are currently being implemented and are anticipated to continue to be implemented.
2. TIER II: PMAs planned for near-term initiation and implementation (2022–2027) by individual member agencies, as well as additional PMAs that may be implemented in the future, as necessary (initiation and/or implementation 2027–2042).

The process of identifying, screening, and finalizing PMAs is illustrated in **Figure 1**. Existing and planned projects were first identified through review of different reports, documents, and websites. Planned and new projects also received stakeholder input in their identification. These projects were then categorized into four categories: supply augmentation, conjunctive use, water conservation, and water quality enhancement. In the next step, all projects were evaluated to identify those with the highest potential to be included in the GSP. Using the integrated hydrological model, the effectiveness of each project, or a combination of projects, can be assessed to identify those projects that, if implemented, will most likely bring the Basin into sustainability. Monitoring will be a critical component in evaluating PMA benefits and measuring potential impacts from PMAs.

The ability to secure funding is an important component in the viability of implementing a particular PMA. Funding sources may include grants or other fee structures (**Section 5**). Under the Sustainable Groundwater Management Implementation Grant Program Proposition 68, grants can be awarded for planning activities, monitoring, and for projects with a capital improvement component. As such, state funds for reimbursing landowners for implementation of PMAs, including land fallowing and well shut offs, currently cannot be obtained under this program, but Department of Water Resources is still evaluating different options.

In 2020, the California Land Stewardship Institute (CLSI) received one of only five watershed coordinator grants in California to work with the Ukiah Valley GSA. CLSI has worked in the Ukiah Valley for over 25 years primarily completing numerous Fish Friendly Farming and Ranching plans and projects, running the Russian River Frost program, and implementing many water storage, conservation, and recycled water projects with landowners and cities. The grant work plan addresses the need for a community-based watershed plan that identifies specific actions needed to implement SGMA and address federal, state, and local planning goals.

The watershed coordinator will support the identification of projects to improve groundwater levels, restore fish and wildlife habitat, and reduce fire fuels in the watershed. The watershed coordinator will work with the GSA, Technical Advisory Committee, Mendocino County, and other partners to define project locations for groundwater recharge and conjunctive use , evaporation reduction , stream revegetation, and fire/fuel reduction and work with landowners to assure such projects can be implemented in a collaborative manner. Project identification starts in May 2021 and will produce a first round of easy-to-implement projects within 2021. CLSI will work with local partners and the GSA to implement projects, and can also rapidly implement projects directly.

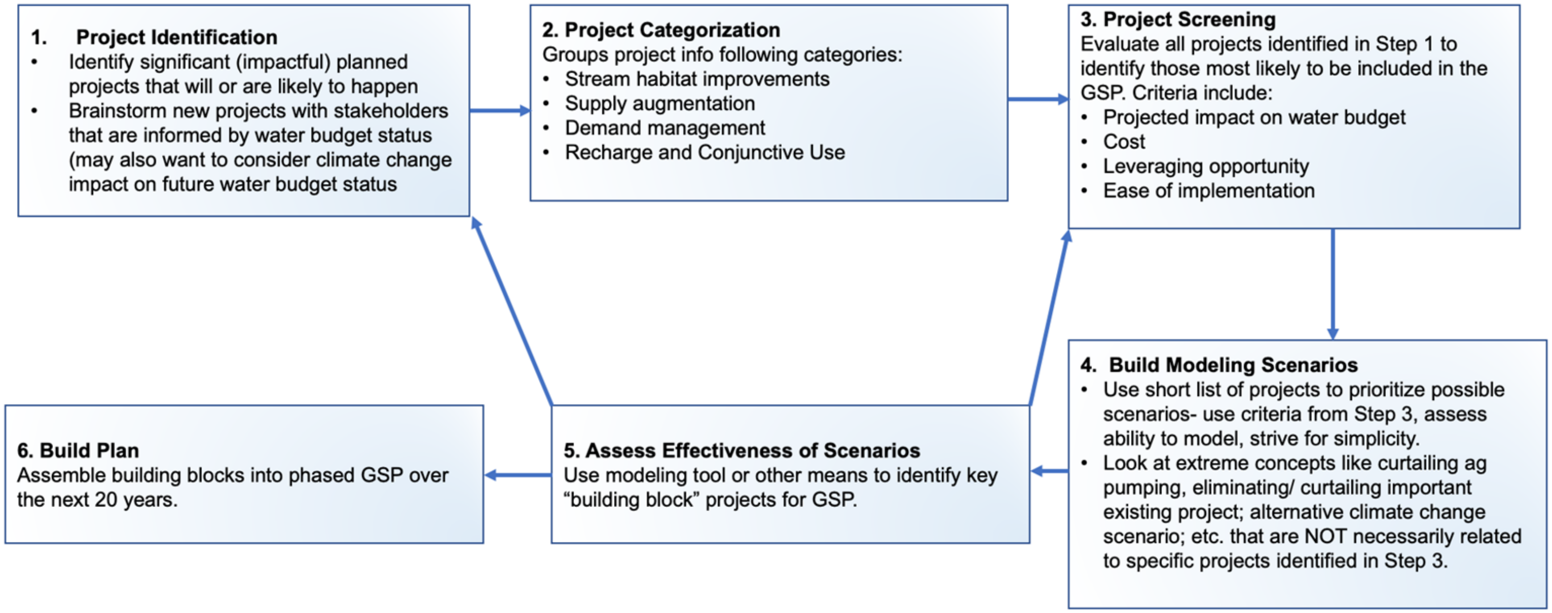

Figure 1: Process for identification and prioritization of PMAs.

4.2 TIER I: Existing or Ongoing Projects and Management Actions

The existing PMAs presented in **Section 4.3** have been extracted from the following documents:

- The County of Mendocino General Plan, August 2009
- Conceptual Model of Watershed Hydrology, Surface Water and Groundwater Interactions and Stream Ecology for the Russian River Watershed, September 2016.
- Ukiah Valley Area Plan, August 2011
- Fish Habitat Flows and Water Rights Project, Draft Environmental Impact Report, August 2016
- The North Coast Resource Partnership projects (website)
- Draft Lake Mendocino Master Plan, 2019 Revision
- Lake Mendocino Water Supply Reliability Evaluation Report, May 2013
- City of Ukiah Storm Water Management Plan, February 2006.
- City of Ukiah 2015 Urban Water Management Plan
- Southern Sonoma County Storm Water Resources Plan, May 2019
- Sonoma Water 2020-2025 Capital Improvement Plan
- North Coast Integrated Regional Water Management Plan Phase III, August 2014

Table 2 presents the existing and ongoing (Tier I) PMAs in the Basin.

Table 2: PMA Summary Table.

Lead Agency	Project Title	Funding Request	Total Project Cost	Project Summary	Status of Project	Estimated Comple-tion Date	Project Type
City of Ukiah's Water Resources Department	Purple Pipe Project (Phase I through III)	$10,276M	$32,085M	The Purple Pipe Project is a recycled water project that includes nearly eight miles of pipeline, a 66-million-gallon water storage reservoir, upgraded treatment facilities and improved water and wastewater infrastructure on Oak Manor Drive to serve agricultural and urban irrigation and frost protection demands of about 1,320 AFY. This allows the City to serve approximately 325 million gallons of water to farmers, parks, and schools.	Completed	2020	Supply Augmentation
Redwood Valley Little River Band of Pomo Indians	Water Meter Replacement	$10,000	$18,000	The Redwood Valley Tribe will replace all 35-year old, malfunctioning residential water meters. The new radio read meters will allow accurate measuring of water usage, identification of possible leaks, and inform the district of residents using excess water. Redwood Valley Tribe receives water from the Redwood Valley County Water District which is extremely limited, and this project will reduce water needs from the District.	60% Complete	Summe 2021	Water Conservation

Table 2: PMA Summary Table. *(continued)*

Lead Agency	Project Title	Funding Request	Total Project Cost	Project Summary	Status of Project	Estimated Comple-tion Date	Project Type
Pinoleville Pomo Nation	Rainwater Catchment & Usage	$125,000	$125,000	Pinoleville Pomo Nation will install a 60,000 gallon rainwater catchment tank at our administrative offices to support the food garden, ornamental landscape. This water will reduce the amount we use from Millview Water District, whose source of water is from the Russian River.	50% Complete	Fall 2022	Water Conservation
12th District Agriculture Association	Redwood Empire Fairgrounds Water System Upgrade	$1.5M	$20M	The aged (ca. 1950) and leaking plumbing system at the fairgrounds has been a problem for many years, but funds to secure a phased upgrade/replacement have not been secured. This site represents the third largest water customer to the City of Ukiah, and leaks may represent 15-20% of total water delivered. Purchasing a ”leak detection wand” is important to monitor the segments where upgrade/replacement will not occur during Phase 1.	50% Complete	Fall 2022	Water Conservation

Table 2: PMA Summary Table. *(continued)*

Lead Agency	Project Title	Funding Request	Total Project Cost	Project Summary	Status of Project	Estimated Comple-tion Date	Project Type
Mendocino College	Irrigation upgrades and turf to xeric landscape conversion	$58,000	$73,000	Mendocino College Ukiah campus will replace irrigation components on ornamental landscapes to increase efficiency, and will convert two turf lawns to xeric landscapes to save water. Purchase of turf aerator will promote deeper root growth on sports fields, thus requiring less frequent irrigation ($4,500).	75% complete	Fall 2021	Water Conservation
Ukiah Unified School District	Sports field conversion to non-irrigated surface	$1.4M	$2.5M	The soccer field at Ukiah High School will be converted from an irrigated turf surface to an artificial year-round playing surface. Staff have calculated the annual water saving to be at least 2,240,000 gallons. The entire soccer facility upgrade cost estimate is $6,700,000.	Division of the State Architect is in review and approval process of 100% design.	Fall 2022	Water Conservation

Table 2: PMA Summary Table. *(continued)*

Lead Agency	Project Title	Funding Request	Total Project Cost	Project Summary	Status of Project	Estimated Comple-tion Date	Project Type
Mendocino County RCD	Forsythe Floodplain Restoration Project	$270,000	$2.7 M	Removal of levee on Forsythe Creek will allow expansion of floodwaters, reducing erosion, and increasing infiltration. Armoring opposite bank will protect private residences from further property damage. Restoring riparian community will promote natural species recovery.	60% design complete. CEQA MND complete	Fall 2025	Water Quality Enhancement

4.3 TIER II: Planned and Potential Future Projects and Management Actions

Tier II PMAs, planned for near-term feasibility evaluation, initiation and/or implementation (2022-2027) by individual agencies, exist at varying stages in their development. Project descriptions are provided below for each of the identified Tier II PMAs. The level of detail provided for the PMAs described below depends on the status of the PMA; where possible the project descriptions include information relevant to §354.42 and §354.44 of the SGMA regulations. Evaluation and implementation of some of these PMAs is still subject to funding availability. Projects are described through the following categories: 1) supply augmentation, 2) demand management and water conservation, and 3) other management actions.

4.3.1 Supply Augmentation Projects

4.3.1.1 Conjunctive Use Many of the projects considered in this analysis can be considered elements of "conjunctive use". Conjunctive use commonly refers to the coordinated use of groundwater and surface water to meet water supply needs and preserve groundwater sustainability. According to the Water Education Foundation, conjunctive use can be categorized into passive and active actions. In passive conjunctive use, or in-lieu conjunctive use, surface water is used in wet years and groundwater is relied upon during dry years. In active conjunctive use, surface water is purposefully diverted to injection wells or ponds to recharge the underlying groundwater aquifer during wet years for later use in dry years. Conjunctive use practices enable water managers to utilize groundwater basins for storage to accumulate and reserve water for use at a later date. They also provide a strategy for adjusting supplies to meet demands under highly variable hydrological conditions. Various strategies rely on these practices including groundwater banking and groundwater transfers. In the case of the Ukiah Valley Basin, there is the opportunity to utilize conjunctive use practices to the benefit of water users in the Basin. This is due to the Basin's proximity to significant surface water storage in Lake Mendocino and the Russian River, the existence of surface water rights, and the presence of numerous surface water diversions and conveyance facilities. To take advantage of the opportunities provided by the presence of these facilities, any proposed action that will rely on facilities managed by DWR or Bureau of Reclamation will have to comply with requirements imposed by those agencies as articulated in the Water Transfer White Paper (DWR and Reclamation, 2019). These requirements are:

- Transfer will result in providing the agreed-upon amount of transfer water. Transfer will not unreasonably affect fish, wildlife, other instream beneficial uses, or the environment and will have no significant unmitigated environmental effects.
- Transfer will not injure other legal users of water.
- Proposal shows that an adequate monitoring and mitigation plan is in place prior to the transfer to document that the above conditions are met. Successful proposals will generally consist of the following components:
- Documentation of surface water rights and the method used to quantify the amount of surface water available for the transfer.
- The location and characteristics of the wells proposed for use in pumping groundwater.
- The historic groundwater pumping in non-water transfer years to establish an appropriate baseline for groundwater pumping volumes that would occur absent the transfer program.
- The proposed volume and schedule of transfer-related groundwater pumping.
- A monitoring plan designed to assess the effects of the transfer.

- A mitigation plan designed to alleviate possible injury to other legal users of water.
- Demonstration that the transfer is consistent with the local requirements and applicable GSP(s) of the groundwater basins where the additional groundwater pumping would occur under the transfer proposal; or written notification to the relevant GSA(s) if a GSP has not been implemented at the time the transfer is being proposed.

Additional requirements are typically imposed that protect the overall amount of groundwater storage in the Basin. A typical requirement is the specification of an “unrecoverable loss” factor to account for a combination of the lateral movement of groundwater out of the area and a mitigation factor which requires a percentage “leave behind” volume. The net result of these requirements is a system that provides a net positive, accumulating benefit to groundwater storage in the basin.

1) Rehabilitation of Existing Reservoirs

There are two primary practices that could help rehabilitate existing reservoirs. These include:

- *Pond Liners:* Older agricultural ponds could benefit from the installation of either synthetic liners or clay-based liners to reduce water loss due to percolation. Initial surveys show that at least five existing ponds could be considered for liner installation if funding is available. The estimated cost would be approximately $1 per square foot.
- *Pond Clean Out* Existing, unlined ponds could benefit from reconditioning; i.e. removal of soil/debris to return pond capacity to original levels, during low water years if storage conditions allow. Such reconditioning practices would also prepare existing ponds for pond liner installation as applicable. The estimated cost would be approximately $20 per cubic yard.

Reservoirs provide additional flexibility in agricultural water supply and increase irrigation efficiency. The additional flexibility and storage can improve the timing of pumping and surface diversions to help maintain appropriate streamflows and reduce surface water depletions. The reduction in instantaneous demand is also beneficial for reducing the risk of impacts to fishery resources.

2) Construction of Additional Off-stream Reservoirs

Existing surface water storage ponds within the Ukiah Valley are essential for reducing instantaneous demand on water sources, especially for reducing surface water diversions, and for providing additional water supply security in drier water years. The reduction in instantaneous demand is also beneficial for reducing the risk of impacts to fishery resources. Between 2009-2013, there were 12 off-stream agricultural ponds built with cost share funding as part of a $5 million grant from the USDA Agricultural Water Enhancement Program (AWEP) administered by the CLSI. While several other off-stream agricultural ponds were built without funding assistance, initial surveys show that at least eight new agricultural ponds could possibly be added if funding is available.

3) Construction of Additional of Off-stream tank for storage

Off-stream tanks and storage can be built to store water during high-flow and wet season to be used during demand season. Such storage can be built at small-scale for domestic and small agricultural uses and/or at a larger scale for municipal and major agricultural uses. A feasibility study needs to be considered at first. The project can increase supply reliability and provide additional supply to offset pumping and surface water diversions that may cause seasonal depletions.

4) Well Analysis, Rehabilitation, and Impact Mitigation

Using the California Well Completion Report (WCR) database, UVBGSA conducted an analysis to evaluate impacts of returning to Fall 2016 groundwater levels. The analysis showed that if the groundwater levels decline 2 ft (3 m) below Fall 2016 conditions about 5% of domestic users with shallow or ill-designed wells may also be impacted. Most of these wells are shallow and located around surface water bodies, which would increase the likelihood of short-term impacts on surface water bodies, especially when pumping is at its peak. These shallow wells are primarly for domestic use, mixed domestic/agricultural use, or small agricultural wells. There are also several riparian users and surface water rights holders along the Russian River that use such rights to divert water as their primary source of supply, including a few public water purveyors. A portion of the rights holders do not have reliable wells to use in low-flow years and/or the number and condition of their wells cannot satisfy their existing demand.

These findings emphasize the importance of reconditioning wells, specifically for the shallow and/or old wells, to improve supply reliability for domestic users in the Basin by making it possible to alternate between sources of supply and to increase conjunctive use of water in the Basin. This would also help adaptively manage undesirable results through different pumping patterns and diversions.

Additionally, the UVGBSA has been using an integrated hydrological model that simulates the Basin and upper Russian River watershed (upstream of Hopland) to evaluate different future scenarios so that effective and adaptive management can be implemented for the Basin to achieve and maintain sustainability. This model can also be used to plan for locating new wells and for the reconditioning of existing wells. The model can help define and optimize the following projects and management actions especially during droughts:

- Locate additional supply wells to be drilled and identify effective pumping patterns that would maximize the supply while causing no significant and unreasonable impacts.
- Evaluate appropriate recharge locations to store and improve Basin conditions.
- Demonstrate that new or reconditioned wells can be developed in locations where no impact will be noticed to the sustainability indicators applicable to the UVB.

The above list is not all inclusive and the model can simulate further scenarios as needed.

Similarly, a better accounting of agricultural production wells can be developed to assess possible impacts on them. Feasibility studies need to be conducted to possibly implement well drilling for major agricultural producers with limited groundwater withdrawal capacity to increase flexibility in changing seasonal surface water diversions and pumping patterns with negligible impact on overall demands. Provide rehabilitation of old and/or faulty wells to increase efficiency and reduce losses.

5) Purple Pipe Project – Phase IV

City of Ukiah's Water Resources Department plans to implement Phase IV of the Purple Pipe Project, which will add six miles of pipeline, a one million gallon storage tank, ponds, and a booster station to provide an additional 400 AFY of recycled water to serve schools, parks, the cemetery, and golf course. This phase of the project is expected to cost approximately $18 million.

4.3.1.2 Managed Aquifer Recharge and Injection Wells Geophysical analysis conducted during the GSP development indicated presence of conductive soils in the Basin that could contribute toward groundwater recharge from surface water sources. However, existing data gaps prevents the GSA from fully analyzing the geology below these soils using the integrated hydrological model to determine operational locations for groundwater recharge projects. If funding becomes available, additional geological analyses can be performed to specify pilot groundwater recharge projects within the Basin.

Both active and passive conjunctive uses can be considered in the Basin and upper Russian River watershed to provide water supplies. As explained above, active conjunctive use, or direct recharge, includes any practice that delivers water to the aquifer and increases groundwater storage. Passive conjunctive use, or indirect recharge, includes conjunctive use practices (i.e., coordinated uses of surface water and groundwater) that reduce the amount of groundwater withdrawals which leads to increased aquifer storage. Direct recharge can be done by:

- **Spreading basins:** Spreading basins facilitate the movement of water from the ground surface to the underlying hydraulically connected unconfined aquifer. A large volume of infiltrating water is concentrated on the ground surface which provides opportunities for recharge over larger areas and for longer time periods than what would otherwise occur.
- **Flooding agricultural fields (Flood-MAR):** This practice involves use of flood water or stormwater for managed aquifer recharge on agricultural lands and proper landscapes. Flood-MAR projects provide multiple benefits to the water supply system, ecosystem, and wildlife habitat by increasing water supply reliability, flood risk mitigation, drought preparedness, aquifer replenishment, ecosystem enhancement, subsidence mitigation, water quality improvement, working landscape preservation and stewardship, climate change adaptation, recreation, and aesthetics.
- **Injection wells and/or dry wells:** Using injection or dry wells involves installation and operation of equipment to inject water into specific aquifers. Aquifer storage and recovery (ASR) wells are the most common injection method used in California. Groundwater injection projects are typically most effective when utilizing a consistent, designated water supply (such as recycled water). ASR wells do not have seasonal constraints and do not depend on surficial soil characteristics, but require controlled operation and regular maintenance to sustain adequate recharge rates.
- **Streams and canals:** These features can be used to infiltrate water and increase groundwater recharge. For example, diverting water during non-irrigation seasons into unlined canals can supplement groundwater recharge if canal seepage reaches the underlying aquifers.
- **Indirect recharge:** This practice involves supplying a water demand with an alternative water source that would otherwise be met by groundwater extraction or surface water diversion.

Except for streams and canal recharge, the rest of the above methods are applicable in the Ukiah Valley Basin and upper Russian River watershed. For direct recharge practices, the initial process to identify possible locations would include:

1. Identifying potential sites through stakeholder coordination, infrastructure feasibility, and long-term planning efforts.
2. Performing site-specific analyses based on the ongoing efforts of the UVBGSA to assess the following:
    a. Local groundwater levels and aquifer characteristics and capacity.
    b. Local infiltration capacity of soils using SSURGO and/or UC Davis SAGBI databases.
    c. Local water quality and possible water quality implications of recharge.

   d. Potential environmental impacts.

3. Perform groundwater flow analysis using the integrated hydrological model to assess:
   a. Residence time of recharged groundwater prior to the closest withdrawal location.
   b. Estimate recharge rate.
   c. Whether the recharged groundwater would be directed to streams or can offset demands in the basin.
4. Perform site-specific geophysical field work and studies to assess hydrogeological characteristics and help conceptual design.
5. Develop cost estimate and prioritize feasible sites for pilot projects or larger-scale implementation.

Steps (1) to (3) can be accomplished by using the existing data analysis and identifying new model scenarios. However, findings from these three steps need to be verified by conducting geophysical studies mentioned in step (4) before proposed recharge sites are considered for design and pilot studies.

The use of surface-based geophysical surveying methods to investigate groundwater aquifer systems and recharge pathways is well documented and is a potentially fast and cost-effective way to identify subsurface targets of interest. Two dominant surface geophysical methods used in groundwater exploration studies are electrical resistivity and electromagnetic conductivity surveying, both of which are occasionally referred to as geoelectric techniques. Using a combination of these two techniques at specific sites of interest across the valley floor is proposed for this GSP. Each are based on the principle of how resistive or conductive the combination of rock, sediment, and/or water and other fluids in the subsurface are to a passing electrical current. Various combinations of saturated and unsaturated subsurface material create a wide spectrum of electrical responses that can be roughly correlated to a geologic material. Both methods produce cross-sectional images of varying resistivity with depth along the surveyed lines. These methods are ideal for using differences in conductivity to identify the elevation of the water table (the saturated zone is more conductive than the unsaturated zone within the same geologic unit), the contact between porous rock or sediment and impermeable bedrock (resistive), and to determine the location of freshwater-saturated coarse sediment (more resistive) and clay layers (less resistive). Where the feasibility of managed aquifer recharge and conjunctive use projects are to be explored, electrical resistivity surveying is utilized, which requires lines of connected, grounded electrodes, to estimate surface properties and structure.

Some more detailed suggestions for possible Managed Aquifer Recharge/Injection Wells project are presented here:

1) City of Ukiah Groundwater Recharge

The City of Ukiah has proposed a groundwater recharge project through the construction of a recharge basin at Riverside Park that would facilitate aquifer recharge and create seasonal wetlands. Estimated costs for the design and construction of this recharge basin, which could potentially recharge the aquifer by 1,000 AFY is approximately $1,750,000. Construction of this recharge basin would improve groundwater supply and reliability while also creating riparian and wetland habitat in a natural park setting.

Legal Authority

The entities sponsoring this project, mainly the City of Ukiah and the GSA, have the legal authority to implement this project.

Public Noticing

The agencies sponsoring this project will meet public noticing and CEQA requirements to the extent they are applicable.

Permitting and Regulatory Process

The agencies sponsoring this project will obtain necessary permits and meet regulatory requirements to the extent they are applicable.

2) Rogina Mutual Water Company and Millview County Water District MAR and/or Injection Wells

This concept project includes conducting feasibility study, and possible implementation, of ASR wells in Rogina Mutual Water Company (customer of RRFCD) and Millview County Water District well fields. Currently, both Rogina Water Company and Millview County Water District divert surface water from the Russian River into percolation ponds that and pump groundwater through supply wells.

This project would increase the efficiency of and expand the seasonal recharge to ground water levels for pumping domestic and agricultural supplies.

3) Mendocino County Water Agency Groundwater Recharge Projects

There are several areas across the Basin, such as reclaimed mines and gravel pits, that would require minimal infrastructural improvements to recharge the underlying aquifer. A Geophysical study must be conducted on these areas to identify geologically suitable locations for recharging the aquifer by stormwater and river diversions. Followed by geophysical studies, the UVBGSA can begin working on contracting or purchasing these tracts of land to implement pilot recharge projects and conduct additional studies with the ultimate goal of implementing effective recharge basins. Some examples of these reclaimed mines include:

- Ford Gravel - Talmage: this is a sand and gravel dredged site owned by NORCAL Recycled Rock in Talmage area. it includes 95 acres of permitted and 26.5 acres of disturbed land (reclamation in progress).
- Redwood Valley Gravel Products Mine: Located in Redwood Valley area, this is a streambed/gravel bar pitting site that includes 56 acres of permitted and 2 acres of disturbed land (none reclaimed).
- Nor-Cal Investment Co., Inc. Mine : Located in the west of town of Calpella, this site includes 3 acres of disturbed land with no listed excavation or completed reclamation.
- Kunzler Terrace Mine Project: Located just north of the City of Ukiah, this site was inteneded to be developed as a sand and gravel quarry by thte Granite Construction Company. A CEQA EIR was completed in 2010 for this site, but the project was never excavated.

4) City of Ukiah Western Hills Source Water Protection

The current hydrology of the western hills of the Ukiah Valley is a major driver for recharging the underlying aquifer. Preserving these properties will protect these important resources. This project is proposed to acquire, through purchase, undeveloped headwater properties in the western hills. The estimated capital cost for this project is $3.5 million. Preservation of headwater properties in the western hills of the Ukiah Valley will help ensure that natural runoff and groundwater recharge patterns will continue in perpetuity.

5) Stream enhancements

Feasibility studies need to be conducted to increase water supply reliability and reduce impacts on groundwater table through:

a) storing flows in the tributaries and creating recharge basins in river channels to conduct direct recharge. Feasibility studies need to be conducted and pilot projects need to be performed to select appropriate sites.

b) stream restoration projects in the Russian River and tributaries to reduce the impacts of historical incision and gravel mining done in the basin and upper Russian River watershed. Stream restoration projects can be form-based or process-based. Feasibility studies need to be designed and conducted to measure the possible benefits of such projects and help with the design of the pilot and final projects.

6) Distributed Storm Water Collection and Managed Aquifer Recharge (DSC-MAR)

Distributed Stormwater Collection and Managed Aquifer Recharge (DSC-MAR) is a landscape management strategy that can help to reduce aquifer overdraft and maintain long-term water supply reliability. DSC-MAR targets relatively small drainage areas from which stormwater runoff can be collected for infiltration. Infiltration can be accomplished in surface basins, typically having relatively small surface areas, or potentially through flooding of agricultural fields or flood plains, use of dry wells, or other strategies.

Feasibility studies and pilot projects need to be designed to take advantage of DSC-MAR in the basin. These projects can be combined with the County of Mendocino and City of Ukiah's stormwater management programs and plans and utilize their respective LID manuals.[1] This PMA can be designed and implemented along or in conjunction with similar and ongoing projects in the basin executed by the MCRCD and local water districts.

7) Aquifer Storage and Recovery (ASR) feasibility & implementation

This project includes identifying suitable locations for managed aquifer recharge / Flood MAR projects to increase groundwater storage in the shallow aquifer layers. Surplus seasonal flows (flood water available during winter and spring months) can be spread onto agricultural or other suitable lands to percolate into the aquifer and provide recharge benefits for the basin. Agricultural lands close to the Russian River and tributaries can be used for this purpose and several agricultural users have shown interest during public meetings and outreach opportunities to cooperate for pilot projects and feasibility studies. Incentive structures can also be set up to encourage landowners to participate in this program.

4.3.1.3 Reduce Evaporative Losses from Existing Surface Water Storage While the area of most agricultural off-stream ponds within Ukiah Valley is between 1 to 5 acres, these ponds vary in volume from 0.5 AF to over 50 AF. There are also municipal storage ponds within the Basin. Although these ponds provide storage benefits, they are subject to significant evaporative losses in this area. Some short-term solutions that can limit the evaporative loss include:

[1] For more information on Mendocino County stormwater management program visit: https://www.mendocinocounty.org/government/planning-building-services/stormwater

- *Shade Balls:* Shade balls are made from various materials in different sizes. These shade balls are floated on the surface of water storage ponds to reduce evaporative loss and water quality impacts (algal blooms). Depending on the manufacturer producing the shade balls, they can reduce evaporative loss by as much as 90%.
- *WaterSavr:* WaterSavr is a patented hydrated lime powder containing hydroxy-alkanes (food grade and potable approved) that is applied to the surface of the water. Ionic repulsion causes the hydroxy-alkanes to self-spread, resulting in a mono-molecular film on the surface of the water. This is an inexpensive method suitable for most water bodies, such as reservoirs, canals, irrigation ponds, and rice paddies. A local application of WaterSavr on an off-stream agricultural pond verified an over 30% reduction in evaporative loss. The cost would be approximately $27.50 per acre per month, while the dispensing unit would cost between $3,000 to $5,000.

4.3.2. Demand Management Water Conservation

4.3.2.1 Pump(s) For Potable Water Intertie The City of Ukiah is proposing to install two pumps within an intertie system to provide potable drinking water to the adjoining county water districts, Millview County Water District to the north and Willow County Water District to the south. The cost for each pump would be about $140,000. This projects is expected to increase supply reliability for the two water districts and the region, and consequently, reduce stress on the groundwater basin and diversions from the surface water bodies.

4.3.2.2 Conservation Easements Description of this project is under review and may be revised

Conservation easements primarily involve voluntary land repurposing that reduce or eliminate surface water irrigation (streamflow augmentation). This would offset depletions of interconnected surface water. These actions may also involve groundwater irrigation reduction for part or all of the irrigation season, in some or all years, on currently irrigated acreage. Conservation easements may also include floodplain reconnection/expansion projects. Depending on the circumstances of an individual project, conservation easements may include habitat conservation easements, wetland reserve easements, or other easements that limit irrigation on a certain area of land. It may be established that certain portions of a property may be suitable for an easement, while the rest of the property remains in irrigated agriculture.

Implementation of this project type includes consideration of the following elements:

- Exploration of program structure.
- Contracting options.
- Exploration and securing of funding source(s).
- Identification of areas and options for conservation easements.

Anticipated benefits from this type of project include improvement in instream flow conditions on the Russian River and its tributaries during critical summer and fall low-flow periods.

Monitoring data to be collected in this conservation easements program include, but are not limited to:

- Location, acreage, and current and future anticipated cropping system/land use on enrolled acreage.
- Quantification and timeline of surface water dedications to instream flow specified in the easement.
- Quantification and timeline of groundwater pumping curtailments, including water year type or similar rule to be applied and specified in the easement.

4.3.2.3 Conservation Programs and Green Infrastructure The objective of these types of projects is to increase water yield from the watershed through green infrastructure. Green infrastructure may include fuel reduction, road improvements, canopy opening to manage snow shade and accumulation, and other actions that reduce flows to surface waters. Anticipated benefits from these types of projects include increased water storage in the watershed during the wet season, improved flows from the watershed during the dry season, and the support of desired instream flow conditions. Changes in streamflow entering the Basin will be monitored and evaluated through existing and proposed new streamflow gauges and through statistical analyses of acquired data.

4.3.2.4 Irrigation Efficiency Improvements Achieving increases in irrigation efficiency through equipment improvements are anticipated to reduce overall water demand, lessening the chance of river disconnection during critical dry periods. This is expected to support desired instream flows, fish migration, and aquatic habitat. This project involves an exploration of options to improve irrigation efficiency, assessment of irrigator willingness, outreach and extension activities, and development of funding options, primarily by cooperators, possibly in cooperation with NRCS. This PMA is likely to be accomplished through a voluntary, incentive-based program. Cost estimates have not yet been completed for this PMA.

An example of this type of project that has been partially implemented in the basin by the CLSI is the supply and installation of soil moisture sensors at agricultural fields to improve the timing and amount of irrigation and applied water. An expansion of this project may be incorporated as part of this broader irrigation efficiency improvement project.

In addition, increasing the flexibility of irrigation systems in the basin can lead to significant improvements in surface water depletion and reduction in aquifer stress. This type of irrigation efficiency improvement can involve infrastructural improvements to the pumps and lifting facilities through the installation of variable frequency drive (VFD) pumps, and/or other equipment, that allow farmers to change their intensity and volume of supply based on the need and acreage of their respective irrigated land and reduce evaporative loss and wastes due to leaks and over-irrigation.

Monitoring data to be collected in this irrigation efficiency improvement program include, but are not limited to:

- Total acreage with improved irrigation efficiency equipment.
- Location of fields under improved irrigation efficiency equipment.
- Assessment of the increase in irrigation efficiency, with particular emphasis on assessing the reduction or changes in consumptive water use (evaporation, evapotranspiration) based on equipment specification, scientific literature, or field experiments.
- Cropping systems in fields with improved irrigation efficiency equipment.

4.3.2.5 Voluntary Land Repurposing (excluding Conservation Easements) Conservation easements (see above) are one form of voluntary land repurposing that support a move away from full-season irrigated agriculture and act to reduce water use. This voluntary land repurposing program will encourage a range of other activities that would reduce water use in the Basin. These activities may include any of the following:

Term Contracts: In some circumstances, programs like the Conservation Reserve Program (CRP) could provide a means of limiting irrigation on a given area for a term of years. Because of low rates, the CRP has not been utilized much in California, but this could change in the future. In addition, other term agreements may be developed at the state or local level.

Crop Rotation: Landowners may agree to include a limited portion of their irrigated acreage in crops that require only early season irrigation. For example, a farmer may agree to include a portion of their land in grain crops that will not be irrigated after June 30.

Irrigated Margin Reduction: Farmers could be encouraged to reduce irrigated acreage by ceasing irrigation of field margins where the incentives are sufficient to offset production losses. For corners, irregular margins, and pivot end guns, this could include ceasing irrigation after a certain date or even ceasing irrigation entirely in some instances.

Crop Support: To support crop rotation, particularly for grain crops, access to crop support programs may be important to ensure that this option is economically viable. Some type of crop insurance and prevented planting payment programs could provide financial assurances to farmers interested in planting grain crops.

Other Uses: In some circumstances, portions of a farm that are currently irrigated may be well suited for other uses that do not consume water. For example, a corner of a field may be well suited for wildlife habitat or solar panels.

Monitoring data to be collected in this voluntary land repurposing program include, but are not limited to:

- Total acreage of land repurposing.
- Location of parcels with land repurposing.
- Assessment of the effective decrease in evapotranspiration and water use.
- Description of the alternative management on repurposed land.

4.3.2.6 Alternative, Lower ET Crops The “alternative, lower ET crop” PMA defines and introduces alternative crops with lower ET, but adding sufficient economic value to the Basin’s agricultural landscape. The objective of this PMA is to facilitate crop conversion in some of the agricultural landscape that will reduce total crop consumptive use (evapotranspiration) of water in the Basin, as needed. The management action is to develop a program to develop and implement pilot studies with alternative crops that have a lower net water consumption for ET, and to provide extension assistance and outreach to growers to facilitate and potentially incentivize the crop conversion process. In the conceptual phase, this project involves:

- Scoping of potential crops.
- Pilot research and demonstrations.
- Defining project plan.
- Exploration of funding options.

- Securing funding.
- Development of an incentives program.
- Implementation.

Anticipated benefits from this project include lower consumptive water use and either an increase in recharge (on surface water irrigated crops) or a reduction in the amount of irrigation or both. As a result, water levels in the aquifer system will rise. This will also lead to an increase in instream flows.

Monitoring data to be collected in this alternative, lower evapotranspiration program include, but are not limited to:

- Total acreage with alternative, lower ET crops.
- Location of fields with alternative, lower ET crops.
- Assessment of the effective decrease in ET.
- Cropping systems used as alternative, lower ET crops.

4.3.2.7 Municipal Supply and Use Efficiency Improvements This PMA involves future infrastructural improvements, outreach and education efforts, and operational adjustments that would reduce municipal demand, increase supply reliability and water use efficiency for municipal beneficial users. It may include educational workshops and training to increase water conservation, provide incentives and rebates on appliances' and utilities' improvements, leak detection and distribution network rehabilitation, and improved metering

As part of this PMA, the Mendocino County Russian River Flood Control and Water Conservation Improvement District intends to conduct a feasibility study to replace old meters and calibrate existing meters to improve tracking of surface water diversions and assess the possibility of telemetry instrumentation. This project would provide data regarding surface water diversions amount and location, and help improve water budget calculations and re-calibrate the integrated hydrological model.

4.3.3 Other Management Actions

4.3.3.1 Monitoring activities **Chapter 3** and the data gap appendix (**Appendix 2-E**) clearly describe the importance for establishing an extensive monitoring network which will be used to support the future GSP updates.

A summary of the monitoring activities to be considered under this management action include, but are not limited to:

- development of new RMPs (Representative Monitoring Points) upon collecting sufficient temporal record in newly drilled monitoring wells to support water level SMC and Interconnected Surface Water SMC;
- installing new streamgages on both the main stem of the Russian river and along key tributaries;
- development of an isotope study to fully evaluate movement of water throughout the basin, inflow to the basin, and to better represent and characterize underflow wells; and,

- use of satellite images, twice per year, to fully evaluate status of Groundwater Dependent Ecosystems.
- conducting one or more seepage runs in summer/fall months during the drought to evaluate local reach losses along the the main stem Russian River. A seepage run is conducted by measuring stream discharge at multiple locations along the river during a short period in time (< 1 day) to obtain a snapshot of local reach losses between measurement locations. Reach loss estimates from a seepage run provide valuable groundwater/surface-water exchange measurements along each local reach to inform model development and depletion of ISW decision-making.

Monitoring activities will be prioritized during the implementation of the GSP considering the availability of funding, addressing data gaps, and feasibility of the monitoring activities.

4.3.3.1 Well inventory program A detailed well inventory will improve the understanding of the Basin's conditions and will enhance integrated hydrological model and well impact model results. It will also help solve ongoing issues with the evaluation of de-minimis users and their proper inclusion in the basin's management and modeling. The GSA will conduct outreach and surveys to assess the willingness of water users in participating in this program and investigate different approaches to facilitate the development of such inventory. This feasibility phase will involve coordination with the SWRCB and NCRWQCB, DWR, the County's environmental health department, City of Ukiah, and other local water management, regulatory entities, and NGOs to obtain and assess existing data, ground-truth the dataset used in GSP development, and evaluating data gaps. Based upon this evaluation next phases of the inventory will be developed and implemented.

4.3.3.2 Drought mitigation measures Drought mitigation plans or similar contingency plans have been developed by the water districts, tribes, and other suppliers in the basin. This PMA involves obtaining such documents and evaluating them to find common conservation and supply reliability actions that require coordination within the basin or the watershed to serve a larger beneficial user group. Results of this investigation will be compared with the GSP metrics (**Chapter 3**) and the next phases will be developed in conjunction with GSP's proposed PMAs. If deemed needed and/or helpful, the GSA will coordinate with other partners to develop a drought resiliency plan for the basin, as well.

4.3.3.3 Forbearance The PMA entails cost analysis and studies to support change petition on MCRRFC and WCID license to allow landowners to purchase surplus water supply when available and use in-lieu of groundwater pumping, or for recharge (basins or Flood-MAR), depending on conditions at the time water is available. Benefits are expected to include reduced groundwater pumping and potentially preventing or reducing loss of surface water to groundwater table in the critical summer months.

4.3.3.4 Future of the basin This Project would entail developing a study of the economic impacts of the projects and management actions included in the GSP. This would include an evaluation of how implementation of the project could affect the economic health of the region and on local agricultural industry. It would also consider the projected changes to the region's land uses and population and whether implementation of these projects would support projected and planned growth.

4.3.3.5 Voluntary wells metering program The GSA has concluded that metering groundwater pumpage in the basin is not feasible at least in the near term considering the difficulties in its implementation, the significant cost that it may impose, and the lack of desire received from the majority of users during outreach programs and meetings. However, groundwater use is a major data gap in the basin, and filling this data gap, even partially, would benefit the management of the basin and its future assessment. Therefore, through this PMA, the GSA will try to encourage and incentivize voluntary well metering throughout the basin. Data collected can be successfully used to validate the estimates developed with the integrated hydrological model and used for future assessments of the basin condition and effectiveness of PMAs.

4.3.3.6 Outreach and education Outreach and education will be a critical component of the future implementation of the GSP. Outreach and education can also contribute to the development of a coordinated response to drought times and support the implementation of drought measures that can help with a drought resiliency plan. Through this PMA, the GSA will coordinate with agencies such as NRCS, MCRCD, etc. to solicit their support and guarantee the successful implementation of the GSP by 2042.

4.3.3.7 Rate fee study The GSA is planning to conduct a rate fee study during the 2022-2023 to help fund the GSP implementation. The study will determine how the GSA will design and implement its fee structure within its authority under the law. Upon completion and approval of the rate fee study by the GSA, as outlined in **Chapter 5**, collected fees will partially replace member contributions to fund the implementation of the GSP. Rate fee study may include an optional initial feasibility study to assess the feasibility and applicability of expanding well inventory in the basin to be used for GSA's financial support and fee implementation. Such study is contingent upon the approval of the Board of the GSA and will be proposed only if determined needed to provide a path for funding and fee structure.