within its service area in-lieu of groundwater pumping, or for recharge (basins or Flood-MAR), depending on conditions at the time water is available. The most likely option is that water would be acquired from Merced ID by short-term or long-term contract and delivered to CWD for direct irrigation use, thereby reducing groundwater demand within CWD's service area.

4.1.3.2 Implementation

CWD has already conducted preliminary investigations of the Merced-Chowchilla Intertie as part of its own planning efforts[64] and under the San Joaquin River Restoration Program. CWD will begin planning, permitting, and other agreements by 2025. CWD anticipates that construction would begin in 2033, with operation starting in 2035 (**Table 4-11**).

Table 4-11. Implementation Timeline

Phase	Start	End
Permitting and environmental documentation	2025	2033
Financing	2030	2063
Construction	2033	2035
Operation	2035	Indefinite

4.1.3.2.1 Construction activities and requirements

A reconnaissance-level feasibility investigation was developed for an early conceptual approach to the project in 2000. The initial study assumed that the intertie would be developed to facilitate up to 15,000 AFY in transfers from Merced ID to CWD. Construction activities would generally include new facilities and enlargement of existing facilities. Several alternatives were identified in the initial feasibility study. CWD will evaluate and refine those alternatives to reflect current conditions, and to identify the most cost-effective construction alternative. Specific construction activities, scheduling, and more detailed cost estimates will be developed by CWD as part of final design of the project between now and 2030 (start of construction).

4.1.3.2.2 Water source

CWD will acquire water from Merced ID, which holds water rights on the Merced River. The quantity, timing, and cost of that water will be assessed under future evaluation of the project by CWD. CWD has assumed for the initial assessment for the GSP that transfers of 15,000 AFY will occur in AN and W year types. The reliability of the source water is Merced ID water rights on the Merced River. The reliability of the source water to CWD depends on those rights and Merced ID willingness to transfer water under different year types.

4.1.3.2.3 Conditions or constraints on implementation

The availability and timing of available water will depend on Merced ID's willingness to make water available and the terms of the agreement between CWD and Merced ID. The terms of the agreement are

[64] Water Transfer Feasibility Study: Merced Irrigation District to Chowchilla Water District. Prepared by Tolladay, Fremming and Parson for the U.S. Bureau of Reclamation. Summer 2000.

not known at this time. CWD will engage Merced ID to discuss terms for short- and long-term transfers under project studies conducted between now and 2030.

4.1.3.2.4 Permitting process and agencies with potential permitting and regulatory control

In addition to CWD and Merced ID, the following agencies are likely to have permitting and regulatory control over the project: California Department of Water Resources, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and the Central Valley Regional Water Quality Control Board. CWD and Merced ID would work with all the responsible agencies to complete the permitting and approval processes.

4.1.3.3 Project Operations and Monitoring

During AN and W year types, CWD will purchase 15,000 AF of water from Merced ID. CWD may use this water in different ways for the benefit of CWD, including Flood-MAR and placing it in recharge ponds. Alternatively, CWD will use those supplies for direct delivery to growers which would be used in-lieu of groundwater pumping. CWD will monitor deliveries and charge growers using its existing system. If water is instead diverted for CWD recharge benefits (ponds or Flood-MAR), CWD will monitor those deliveries. If project water is used for groundwater recharge and it is determined that monitoring of groundwater recharge is necessary, groundwater extraction will be monitored and enforced by CWD with meters installed on individual deep wells.

4.1.3.4 Project Benefits

CWD intends to purchase an annual average of 15,000 AF from Merced ID in AN and W years. This amount is based on a conservative estimate of CWD's initial target specified in the initial feasibility study (15,000 AFY). It does not depend on a hydrologic analysis of water available from the Merced River. The actual pattern of purchases will be defined in the terms of agreement with Merced ID. Assuming purchases of 15,000 AFY in all AN and W years, and the water is used in-lieu of pumping in CWD, the average annual benefit of the project equals 7,350 AFY (**Table 4-12**).

Table 4-12. CWD Merced-Chowchilla Intertie Estimated Average Annual Benefit Volume by Year Type, in AF

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	15,000	35%	5,250
AN	15,000	14%	2,100
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual			**7,350**

4.1.3.5 Project Costs

Construction costs are based on a reconnaissance-level feasibility study prepared in 2000[65] (**Appendix 4.B**). The analysis considered different alternatives for construction of new facilities and expansion of existing facilities. Study alternative 6 is used for the GSP. The construction cost for alternative 6 in the feasibility study was indexed to current dollars, totaling $6.7 million. It should be noted that the study completed in 2000 assumes lower land acquisition costs and does not include environmental permitting or Right-of-Way costs. CWD will develop a current estimate of project costs during the GSP implementation period.

Operating costs of the project include the costs to operate the system and move water from Merced ID to CWD, in addition to ongoing administration, maintenance and legal costs. O&M costs additionally include water purchase costs. Merced ID faces similar water management constraint to CWD, including potential curtailments to surface water diversions and groundwater management specified in its GSP. This will affect the availability of water and purchase costs under an agreement with Merced ID. The average annual water purchase and project O&M cost equals $1.5 million. Actual O&M and water purchase costs will be assessed by CWD as the project is developed. These costs reflect weighted-average annual costs; costs are higher in years when water is purchased and delivered (**Table 4-13**).

Table 4-13. CWD Merced-Chowchilla Intertie Project Costs

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Project development	$6,700,000	Start of project	Does not include Right-of-Way costs, and does not include all permitting and legal costs
O&M Costs			
Water purchase cost	$1,500,000	All	Average annual cost; costs are higher in years when water is available.

4.1.4 Madera Canal Capacity Increase

As part of the San Joaquin River Restoration Program, Reclamation, working with CWD, investigated the feasibility of expanding the capacity of the Madera Canal[66]. The purpose of the project is to increase hydraulic capacity of the canal to 1,500 cfs at the head of the canal and to 750 cfs at the end of the canal. The additional capacity would be shared by CWD and Madera Irrigation District. CWD would undertake concurrent efforts to improve operational flexibility in its system to be able to utilize additional supply delivered through the expanded Madera Canal. Additional deliveries would provide a benefit to the Subbasin. CWD would deliver water to growers to reduce groundwater pumping within the CWD service area.

[65] Water Transfer Feasibility Study: Merced Irrigation District to Chowchilla Water District. Prepared by Tolladay, Fremming and Parson for the U.S. Bureau of Reclamation. Summer 2000.

[66] Madera Canal Capacity Restoration Feasibility Study. Final Feasibility Report. San Joaquin River Restoration Program. September 2016. U.S. Bureau of Reclamation.

4.1.4.1 Project Overview

The Madera Canal is 36 miles in length. The first 7 miles are concrete lined and the remaining 29 miles are earth lined. The capacity at the head of the canal is 1,275 cfs and the capacity at the end is 600 cfs. The capacity of the first three siphons are 1,500 cfs with the remainder of the siphons and drop structures having capacities gradually declining to 935 cfs. This project would increase the capacity at the head of the canal to 1,500 cfs, with capacities gradually declining to 750 cfs at the end.

4.1.4.2 Implementation

CWD will initiate studies and permitting by 2028. Construction is planned over a five-year period, beginning in 2030 and completed by 2035. The canal's expanded capacity would be available to deliver additional water to CWD starting in 2035 (**Table 4-14**).

Table 4-14. Implementation Timeline

Phase	Start	End
Final design, Permitting and environmental documentation	2025	2030
Financing	2028	2058
Construction	2030	2035
Operation	2035	Indefinite

4.1.4.2.1 Construction activities and requirements

The preliminary feasibility assessment developed by Reclamation considered several alternative project configurations. Davids Engineering worked with CWD to develop a refined project configuration and cost estimate. A summary of this work is provided in an **Appendix 4.C**.

Specific construction activities, scheduling, and a more detailed cost estimation will be developed as part of final design of the project.

4.1.4.2.2 Water source

CWD has a contract with the US Bureau of Reclamation to provide Class 1 and Class 2 CVP water, plus surplus flows when they are available. CWD expects that the Madera Canal expansion would also enable the delivery of other water supplies that may be available in the future, potentially via exchanges with other Friant districts.

The reliability of the source water that would typically be delivered to growers is similar to the reliability of CWD's Class 1 and Class 2 water supply. Water allocations are announced and updated by Reclamation in the spring. CWD contract water is typically available except in critically dry years. CWD will evaluate future changes to the Friant system that may impact future water reliability. The reliability of surplus flows, which could be diverted to recharge basins or for use in the Flood-MAR program, depends on water year conditions and the ability of other water users to divert surplus flows for their own uses. CWD will assess source reliability as part of final design of the project.

4.1.4.2.3 Conditions or constraints on implementation

This is a planned project of the GSP and its implementation does not depend on the performance of other projects or activities. Implementation would begin by 2030. However, the project's ability to provide new water supply is contingent on the availability of additional CVP water or other water acquired via purchase

or exchange. The project would be subject to environmental review, which would be jointly conducted by CWD and its partner agencies.

4.1.4.2.4 Permitting process and agencies with potential permitting and regulatory control

Reclamation owns the facilities to be expanded. The operator of the canal, the Madera-Chowchilla Water and Power Authority, would participate during the construction period to avoid impacts on existing operations.

The Madera-Chowchilla Water and Power Authority would apply for permits from Reclamation to modify the structure. Reclamation would be the lead agency in the preparation of the NEPA/CEQA documents.

4.1.4.3 Project Operations and Monitoring

The delivery of the project's water supply to CWD will be provided by the existing canal operating agency, the Madera-Chowchilla Water and Power Authority. CWD will deliver the water using its existing facilities and operational rules and procedures.

The GSA will keep track of how much additional water supply it estimates has been delivered as a result of the project. No additional monitoring of groundwater conditions would be required beyond what is already required for implementing the GSP. If applicable, CWD will estimate any additional groundwater recharge from percolation of the water supply. Credit for that recharge will be accounted for in the same way as percolation from other surface water delivery, as specified in Chapter 2 of the GSP.

4.1.4.4 Project Benefits

Water provided by the canal expansion would help meet total water demands in the Subbasin. Additional water would be conveyed to CWD for delivery to water users in CWD. The water would help to meet on-farm irrigation demands, thereby reducing groundwater pumping. Percolation of the additional water would provide some additional groundwater recharge.

It is anticipated that in 1 out of 3 years an additional 100 cfs of water will be conveyed to CWD for 90 days, resulting in an average annual increased water supply of 5,147 AF (**Table 4-15**). The reliability of source water is based on the historical hydrology being a good projection of future hydrology. This estimate is based on a hydrologic and operations analysis covering the 29-year historical period 1989-2017.

Table 4-15. Estimated Average Deliveries by Year Type for Madera Canal Capacity Increase, in AF

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	10,500	35%	3,706
AN	10,500	14%	1,441
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual			**5,147**

4.1.4.5 Project Costs

The development of project cost estimates is summarized in **Appendix 4.C**.

Total capital cost equals $61.2 million. CWD pays standard rates for additional Madera Canal water. Other Operating costs are assumed at $25 per acre-foot and will be assessed as part of additional analysis by CWD (**Table 4-16**).

Table 4-16. CWD Madera Canal Expansion Project Costs

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Project planning and development	$61,200,000	Start of project	Davids Engineering estimate
O&M Costs			
Water supply cost	$200,000	All	Average annual cost; costs are higher in years when water is available.
Other O&M cost	$130,000	All	Average annual cost; costs are higher in years when water is available.

4.1.5 Buchanan Dam Capacity Increase

As part of the San Joaquin River Restoration Program, Reclamation, working with CWD, investigated the feasibility of expanding Eastman Lake[67]. The purpose of the project is to enlarge the capacity of Eastman Lake by approximately 50 thousand AF (from 150 to 200 TAF). The additional capacity would allow for additional deliveries to CWD, and CWD would deliver water to growers to reduce groundwater pumping within the CWD service area. However, the additional deliveries would partially offset the availability of flood flows which are used for groundwater recharge benefits under other CWD projects (recharge basins and Flood-MAR). CWD will assess these tradeoffs under future project planning efforts.

4.1.5.1 Project Overview

The U.S. Army Corps of Engineers (USACE) owns and operates Buchanan Dam and Eastman Lake on the Chowchilla River as part of the Central Valley Project, with a gross capacity of 150 thousand AF (TAF). It is operated with a 45 TAF flood management reservation. CWD has a long-term contract with Reclamation for 24 TAF of CVP supplies per year from Eastman Lake. In wet years storage in Eastman Lake is carried over to subsequent drier years. In wet years, inflows that would encroach into the flood reservation space are evacuated as flood flows.

Under this project, CWD would enlarge the current 150 TAF capacity of Eastman Lake by 50 TAF to 200 TAF. The reconnaissance-level feasibility assessment conducted in 2014 estimated that the existing dam and spillway crest would be raised in place by 24 feet, and a 700-foot saddle dam would be constructed to the east of the spillway. The increase in capacity would allow USACE to maintain the flood reserve and store additional runoff for delivery to CWD.

4.1.5.2 Implementation

CWD expects that studies and permitting would begin by 2025 and continue for 10-12 years. Construction is planned over a three-year period, beginning in 2037 and completed in 2040. By 2040 the expanded dam

[67] Eastman Lake Enlargement. Working Administrative Draft. Water Management Goal – investment Strategy. San Joaquin River Restoration Program. January 2014. U.S. Bureau of Reclamation.

would be ready to capture and deliver additional yield to CWD (**Table 4-17**). The availability of that yield to CWD depends on the quantity and timing of future hydrologic conditions, and the ability to store and deliver additional runoff.

Table 4-17. Implementation Timeline

Phase	Start	End
Design, Permitting and environmental documentation	2025	2037
Financing	2037	2067
Construction	2037	2040
Operation	2040	Indefinite

4.1.5.2.1 Construction activities and requirements

The preliminary feasibility assessment developed by Reclamation in 2014 identified the general types of construction activities that would be necessary in a pre-appraisal level cost estimate. The existing dam and spillway crest would be raised in place by 24 feet, and a 700-foot saddle dam would be constructed to the east of the spillway. Environmental documentation and mitigation would likely be required. Details on construction activities, schedule, and project costs will be developed as part of final project design.

4.1.5.2.2 Water source

Runoff in the Chowchilla River watershed that exceeds Buchanan Dam's existing storage space is currently released as flood flow during times that it cannot be diverted and used by CWD. Some of this released water would be stored behind the expanded dam and CWD would be able to deliver the stored water to its growers. Average annual inflows over the 1990 – 2017 hydrologic period averaged 70,195 AF (**Table 4-18**). CWD diverted an average of 40,765 AF over the same period, and 21,901 was released for flood management. The potential benefit of the project is to capture additional flood releases, which typically occur in W and AN year types. The reliability of the source water depends on annual hydrology.

4.1.5.2.3 Conditions or constraints on implementation

This is a planned project of the GSP and its implementation does not depend on the performance of other projects or activities. However, there are possible environmental issues that could impede the project, such as inundating miles of stream, that CWD will continue to monitor. Implementation would begin by 2025.

4.1.5.2.4 Permitting process and agencies with potential permitting and regulatory control

The following agencies would have permitting or other regulatory authority over the construction and operation of the Buchannan Dam capacity increase project: USACE, U.S. Bureau of Reclamation, California Department of Water Resources, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and the California Water Resources Control Board.

USACE would be the owner of the project and would obtain approvals from Congress to construct the project. CWD would coordinate with partner agencies to develop environmental documents and in other planning efforts.

Table 4-18. Buchanan Dam Inflow, CWD Diversion, and Flood Release 1990-2017

Year	Water Year Type	Inflow, AF	CWD Diversion, AF	Flood Release, AF
1990	C	5,079	3,448	0
1991	C	21,562	18,356	0
1992	C	19,404	17,751	0
1993	W	104,457	22,095	0
1994	C	6,387	57,640	0
1995	W	158,046	63,371	11,485
1996	W	78,895	55,345	40,105
1997	W	233,681	42,999	186,296
1998	W	194,825	78,291	111,794
1999	AN	35,817	44,283	0
2000	AN	81,991	60,333	7,600
2001	D	23,183	74,028	0
2002	D	20,998	22,910	0
2003	BN	23,454	12,532	0
2004	D	18,029	19,526	0
2005	W	144,626	57,831	0
2006	W	134,024	69,358	65,757
2007	C	9,601	72,455	0
2008	C	24,703	24,711	0
2009	BN	21,653	15,906	0
2010	AN	56,277	19,610	0
2011	W	173,820	51,861	45,078
2012	D	15,219	91,017	0
2013	C	17,415	34,862	0
2014	C	1,420	0	0
2015	C	1,113	0	0
2016	D	47,522	44,060	0
2017	W	292,248	66,843	145,099
Average		*70,195*	*40,765*	*21,901*

4.1.5.3 Project Operations and Monitoring

Operations would be integrated into the current operations of Buchannan Dam. In general, more runoff would be held during heavy rain events (or sequence of events). The stored water would be released later in the same irrigation year or held over to subsequent years for release to CWD. CWD would divert and deliver the water using its current facilities. The released water would be used for irrigation delivery or delivery to direct recharge facilities. Water held over from previous years would be subject to spillage if current year storage begins to encroach into the flood reserve space.

CWD will keep track of how much additional water supply it estimates has been delivered as a result of the project. The project would not require any additional groundwater monitoring beyond what is already planned to implement the GSP or needed to track performance of other PMAs. If applicable, CWD will estimate any additional groundwater recharge from percolation of the water supply. Credit for that

recharge will be accounted for in the same way as percolation from other surface water delivery, as specified in Chapter 2 of the GSP.

4.1.5.4 Project Benefits

Water provided by the capacity increase would help meet total water demands in the Subbasin. Surplus flood water conserved by the project would be released to CWD for delivery to water users in CWD to meet on-farm irrigation demands, thereby reducing groundwater pumping. Percolation of the additional water would provide some groundwater recharge. Alternatively, CWD may choose to deliver some of the additional water to recharge basins or for Flood-MAR, depending on conditions.

Based on a hydrologic and operations analysis covering the historical period, 1990-2017, the project would yield an average of 8,753 AFY. The table below illustrates the average annual supply that CWD expects to be able to receive from the project. **Appendix 4.D**. summarizes the estimated monthly benefit and weighted-average annual benefit of the Buchannan Dam enlargement project.

Table 4-19. Estimated Additional Average Deliveries by Year Type for Buchanan Dam Capacity Increase, in AF

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	24,800	35%	8,753
AN	0	14%	0
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual			**8,753**

4.1.5.5 Project Costs

Construction costs are based on the pre-appraisal level cost estimate developed by Reclamation in 2014. The construction cost was indexed to current dollars, totaling $49.6 million. The estimated average annual O&M cost equals $220,000, assuming $25 per acre-foot. Actual O&M costs will be assessed by CWD as the project is developed. These costs reflect weighted-average annual costs; O&M costs are higher in years when water is purchased and delivered (**Table 4-20**).

Table 4-20. Buchannan Dam Enlargement Project Costs

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Project planning and development	$49,200,000	Start of project	Pre-appraisal estimate prepared by Reclamation
O&M Costs			
Other O&M cost	$220,000	All	Average annual cost; costs are higher in years when water is available. Does not include water purchase costs.

4.1.6 CWD Project Financing

Pursuant to 23 CCR § 354.44 and § 354.6, CWD has evaluated and described the ability to cover project costs. Since most projects are still being assessed, and feasibility studies are being refined or developed, a general description of how CWD will cover project costs is presented. CWD will conduct economic and fiscal feasibility studies as part of its ongoing planning efforts to better understand willingness and ability to pay for the projects included in the GSP.

CWD will pursue available state and federal grants or loans to help construct projects. The remaining construction costs will be financed through issuance of bonds, to be repaid from revenues raised through water rates and/or fees and assessments. Operation and maintenance costs will be paid using revenues raised through water rates and/or fees and assessments. CWD will conduct the necessary studies and decision processes (including Proposition 218 elections) to approve rates, fees, or assessments to provide the required funding. CWD water users have, in the past, approved assessments to fund projects.

4.1.7 CWD Coordination with Other GSAs and Planning Agencies

As part of the Chowchilla Subbasin GSP, the Chowchilla Water District GSA will coordinate with other GSA's in the GSP. Coordination will continue among these and other agencies as needed to implement projects successfully.

4.2 Madera County GSA Projects

Madera County GSA (Madera County) has identified two projects and a demand management action that it will implement as part of the GSP.

Madera County West, which is in the Management Area shared with Triangle T Water District, will develop a winter floodwater recharge project. It will construct basins to recharge floodwater diverted from the Eastside Bypass. Groundwater recharge benefits would be managed for the benefit of Madera County groundwater pumpers.

Madera County East will purchase surplus water (e.g., Section 215 flood flow from the CVP Friant Division) or other water that may become available, such as from Sites Reservoir. The water would be used for recharge or delivered for irrigation in lieu of pumping in eastern areas of Madera County.

Madera County (East and West) proposes to implement a demand management action that would impose groundwater pumping limits, allocate pumping credits to parties based on those limits, and allow groundwater users to buy, sell, or carry over pumping credits. Madera County is currently working with stakeholders to develop program-specific parameters.

The projects and demand management action descriptions are based on information developed during the initial GSP development process and, where applicable, other studies. Water available from these projects is evaluated in combination with other projects in the GSP.

At the time of initial GSP development, planning for the PMAs was at varying stages of development, so complete information on construction requirements, operations, costs, permitting requirements, and other details were not available. Section 4.6 summarizes PMA implementation efforts and updates from the time of initial GSP development through the latest GSP Annual Report (water year 2021). A description of how these PMAs fit and coordinate with other Subbasin PMAs is provided in Chapter 5: Plan Implementation.

4.2.1 Madera County West: Recharge Basins

Madera County will develop recharge basins. Water will be diverted off the Eastside Bypass into basins where it will percolate into the deep aquifer. The size, location, and performance of Madera County recharge basins depends on site-specific characteristics that are currently being assessed by Madera County. Madera County will develop recharge basins to maximize recharge efficiency to ensure maximum net recharge benefits stay within the Subbasin.

4.2.1.1 Project Overview

Madera County recharge basins encompass three projects that would divert water from the Eastside Bypass and Ash Slough into recharge basins or fields during wet and above normal years when water is available.

1. Eastside Bypass diversions to recharge ponds within Clayton Water District
2. Office of Emergency Services (OES) Joint Redtop Banking Project with Triangle T Water District and with Clayton Water District
3. Expanded Joint Redtop Banking Project with Triangle T Water District

The Eastside Bypass diversion project is a joint project with Clayton Water District. Project costs and benefits are split proportionally between Madera County and Clayton Water District. The joint banking projects would be implemented jointly with Triangle T Water District (TTWD). The gross project benefit for each project reflects the split of benefits between the County and TTWD. The projects would include three or more recharge basins capable of recharging an average of nearly 28,000 AFY, although the recharge activity would likely occur only in W or AN water years. In years of large available flood flow, an average of 79,000 AF could be recharged. In addition, the project would construct 14 new 20-cfs slant pump turnouts to flood recharge basins and fields.

The recharge basins would be located in the Madera County West portion of the Madera County GSA, which is in the same Management Area as TTWD. Recharge in this management area will be managed for water supply benefits and to prevent additional land subsidence to stay above MTs and meet MOs specified in GSP Chapter 3. The County and TTWD will work cooperatively to maximize the opportunities for recharge and benefits for this Management Area of the Subbasin. Coordination will include potential pursuit of joint water rights applications, joint facilities, grant funding, and design and construction efforts.

4.2.1.2 Implementation

Implementation would be staged over a five-year period, beginning in 2020 as shown in the table below. Madera County has conducted a preliminary review of suitable lands using the SAGBI index and by soliciting feedback from growers. It will conduct a detailed study to identify appropriate recharge sites starting in 2020. Permitting and environmental documentation will be initiated in 2020, and financing for construction will be identified and secured. Construction will occur in 2023 and 2024.

Table 4-21. Implementation Timeline

Phase	Start	End
Permitting and environmental documentation	2020	2022
Financing	2022	2023
Construction	2023	2024
Operation	2025	Indefinite

4.2.1.2.1 Construction activities and requirements

Madera County, working with Davids Engineering, has developed preliminary construction cost estimates for facilities to divert water from the bypass and convey it to fields or basins. A summary of this analysis is provided in **Appendix 4.E.** Cost estimates are being refined to reflect the optimal scale of the project. General construction activities include developing diversions from the bypass, conveyance to recharge basins, and the basins.

The basins will be in operation by 2025. Land purchased for the basins will be selected based on location and suitability for recharge. It is assumed that land purchased for recharge basins would be land that is currently farmed.

4.2.1.2.2 Water source

Flood flow from the Eastside Bypass and Ash Slough would be diverted into recharge basins or fields during wet and above normal years when water is available.

4.2.1.2.3 Conditions or constraints on implementation

The projects rely on the availability of flood flow in the Eastside Bypass and the availability of suitable land to purchase for the basins. Madera County will coordinate with TTWD to ensure that the projects are jointly implemented and operated to achieve their purpose.

4.2.1.2.4 Permitting process and agencies with potential permitting and regulatory control

The following agencies have potential permitting roles for the project: Madera County, Regional Water Quality Control Board, and State Water Resources Control Board. Recharge basin projects of this scale may require an environmental review process under CEQA. This would require either an Environmental Impact Report, and Negative Declaration, or a Mitigated Negative Declaration.

Madera County will obtain grading permits for construction of the recharge basins and will apply for permits required from the State Water Resources Control Board for diversion of water into the recharge basins or onto fields to the extent that diversion is not already permitted under existing water rights and contracts.

4.2.1.3 Project Operations and Monitoring

During periods of winter flood flow, water will be diverted from the bypass into recharge basins. Based on hydrologic analysis, the initial basins will recharge up to 79,000 AF in wet years, about one out of three years. Delivery would typically occur during the winter and spring but could occur any time that surplus water is available.

Extraction of recharged groundwater will be done by water users within the Madera County. If allocation of groundwater recharge credits is determined to be necessary, groundwater extraction will be monitored and enforced by Madera County with meters installed on individual deep wells. Any allocation of credits will be consistent with the Madera County demand management action (see Section 4.2.3).

4.2.1.4 Project Benefits

Table 4-22 summarizes the expected diversions to the recharge areas by year type for the three projects that form the Madera West recharge basins project. The expected annual volume of water recharged (averaged over all year types) is 27,953 AF.

Table 4-22. Madera County Recharge Basins Estimated Average Flood Flow Diversions by Year Type for Recharge, in AFY

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	79,200	35%	27,953
AN	0	14%	0
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual			**27,953**

4.2.1.5 Project Costs

Construction costs are based on the estimates developed by Davids Engineering and the TTWD's Office of Emergency Services Grant. Estimated capital and operating costs are shown for each of the three Madera County recharge basin projects, ranging from $110 million to $1 million. The combined capital cost equals $118 million. Madera County will continue to work with its partners to develop refined project costs.

The development of project cost estimates is summarized in an **Appendix 4.E**.

O&M costs include costs to deliver water to fields or basins are assumed to equal $25 per acre-foot. Actual diversion and pumping costs may be significantly higher, Madera County will develop refined project cost estimates as part of its planning efforts during the project implementation period (**Table 4-23**). Project operating costs do not include any water purchase costs for Eastside Bypass flood flows. Madera County will need to obtain permits to divert the water from the bypass. Since other GSAs are looking to divert the same source of water, future water costs may increase (either to obtain permits or negotiate agreements with other GSAs looking to utilize the same supply).

Table 4-23. Madera County West Recharge Basins Project Costs

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Project #1. Eastside Bypass diversions to Madera County recharge ponds	$110,000,000	Start of project	Preliminary capital cost estimate; will be refined
Project #2. OES Joint Banking Project	$7,000,000	Start of project	Preliminary capital cost estimate; will be refined
Project #3. OES Joint Banking Project	$1,000,000	Start of project	Preliminary capital cost estimate; will be refined
O&M Costs			
Project #1. Eastside Bypass diversions to Madera County recharge ponds	$450,000	All	Average annual cost; costs are higher in years when water is available. Assumes no water purchase costs.
Project #2. OES Joint Banking Project	$225,000	All	Average annual cost; costs are higher in years when water is available. Assumes no water purchase costs.
Project #3. OES Joint Banking Project	$32,000	All	Average annual cost; costs are higher in years when water is available. Assumes no water purchase costs.

4.2.2 Madera County East: Water Purchase

Madera County will develop additional recharge basins, encourage Flood-MAR, or deliver water for in-lieu recharge in the Madera County East area. The project would purchase additional water supplies that would be delivered to the Madera County East area. Madera County is currently working with partners to identify sources of supply, costs, and maximize net recharge benefits in the Subbasin. The water purchase project includes two related projects:

1. Import other water supplies from partners into Madera County East and deliver that water for in-lieu recharge
2. Import CVP 215 water into Madera County East using Madera Canal and deliver that water to recharge ponds, dry wells, or as Flood-MAR on cropland

Both projects are similar, and the general concept/approach is described in the following section.

4.2.2.1 Project Overview

The County GSA would directly acquire or facilitate the acquisition of approximately 5,000 AF of new surface water supplies that would be available for diversion from Millerton during an irrigation season. The water would be acquired from a water supplier with rights/contracts for water from Millerton, or from another water supplier whose supply can be exchanged with water from Millerton. The water would be conveyed to Madera County East parcels that are within ½ mile of an existing major water delivery system (e.g. Madera Canal, CWD delivery system, natural stream course). Water would be conveyed to the various locations under a conveyance agreement entered into with CWD and others, as may be appropriate. Diversion and conveyance facilities would be constructed to serve the lands not currently within the delivery system of a district. The 5,000 AF would be expected to serve the irrigation needs of approximately 3,000 to 5,000 acres of currently irrigated lands – depending on the irrigation needs of the properties.

4.2.2.2 Implementation

The County will contact (either directly or through brokers) potential sellers of water delivered from Millerton and, if necessary, with other sellers of water that can be delivered from Millerton via exchange agreements. Diversion and conveyance facilities would be constructed to serve the lands. The County will negotiate operation and conveyance agreements to deliver the water to parcels within the Madera County East area. The exact parcels to receive the water have yet to be identified. To minimize costs, Madera County intends to serve parcels with irrigation systems accessible within ½ mile of a conveyance pathway (e.g. Madera Canal, CWD channel, or natural stream course).

Madera County has already started working with partners to identify potential purchases. Implementation of the project would start immediately in 2020 and continue through full development of the project by 2025.

Table 4-24. Implementation Timeline

Phase	Start	End
Permitting and environmental documentation	2020	2022
Financing	2022	2023
Construction	2023	2024
Operation	2025	Indefinite

4.2.2.2.1 Construction activities and requirements

Madera County would need to obtain a permit to divert water for the project. Construction would be required to divert water from existing canals or streams and convey the water to served lands. Depending on the expected frequency and duration of diversions, both temporary and permanent diversion structures could be used. Madera County expects to identify parcels that are located near existing CWD facilities and build a turn out to receive delivery at those parcels. This would require a wheeling agreement with CWD.

4.2.2.2.2 Water source

The project will acquire water from Millerton by agreement with an existing CVP contractor. Other water that may be available for acquisition will also be considered. This could include any water that can be conveyed to Madera County via exchange agreements, including water from potential new projects such as Sites Reservoir.

4.2.2.2.3 Conditions or constraints on implementation

A necessary requirement for this project is the availability of water for purchase. Construction of the diversion facilities would not be justified without reasonable access to water. The cost of the water to growers receiving the water could also be an impediment to participation. Delivery of acquired water must be within the capability of existing facilities and reasonably assured by conveyance agreements with CWD.

4.2.2.2.4 Permitting process and agencies with potential permitting and regulatory control

The project will require conveyance agreements with CWD (and/or others) to allow the use of facilities to route the water to the new diversion locations. The project will require coordination with Reclamation for scheduling the storage and delivery of water within Millerton or to facilitate exchanges of water acquired from more distant parts of the Central Valley.

Depending on how the water is used, the following agencies have potential permitting roles for the project: Madera County, Regional Water Quality Control Board. The project may require an environmental review process under CEQA. This would require either an Environmental Impact Report, and Negative Declaration, or a Mitigated Negative Declaration.

4.2.2.3 Project Operations and Monitoring

Up to 5,000 AF would be targeted for acquisition every year, adjusted as appropriate for hydrologic constraints imposed on the availability of water. The water would be delivered during the irrigation season using existing conveyance facilities.

4.2.2.4 Project Benefits

Table 4-25 summarizes the results of an integrated hydrologic analysis of water potentially available by year type and month for this project. Although 5,000 AF would be sought every year, a conservative estimate of the overall average delivery is 3,015 AFY, with the largest delivery acquired from Millerton floodwater (Section 215) water in wet years. Deliveries in other year types are purchases from existing or new supplies.

Table 4-25. Estimated Average Deliveries by Year Type for Madera County East Water Purchases, in AFY

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	5,000	35%	1,765
AN	0	14%	0
BN	1,875	8%	147
D	3,750	16%	588
C	1,875	27%	515
Avg. Annual			**3,015**

To the extent the delivered water substitutes for groundwater, it provides in-lieu recharge equal to the net amount of avoided pumping (gross pumping minus return percolation from the pumped water) plus the percolation from applying the surface water. Therefore, the total recharge (in-lieu plus direct percolation) is equal to the amount of surface water delivered.

Madera County will manage the projects for the benefit of its GSA. It may decide to allocate water to specific parcels and will decide how to allocate project costs to those specific parcels, and other groundwater pumpers in the Madera County GSA.

4.2.2.5 Project Costs

The project would require purchasing water, constructing facilities, and delivering water to the lands which are not currently served by surface water. The cost components are:

- Cost to acquire water. Water would be purchased from existing water suppliers or from new supplies that may become available, potentially in all year types. The estimated cost of water in Millerton (accounting for likely exchanges and conveyance costs) would be $1,000/acre-foot.
- O&M costs to convey water. Madera County would pay an additional fee per acre-foot of water to convey water, based on conveyance agreements with CWD and/or others. Additional costs are expected to convey water from the existing facilities to the served lands. For purposes of project estimating, this total cost is estimated to be $50/acre-foot.
- Capital costs for Infrastructure. Diversion of water from existing canals or streams could rely on a combination of temporary and permanent infrastructure. This is estimated to be $50,000 per diversion. Assuming 200 acres served per diversion, 10 diversion locations would be required at a total capital cost of $500,000 (2019 dollars).
- Other permitting, environmental review, legal, and consultant costs.

Madera County is currently developing project details and will continue to work with partners to develop and refine project costs. Preliminary capital cost estimates are around $500,000 for each project to build turnouts and other limited infrastructure. The first water purchase project relies on expensive sources of imported water, therefore O&M costs are moderate, but water purchase costs are significant (around $1,000 per acre-foot). The second project assumes that CVP 215 water is available at cost and a wheeling agreement with CWD. (See **Table 4-26**)

Table 4-26. Madera County East Water Purchase Project Costs

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Project #1. Other water purchase for irrigation	$500,000	Start of project	Preliminary capital cost estimate; costs will be refined.
Project #2. CVP 215 water purchase for recharge	$500,000	Start of project	Preliminary capital cost estimate; costs will be refined.
O&M Costs			
Project #1. Other water purchase for irrigation	$1,000,000	All	Average annual cost; costs are higher in years when water is available.
Project #2. CVP 215 water purchase for recharge	$110,000	All	Average annual cost; costs are higher in years when water is available.

4.2.3 Management Action: Demand Management

Madera County has determined that its potential projects are unlikely to generate enough new water to offset the estimated current and projected future overdraft conditions in its GSA. It has decided to implement a management action to gradually reduce groundwater pumping over the GSP implementation period.

The management action is a demand management (water use reduction) program. In broad terms, demand management can include any water management activity that reduces the diversion, conveyance, or use of irrigation water. However, to be effective for purposes of sustainable groundwater management, demand management must result in a decline in net groundwater pumping (pumping net of recharge). That is, it must reduce consumptive use or irrecoverable losses into a saline water body. Activities that, for example, reduce canal seepage or reduce deep percolation from irrigation will not be effective. They may decrease quantity of water diverted or applied but they also reduce recharge to usable groundwater, so do not improve the net pumping from the aquifer.

Madera County is continuing to work with stakeholders to develop the specific details of the program. A general overview of the proposed program and summary of decisions that had been made as of late May 2019 are summarized in this section.

4.2.3.1 Project Overview

The Madera County demand management program will reduce consumptive water use (measured as evapotranspiration, ET) over the GSP implementation period. Demand management actions that reduce consumptive use can include changing to lower water-using crops, water-stressing crops (providing less water than the crop would normally consume for full yield), reducing evaporation losses, and reducing irrigated acreage. However, Madera County will not dictate which of those reduction methods growers would implement. Madera County's primary approach to demand management is to set demand reduction targets for the GSA service area as a whole, based on conditions in the Subbasin. Achieving the targets can be approached through a variety of methods, including groundwater allocations, internal groundwater markets (e.g. limited to within the GSA), fee structures, and fallowing programs. The County seeks a balance of individual flexibility and GSA-wide accountability. Pumping will be monitored and enforced by Madera County to ensure compliance with the demand reduction targets and sustainability objectives. California Water Code §10726.4 (a)(2) provides the Madera County GSA with the authority to

control groundwater extractions by regulating, limiting, or suspending extractions from individual groundwater wells or extractions from groundwater wells in the aggregate.

The following principles are guiding development of the demand management program. These are in no order of preference and Madera County recognizes tradeoffs exist among these principles.

- Minimize the economic impacts of any demand management required in Madera County
- Maintain established water rights
- Incentivize investment in water supply infrastructure
- Incentivize economically efficient water use
- Incentivize recharge in aggregate, and in specific regions
- Allow sufficient program flexibility for groundwater pumpers to adjust over time
- Ensure access to domestic water supply (de minimis domestic use as defined by SGMA is less than 2 AF annually per user)

4.2.3.2 Implementation

Madera County is currently evaluating a range of demand management program options. All options impose a limit on groundwater pumping that will start in 2020. Madera County is continuing to work with stakeholders to develop a program that is implementable, consistent with the guiding principles, and achieves sustainability objectives in the basin. The demand management program may include one or more of the following approaches:

- **Allocations**. Madera County would implement a groundwater allocation program that would directly relate to the overall demand reduction goals necessary to achieve anticipated reductions by 2040. Allocations could be tied to a crop-type or historical use or could be evenly distributed among existing irrigators or over all lands. Various approaches have differing effects on grower flexibility, County management and administration, and perceptions of equality.
- **Water trading program (water market, cap and trade)**. Madera County would establish a local groundwater credit system and allow trading of those credits among groundwater users. The program would establish a full accounting of available groundwater supply, allocation of that water supply to local stakeholders, and a record-keeping system that facilitates and records all trades. Additional conditions on location and timing of the use of traded credits may be needed, and in fact, are likely to be required in many areas.
- **Easements**. Madera County would identify potential easement programs and other sources of funding to incentivize fallowing of irrigated lands.

The Madera County demand management program will impose groundwater pumping limits starting in 2020. The program applies to both the Madera County East and Madera County West portions of the Madera County GSA. At this time, based on the expected yield of the projects identified under Section 4.2.1 and 4.2.2, the Madera County demand management program will reduce average annual groundwater pumping by 27,550 AF (16,250 AF in Madera County West and 11,300 in Madera County East). However, if Madera County project yields are lower than initially estimated, Madera County will proportionally increase the level of demand management.

Madera County plans to gradually phase-in demand management between now and 2040. Starting in 2020 and continuing through 2025, average annual groundwater pumping is reduced by 2% (of the total demand reduction amount) per year, for a total cumulative reduction of 10% by 2025. Groundwater pumping is reduced by 6% per year starting in 2026 and continuing through 2040. **Figure 4-1** illustrates the annual reduction in pumping by year between 2020 and 2040. The annual reduction in pumping in

Madera County equals 27,550 AF by 2040. The second axis shows the corresponding reduction in ET_{aw} under the demand management program. Crop ET_{aw} is reduced to 71% of the current ET_{aw} in the Madera County area by 2040.

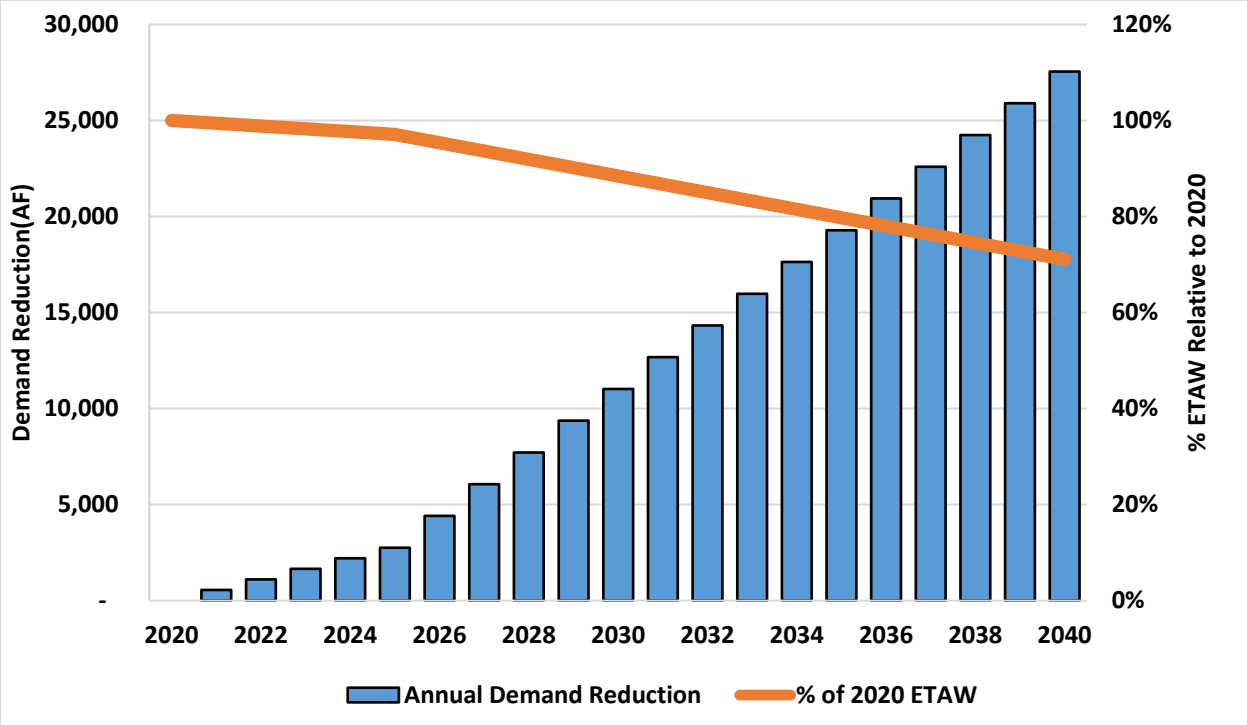

Figure 4-1. Madera County Demand Management Program

The fundamental requirements of any demand management program include establishing a full accounting of available groundwater supply, a method for allocating the supply, and a system for monitoring and enforcement to ensure that the allocation is not exceeded by any individual or in the aggregate. Madera County is currently working with stakeholders to develop the initial guidelines of the demand management program. Important events and preliminary decisions relevant to the demand management program include:

- June 27 – 29, 2018 – The County of Madera met with representatives in Ventura County to tour recharge facilities and discuss Fox Canyon Groundwater Management Agency water market approaches that could apply to Madera County.
- July 17, 2018 – Following several weeks of development, the County of Madera submitted a proposal for a US Bureau of Reclamation WaterSMART grant to fund a study to evaluate water trading strategies.
- September 24, 2018 – The County of Madera met with the Pajaro Valley Groundwater Management Agency to discuss groundwater management options that may apply to Madera County.

- October 5, 2018 – The County of Madera was notified that it received funding for its US Bureau of Reclamation WaterSMART proposal to develop a groundwater marketing strategy for Madera County.
- November 11, 2018 – The County of Madera held a water marketing workshop to allow stakeholders to discuss water trading approaches that could be implemented under the demand management program.
- December 17, 2018 – The County of Madera held a second water marketing workshop to allow stakeholders to discuss water trading approaches that could be implemented under the demand management program and test alternative market rules.
- February 12, 2019 – The Madera County Advisory Committee for GSAs recommended that as part of the GSP, native groundwater should be allocated equally across irrigated and unirrigated land within the County GSAs. The vote was 10-1.
- March 7, 2019 – The Madera County Advisory Committee for GSAs recommended that as part of the initial modeling efforts, groundwater pumping in the County GSAs decrease over time decreased at approximately 2% a year from 2020 to 2040 (see Figure 4-1). The vote was 11-0.
- April 12, 2019 – The Madera County Advisory Committee for GSAs recommended that credits be given only for activities that introduce new water into the Subbasin (new water is water that would not otherwise be part of the Subbasin water supplies). The vote was 8-0.
- April 12, 2019 – The Madera County Advisory Committee for GSAs recommended that credits be evaluated by an outside entity to establish the quantity of water to be credited. The vote was 8-0.

Madera County will continue to work with stakeholders to further develop the demand management program. Implementation will start immediately and continue indefinitely.

The following subsections describe the demand management program activities and costs assuming that the Madera County demand management program includes groundwater trading. (See **Table 4-27**)

Table 4-27. Madera County Demand Management Program Implementation Timeline

Phase	Start	End
Permitting and environmental documentation	2020	Indefinite
Financing	2020	Indefinite
Construction	N/A	N/A
Operation	2020	Indefinite

4.2.3.2.1 Construction activities and requirements

No new physical water storage or conveyance facilities are required to operate a demand management program. The program could require investment in well meters or other monitoring approaches (e.g. remote sensing) to ensure pumpers comply with pumping limits.

The demand management program will require significant outreach, planning, and strategy development efforts. A groundwater market would require measurement of groundwater pumping and development of accounting software to manage trades and pumping credits. Individual water users may incur costs to manage their demand and participate in trading, but such costs are borne by individual users, may include voluntary activities, and do not require funding by the GSA.

4.2.3.2.2 Water source

No new water is provided. The existing groundwater is capped and allocated under the demand management program.

4.2.3.2.3 Conditions or constraints on implementation

The demand management program is a mandatory program for Madera County groundwater users. If Madera County implements a groundwater market, participation in the market (trading) would be voluntary. Successful implementation of demand management does not depend on all users participating, but the success of the program does depend on other factors, including:

- Any trading program must establish definitive limits on groundwater pumping and be able to enforce conditions.
- Any trading program must have an accounting mechanism to monitor pumping (or allocate credits) and an acceptable method for reviewing and ensuring compliance with the program.
- Any trading program must implement rules and constraints to ensure that the program is consistent with the GSP goals.

4.2.3.2.4 Permitting process and agencies with potential permitting and regulatory control

The County will likely have the primary and only regulatory control for the GSA's demand management program.

Additional regulatory or permitting processes or control are not anticipated to be necessary under this component of the Madera County GSA's sustainability program.

4.2.3.3 Project Operations and Monitoring

Madera County is currently working with GSA stakeholders and other GSAs in the Subbasin to define the demand management program, including the potential for a within-GSA groundwater market. The County has recently received a U.S. Bureau of Reclamation WaterSMART grant to investigate the functionality and viability of a groundwater market, anticipating results from that effort to further inform development of the demand management program.

Tasks that are funded by the WaterSMART grant include:

1. Defining opportunities with potential partners
2. Obtaining input from potential partners regarding concerns and priorities
3. Assessing economic, social, and environmental impacts of a water marketing strategy
4. Analyzing legal opportunities and constraints regarding a water marketing system
5. Developing monitoring, quantification, mitigation and standards for assessment of future needs
6. Developing finalized water marketing strategy framework through the grant program
7. Conducting a pilot water market demonstration

The County recognizes a critical element of success for this program will be on-going monitoring of groundwater use across the entire GSA management area. Madera County is currently evaluating potential measurement methods including:

- Meters on wells.
- Water use based on established crop factors.

- Remote-sensing measures of ET with additional analysis to determine ET_{aw}.

4.2.3.4 Project Benefits

The demand management program allows Madera County GSA and groundwater users to achieve the sustainability targets in a cost-effective way. Coupled with the Madera County projects to augment supplies, demand must be reduced to meet the sustainability goals.

4.2.3.5 Project Costs

Madera County is currently developing the demand management program and assessing potential costs. Since the details are still under development, project costs cannot be estimated at this time, but demand management is anticipated to require substantial County administration and implementation budgets.

Costs to measure pumping and monitor groundwater conditions are part of overall GSP management and not imposed by this program.

The most significant cost of the demand management program falls on agricultural groundwater pumpers (growers) and the regional economy. An economic impact analysis of the demand management program has estimated average annual direct economic costs at $19 million per year. This represents reduced net returns to crop production resulting from demand management. It does not include indirect and induced economic impacts to other businesses, employees, and the Madera County regional economy.

4.2.4 Madera County Project Financing

Pursuant to 23 CCR § 354.44 and § 354.6, Madera County has evaluated and described the ability to cover project costs. Since most projects are still being assessed, and feasibility studies are being refined or developed, a general description of how Madera County will cover project costs is presented. Madera County will conduct economic and fiscal feasibility studies as part of its ongoing planning efforts to better understand willingness and ability to pay for the projects included in the GSP. Demand management program costs will be covered through grants and fees on groundwater pumpers.

To cover project costs, Madera County will pursue available state and federal grants or loans to help construct projects. The remaining construction costs will be financed through issuance of bonds, to be repaid from revenues raised through water fees and other assessments. Operation and maintenance costs will be paid using revenues raised through water fees and other assessments. Madera County will conduct the necessary studies and decision processes (including Proposition 218 elections) to approve fees or assessments to provide the required funding.

To cover demand management program costs, Madera County will obtain available state and federal grants or loans to help set up and test the program. Any remaining set-up cost will be paid for using revenues raised through fees and assessments. Water trading program operating costs may be paid using a per-unit fee on trades or using revenues raised through fees and assessments. Madera County will conduct the necessary studies and decision processes (including Proposition 218 elections) to approve rates, fees, or assessments to provide the required funding.

4.2.5 Coordination with Other GSAs and Planning Agencies

As part of the Chowchilla Subbasin GSP, the Madera County GSA will coordinate with other GSA's in the GSP. Coordination will continue among these and other agencies as needed to implement projects successfully.

At this time, no trading of pumping credits across GSA boundaries is anticipated. To the extent that trading within Madera County GSA may affect groundwater conditions at the boundary between it and a neighboring GSA, additional coordination may be needed.

4.3 Sierra Vista Mutual Water Company Projects

Sierra Vista Mutual Water Company (SVMWC) is a private water company located in the Merced County and Madera County GSAs. SVMWC irrigated area covers all of the Merced County GSA and a small area of the Madera County GSA. SVMWC has identified one project for implementation of the Chowchilla Subbasin GSP. The SVMWC project is the construction and operation of a winter floodwater recharge project within or near the SVMWC lands, or the participation in a joint recharge project yielding similar results with CWD. The source of water for the project for recharge is floodwater diverted from the Chowchilla River. The project description is based on information developed during the initial GSP development process and, where applicable, other studies. Section 4.6 summarizes applicable PMA implementation efforts and updates from the time of initial GSP development through the latest GSP Annual Report (water year 2021). A description of how this project fits and coordinates with other Subbasin projects and actions is provided in Chapter 5: Plan Implementation.

4.3.1 Recharge Basins to Capture Floodwater

SVMWC intends to develop and manage recharge basins to capture flood water for groundwater recharge benefits in SVMWC.

4.3.1.1 Project Overview

The project proposes to develop infrastructure and up to 300 acres of recharge ponds within the SVMWC area, or nearby lands, that could be used to recharge Chowchilla River flood flows during the winter months of wet years. SVMWC would keep track of the amount of water recharged and stored underground. In dry years, the recharged water would be pumped and used by landowners to irrigate the approximately 3,500 acres of irrigated farmland within SVMWC. Recharge ponds are assumed to recharge 4.6 inches of water per day when operating at full capacity.

4.3.1.2 Implementation

Implementation will occur over a three-year period, beginning in 2020. SVMWC will identify recharge pond locations and begin environmental and permitting studies in 2020. Once recharge pond locations and designs are finalized, SVMWC will establish project financing through its corporate structure and/or available grant programs. Construction is likely in 2022 with operation beginning in 2023 or when wet year flood flows for recharge are available thereafter (See **Table 4-28**). Operations are expected to continue throughout the planning horizon (through 2090).

Table 4-28. Implementation Timeline

Phase	Start	End
Permitting and environmental documentation	2020	2021
Financing	2021	2022
Construction	2021	2022
Operation	2023	Indefinite

4.3.1.2.1 Construction activities and requirements

Construction activities vary by recharge basin site. General activities include survey, initial feasibility assessment, permitting, environmental review, land purchase (if needed), earthwork, site development, water supply development, and operating infrastructure. Details on construction activities, schedule, and project costs will be developed as part of final project design for the recharge basins developed by SVMWC.

4.3.1.2.2 Water source

Water for recharge is floodwater in the Chowchilla River, diverted using facilities already in place or to be constructed as part of the project. The analysis of benefits below does not account for other potential sources nor for any changes in operations elsewhere that might affect availability of flows in these rivers.

4.3.1.2.3 Conditions or constraints on implementation

This is a planned project of the GSP and its implementation does not depend on the performance of other projects or activities.

4.3.1.2.4 Permitting process and agencies with potential permitting and regulatory control

The following agencies may have permitting or other regulatory roles in project implementation: State Water Resources Control Board, US Army Corp of Engineers, Regional Water Quality Control Board, California Department of Fish and Wildlife, San Joaquin Valley Air Pollution Control District, and California Stormwater Pollution Prevention Plan.

The proposed project components will be installed on land owned by landowners in SVMWC or on nearby land that SVMWC acquires by purchase or lease. Agreements will be developed between SVMWC and landowners during the Environmental Planning and Permitting phase of the schedule.

4.3.1.3 Project Operations and Monitoring

SVMWC expects that floodwater will be available for diversion and recharge in approximately 1 in 3 years and would be delivered using existing SVMWC diversion and conveyance structures plus the facilities constructed or modified for this project. In years when flood waters are available, SVMWC would divert the water into recharge basins covering up to 300 acres, recharging 4.6 inches per day. The availability of flood flows varies but is estimated to be 100 days per year during the winter and spring months of wet year types. SVMWC will account for the amount of water recharged.

Extraction and beneficial use of recharged groundwater will be done by water users in SVMWC who will pump the recharged water in future years to irrigate crops in SVMWC. SVMWC will account for groundwater pumped with meters installed on individual wells.

4.3.1.4 Project Benefits

The groundwater recharge would benefit the Chowchilla Subbasin groundwater condition in two ways:

1. Groundwater recharge would help reduce land subsidence and the resulting impacts on water conveyance infrastructure and permanent loss of groundwater storage capacity.
2. Groundwater recharged by the project will provide water for water users in SVMWC in dry and critical years and will improve the overall water balance within SVMWC.

Based on a hydrologic and operations analysis covering the historical period, 1989-2014, and the resulting frequency and amount of recharge, the average annual net recharge for 300 acres at buildout, the net

yield would average 11,490 AFY in wet years (assuming 0.383 AF/day x 100 days x 300 acres), and lesser amounts in above normal years. The project would not operate in below normal and dry year types.

The table below illustrates the anticipated frequency and amount of flood water that could be diverted into the project. The reliability of source water is based on historical hydrology being a good projection of future hydrology.

Table 4-29. SVMWC Recharge Basin Estimated Average Recharge Volumes by Year Type, in AFY

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	11,490	35%	4,022
AN	2,298	14%	322
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual			**4,344**

4.3.1.5 Project Costs

SVMWC will evaluate project costs to develop 300 acres of recharge basins. Costs for each basin will vary based on site characteristics and market conditions affecting land, construction, and material costs at that time. Costs shown here are representative of average recharge basin development costs. All costs are reported in current 2019 dollars.

Table 4-30. SVMWC Recharge Basins Project Costs

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Land purchase and construction, 300 acres of basins	$7,500,000	Start of construction	Assumed $20,000/acre purchase and $5,000/acre development cost; costs will be refined.
O&M Costs			
Annual Power and other O&M	$217,200	All	Assumed $50/AF average annual cost; O&M costs are higher in years when water is available

4.3.2 SVMWC Project Financing

SVMWC intends to finance capital costs through available grants and/or assessments through its corporate structure. SVMWC will conduct the necessary studies and decision processes to approve the assessments to provide the required funding.

4.3.3 Coordination with Other GSAs and Planning Agencies

As part of the Chowchilla Subbasin GSP, SVMWC will coordinate with all other GSA's in the GSP, as well as neighboring GSAs in the surrounding subbasins. Coordination will continue among these and other agencies as needed to implement projects successfully. In particular, since SVMWC is not a separate GSA, but is covered in part by the Madera County GSA and in part by the Merced County GSA, SVMWC will coordinate with the two county GSAs.

4.4 Triangle T Water District GSA Projects

The Triangle T Water District GSA (TTWD) has identified the following projects that it has included in the GSP: (i) the OES Joint Redtop Banking Project is a winter floodwater recharge project that would construct basins to recharge the shallow groundwater for use in lieu of pumping deep groundwater, and (ii) the Poso Canal Pipeline and Columbia Canal Pipeline projects that would enable purchases of surface water (from San Joaquin River Exchange Contractors and others) to be conveyed into the District for irrigation supply in lieu of pumping groundwater. The Poso Canal Pipeline is already complete and the Columbia Canal Pipeline is expected to be complete by 2021. A portion of the OES project is outside of the TTWD service area and is being developed jointly with the Madera County GSA and the clayton Water District.

Project descriptions are based on information developed during the initial GSP development process and, where applicable, other studies. At the time of initial GSP development, planning for the PMAs was at varying stages of development, so complete information on construction requirements, operations, costs, permitting requirements, and other details were not available. Section 4.6 summarizes PMA implementation efforts and updates from the time of initial GSP development through the latest GSP Annual Report (water year 2021). Description of how these projects fit and coordinate with other Subbasin projects and actions is provided in Chapter 5: Plan Implementation.

4.4.1 OES Project Recharge Basins to Capture Floodwater

TTWD intends to develop and manage recharge basins to capture flood water for groundwater recharge benefits in TTWD.

4.4.1.1 Project Overview

The recharge basins are being developed under an OES Federal Emergency Management Agency (FEMA) grant. The project proposes to develop infrastructure and 310 acres of recharge ponds within the Red Top area that would allow San Joaquin/Fresno River flood flows to be stored in the shallow aquifer. The stored water would be pumped in dry years to reduce pumping from beneath the Corcoran Clay layer, in order to reduce overdraft and mitigate land subsidence. Recharge ponds can accept approximately 500 AF of additional water per day when operating at full capacity from existing and new turnouts and facilities. The project would improve monitoring of both groundwater and surface water use to better manage resources. Three measurement structures are proposed along the Fresno River and Berenda Slough, consisting of one rate section and two flow measurement devices. Recovered water would be used in dry or critical water years.

4.4.1.2 Implementation

Implementation started in 2019. Approximately 1,500 acres will be identified that show good recharge potential, and TTWD will construct 310 acres of recharge ponds within the 1,500 acres. TTWD will begin environmental and permitting studies in 2019. When locations and designs are finalized, financing for

construction will be secured and construction will begin in 2020. TTWD will complete construction and begin operation of the recharge facilities in 2021. Operations are expected to continue indefinitely.

Table 4-31. Implementation Timeline

Phase	Start	End
Permitting and environmental documentation	2019	2020
Financing	2020	2021
Construction	2020	2021
Operation	2021	Indefinite

4.4.1.2.1 Construction activities and requirements

The broader OES FEMA grant project proposes 13 new shallow water wells, 5.5 miles of surface water distribution pipeline (to distribute surface water conveyed to TTWD through the pipeline projects, described under Section 4.4.2), increasing the capacity of the existing Road 9 turnout, removing and replacing one turnout, adding one turnout from the Fresno River, and adding twelve new turnouts (slant pumps) into the project area, some of which will be in the TTWD area and others will be in the Madera County GSA. The split of project benefits and costs reflects these differences.

The OES recharge basin project includes: constructing 5 new 20-cfs slant pump turnouts to flood recharge basins and fields; and a new 48-inch RCBC (60 to 150 cfs) off Eastside Bypass to Fresno River, along with capacity improvements to Grover Junction to flood recharge basins and fields.

Details on construction activities, schedule, and project costs will be developed as part of final project design.

4.4.1.2.2 Water source

Water for recharge is floodwater in the San Joaquin and/or Fresno River, diverted using facilities already in place or to be constructed as part of the project. The analysis of benefits below does not account for other potential sources nor for any changes in operations elsewhere that might affect availability of flows in these rivers.

4.4.1.2.3 Conditions or constraints on implementation

Implementation of these projects does not depend on the implementation or performance of other projects or activities.

4.4.1.2.4 Permitting process and agencies with potential permitting and regulatory control

The following agencies have potential permitting or regulatory roles in implementing the project: US Army Corp of Engineers, Regional Water Quality Control Board, California Department of Fish and Wildlife, San Joaquin Valley Air Pollution Control District, and California Stormwater Pollution Prevention Plan.

The proposed project components will be installed on land owned by various landowners in the Red Top Area. Agreements will be developed between the Districts and landowners during the Environmental Planning and Permitting phase of the schedule.

Encroachment permits have been submitted for 6 of the turnouts along the Eastside Bypass to the Flood Protection Board. The remaining will be submitted as the projects proceed. Encroachment permits and license agreements may be needed with the County for placing a pipeline along Road 4 and along the Road 4 Bridge over the Eastside Bypass.

Agreements will be developed between the Districts and landowners during the Environmental Planning and Permitting phase of the schedule.

4.4.1.3 Project Operations and Monitoring

TTWD expects that floodwater will be available for diversion and recharge in wet and above normal years. It would be delivered using existing structures plus the facilities constructed or modified for this project. For the first project, TTWD expects to deliver sufficient water during such years to recharge 310 acres of basins, recharging up to a maximum recharge rate of 500 AF per day. Delivery would typically occur during the winter and spring but could occur any time that surplus water is available.

TTWD expects to divert up to 15,000 AF per month in wet years during January through March. The expected recharge from the OES projects, averaged over all year types, will be about 16,000 AFY.

Recharge will be delivered by TTWD to groundwater recharge basins and for application to fields. Extraction of recharged groundwater will be by water users in TTWD and nearby lands in the Subbasin. If allocation of groundwater recharge is determined to be necessary, groundwater extraction will be monitored and enforced by TTWD with meters installed on individual wells.

4.4.1.4 Project Benefits

The groundwater recharge would benefit the Chowchilla Subbasin groundwater condition by recharging the shallow aquifer. Groundwater users will be able to pump from the shallow aquifer in lieu of pumping from below the Corcoran clay. It may also increase total water supply to users in dry and critical years.

Based on a hydrologic and operations analysis covering the historical period, 1989-2014, and the resulting frequency and amount of recharge, the combined OES FEMA grant projects yield 24,657 AFY.

The size, location, and performance of a recharge basin depends on site-specific characteristics that will be assessed by TTWD. For example, some of the water that percolates from the recharge basin may move laterally to nearby streams and flow out of the basin before it can reach the deeper aquifer. This lost water would not provide any recharge benefits to TTWD or the Subbasin. TTWD will develop recharge basins to maximize recharge efficiency to ensure maximum net recharge benefits stay within the Subbasin and monitor for losses to calculate the true net benefit.

The table below illustrates the frequency and amount of floodwater the three projects are expected to divert into recharge. The reliability of source water is based on historical hydrology being a good projection of future hydrology. In addition, reliability depends on other users diverting supplies.

Table 4-32. TTWD Recharge Basins Estimated Average Recharge Volume by Year Type, in AF

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	65,000	35%	22,941
AN	12,500	14%	1,716
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual			**24,657**

4.4.1.5 Project Costs

TTWD will evaluate project costs to develop recharge basins. Costs for each basin will vary based on site characteristics and market conditions affecting land, construction, and material costs at that time. Costs shown here are representative of average recharge basin development costs. All costs are reported in current 2019 dollars.

Table 4-33. TTWD Recharge Basin Estimated Costs

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Capital costs for TTWD projects	$24,500,000	Start of construction	
O&M Costs			
Water purchase costs and other O&M	$700,000	All	Average annual cost; O&M costs are higher in years when water is available

4.4.2 Poso Canal Pipeline and Columbia Canal Company (CCC) Pipeline Projects

TTWD will implement a pipeline project to buy and deliver surface water. It will construct conveyance for delivery of water purchased from San Joaquin River Exchange Contractors and others. The water will be used in-lieu of groundwater pumping in TTWD. The Poso Canal Pipeline is operational and the Columbia Canal Pipeline is expected to be operational in 2021.

4.4.2.1 Project Overview

The projects propose to construct conveyance for delivery of water to be purchased from one or more San Joaquin River Exchange Contractors or other partners to the west and south of the District. A portion of the purchased water would be conveyed through new pipelines from the Poso Canal west of TTWD and from CCC to the south. The water would be delivered to recharge facilities or used for irrigation in lieu of pumping groundwater, in order to reduce overdraft and mitigate land subsidence. Up to 8,000 AFY would be targeted for purchase in total.

4.4.2.2 Implementation

Planning and agreements have been under development, with construction of the Columbia Pipeline expected to begin in 2019 or 2020. The Poso Canal Pipeline is operational and the Columbia Canal Pipeline is expected to be operational and provide deliveries in 2021. **Table 4-34** summarizes the anticipated timeline for construction and operations of the pipelines.

Table 4-34. Implementation Timeline

Phase	Start	End
Permitting and environmental documentation	Under way	2019
Financing	2019	2020
Construction	2019	2020
Operation	2020	indefinite

4.4.2.2.1 Construction activities and requirements

Details on construction activities, schedule, and project costs will be developed as part of final project design.

4.4.2.2.2 Water source

Water would be purchased from willing sellers and delivered through Exchange Contractor facilities. Exchange Contract deliveries are among the most reliable among CVP deliveries, with 100% deliveries in most years, dropping to 75% in the driest years (about one in 10). The cost to purchase water from Exchange Contractors or other willing partners will increase as GSPs are implemented and multiple parties, including TTWD, compete for water transfer partners.

4.4.2.2.3 Conditions or constraints on implementation

The projects will compete with other users for water within the San Luis-Delta Mendota Water Authority and SWP service areas. This will increase the cost of the project to TTWD over time.

4.4.2.2.4 Permitting process and agencies with potential permitting and regulatory control

The following agencies have potential permitting or regulatory roles in implementing the project: US Army Corp of Engineers, Regional Water Quality Control Board, State Water Resources Control Board, California Department of Fish and Wildlife, San Joaquin Valley Air Pollution Control District, and California Stormwater Pollution Prevention Plan.

4.4.2.3 Project Operations and Monitoring

Water will be acquired by long-term and/or short-term agreements between TTWD and Central California Irrigation District (CCID), CCC, and other willing sellers. Operations and deliveries will be coordinated between the Poso Canal Pipeline and the CCC Pipeline. Water will be delivered for recharge and irrigation in lieu of groundwater pumping. Quantities delivered will be tracked as part of the GSA's monitoring of groundwater use, recharge, and conditions.

4.4.2.4 Project Benefits

The table below shows the planned water purchase and delivery amounts by water year type, for both the Poso Canal Pipeline project and the CCC Pipeline project.

Table 4-35. Estimated Average by Year Type for Poso Canal and CCC Pipeline Projects, in AFY

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	7,000	35%	2,471
AN	8,000	14%	1,098
BN	8,000	8%	627
D	8,000	16%	1,255
C	8,000	27%	2,196
Avg. Annual			**7,647**

Based on the projected year type frequency, the average annual amount purchased and conveyed into the District by the two projects is estimated to be 7,647 AF. Increasing water purchase costs may limit the economic feasibility of purchasing water in some years.

4.4.2.5 Project Costs

The value of water supply is high in this region, especially in critical years. According to records of water purchased by San Luis and Delta Mendota Water Authority for its member agencies, the Authority paid an average of $289 per acre-foot during non-critical years and $500 per acre-foot during the 2015 critical year (see analysis provided by Castle and Cooke in CCID's application to the Hazard Mitigation Grant Program DR-4308). Therefore, TTWD expects water purchase costs to increase in the future, which may increase the cost of the project.

TTWD will evaluate project costs as it continues to refine and implement the project. The most significant share of O&M costs is expected to be annual water purchase costs. All costs are reported in current 2019 dollars.

Table 4-36. TTWD Pipeline Projects Estimated Costs

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Capital costs	$5,200,000	Start of construction	
O&M Costs			
Water purchase costs and other O&M	$4,550,000	All	Average annual cost; O&M costs are higher in years when water is available

4.4.3 TTWD Project Financing

TTWD intends to finance capital costs through its authorized borrowing mechanisms, most likely by issuing bonds. Costs to repay bonds, purchase water, and cover other operating costs will be funded through water rates or, as needed, other fees or assessments. TTWD will conduct the necessary studies and decision processes (including Proposition 218 elections) to approve rates, fees, or assessments to provide the required funding.

4.4.4 Coordination with Other GSAs and Planning Agencies

As part of the Chowchilla Subbasin GSP, TTWD GSA will coordinate with all other GSA's in the GSP, as well as neighboring GSAs in the surrounding subbasins. Years of planning and coordination for the Poso Canal and CCC pipeline projects have occurred between the districts involved (TTWD, CCID, and CCC) and Madera and Merced Counties. Coordination will continue among these and other agencies as needed to implement projects successfully. TTWD and the Madera County GSA will work cooperatively to maximize the opportunities for recharge and benefits for this Management Area of the Subbasin. Coordination will include potential pursuit of joint water rights applications, joint facilities, grant funding, and design and construction efforts.

4.5 Subbasin Water Available for Recharge by Projects

Four sources of water are available for the recharge and water supply projects: combined flood releases and Section 215 water from Millerton Lake and Buchanan Dam, Eastside Bypass flows, Fresno River flood flows to Triangle T Water District, and water purchases. A summary of the total projected water available, the projected water committed to projects, and the expected water remaining after the projects recharge or use the water committed is provided below for each water source.

4.5.1 Combined Flood Releases and Section 215 Water from Millerton Lake and Buchanan Dam

The first source of water available for projects in the Chowchilla Subbasin is the combined flood releases and Section 215 water from Millerton and Buchanan Dam. Flood releases and Section 215 water are released from Millerton Lake and enter the Chowchilla Subbasin along Madera Canal at Miles 33.6 and 35.6. Flood releases from Buchanan Dam enter the Chowchilla Subbasin along Chowchilla River. Upstream of Chowchilla Water District, flood releases from both sources and Section 215 water merge and are distributed downstream through Ash Slough, Berenda Slough, and Chowchilla River.

Table 4-37 shows the average combined flood releases and Section 215 water from Millerton Lake and Buchanan Dam that are expected to be available by water year type during the 2019-2090 projected period. These flood releases and Section 215 water are expected only during wet and above normal years (25 years and 10 years expected between 2019-2090, respectively).

The total combined flood releases and Section 215 water from Millerton Lake and Buchanan Dam that are committed to projects in the Chowchilla Subbasin are summarized in **Table 4-38**. The remaining water available of this source type after project-related recharge is summarized in **Table 4-39**. In total, projects are expected to utilize much of the available water during winter and pre-irrigation season months (Nov-Apr) of average wet and above normal years. However, projects potentially overcommit available water during most irrigation season months (May, July-Oct) of average wet years.

Reclamation's approval will be needed for Section 215 water to be used to support the recharge projects. Recent 215 contracts have stated that water may be used for irrigation and municipal and industrial purposes and must be used within the contractor's water service boundary and within the Friant Division's Place of Use. The language of the Section 215 contract needs to state the water's intended use for recharge and the location(s) that it may be applied.

Table 4-37. Average Projected Buchanan Dam and Madera Canal Flood Releases and Additional Water Supply During Uncontrolled Season Water Supply Available to Chowchilla Subbasin Recharge Projects, by Water Year Type (2040-2090).

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	95,200	35%	33,600
AN	8,200	14%	1,100
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual		100%	34,700

Table 4-38. Average Buchanan Dam and Madera Canal Flood Releases and Additional Water Supply During Uncontrolled Season Water Supply Committed to Chowchilla Subbasin Recharge Projects, by Water Year Type (2040-2090).

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	90,700	35%	32,000
AN	7,500	14%	1,000
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual		100%	33,000

Table 4-39. Average Available Buchanan Dam and Madera Canal Flood Releases and Additional Water Supply During Uncontrolled Season Water Supply Remaining After Chowchilla Subbasin Recharge Projects, by Water Year Type (2040-2090).

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	4,800	35%	1,700
AN	700	14%	100
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual		100%	1,800

4.5.2 Eastside Bypass

Eastside Bypass flows include all water entering the Subbasin along Chowchilla Bypass and Fresno River downstream of the Madera Subbasin. Chowchilla Bypass flows originate from the San Joaquin River below the control structure, approximately 5 miles east of the town of Mendota, at times when combined flood flows from the San Joaquin River and the Kings River through James Bypass approach the river's downstream capacity. Fresno River flows originate from Hensley Lake releases and Millerton Reservoir releases, which are, at times, routed to the Fresno River at Madera Canal Mile 18.8.

Average monthly Eastside Bypass flows projected for the 2019-2090 projected future period are shown in **Table 4-40** by water year type. Eastside Bypass inflows to Chowchilla Subbasin are expected to occur only during wet and above normal years (25 years and 10 years expected between 2019-2090, respectively).

The total Eastside Bypass flows committed to projects in the Chowchilla Subbasin and the remaining water available in Eastside Bypass following project-related recharge are summarized in **Tables 4-41** and **4-42**, respectively. In total, projects are expected to utilize much of the available water during pre-irrigation season months (Feb-Apr) of average wet years, though significant recharge potential remains for winter flood flows in December and January of wet years. Projects also utilize much of the available water in above normal years, even potentially overcommitting available water during some irrigation season months (April-June).

Table 4-40. Average Projected Eastside Bypass Flows Available to Chowchilla Subbasin Recharge Projects, by Water Year Type (2040-2090).

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	638,300	35%	223,400
AN	120,900	14%	16,900
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual		100%	240,300

Table 4-41. Average Eastside Bypass Flows Committed to Chowchilla Subbasin Recharge Projects, by Water Year Type (2040-2090).

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	113,600	35%	39,800
AN	12,500	14%	1,800
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual		100%	41,600

Table 4-42. Average Available Eastside Bypass Flows Remaining After Chowchilla Subbasin Recharge Projects, by Water Year Type (2040-2090).

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	524,300	35%	183,500
AN	108,500	14%	15,200
BN	0	8%	0
D	0	16%	0
C	0	27%	0
Avg. Annual		100%	198,700

4.5.3 Water Purchases

The fourth source of water available for projects is water acquired from willing sellers. Table 4-43 provides a summary of projected average monthly water purchases by water year type to be used as part of GSP projects. This water includes purchases by CWD GSA from Merced Irrigation District, contract water purchases by TTWD GSA from Exchange Contractors, and imported water to Madera County East GSA along Madera Canal. Imported water could be purchased from any willing seller anywhere in the Central Valley provided the water can be delivered to Madera County using existing or proposed conveyance facilities, including via exchanges involving three or more parties. For example, water offered for sale from the Sites JPA could be imported via exchanges through CVP contractors and facilities.

Table 4-43. Average Water Volume Assumed to Be Purchased for Chowchilla Subbasin Recharge Projects, by Water Year Type (2040-2090).

Year Type	Total Annual Volume	% of Years	Weighted Avg.
W	18,700	35%	6,600
AN	19,700	14%	2,800
BN	9,900	8%	800
D	11,800	16%	1,900
C	9,900	27%	2,700
Avg. Annual		100%	14,700

4.6 Implementation of Projects and Management Actions Since Initial GSP Development

The implementation of PMAs is critical for achieving and maintaining groundwater sustainability. Since development of the initial GSP, GSAs and local agencies in the Chowchilla Subbasin have made substantial progress toward implementing the PMAs described in the sections above. Updates to these PMAs are summarized in each of the GSP Annual Reports.

The sections below summarize the PMA implementation efforts and updates from the time of initial GSP development through the latest GSP Annual Report (water year 2021).

4.6.1 Chowchilla Water District GSA

Updates to the implementation of PMAs proposed and planned by the CWD GSA are summarized below.

4.6.1.1 Updates in the 2020 Annual Report (Water Year 2019)

4.6.1.1.1 Groundwater Recharge Basins

- CWD purchased a 56-acre parcel for dedicated groundwater recharge. Of the total area, CWD planned to develop 38 acres as a dedicated groundwater recharge basin; the remaining 18 acres are in Berenda Slough. Construction of the recharge basin began in February 2020 and was expected to be completed in 2020.
- A 65-acre parcel was also identified and purchase of the parcel was in progress as of April 2020.
- Two existing recharge basins within the CWD GSA, City Pond and Road 13 Pond, were used for groundwater recharge in 2019, providing nearly 3,800 AF of recharge with no costs incurred outside of normal CWD operational costs.

4.6.1.1.2 Flood-MAR (Winter Recharge)

- In 2019, CWD diverted surplus flows through the existing CWD distribution system and delivered them to lands whose landowners elect to participate in the program. The process for monitoring the program was in progress, so there were no reported costs or benefits of the program.

4.6.1.1.3 New Projects and Management Actions Since the Initial GSP

- Operation of the CWD Distribution System for Recharge
    - In 2019, CWD utilized its distribution system and the Chowchilla River, Ash Slough, and Berenda Slough to recharge an estimated 95,000 AF.

- Enhanced Management of Flood Releases for Recharge
    - In 2017 and 2019, CWD strategically operated its distribution system for recharge during periods when flood flows were available and when the distribution system was not at its operational capacity with deliveries to landowners. Diverted water was spread throughout unlined portions of the distribution system, allowing for increased groundwater recharge . This was initiated in 2017 and also done in 2019, with an estimated annual recharge benefit of approximately 26,800 AF in wet years (approximately 9,400 AF, on average, in all years).

4.6.1.2 Updates in the 2021 Annual Report (Water Year 2020)

4.6.1.2.1 Groundwater Recharge Basins

- As reported in the previous Annual Report, CWD purchased a 56-acre parcel for dedicated groundwater recharge. Construction of a 38-acre dedicated recharge basins was ongoing as of the end of water year 2020.
- As reported in the previous Annual Report, CWD identified a 65-acre parcel for an additional recharge basin. As of the end of water year 2020, CWD successfully purchased the parcel, began removing existing almond trees, and began construction.
- Due to dry conditions, the two existing recharge basins within the CWD GSA, City Pond and Road 13 Pond, were not used for groundwater recharge in water year 2020.

4.6.1.2.2 Flood-MAR (Winter Recharge)

- No Flood-MAR occurred in water year 2020 due to dry conditions.

4.6.1.2.3 New Projects and Management Actions Since the Initial GSP

- Enhanced Management of Flood Releases for Recharge
    - No flood flows were available for recharge in water year 2020 due to dry conditions.

4.6.1.3 Updates in the 2022 Annual Report (Water Year 2021)

4.6.1.3.1 Groundwater Recharge Basins

- In 2021, CWD completed construction of three groundwater recharge basins:
    - The Road 19 Groundwater Recharge Basin, on a 56-acre parcel near Berenda Slough
    - The Wood Groundwater Recharge Basin, a 67-acre recharge basin
    - The Acconero Groundwater Recharge Basin, a 63-acre recharge basin.
- No water was delivered for recharge in 2021 due to drought conditions.

4.6.1.3.2 Flood-MAR (Winter Recharge)

- No Flood-MAR occurred in water year 2021 due to dry conditions.

4.6.1.3.3 Buchanan Dam Capacity Increase

- CWD initiated discussed with the United States Army Corps of Engineers to discuss the potential to increase the capacity of Eastman Lake.

4.6.1.3.4 New Projects and Management Actions Since the Initial GSP

- Enhanced Management of Flood Releases for Recharge
    - No flood flows were available for recharge in water year 2020 due to dry conditions.

- Land Fallowing
    - CWD GSA proposed a land fallowing program that would be implemented by growers on a voluntary basis. Benefits would be measured by the reduction in the total volume of groundwater previously used to irrigate the fallowed lands.
    - CWD began planning a study, with plans to initiate the program in 2023. The target reduction in groundwater pumping from land fallowing was anticipated to be 5,000 to 10,000 AFY, with estimated program costs between $1,000,000 to $2,000,000 per year.

4.6.2 Madera County GSA

Updates to the implementation of the PMAs proposed and planned by the Madera County GSA are summarized below.

4.6.2.1 Updates in the 2020 Annual Report (Water Year 2019)

4.6.2.1.1 Madera County West: Recharge Basins

- Madera County had begun actively discussing options and approaches with local landowners and DWR's Flood-MAR project team to initiate recharge projects in the western portion of the Subbasin along the Chowchilla Bypass and Berenda Slough.

4.6.2.1.2 Madera County East: Water Purchase

- Madera County had begun working with the United States Bureau of Reclamation (Reclamation) to modify its current CVP contract to enable access to additional CVP supplies (e.g. Section 215 water) and to open up opportunities for acquiring CVP supplies from outside the Subbasin.

4.6.2.1.3 Management Action: Demand Management

- As of April 2020, Madera County GSA had begun preparations for implementing a demand management program that would oversee a managed reduction in the volume of groundwater consumed by irrigated agriculture over the 20-year GSP implementation period. As support for this program, Madera County began work on two studies (SALC study and water markets study) and began implementing a demand measurement program. Those supporting efforts are described below.

4.6.2.1.4 New Projects and Management Actions Since the Initial GSP

- Sustainable Agricultural Lands Conservation (SALC) Study
    - The Madera County GSA received a grant to fund a planning project to explore the feasibility of adopting an agricultural easement process within Madera County. The Madera County GSA issued a request for proposals (RFP) for a consultant to assist with the work and was *evaluating responses* as of April 2020, with plans to begin work in spring/summer 2020.
- Water Markets Study
    - The Madera County GSA applied for and was awarded a grant from the Reclamation to develop a comprehensive water marketing strategy. An RFP was issued, a contractor was selected, and work began in late 2019. As of April 2020, the contractor was working closely with Madera County, stakeholders, and technical experts to conduct an economic analysis to support development of a comprehensive water marketing strategy.
- Demand Monitoring

- Madera County began obtaining extended satellite-based ET datasets to help design and manage demand reduction efforts.

4.6.2.2 Updates in the 2021 Annual Report (Water Year 2020)

4.6.2.2.1 Madera County West: Recharge Basins

- Madera County GSA initiated a recharge planning study to refine the costs, benefits, and schedule for recharge projects described in the GSP. The recharge planning study also includes the costs, benefits, and schedule to construct additional basins and conduct additional Flood-MAR to recharge winter floodwater diverted from the Eastside Bypass.
- Madera County GSA submitted a grant application on behalf of the Chowchilla Subbasin to build four turnouts on the Eastside Bypass to supply two recharge basins and Flood-MAR on farmland. This project was developed in close coordination with TTWD GSA and Clayton Water District landowners in Madera County who offered to use their farmland for recharge. The project was recognized with a draft award recommendation of $4,197,600 on March 5, 2021.

4.6.2.2.2 Madera County East: Water Purchase

- No updates in water year 2020.

4.6.2.2.3 Management Action: Demand Management

- In water year 2020, Madera County GSA continued its preparations for implementing a demand management program. Madera County continued work on two studies (SALC study and water markets study) and continued implementing a demand measurement program and developing an allocation framework. Those supporting efforts are described as "New PMAs Since the Initial GSP," below.

4.6.2.2.4 New Projects and Management Actions Since the Initial GSP

- SALC Study
    - In 2020, Madera County conducted stakeholder interviews to provide feedback on the structure of the SALC program. Interviews were conducted with representatives of groups including: California Milk Producers Council, Madera County Cattlemen's Association, Leadership Counsel for Justice and Accountability, Self-Help Enterprises, Madera County Farm Bureau, and Madera Ag Water Association (MAWA). Feedback from these groups was summarized into an SALC Assessment Interview Summary, and was used to inform GSA and County decisions about the timing, flexibility, incentives, and areas for the program. In January 2021, a stakeholder meeting was held to share the results of the study, present similar cases in other GSAs, and discuss options and next steps.
- Water Markets Study
    - In 2020, Madera County GSA continued work on the water markets study efforts that begin in 2019. Three partner workshops were held in 2020 to define opportunities, understand concerns, and develop solutions. Interviews were conducted with local stakeholders to voice opinions and concerns and legal frameworks were also developed in cooperation with the consulting team. In January 2021, a virtual pilot water market was initiated. The goal of the pilot program is to test effectiveness and implications of the potential market rules over a multi-year time period. Approximately 60 local landowners had signed up for the virtual pilot program as of April 2021.
- Demand Monitoring

- Madera County GSA selected the IrriWatch program to measure consumptive water use on irrigated acres. The Madera County GSA's main objective in using the program was to track evapotranspiration of applied water (ET_{aw}) against an allocation of ET_{aw}.
- In water year 2020, worked with IrriWatch to develop protocols for using satellite-based estimates of ET_{aw} to monitor demand and for offering irrigation scheduling advice to farmers. The Madera County GSA also hosted trainings to inform growers about the program.

- Allocation Framework
  - In water year 2020, the Madera County GSA developed an allocation framework through a series of public meetings with the Madera County GSA Advisory Committee. The Madera County GSA Board of Directors adopted the allocation framework at their December 2020 meeting.
- Rate Study
  - As of April 2021, Madera County had a contract with a consultant to quantify implementation costs and move through a Proposition 218 process for a water rate for extraction of groundwater.

4.6.2.3 Updates in the 2022 Annual Report (Water Year 2021)

4.6.2.3.1 Madera County West: Recharge Basins

- Madera County GSA continued the recharge planning study, which yielded two grant proposals to DWR between 2020-2021.
- The first grant proposal, described above, received a final grant award in 2021. As of April 2022, those funds were being used toward planning, design, and construction of turnouts on the Eastside Bypass that will supply flood water to recharge areas. This project has been developed in close coordination with TTWD GSA and Clayton Water District landowners in Madera County who offered to use their farmland for recharge. The recharge sites were surveyed in March 2022. Further designs are anticipated to be completed later in 2022, and construction is anticipated to begin in 2022-2023, pending successful completion of CEQA and permitting.
- The second grant proposal – a spending plan that would fund implementation of phase 2 of the recharge program – was submitted to DWR in February 2022 as part of Round 1 of the 2022 SGMA Implementation Grant program. The spending plan received approval in spring 2022.

4.6.2.3.2 Madera County East: Water Purchase

- No updates in water year 2021.

4.6.2.3.3 Management Action: Demand Management

- In water year 2021, Madera County GSA continued its preparations for implementing a demand management program. Supporting efforts are described as "New PMAs Since the Initial GSP," below.

4.6.2.3.4 New Projects and Management Actions Since the Initial GSP

- SALC Study
  - In 2021, interviews and feedback on the SALC program structure continued to be used to inform GSA and County decisions about the timing, flexibility, incentives, and areas for the program.
- Water Markets Study

- A virtual pilot water market simulation occurred between January 2021 and November 2021, with the goal of testing the effectiveness and implications of the potential market rules over a multi-year time period. The simulation was jointly implemented by the Madera County GSA in both the Madera and Chowchilla Subbasins. A total of 57 unique participants from the Madera and Chowchilla Subbasins were enrolled in in the overall simulation, with about 25 regular participants each month.

- Demand Monitoring
  - On January 1, 2021, IrriWatch began calculating and making data available to the Madera County GSA and growers that enrolled.
  - As of April 2022, all irrigated parcels in the Madera County GSA had been auto-enrolled in the program. More than 1,200 irrigated parcels were enrolled as of early 2022, representing nearly 120,000 irrigated acres across the Chowchilla, Madera, and Delta-Mendota Subbasins.
- Allocation Framework
  - The Madera County GSA Board of Directors adopted resolutions in December 2020, June 2021, and August 2021 that describe "per-acre" allocations and rules for credits.
- Rate Study
  - In water year 2021, the Madera County GSA continued development of a Rate Study that will result in a water rate for extraction of groundwater within the Madera County GSA. A penalty for groundwater extraction above the allocation was also being considered separately.

4.6.3 Sierra Vista Mutual Water Company

Updates to the implementation of a project proposed and planned by SVMWC are summarized below.

4.6.3.1 Updates in the 2020 Annual Report (Water Year 2019)

4.6.3.1.1 Recharge Basins to Capture Flood Water

- As of April 2020, SVMWC was in the early stages of developing up to 300 acres of dedicated recharge basins. Operation of the recharge basins is anticipated for 2023.

4.6.3.2 Updates in the 2021 Annual Report (Water Year 2020)

4.6.3.2.1 Recharge Basins to Capture Flood Water

- No updates in water year 2020. As of April 2021, SVMWC was still in the early stages of developing up to 300 acres of dedicated recharge basins.

4.6.3.3 Updates in the 2022 Annual Report (Water Year 2021)

4.6.3.3.1 Recharge Basins to Capture Flood Water

In early 2022, SVMWC applied for and was awarded Proposition 68 funding to support further development and construction of this project.

4.6.4 Triangle T Water District GSA

Updates to the implementation of projects proposed and planned by TTWD GSA are summarized below.

4.6.4.1 Updates in the 2020 Annual Report (Water Year 2019)

4.6.4.1.1 OES Project Recharge Basins to Capture Flood Water

- As of April 2020, TTWD was in the process of developing up to 310 acres of dedicated recharge basins under an OES grant. TTWD planned to obtain flood water rights for bypass water and divert this to existing recharge ponds (and later to the OES ponds once those were constructed).
- The OES ponds had not yet been constructed as of April 2020, but the total capital costs incurred at the time were roughly $220,000.

Poso Canal Pipeline and Columbia Canal Company Pipeline Projects

- As of April 2020, construction of two water conveyance pipelines to import additional surface water supplies to landowners in TTWD had been completed.
- The Columbia Canal pipeline did not convey water in 2019.
- In 2019, the Poso Canal pipeline was used to import 10,387 AF of surface water at a cost of roughly $2,240,000 (cost of purchasing the imported water, not for O&M). In 2018, the Poso Canal pipeline was used to import 7,515 AF at a cost of roughly $1,900,000.

4.6.4.1.2 New Projects and Management Actions Since the Initial GSP

- Utilize Existing Recharge Basins
    - TTWD diverted surplus flows into 508 acres of existing recharge basins within the GSA. The project provided 4,994 AF of recharge benefits in 2019, 180 AF of recharge in 2018, and 14,096 AF of recharge in 2017.

4.6.4.2 Updates in the 2021 Annual Report (Water Year 2020)

4.6.4.2.1 OES Project Recharge Basins to Capture Flood Water

- As of April 2021, TTWD was continuing the water rights application process. A temporary water rights permit had been granted and additional information in support of the permanent water right was submitted to the SWRCB.
- TTWD collaborated with the Madera County GSA to seek grant funding. The draft award (described above) will fund one recharge basin in TTWD.
- TTWD spent an additional $58,000 to develop the recharge basins.

4.6.4.2.2 Poso Canal Pipeline and Columbia Canal Company Pipeline Projects

- As of April 2021, approximately $6 million dollars in capital costs had been invested in the Poso Canal Pipeline and Columbia Canal pipeline construction projects.
- The Columbia Canal pipeline did not convey water in 2020.
- In 2020, the Poso Canal pipeline was used to import 7,498 AF of surface water at a cost of roughly $2,830,000.

4.6.4.2.3 New Projects and Management Actions Since the Initial GSP

- Utilize Existing Recharge Basins
    - No updates in water year 2020.

4.6.4.3 Updates in the 2022 Annual Report (Water Year 2021)

4.6.4.3.1 Additional Recharge Basins to Capture Floodwater (Formerly OES Project Recharge Basins to Capture Flood Water)

- As of April 2022, this project was funded under Proposition 68 and was renamed the "Additional Recharge Basins to Capture Floodwater" project.
- As of April 2022, TTWD was continuing efforts to secure a permanent water rights permit on the Chowchilla Bypass.
- In 2020-2021, TTWD GSA collaborated with the Madera County GSA on the Proposition 68 grant. One of the recharge basins being designed and planned for construction using those grant funds will be constructed in TTWD.
  In total, approximately $274,000 in capital costs had been incurred for the project through water year 2021.

Poso Canal Pipeline and Columbia Canal Company Pipeline Projects

No updates in water year 2021

4.6.4.3.2 New Projects and Management Actions Since the Initial GSP

- Utilize Existing Recharge Basins
  - No updates in water year 2021.
- Installation of Nested Monitoring Wells
  - TTWD installed six nested monitoring wells within the District area in 2021. These wells were planned to provide additional information about groundwater conditions in TTWD and the Western Management Area of the Chowchilla Subbasin.
- Poso Canal Pipeline Extension
  - TTWD initiated work on an extension of the existing pipeline project to deliver more purchased water for irrigation and recharge within TTWD and in adjacent areas prioritized for subsidence mitigation. The pipeline extension project would provide surface water access to approximately 3,800 acres of irrigated farmland that currently uses groundwater, primarily pumped from beneath the Corcoran Clay which is known to cause subsidence.
  - In early 2022, TTWD applied for and was awarded Proposition 68 funding to support further development and extension of the Poso Canal pipeline project.

4.6.5 Jointly Implemented Projects, Management Actions, and GSP Implementation Efforts

This section summarizes updates on PMAs and GSP implementations efforts that are jointly implemented by multiple GSAs.

4.6.5.1 Emergency Recharge Plan

In addition to the ongoing development of recharge projects proposed in the Chowchilla Subbasin GSP, the Madera County GSA has initiated work on an emergency recharge plan to achieve more immediate recharge benefits from flood flows available on the Chowchilla Bypass. Under this plan, Madera County GSA and TTWD GSA have worked collaboratively to secure temporary water rights and develop a plan for installation of temporary infrastructure to divert flood flows off the Chowchilla Bypass to the extent they are ahead of construction of permanent infrastructure. In winter 2021-2022, Madera County initiated the environmental permitting for the points of diversions (PODs) available for use as part of the emergency

recharge plan. Madera County also continued development of the plan, and TTWD resubmitted the temporary water rights application used for this project. As of February 2022, approximately $40,000 in project development costs have been incurred, although no water was available for recharge in winter 2021-2022. The GSAs will continue collaborating and preparing for recharge efforts in the future.

4.6.5.2 Domestic Well Mitigation Program

The GSAs are planning to implement a Domestic Well Mitigation Program (Program) until groundwater sustainability is achieved. As proposed, the Program will sustain long-term access to drinking water in the Chowchilla Subbasin and avoid undesirable results for domestic well users during GSP implementation or until sustainable groundwater conditions are achieved. Implementation of the Program will allow the GSAs to establish lower minimum thresholds (MTs) that avoid undesirable results to other groundwater users, while still preserving access to critical water supplies for domestic well users. The alternative of specifying higher MTs that avoid any additional groundwater level declines (to avoid the need for a Domestic Well Mitigation Program) would require immediate and substantial cutbacks in groundwater pumping that result in major impacts to the local economy and all basin stakeholders, including domestic well owners. As described in **Appendix 3.C**, the GSAs completed an economic analysis to evaluate the costs of setting MTs at higher levels to protect domestic well users, and determined that the avoided costs (fewer domestic wells requiring replacement) resulting from immediate demand reduction would be small ($4.6 million) relative to the additional lost agricultural net return ($122.9 million) in the Chowchilla Subbasin, even after accounting for pumping cost savings ($82.5 million). These analyses considered the impacts of immediate demand reduction only on agricultural net return, but in reality the economic impacts would spread to other county businesses and industries, significantly increasing the net effect on all beneficial uses and users of groundwater in the Chowchilla Subbasin, including domestic well owners. With these considerations in mind, the GSAs have elected to mitigate for potential impacts to domestic well users caused by temporary further declines in groundwater levels during the implementation period or until groundwater sustainability is achieved.

The GSAs in the Chowchilla Subbasin have expressed and formalized their clear **commitment to fund and implement the Program beginning no later than January 1, 2023**. GSA staff and representatives have made substantial and material progress toward Program development and implementation by executing a Memorandum of Understanding (MOU). The MOU is provided in **Appendix 3.D**, and was developed with review and consideration of the content and recommendations set forth by Self-Help Enterprises, the Leadership Counsel for Justice and Accountability, and the Community Water Center in their publication titled, “Framework for a Drinking Water Well Impact Mitigation Program” (SHE et al., 2020). The MOU defines, among other aspects, the:

- Proportionate responsibilities for implementing the Program: Assigned by the proportionate share of the average shortage (i.e., negative net recharge from the surface water system) attributed to each GSA.
- Program term: Starting no later than January 1, 2023, and covering all wells eligible for mitigation between January 31, 2020, and through the duration of the GSP Implementation Period or until groundwater sustainability is achieved.
- Program eligibility, terms and conditions: Agreement among the GSAs to develop eligibility, terms, and conditions that include, but are not limited to: eligibility of properties and property owners, program application process, preliminary inspection process, prioritization of sites, preferred contractors, eligible/non-eligible mitigation.
- Repercussions of failure to pay: Resulting in legal action, ineligibility to vote on any subject or issue (unless formally excused), and explicit annotation of that failure to pay in the Annual Report.

GSA representatives have met at least monthly during 2022 to jointly discuss and advance plans for creating and administering the Program within the Chowchilla Subbasin by 2023. As part of these efforts, the GSAs have created an organizational structure and a workflow to guide operation of the Program (see Section 3.3.1). Efforts to refine program eligibility, terms and conditions, program management, and other principles for implementing the Program are ongoing. In accordance with the MOU, the Program and its development are on track to be active starting 2023.

4.6.5.3 Domestic Well Inventory and Monitoring Well Installation

In addition to advancing the Domestic Well Mitigation Program, the GSAs in the Chowchilla Subbasin have conducted a Domestic Well Inventory and Monitoring Well Installation project to refine the understanding of domestic wells in the Subbasin and improve monitoring in areas where high densities of domestic wells exist. The GSAs applied for and were awarded a Proposition 68 grant from DWR to conduct the domestic well inventory and install nine new monitoring wells at three sites in the Chowchilla Subbasin. The Madera County GSA applied for the grant on behalf of the Chowchilla Subbasin and has led the project since its inception. The Madera County GSA issued an RFP and selected a consultant for the study in 2020. The domestic well inventory was conducted in 2021-2022. Three new nested monitoring well sites have been identified and are planned for installation in summer 2022. In addition to an updated and more accurate domestic well inventory, information collected during this project from the drilling, geologic and geophysical logging, groundwater quality sampling, and automated groundwater level monitoring will aid further in filling data gaps in the monitoring and conceptualization of the Chowchilla Subbasin hydrogeology. The project will also improve understanding and management of groundwater in the Chowchilla Subbasin.

5 PLAN IMPLEMENTATION

To achieve the Subbasin sustainability goal by 2040 and avoid undesirable results through 2090 as required by SGMA and the GSP regulations, various projects and management actions (PMAs) have been developed and will be implemented by the GSAs. Chapter 4: Projects and Management Actions describes each GSAs PMAs, gross benefit, and operations. In addition, Chapter 4 provides an estimate of the project-specific capital and operating costs for the PMAs. This chapter describes:

- Costs for GSAs to administer GSP activities (not including the project-specific costs described in Chapter 4), as required by 23 CCR § 354.6(e).
- Financing approaches.
- Timeline and roadmap for implementing all GSA PMAs between 2020 and 2040.
- Monitoring and reporting, including the contents of annual reports and five-year periodic evaluations that must be provided to the California Department of Water Resources (DWR) (23 CCR § 356.2 and §356.4).
- The Subbasin data management system.

5.1 Estimate of GSP Implementation Costs

Total GSP implementation costs include both project-specific costs and costs for GSAs to administer and operate all other aspects of the GSP. The GSAs implementing the Chowchilla Subbasin GSP will incur costs for managing the GSP, planning and studies, monitoring implementation, and providing general administration. Projected capital and operating costs of PMAs are summarized in Chapter 4 and are not repeated in this chapter. For the purposes of this chapter, each GSAs implementation costs are aggregated into six (6) categories including GSA administration, GSP studies, GSP implementation and updates, project planning, monitoring, and contingency to cover any unanticipated costs. The following subsections describe the general types of costs that could fall under each category. In practice, each GSA will allocate GSP implementation costs to cost categories that are consistent with its internal bookkeeping and accounting practices.

5.1.1 GSA Administration

Administrative costs generally include meetings, reporting, record keeping, bookkeeping, legal advice, continued outreach to stakeholders, and government relations. GSAs will also need to continue to monitor PMAs to assess their benefit, economic feasibility, and coordinate with stakeholders and other GSAs if modification of PMAs is necessary to ensure the Subbasin meets the sustainability objectives.

The GSAs implementing the Chowchilla Subbasin GSP anticipate that significant coordination of administrative tasks will be required. Many GSP projects require coordination between one or more GSAs, and overall Subbasin sustainability depends on continued coordination, planning, and evaluation of groundwater conditions. In general, it is anticipated that most administrative tasks will have a lead GSA. The lead GSA for each administrative task will keep the other GSAs informed through periodic updates to stakeholders and other GSA committees.

Each GSA will conduct public outreach/engagement to provide timely information to stakeholders regarding GSP progress and Subbasin conditions. Most GSAs will develop and maintain a website that will be used to post data, reports, and meeting information. In addition, each GSA will conduct general business administration including record keeping, bookkeeping, and general management.

5.1.2 GSP Studies

GSP implementation will require various planning, technical, and economic/fiscal studies. These are additional costs that are not covered by the cost of specific PMAs (see Chapter 4), including for example, more detailed evaluation of proposed projects and assessment of overall cost-effectiveness of GSP implementation strategies.

- **Planning Studies**. GSAs will continue to develop planning studies to integrate the GSP with other regional water management efforts, monitor Subbasin conditions, and update the GSP to ensure that the Subbasin meets all sustainability objectives. GSAs will continue to evaluate Subbasin conditions and adjust short- and long-term Subbasin planning efforts accordingly. Other planning studies may include evaluating projects and developing other programs to support sustainable management.
- **Technical Evaluations**. Subbasin GSAs are required to prepare annual updates and five-year periodic evaluations for DWR (§354.2 and §354.4). These reports will require additional technical analysis. GSAs will continue to monitor groundwater levels in the Subbasin to document progress toward sustainability objectives. Additional monitoring wells will be installed, and GSAs will evaluate and report groundwater conditions, water use, and change in groundwater storage as required by DWR. GSAs will continue to evaluate data gaps and implement programs to improve data availability.
- **Economic/Fiscal Analyses**. GSAs will develop economic and fiscal studies to support implementation of projects and managements and the overall GSP. This may include cost-effectiveness assessments and preliminary investigations of proposed projects. Fiscal and economic analyses are expected to include rate studies and other analysis required to implement fees or assessments, willingness to pay, and ability to pay studies. GSAs will engage legal and technical experts to help develop the required studies. Economic impact studies will be developed to evaluate GSP implementation, understand distribution of costs to different stakeholder groups, and identify methods for reducing those costs during the implementation period.

5.1.3 GSP Implementation and Updates

GSP implementation costs include internal GSA coordination, meetings, and document preparation. This cost category includes costs not covered by GSA Administration and GSP Studies, in addition to costs incurred to comply with annual updates and five-year periodic evaluations.

- **Annual reports**. 23 CCR §356.2 requires GSAs to prepare and submit annual reports to DWR. GSAs will prepare any required technical analysis, data, summary material, and provide a report on sustainable management objectives. GSAs expect that annual reports will also require inter- and intra-GSA coordination as well as stakeholder outreach.
- **Periodic evaluations**. 23 CCR §356.4 requires GSAs to prepare and submit five-year evaluation reports. In contrast to the annual report, this report requires additional evaluation of sustainability conditions, objectives, monitoring, and documentation of new information that is available since the last update to the GSP. GSAs expect that periodic evaluations will also require significant inter- and intra-GSA coordination and stakeholder outreach.

5.1.4 Project Planning

GSAs will incur additional costs for project planning. Project capital and operating and maintenance costs for projects that are included in the GSP are already summarized in Chapter 4. However, GSAs expect to evaluate other project ideas proposed by stakeholders, assess cost-effectiveness of proposed projects,

and evaluate the joint implementation of multiple projects to ensure the GSP continues to meet sustainability objectives. Technical studies may include feasibility assessments, environmental studies, water rights evaluations, coordination with permitting agencies, and other project planning efforts. GSAs may evaluate land acquisition and easements, pursue grant applications, administer grants, and engage other legal and technical services.

As needed, the GSAs will coordinate on the specific studies and analyses necessary to improve understanding of Subbasin conditions. The GSAs will use new information on Subbasin conditions to improve projects and management actions to achieve sustainability. Evaluations and updates will occur annually (annual report) and every five-years (periodic evaluation) as required by the GSP regulations, but GSAs anticipate that planning, coordination, and studies will be continuous and ongoing.

5.1.5 Monitoring

GSAs will implement programs to monitor groundwater extractions, measure elevations, and track total water use. Monitoring activities will include data management, installing and measuring monitoring wells, maintaining existing wells, and deploying other technology.

GSAs will oversee monitoring programs outlined in Chapter 3. This will include tracking Subbasin conditions and sustainability indicators. Data from the monitoring programs will be routinely evaluated to ensure progress is being made toward sustainability or to identify whether undesirable results are occurring.

5.1.6 Contingency

An additional contingency cost is included for planning purposes. This may include actions needed to respond to critically dry years or if Subbasin conditions start trending towards minimum threshold levels in any area.

5.2 GSA Implementation Costs

The following subsections summarize estimated costs for each GSA to implement non-project-specific costs of the GSP. These costs are reported as of January 2020, and not include:

- The costs of implementing the Domestic Well Mitigation Program, although the GSAs have expressed their clear and firm commitment to funding the Program. As of July 2022, the total annual cost of implementing the Domestic Well Mitigation Program is anticipated to range between approximately $1.18 million and $10,000 per year between 2023-2032, with higher costs expected in the first several years. Additional information is provided in **Appendix 3.D.**
- The costs of implementing data gaps workplans identified in 2022. The GSAs plan to complete development of the subsidence workplan by October 1, 2022. Upon completion of the workplan, the GSAs will submit the workplan to DWR.
- The capital and annual operating cost of PMAs.

Costs are presented for each of the six cost categories identified above. However, GSAs manage costs and expenses in different ways and as such may record costs in different categories. In addition, some GSAs are still developing operating budgets and expect to issue requests for proposals to engage additional consultant technical services, but these costs are not known at this time.

5.2.1 Chowchilla Water District GSA

As of January 2020, the Chowchilla Water District GSA (CWD) estimates that annual implementation costs will be approximately $150,000 per year over the next five years (**Table 5-1**). This does not include project-specific costs described in Chapter 4 or costs to build and operate additional projects or management actions that may be required if CWD determines that its sustainability objectives are not being met. These costs do not include costs identified in 2022 for implementing the Domestic Well Mitigation Program (see **Appendix 3.D**, Exhibit C) or implementing the data gaps workplans that the GSAs identified and are developing in 2022. These costs also do not include costs for consultants to support technical content development, including annual reports. The actual costs of GSP administration, monitoring, and reporting will be reassessed and reported in future GSP updates and Annual Reports.

CWD will recover GSP implementation costs through grants and local revenues that are yet to be determined. CWD is currently evaluating options. Section 5.3 provides a general description of how CWD and other GSAs may recover GSP implementation costs.

Table 5-1. Chowchilla Water District GSA Implementation Costs

Cost Category	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
GSA Administration	$30,240	$40,320	$41,530	$42,780	$44,060	$45,380
GSP Studies	$5,000	$10,000	$10,300	$10,610	$10,925	$11,255
GSP Implementation and Updates	$30,240	$40,320	$41,530	$42,780	$44,060	$45,380
Project Planning	$30,000	$30,900	$31,825	$32,780	$33,765	$34,780
Monitoring	$48,000	$49,440	$50,925	$52,450	$54,025	$55,645
Contingency	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
Total	**$153,480**	**$180,980**	**$186,110**	**$191,400**	**$196,835**	**$202,440**

5.2.2 Triangle T Water District GSA

As of January 2020, the Triangle T Water District GSA (TTWD) estimates that annual implementation costs will be approximately $240,000 per year over the next five years (**Table 5-2**). This does not include project-specific costs described in Chapter 4 or costs to build and operate additional projects or management actions that may be required if TTWD determines that its sustainability objectives are not being met. These costs do not include costs identified in 2022 for implementing the Domestic Well Mitigation Program (see **Appendix 3.D**, Exhibit C) or implementing the data gaps workplans that the GSAs identified and are developing in 2022. Costs include no contingency and assume a modest level of effort for annual updates and periodic evaluations. The actual costs of GSP administration, monitoring, and reporting will be reassessed and reported in future GSP updates and Annual Reports.

TTWD will recover GSP implementation costs through grants and local revenues that are yet to be determined. TTWD is currently evaluating options. Section 5.3 provides a general description of how TTWD and other GSAs may recover GSP implementation costs.

Table 5-2. Triangle T Water District GSA Implementation Costs

Cost Category	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
GSA Administration	$30,000	$33,000	$36,000	$39,000	$42,000	$45,000
GSP Studies	$100,000	$50,000	$51,500	$53,000	$54,600	$56,200
GSP Implementation and Updates	$85,000	$40,000	$41,200	$42,400	$43,700	$45,000
Project Planning	$30,000	$33,000	$34,000	$35,000	$36,100	$37,200
Monitoring	$75,000	$40,000	$41,200	$42,400	$43,700	$45,000
Contingency	$0	$10,000	$10,000	$10,000	$10,000	$10,000
Total	**$320,000**	**$206,000**	**$213,900**	**$221,800**	**$230,100**	**$238,400**

5.2.3 Madera County GSA

As of January 2020, the Madera County GSA estimates that its implementation costs for the Chowchilla Subbasin (excluding the costs of specific projects) would total $3.38 million through 2024, or an average of about $0.56 million per year. GSA administration will include administration of the GSP, Subbasin coordination, communications, and government relations. Studies will include rate studies, Proposition 218 processes, and legal and technical support. Implementation and updates will include preparing and implementing the initial GSP, internal GSA coordination, meetings, guidance document preparation, costs for periodic updates to the GSP, and coordination and agreements for future updates. Project planning would include, as needed, feasibility and environmental studies, costs to plan any new programs or projects not included in Chapter 4, and grant applications. Monitoring costs include equipment costs and maintenance for well monitoring, performing satellite-based demand analysis, and data management. Contingency costs would cover cost overruns and unanticipated activities such as litigation. These costs do not include costs identified in 2022 for implementing the Domestic Well Mitigation Program (see **Appendix 3.D**, Exhibit C) or implementing the data gaps workplans that the GSAs identified and are developing in 2022. The actual costs of GSP administration, monitoring, and reporting will be reassessed and reported in future GSP updates and Annual Reports (**Table 5-3**).

Table 5-3. Madera County GSA Implementation Costs

Cost Category	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
GSA Administration	$0	$116,000	$116,000	$116,000	$116,000	$116,000
GSP Studies	$0	$220,000	$120,000	$120,000	$120,000	$120,000
GSP Implementation and Updates	$419,000	$20,000	$20,000	$20,000	$20,000	$20,000
Project Planning	$80,000	$100,000	$100,000	$100,000	$100,000	$100,000
Monitoring	$0	$150,000	$150,000	$150,000	$150,000	$150,000
Contingency	$0	$50,000	$50,000	$50,000	$50,000	$50,000
Total	$499,000	$656,000	$556,000	$556,000	$556,000	$556,000

5.2.4 Merced County GSA

The Merced County GSA estimates that its implementation costs for the Chowchilla Subbasin would total approximately $225,000 through 2024, or an average of about $37,000 per year. The Merced County GSA covers a small portion of land in the Chowchilla Subbasin and it is anticipated that some Merced County GSA cost will be included with Merced County work to support GSP development in the Merced Subbasin. In general, Merced County GSA administration will include administration of the GSP, Subbasin coordination, communications, and government relations. Studies will include rate studies, Proposition 218 processes, and legal and technical support. Implementation and updates will include preparing and implementing the initial GSP, internal GSA coordination, meetings, guidance document preparation, costs for periodic updates to the GSP, and coordination and agreements for future updates. Project planning would include, as needed, feasibility and environmental studies, costs to plan any new programs or projects not included in Chapter 4, and grant applications. Monitoring costs include equipment costs and maintenance for well monitoring, and data management. Contingency costs would cover cost overruns and unanticipated activities such as litigation. These costs do not include costs identified in 2022 for implementing the Domestic Well Mitigation Program (see **Appendix 3.D**, Exhibit C) or implementing the data gaps workplans that the GSAs identified and are developing in 2022. The actual costs of GSP administration, monitoring, and reporting will be reassessed and reported in future GSP updates and Annual Reports (**Table 5-4**).

Table 5-4. Merced County GSA Implementation Costs

Cost Category	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
GSA Administration	$0	$8,000	$8,000	$8,000	$8,000	$8,000
GSP Studies	$0	$15,000	$8,000	$8,000	$8,000	$8,000
GSP Implementation and Updates	$29,000	$1,000	$1,000	$1,000	$1,000	$1,000
Project Planning	$6,000	$7,000	$7,000	$7,000	$7,000	$7,000
Monitoring	$0	$10,000	$10,000	$10,000	$10,000	$10,000
Contingency	$0	$3,000	$3,000	$3,000	$3,000	$3,000
Total	$35,000	$44,000	$37,000	$37,000	$37,000	$37,000

5.3 GSP Financing

Administering the GSP and monitoring and reporting progress is projected to cost approximately $1.2 million per year across all Subbasin GSAs. Costs are expected to be higher during years in which five-year periodic evaluations are required, and slightly lower during years in which annual reports are required. This does not include the capital and annual operating cost of PMAs (see Chapter 4).

Development of this GSP was funded through a Proposition 1 Grant and contributions from individual GSAs (e.g. through in-kind staff time, or separately contracted consulting services). Individual GSAs are also funding additional, ancillary studies and implementation efforts. To fund GSA operations and GSP implementation, GSAs are developing a financing plan that will include one or more of the following financing approaches:

- **Grants and low-interest loans**: GSAs will continue to pursue grants and low interest loans to help fund planning studies and other GSA activities. However, grants and low-interest loans are not expected to cover most GSA operating costs for GSP implementation.

- **Groundwater extraction charge**: A charge per acre-foot pumped could be used to fund GSP implementation activities.
- **Other Fees and charges**: Other fees may include permitting fees for new wells or development, transaction fees associated with contemplated groundwater markets, or commodity-based fees, all directed at aiding with sustainability objectives. Depending on the justification and basis for a fee, it may be considered a property-related fee subject to voting requirements of Article XIII D of the California Constitution (passed by voters in 1996 as Proposition 218) or a regulatory fee exempt from such requirements.
- **Assessments:** Special benefit assessments under Proposition 218 could include a per-acre (or per-parcel) charge to cover GSA costs, or other fees under Proposition 26.
- **Taxes:** This could include general property related taxes that are not directly related to the benefits or costs of a service (ad valorem and parcel taxes), or special taxes imposed for specific purposes related to GSA activities.

GSAs are pursuing a combined approach, targeting available grants and low interest loans, and considering a combination of fees and assessment to cover operating and program-specific costs. As required by statute and the Constitution, GSAs would complete an engineer's report, rate study, and other analysis to document and justify any rate, fee, or assessment. For example, Madera County has initiated two separate rate studies for Fall 2019. In the first rate study, an engineering report is being produced to adequately fund an existing flood control and water conservation agency, which would allow for the agency to adequately control flood flows with existing infrastructure. In the second rate study, an engineering report is being produced for the ongoing costs associated with running the three County GSAs, which would include administration as well as sufficient planning funds for eventual project implementation.

Some cost recovery approaches will affect the cost of water for specific uses in the Subbasin. This will affect business (farm) income and incentivize changes in cropping decisions and farming practices in the Subbasin. As cropping and other land use adjusts, GSAs will monitor and adjust fees/assessments, and modify the GSP accordingly.

5.4 Schedule for Implementation

The GSP implementation schedule allows time for GSAs to develop and implement PMAs and meets all sustainability objectives by 2040. While some sustainability projects began immediately after SGMA became law and are already contributing to Subbasin goals, the GSAs will begin implementing all other GSP activities in 2020, with full implementation of PMAs to achieve sustainability by 2040. **Figure 5-1** illustrates the GSP implementation schedule for PMAs implemented by each GSA (Madera County East and West correspond to the portion of the Madera County GSA within each Management Area). The GSP implementation schedule also shows mandatory reporting and updating for all GSAs, including annual reports and five-year periodic updates (evaluations) prepared and submitted to DWR.

The Chowchilla Subbasin GSP implementation plan for PMAs recognizes that projects will take several years to plan and develop, and planned demand reduction programs will incrementally expand until reaching planned targets by 2040. The Subbasin economy, which is heavily reliant on agriculture, needs time to adjust to sustainability. Important adjustments include higher water costs and limited water supplies in some areas that will result in cropping changes and land idling and affect farming, linked agricultural industries, and all residents in the County. The implementation plan is phased in order to minimize impacts to businesses, individuals, and disadvantaged communities in Madera County.

Implementing PMAs to achieve sustainability objectives specified in the GSP will increase irrigation water costs and limit the quantity of water available for farming in some parts of the Chowchilla Subbasin. This

will impact agriculture and create ripple effects across all sectors of the Madera County[68] economy, including County tax revenues and jobs that support many of the County's disadvantaged communities. The GSP implementation schedule, especially for the Madera County GSA's planned demand management program, allows time for the Madera County economy to adjust in order to minimize economic impacts to disadvantaged communities, businesses, and other individuals in the region.

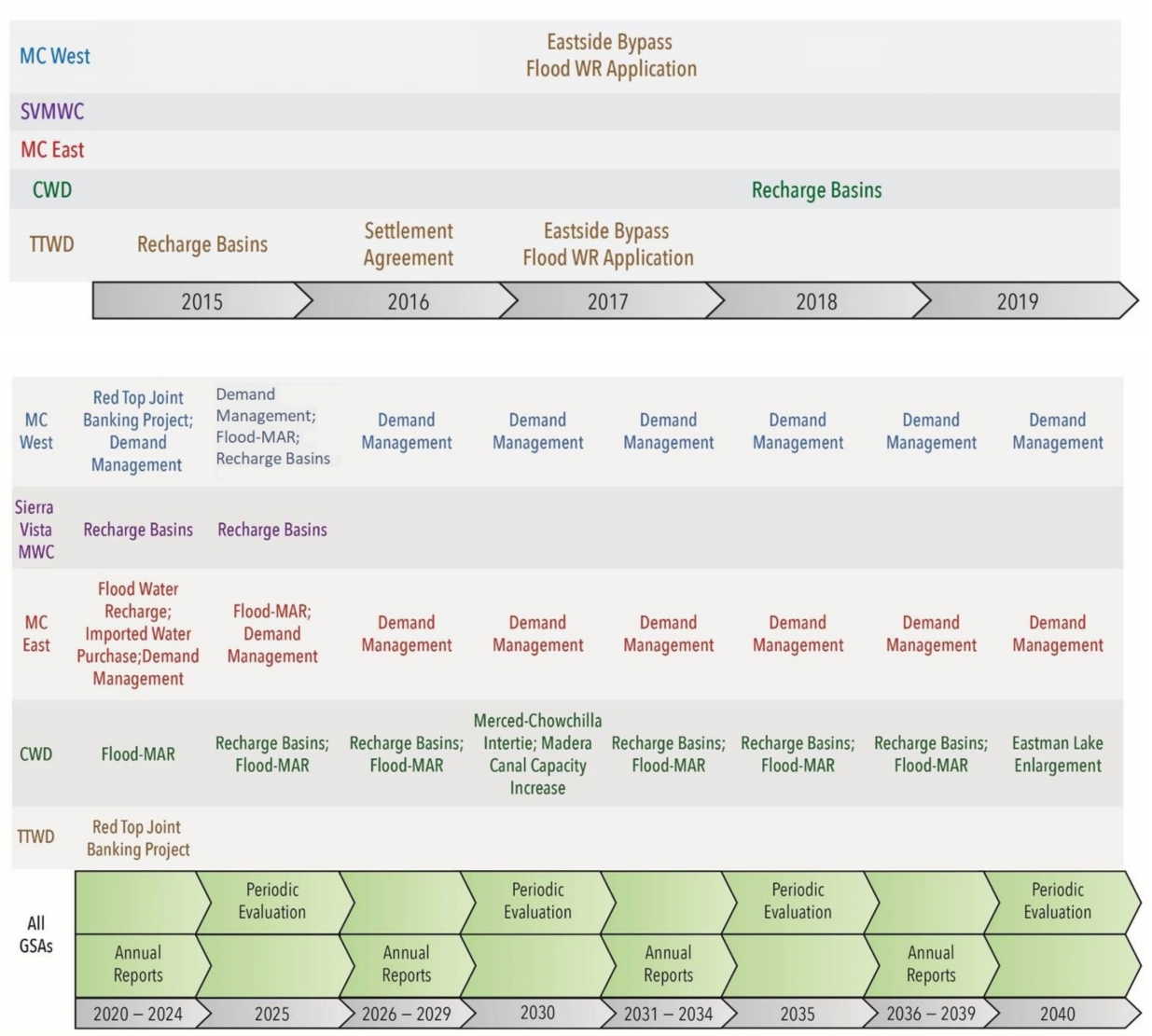

Figure 5-1. Chowchilla Subbasin Implementation Schedule

Figure 5-2 illustrates the conceptual GSP implementation plan, showing the gross benefit (measured in average acre-feet per year (AFY) of projects and the County's demand management program to meet the Subbasin sustainability objective by 2040. Many GSAs have already started to implement PMAs. The gross

[68] The Chowchilla Subbasin GSP covers a small portion of Merced County and some economic impacts would occur in Merced County.

annual benefit to the basin from the projects described in Chapter 4 is expected to equal approximately 55,000 AF in 2020, increasing to just over 140,000 AF by 2040 when the Subbasin will achieve all sustainability objectives. Gross benefit values shown in **Figure 5-2** include the demand management program implemented by the Madera County GSA, which anticipates an additional (approximately) 30,000 AF of benefit (demand reduction) by 2040.

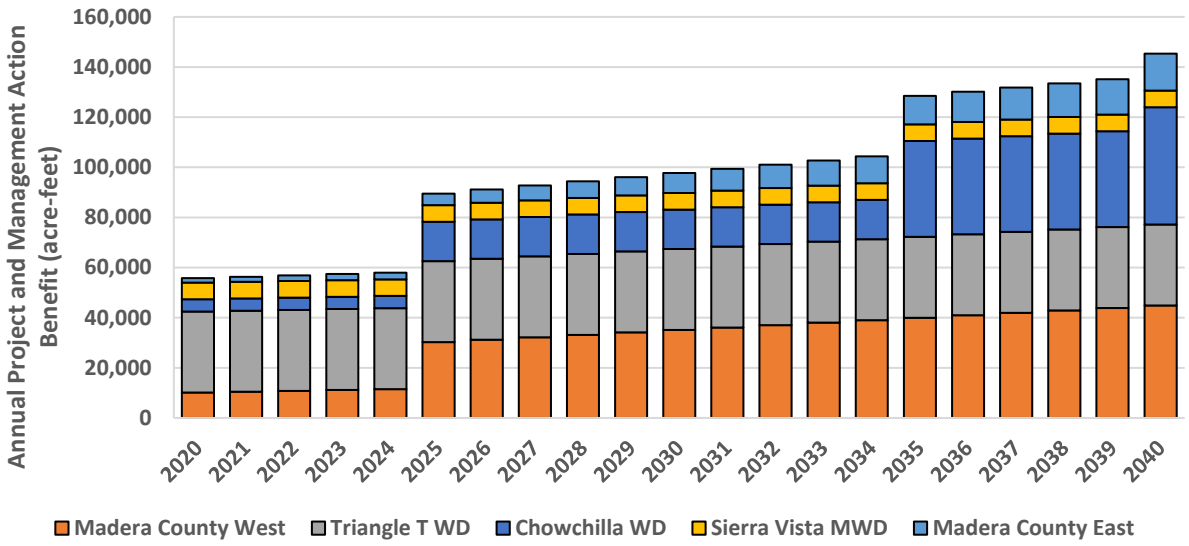

Figure 5-2. Chowchilla Subbasin Project Gross Benefit Timeline

In addition to funding GSA activities, GSP updates, and ongoing monitoring and reporting, GSA's will develop and implement PMAs to provide groundwater benefits for the Subbasin (see Figure 5-2). The annual gross benefit increases until it nearly reaches the projected shortfall in 2034 and then in 2035 and 2040 additional projects come online. Progress will be evaluated in 2035 and each following year and the additional projects adjusted to meet the sustainability objective. Thus, the 2035 through 2040 annual gross project benefit values will be revised to reflect actual conditions being realized by the projects and actions implemented to-date, and to assure the Subbasin is able to meet the sustainability objective. The capital cost of each project and management action is summarized and discussed in more detail in Chapter 4. **Figure 5-3** illustrates the capital outlay required to implement all of the projects specified in the GSP. The figure indicates the year that the projects would be completed and begin operation, not when all the capital cost would be incurred. The total capital cost of all projects equals approximately $315 million. The GSP implementation plan includes significant outlays when large recharge and storage projects are planned for development by multiple GSAs. These capital costs do not include the cost of developing the Madera County GSA demand management program or the cost of demand management (economic impacts from land idling and crop switching) under that program.

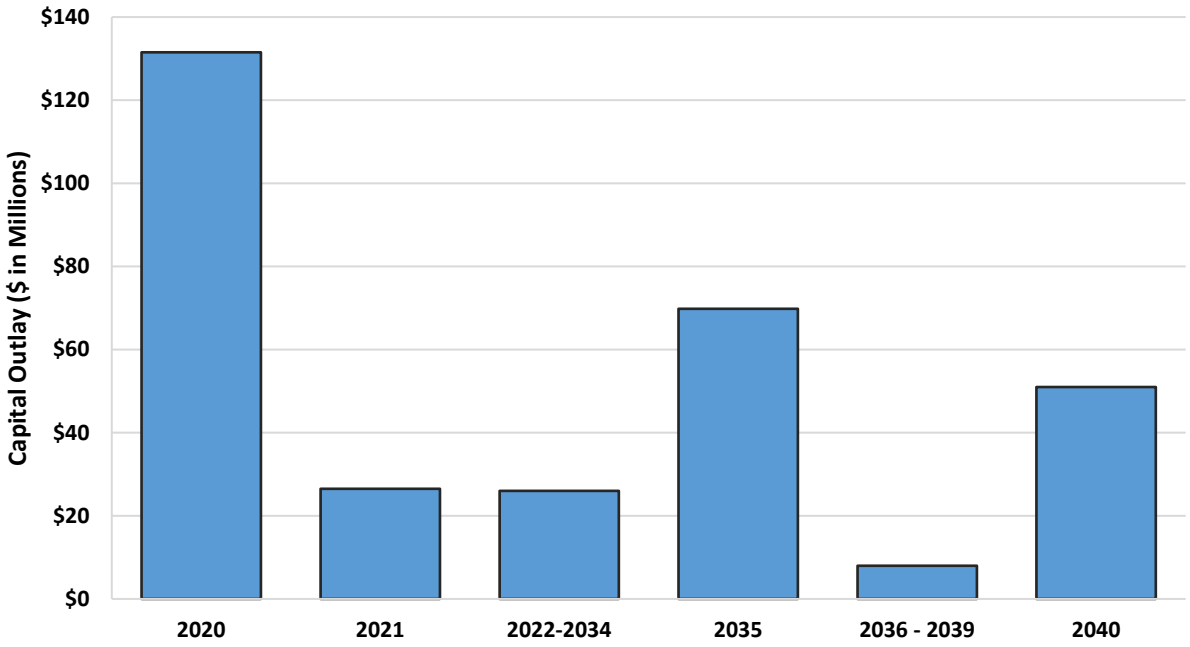

Figure 5-3. Chowchilla Subbasin Estimated Capital Outlay for Projects Only

As projects are implemented, GSAs will incur additional operation and maintenance (O&M) costs. **Figure 5-4** illustrates the estimated annual O&M costs (in current dollars) for all GSP projects described in Chapter 4 and the annual costs of GSA implementation described in Section 5.2. This figure does not include the cost that the Madera County GSA demand management program would impose on growers and the County economy. Average annual operating costs for projects increase from $6.5 million per year in 2020 to over $12 million per year by 2040. Project costs will be refined by GSAs as the GSP is implemented. GSA implementation costs total about $1.05 million per year.

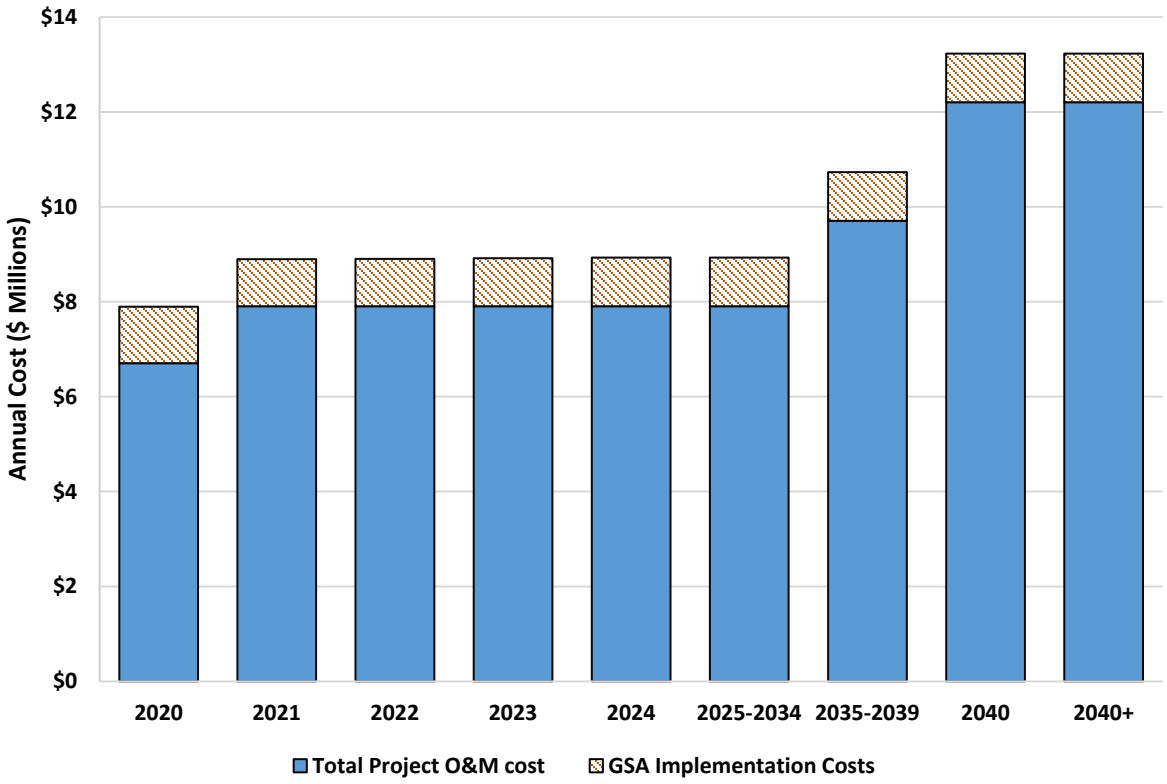

Figure 5-4. Chowchilla Subbasin Estimated Annual Costs for Project O&M and GSA Implementation

5.5 Annual Reports

23 CCR §356.2 requires annual reports to be submitted to DWR by April 1 of each year following the adoption of the GSP. GSAs will prepare annual reports that comply with the requirements of §356.2. It is anticipated that GSAs will need to develop independent analyses and data (e.g. for surface water use by a particular GSA) as well as joint analyses (e.g. estimating the Subbasin-wide change in groundwater storage) in order to develop annual reports. GSAs will work together to complete the annual report and will incur joint and individual costs in the process. Annual reports must provide basic information about the Subbasin in addition to technical information including:

- Groundwater elevation data from monitoring wells
- Hydrographs of groundwater elevations
- Total groundwater extractions for the prior year
- Surface water supply used in the prior year, including for groundwater recharge or other in-lieu uses
- Change in groundwater storage
- Progress towards implementing the GSP

The following subsections provide a general outline of what information will be provided in the annual report. The annual report provided to DWR will fully comply with the requirements of §356.2.

5.5.1 General Information (23 CCR § 356.2(a))

General information will include an executive summary that highlights the key content of the annual report. This will include a description of the sustainability goals and provide a description of GSP projects, an updated implementation schedule, and a map of the Subbasin. Any important changes or updates since the last annual report will be noted and described.

5.5.2 Subbasin Conditions (23 CCR § 356.2(b))

The Subbasin conditions section of the annual report will provide an update on groundwater and surface water conditions in the Subbasin.

Current groundwater conditions with respect to the sustainability goals in the Subbasin will be described. GSAs will summarize the groundwater monitoring network data and report current and change in groundwater elevation. This will include groundwater elevation contour maps for each aquifer in the Subbasin tailored to specific hydrogeologic conditions across the region. This will show seasonal high and low conditions within the current season and show historical data from at least January 1, 2015.

Total groundwater extractions will be summarized (in tabular and map form) by water use sector and the method of measurement will be identified (e.g. metering, satellite analysis, crop-based ET estimates, etc.). All data and methods used to characterize extractions and levels will follow best practices and be described in the annual report.

Total ET_{aw} in the Subbasin will be summarized and parsed into ET_{aw} of surface water and ET_{aw} of groundwater using the information on applied surface water. Surface water data will show whether it was used for direct or in-lieu recharge and identify all sources for each GSA.

The groundwater system balance will be used to estimate the change in groundwater storage. Change in storage will be summarized in tabular form and as a map for each principal aquifer in the Subbasin. A graph will show the water year type, groundwater use, change in storage, and cumulative change in storage for the Subbasin using historical data from no later than January 1, 2015.

5.5.3 Plan Implementation Progress (23 CCR § 356.2(b))

The annual report will summarize GSP implementation of PMAs and other GSA-related activities, and describe progress toward established interim milestones and planned sustainability objectives. It will summarize sustainability conditions in the Subbasin.

5.6 Periodic Evaluation (Five-Year Updates)

DWR will review the GSP's progress toward meeting its sustainability goals at least every five years. GSAs will prepare the periodic evaluation to summarize GSP implementation, whether the GSP is meeting sustainability goals, and summarize implementation of PMAs. An evaluation will also be made whenever the GSP is amended. A summary of the general information that will be included in the five-year periodic evaluation required by §356.4 is provided in the following subsections.

5.6.1 Sustainability Evaluation (23 CCR § 356.4(a) - § 356.4(d))

The evaluation will summarize current groundwater conditions for each sustainability indicator and describe overall progress towards sustainability. A summary of interim milestones and MOs will be included, along with an evaluation of groundwater elevations in relation to minimum thresholds (MTs). If any MTs are found to be exceeded, the GSAs will investigate probable causes and implement actions to

correct conditions, as warranted. However, exceedance of a minimum threshold does not automatically trigger corrective action, as the exceedance may be due to factors beyond the control of the GSA.

Implementation of PMAs will be documented and used to adaptively manage the Subbasin. This will include a summary of implementation timelines compared to the proposed timeline (Figure 5-1) and implementation schedule described in Chapter 4. And evaluation of the project contribution to improving conditions. If conditions are improving faster or slower than projected, the reason for the difference from the projection will be evaluated. If conditions are improving slower than projected because any projects or management actions are not implemented according to the specified timeline, the deviation from the original plan will be documented and to the extent possible, corrective actions to speed implementation will be taken. This may include imposing limits on groundwater pumping more broadly than described in Chapter 4, or at a more rapid rate. Similarly, if conditions are improving faster than projected, the scale or timeline of some projects or management actions (notably demand management) may be re-evaluated and revised.

The evaluation will analyze and describe the effect of PMAs on Subbasin sustainability indicators and compare that to the estimated gross benefits of the PMAs presented in Chapter 4. If differences are identified, these will be described in the periodic evaluation. If projects or management actions are not performing as expected, the update will describe steps the GSAs will take to implement additional projects or reduce pumping, if warranted. Any changes to the implementation schedule of PMAs will be described in the periodic evaluation.

As GSP PMAs are implemented, monitoring data may indicate unanticipated effects. Also, land uses and economic conditions will change in ways that cannot be anticipated at this time. For example, the GSP has not developed an economic analysis to consider the effect of higher water costs and lower water supply availability on farm profitability and regional crop mix. As such, it may be necessary to revise the GSP to account for these changes. The elements of the GSP including the basin setting, Management Areas, undesirable results, MTs, and MOs will be reconsidered by the GSAs during the periodic evaluations. Any proposed revisions will be documented in the periodic evaluation.

5.6.2 Monitoring Network Description (23 CCR § 356.4l)

Chapter 3 details the planned monitoring network and protocols. The effectiveness of the monitoring network and overall GSP implementation depends on timely, accurate, and comprehensive data. The GSP includes Data Management System (DMS) protocols, as well as expanded monitoring wells and data collection. However, as described in Chapter 3, data gaps still exist in the Subbasin that will require expanding the network. If data gaps are identified, a plan will be developed to improve the monitoring network, consistent with 23 CCR §354.38.

GSAs expect that data gaps will be identified in future GSP updates. The periodic evaluations of the GSP will assess changes to the monitoring program needed to acquire additional data sources, and how the new information will be used and incorporated into any future GSP updates. The installation of new data collection facilities and analysis of new data will be prioritized in the GSP.

5.6.3 New Information (23 CCR § 356.4(f))

GSAs are continuing to monitor Subbasin conditions and additional monitoring wells are being installed under a Proposition 1 grant. In addition, the DMS will allow GSAs to identify additional data gaps and implement procedures to secure additional data. Land use and economic incentives for farming and other water uses in the Subbasin will continue to change as the GSP is implemented. GSAs expect that new information about groundwater conditions, PMAs, and sustainability objectives will continue to be

available. An adaptive management approach will be applied to identify, review, and incorporate all new information into the GSP. Periodic evaluations will indicate whether new information warrants changes to any aspect of the GSP, including the basin setting, MOs, MTs, or undesirable results.

5.6.4 GSA Actions (23 CCR §356.4(g) - § 356.4(h))

GSAs are continuing to monitor, manage, and collaborate to meet sustainability goals specified in the GSP. Within their allowed authorities, GSAs are evaluating new regulations or ordinances that could be implemented to help achieve sustainability objectives. Any changes in regulations or ordinances will be summarized in the periodic update. The effect on any aspect of the GSP, including the basin setting, MOs, MTs, or undesirable results will be described.

The five-year periodic evaluation will include a summary of state laws and regulations or local ordinances related to the GSP that have been implemented since the previous periodic evaluation and address how these may require updates to the GSP. Enforcement or legal actions taken by the GSAs in relation to the GSP will be summarized along with how such actions support sustainability in the Subbasin.

5.6.5 Plan Amendments, Coordination, and Other Information (23 CCR § 356.4(i) - §356.4(k))

Any proposed or completed amendments to the GSP will be described in the periodic evaluation. This will also include a summary of amendments that are being considered or developed at that time. Any changes to the basin setting, MOs, MTs, or undesirable results will be described.

Any changes to the GSA coordination agreement, or other Subbasin coordination agreements will be documented and summarized. GSAs will summarize any other information deemed appropriate to support the GSP and provide required information to DWR for review of an amended GSP.

5.7 Data Management System (23 CCR § 352.6)

The Chowchilla Subbasin Data Management System (DMS) has been developed as an integrated network of databases and linked programs and tools. Each element is directly or indirectly linked to the central water budget database, which organizes and calculates the Subbasin water budget (**Figure 5-5**). Inputs to the water budget database are organized into inputs that are managed and implemented at the Subbasin-level and inputs that are managed at the GSA-level. Subbasin-level inputs include:

- **Time series**: time series data managed in a database structure and used to quantify surface water inflows/outflows and groundwater levels
    - USGS and USACE station data
    - DWR-compiled data (WDL and CDEC)
- **Weather:** weather data managed in a database structure and used to quantify reference evapotranspiration and precipitation, and to support root zone water budget calculations (crop evapotranspiration, infiltration, runoff)
    - CIMIS station data
    - NCEI (NOAA) station data
    - PRISM data
- **eWRIMS**: water rights diversions records managed publicly in a database structure and used to quantify surface water supply utilized for irrigation
- **GIS:** spatially-defined geographic data managed in GIS and used to support land use analyses and spatial water use by sector

- DWR spatial data (Subbasin boundaries, GSA boundaries, land use survey spatial coverages, Land IQ land cover classification and analysis)
- DWR interpolation tool results (spatial and temporal interpolation of spatial coverages, using Ag Commission reports)
- Local land use data comparison and validation

- **IWFM IDC**: daily root zone water budget results estimated by the IWFM IDC program and used to quantify crop evapotranspiration, infiltration, runoff, and change in SWS storage (see Section 2.2.3.3)

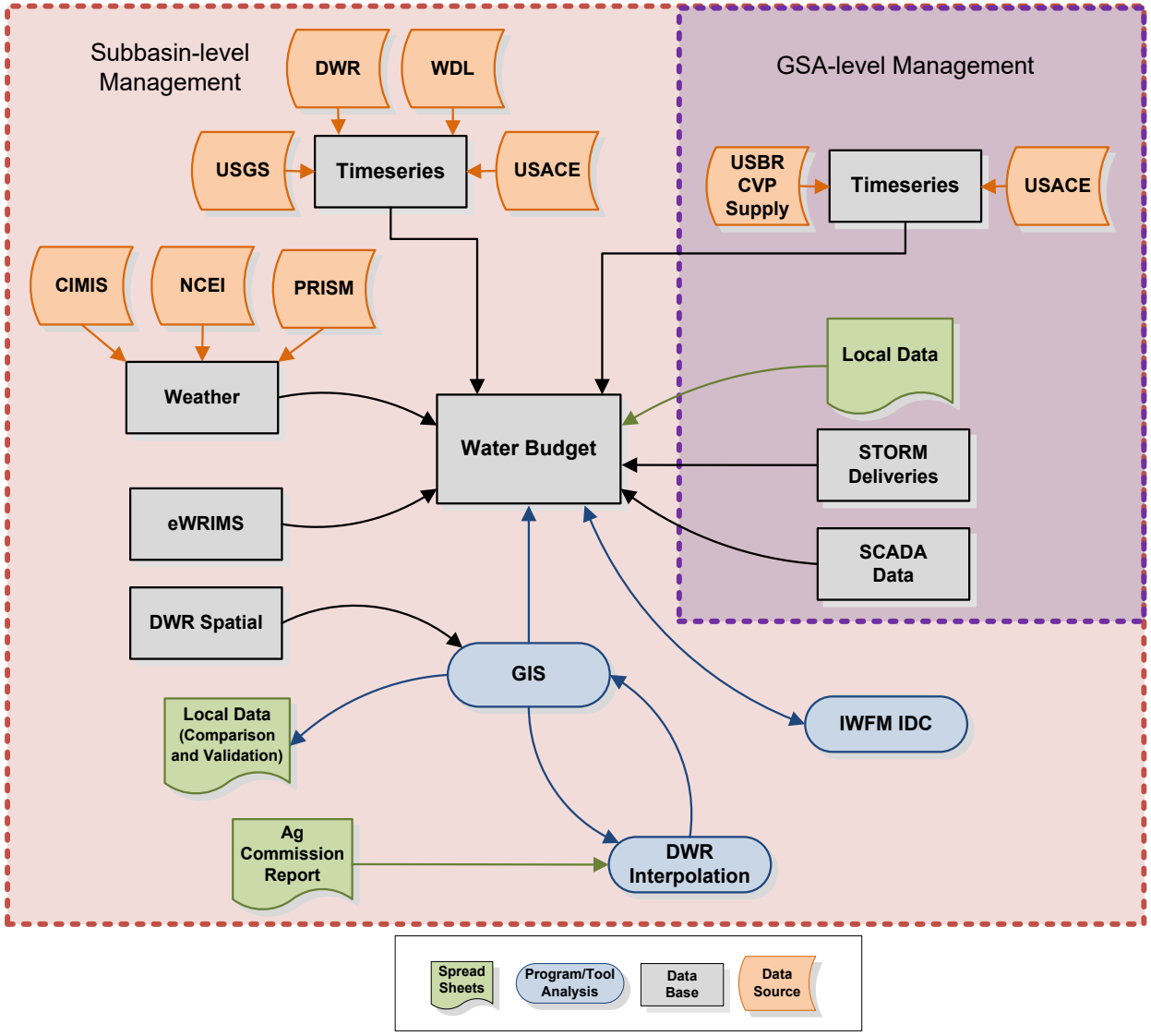

Figure 5-5. Chowchilla Subbasin Data Management System Structure

Inputs to the Subbasin water budget that are managed at the GSA-level include:

- **Time series:** time series data relating to GSA-specific inflows that are managed in a database structure and used to quantify surface water inflows/outflows
- **Local Data:** local data managed in spreadsheets and used to quantify GSA-specific inflows/outflows (diversions and deliveries not recorded in Subbasin-level data sources)
- **STORM Deliveries**: CWD deliveries data managed in a database structure and used to quantify surface water supply utilized for irrigation
- **SCADA Data**: CWD SCADA data managed in a database structure and used to quantify spillage from the CWD Conveyance System and inflows to the Rivers and Streams System

Data that is managed at the GSA-level is provided in further detail for each individual GSA in **Figure 5-6**. All GSAs will manage data related to GSP project implementation within their boundaries. CWD GSA additionally manages: time series data related to CVP supply received from Madera Canal (USBR records) and Buchanan Dam releases (USACE records), monthly water supply reports, crop data within their service area, well information, deliveries, spillage, and water rights credits/usage. TTWD GSA additionally manages: deliveries records from one or more San Joaquin River Exchange Contractors outside the Subbasin, crop data within their service area, and well depths. GSAs are continually working to refine data, identify data gaps, and incorporate additional information characterizing groundwater conditions in the Subbasin.

GSAs are currently developing a Request for Proposals (RFP) to secure a database development contractor to develop a database system to store, manage, and retrieve data. This will formalize the DMS, which will be developed to meet the requirements in the GSP regulations, including 23 CCR § 352.4, § 352.6, and § 354.4. As described previously, the data will be managed so that appropriate tables, graphs, and maps supporting the GSP annual reports and periodic evaluations can be queried and provided to DWR.

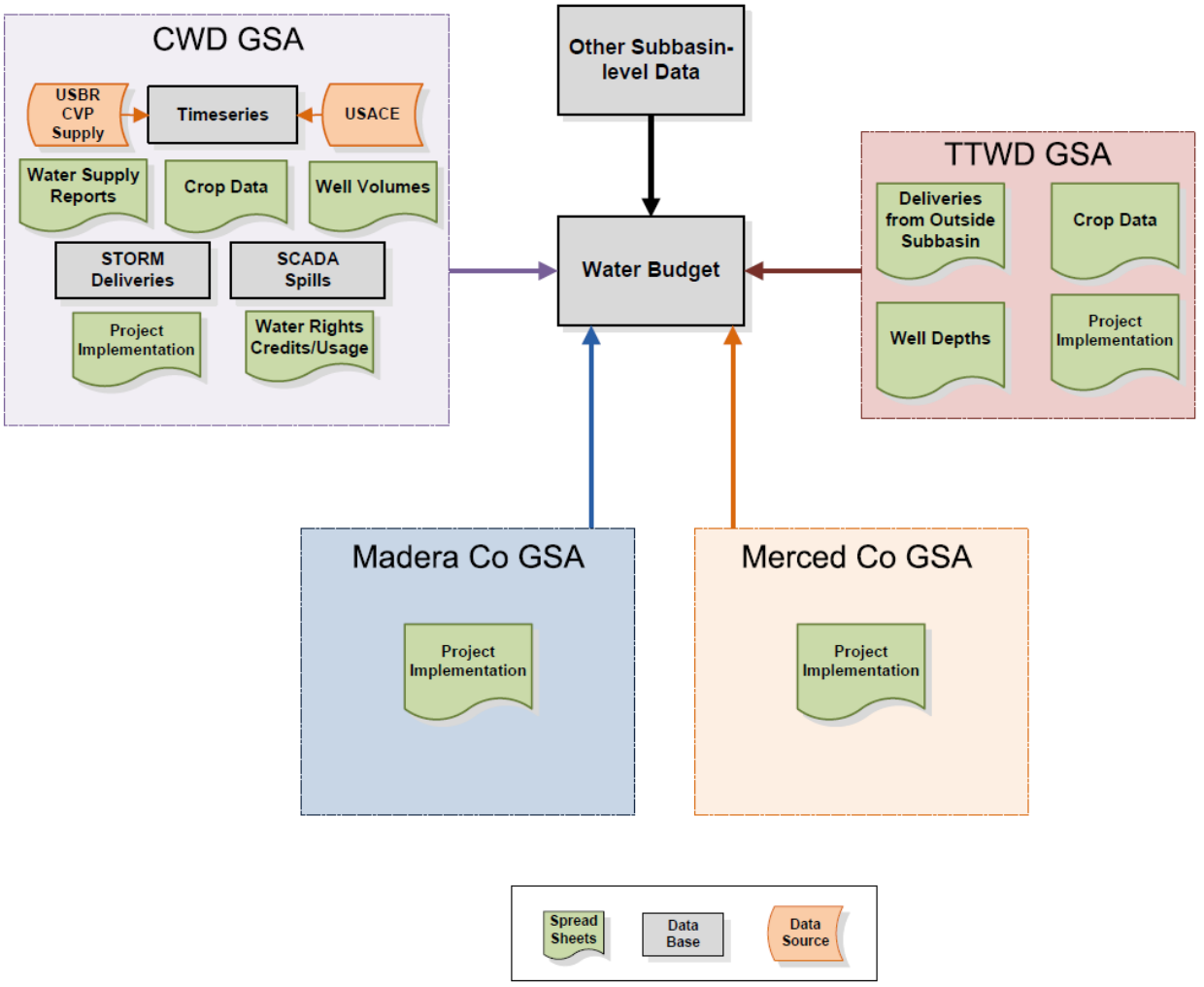

Figure 5-6. GSA-Level Data Management Structure

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CHOWCHILLA SUBBASIN

Sustainable Groundwater Management Act (SGMA)

Groundwater Sustainability Plan

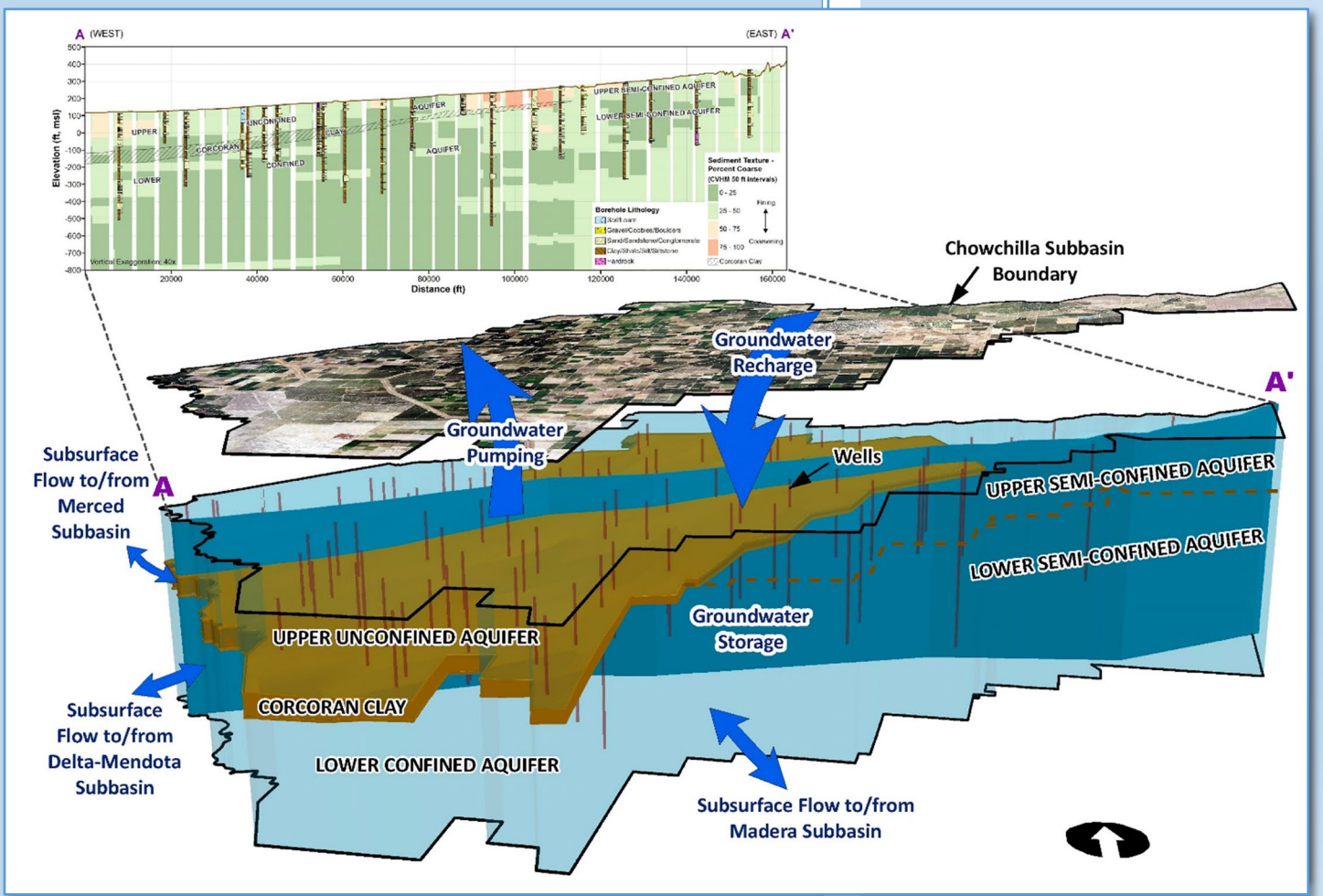
APPENDIX 1. INTRODUCTION

Technical Appendices 1.A. through 1.F.

January 2020

Prepared by

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento



Chowchilla Subbasin

Sustainable Groundwater Management Act

Groundwater Sustainability Plan

Technical Appendices 1.A. through 1.F.

January 2020

Prepared For

Chowchilla Subbasin GSP Advisory Committee

Prepared By

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

APPENDIX 1. INTRODUCTION

1.A. Chowchilla Water District's Groundwater Sustainability Agency Formation Notice.

1.B. Madera County's Groundwater Sustainability Agency Formation Notice.

1.C. Merced County's Groundwater Sustainability Agency Formation Notice.

1.D. Triangle T Water District's Groundwater Sustainability Agency Formation Notice.

1.E. GSP Adoption Resolutions, Meeting Minutes and Notices.

1.F. Glossary: SGMA Definitions

APPENDIX 1.A. CHOWCHILLA WATER DISTRICT'S GROUNDWATER SUSTAINABILITY AGENCY FORMATION NOTICE

Prepared as part of the

Groundwater Sustainability Plan
Chowchilla Subbasin

January 2020

GSP Team:

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

CHOWCHILLA WATER DISTRICT

RESOLUTION NO. 2016-17

RESOLUTION ELECTING TO ESTABLISH CHOWCHILLA WATER DISTRICT AS A GROUNDWATER SUSTAINABILITY AGENCY FOR THOSE PORTIONS OF THE CHOWCHILLA SUBBASIN OF THE SAN JOAQUIN VALLEY GROUNDWATER BASIN

WHEREAS, the California Legislature passed a statewide framework for sustainable groundwater management, known as the Sustainable Groundwater Management Act (California Water Code § 10720 *et seq.*) pursuant to Senate Bill 1168, Senate Bill 1319, and Assembly Bill 1739, which was approved by the Governor and Chaptered by the Secretary of State on September 16, 2014; and

WHEREAS, the SGMA went into effect on January 1, 2015; and,

WHEREAS, the SGMA requires all high- and medium-priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or multiple GSAs; and,

WHEREAS, the Chowchilla Groundwater Sub-basin has been designated by DWR as a high-priority basin and in critical groundwater overdraft; and,

WHEREAS, the SGMA authorizes a local public agency overlying a groundwater sub-basin to elect to become a GSA; and,

WHEREAS, Chowchilla Water District (the "District") is a local public agency as defined under the SGMA and is therefore eligible to serve as a GSA; and,

WHEREAS, Section 10723.2 of the SGMA requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and,

WHEREAS, Section 10723.8 of the SGMA requires that a local public agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within a sub-basin; and,

WHEREAS, the District is committed to sustainable management of its groundwater resources; and,

WHEREAS, pursuant to Government Code Section 6066, notices of a public hearing regarding whether to adopt a Resolution to elect to become a GSA were published on November 30th and December 7th, 2016 in the Chowchilla News; and Merced Sun Star.

WHEREAS, the District held a public hearing on December 14, 2016, after publication of notice pursuant to Government Code section 6066 to consider adoption of this Resolution; and,

WHEREAS, the District wishes to exercise the powers and authorities of a GSA granted by the SGMA;

NOW, THEREFORE, BE IT RESOLVED that this Board of Directors of Chowchilla Water District hereby elects to become a GSA for those portions of Chowchilla subbasin shown in the map attached hereto as **Exhibit A**; and,

BE IT FURTHER RESOLVED that the District authorizes the General Manager to, within 30 days from the date of this Resolution, provide notification of this election to the DWR, including a copy of this Resolution and additional information required by Water Code Section 10723.8, in the manner required by law.

AYES: Upton, Mandala, Taylor, Harris, and Maddalena

NOES: None

ABSENT: None

ATTEST:

Brandon Tomlinson

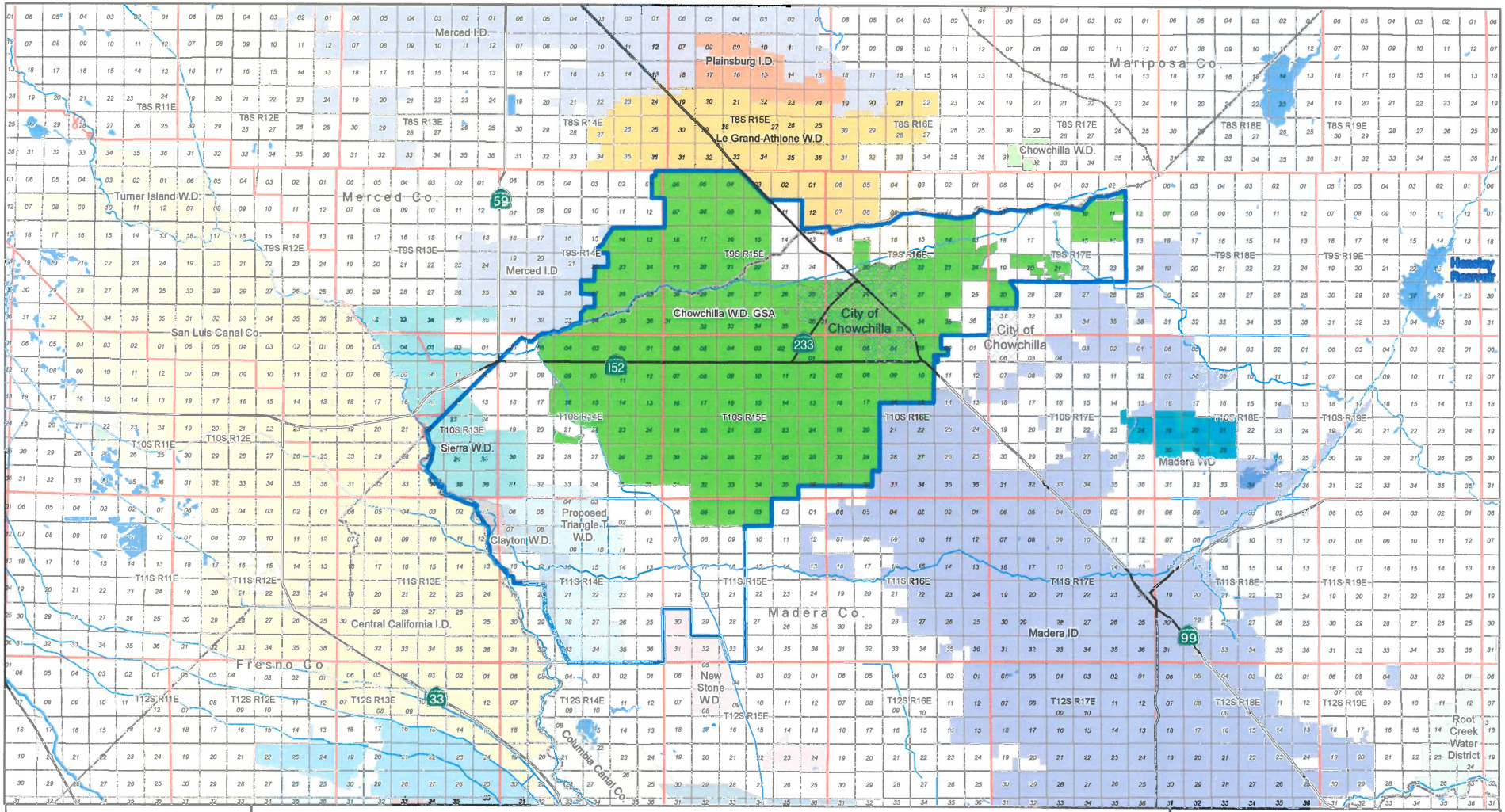
General Manager

CERTIFICATE OF SECRETARY

The undersigned, Secretary of the Chowchilla Water District, hereby certifies that the foregoing Resolution was adopted by the Board of Directors of said District at a meeting thereof, duly and specially held on December 14th, 2016 at which meeting a quorum of the Board of Directors was at all times present and acting.

IN WITNESS WHEREOF, I have set my hand this 14th day of December, 2016.

Secretary



EST 1969
PROVOST& PRITCHARD CONSULTING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

G:\Chowchilla WD - 1049\104915002 SBx7-7 Supplement 2015\GIS\Map\GSA_related_subbasin_finaldraft.mxd

EXHIBIT B

Notice of Public Hearing

MERCED SUN-STAR | ENTERPRISE

CHOWCHILLA NEWS | Chronicle | Atwater Signal | Vida

DEC 14'16 11:53AM

AFFIDAVIT OF PUBLICATION

Account #	Ad Number	Identification	PO	Cols	Lines
336260	0002745190	HEARING 12/14/16 LELA BEATTY	/MS HEARING 12/14 LELA BEAT	1	41

Attention:

CHOWCHILLA WATER DISTRICT - LEGALS
PO BOX 905
CHOWCHILLA, CA 93610

CHOWCHILLA WATER DISTRICT
NOTICE OF PUBLIC HEARING
ELECTION TO BECOME A
GROUNDWATER
SUSTAINABILITY AGENCY
UNDER THE SUSTAINABLE
GROUNDWATER MANAGEMENT
ACT

NOTICE IS HEARBY GIVEN that, pursuant to Water Code Section 10723, the Chowchilla Water District (District) will hold a public hearing during a regular meeting of the District Board of Directors on December 14, 2016, commencing at 1:30 PM at the District's office at 327 S. Chowchilla Blvd, Chowchilla, CA 93610, to determine whether the District will become a Groundwater Sustainability Agency for a portion of the Chowchilla Groundwater Subbasin of the San Joaquin Valley Groundwater Basin. Written Comments may be submitted to the District, Attn. Board Secretary (btomlinson@cwdwater.com) no later than 5:00 PM on December 13, 2016, or to the District's office at the address above. During the Hearing, the District will allow oral comments and will receive additional written comments before making a decision. The Presiding Officer may limit oral comments to a reasonable length.

Dated: November 30, 2016

Published: November 30 and December 7, 2016
MER- 2745190 11/30, 12/7

Declaration of Publication
2015.5 C.C.P.

STATE OF CALIFORNIA)
) ss.
County of Merced)

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the Merced Sun-Star, a newspaper of general circulation, printed and published in the city of Merced, County of Merced, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Merced, State of California, under the date of July 14, 1964 Case Number 33224 that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

November 30, 2016, December 07, 2016

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Merced, California on:

Date: 7th, day of December, 2016

Signature

MERCED SUN-STAR | ENTERPRISE
CHOWCHILLA NEWS | Chronicle | Atwater Signal | Vida

AFFIDAVIT OF PUBLICATION

Account #	Ad Number	Identification	PO	Cols	Lines
336260	0002745190	HEARING 12/14/16 LELA BEATYY	/MS HEARING 12/14 LELA BEAT	1	41

Attention:

CHOWCHILLA WATER DISTRICT - LEGALS
PO BOX 905
CHOWCHILLA, CA 93610

CHOWCHILLA WATER DISTRICT
NOTICE OF PUBLIC HEARING
ELECTION TO BECOME A
GROUNDWATER
SUSTAINABILITY AGENCY
UNDER THE SUSTAINABLE
GROUNDWATER MANAGEMENT
ACT

NOTICE IS HEARBY GIVEN that, pursuant to Water Code Section 10723, the Chowchilla Water District (District) will hold a public hearing during a regular meeting of the District Board of Directors on December 14, 2016, commencing at 1:30 PM at the District's office at 327 S. Chowchilla Blvd, Chowchilla, CA 93610, to determine whether the District will become a Groundwater Sustainability Agency for a portion of the Chowchilla Groundwater Subbasin of the San Joaquin Valley Groundwater Basin. Written Comments may be submitted to the District, Attn. Board Secretary (btomlinson@cwdwater.com) no later than 5:00 PM on December 13, 2016, or to the District's office at the address above. During the Hearing, the District will allow oral comments and will receive additional written comments before making a decision. The Presiding Officer may limit oral comments to a reasonable length.

Dated: November 30, 2016

Published: November 30 and December 7, 2016
CN- 2745190 11/30, 12/7

Declaration of Publication
2015.5 C.C.P.

STATE OF CALIFORNIA)
) ss.
County of Madera)

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the Chowchilla News, a newspaper of general circulation, printed and published in the city of Chowchilla, County of Madera, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Madera, State of California, under the date of June 10, 1918 Case Number 1943 that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

November 30, 2016, December 07, 2016

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Chowchilla, California on:

Date: 7th, day of December, 2016

Patty Mandell
Signature

EXHIBIT C

LIST OF INTERESTED PARTIES

Chowchilla Water District

Post Office Box 905 ♦ 327 S. Chowchilla Blvd. ♦ Chowchilla, CA 93610
Phone (559) 665-3747 ♦ Fax (559) 665-3740 ♦ Email dwelch@cwdwater.com

Board of Directors
Dan Maddalena ♦ Michael Mandala ♦ Vince Taylor ♦ Kole M. Upton ♦ Russell Harris

December 22, 2016

Via Email & U.S. Mail
Mr. Mark Nordberg, GSA Project Manager
Senior Engineering Geologist
California Department of Water Resources
901 P Street, Room 213A
P.O. Box 942836
Sacramento, CA 94236
Mark.Nordberg@water.ca.gov

Mr. Dane Mathis
Sup. Engineering Geologist
3374 East Shields Avenue
Fresno, CA 93726
Dane.Mathis@water.ca.gov

RE: ***Notice of the Chowchilla Water District Intent to Serve as Groundwater Sustainability Agency for a Portion of the Chowchilla Groundwater Subbasin***

Gentlemen:

This letter constitutes notice to the Department of Water Resources (DWR), pursuant to Water Code sections 10723(d) and 10723.8, of the Chowchilla Water District's (CWD or District) intent to undertake sustainable groundwater management of a portion of the Chowchilla Subbasin (the Basin) as a Groundwater Sustainability Agency (GSA) pursuant to the Sustainable Groundwater Management Act (SGMA). The District is a public agency with water supply and water management responsibilities in over half of the surface acreage of the Basin.

The proposed Chowchilla Water District GSA management area is about 86,000 acres, or about 59% of the entire Basin (145,940 acres). The GSA will include that portion of the City of Chowchilla that falls within the District service area in the Basin. The District will coordinate with the City of Chowchilla in the development and implementation of the Groundwater Sustainability Plan (GSP).

The District has been actively coordinating efforts with other local agencies[1] and other interests[2] in the Basin and intends to enter into a memorandum of understanding or other form of agreement with these parties to coordinate preparation of a single Groundwater Sustainability Plan for the Basin.

The District has held several public meetings to receive input on whether the District should serve as the GSA.[3] On December 14, 2016, the District held a public hearing to receive public comment on the proposed GSA. Notice of this hearing was provided in compliance with Water Code Section 10723(b) and Government Code Section 6066.

There were no comments submitted prior to or during the hearing on December 14, 2016,

At the conclusion of the December 14, 2016 hearing, the District Board of Directors adopted Resolution No. 2016-17, electing to serve as the GSA. This notice of intent is timely filed within 30 days of the date of that action.

Copies of the Resolution and a map showing the proposed Chowchilla Water District GSA management area are attached. No new bylaws, ordinances, or other new authorities were adopted in connection with this resolution to serve as GSA.

Interested Parties

Pursuant to Sections 10723.2 and 10723.8(a)(4) of the Water Code, the following is a list of "interested parties" in the Basin, followed by an explanation on how their interests will be considered in the development and operation of the GSA and development and implementation of the GSP:

(a) Holders of overlying groundwater rights, including:

(1) Agricultural users

The District encompasses about 86,000 acres of which about 75,000 acres are irrigated agriculture. The District's agricultural users receive surface water through the District from the Friant Dam via the Madera Canal and the Buchanan Dam via the Chowchilla River and are also groundwater users.

---

[1] City of Chowchilla, County of Madera, County of Merced, Clayton Water District, and landowners forming the Triangle T Water District.

[2] Sierra Vista Mutual Water Company, Madera County Farm Bureau

[3] June 15, 2016, October 12, 2016, November 9, 2016, December 13, 2016, December 14, 2016

(2) Domestic well owners

There are over 600 domestic wells within the proposed GSA management area.

(b) Municipal well operators

City of Chowchilla, MD 33 Fairmead, MD85 Valeta

(c) Public water systems

See Municipal well operators, above. Additional public water systems within the proposed GSA management area may be identified during the SGMA implementation process.

(d) Local land use planning agencies

Madera and Merced Counties

(e) Environmental users of groundwater

N/A. None within the proposed GSA management area.

(f) Surface water users, if there is a hydrologic connection between surface and groundwater bodies

The District manages the delivery of surface water used within the proposed management area. The interests of other nearby holders of surface water rights will be considered in the development of the GSP.

(g) The federal government, including, but not limited to, the military and managers of federal lands

N/A.

(h) California Native American tribes

N/A. None within the proposed GSA management area.

(i) Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems

There are disadvantaged communities near and adjacent to the proposed management area: Fairmead, Chowchilla

(j) Entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the groundwater sustainability agency

Merced Area Groundwater Pool Interests (MAGPI)

Madera-Chowchilla CASGEM Group

The interests of the interested parties identified above will be considered in the development and operation of the GSA and the development and implementation of the GSP. The District is committed to an open and inclusive process to implement SGMA. Interested parties will have opportunities, both formal and informal, to provide input to the District throughout the process of developing, operating, and implementing the GSA and GSP. Such opportunities may include, but are not limited to, public workshops and comment periods required by SGMA (e.g., Water Code section 10728.4); opportunities for public comment during the District regular and special board meetings; and at other times to be determined and noticed pursuant to Water Code section 10727.8(a)).

Sincerely yours,

Brandon Tomlinson
Acting General Manager
Chowchilla Water District

Enclosures

APPENDIX 1.B. MADERA COUNTY'S GROUNDWATER SUSTAINABILITY AGENCY FORMATION NOTICE

Prepared as part of the

Groundwater Sustainability Plan
Chowchilla Subbasin

January 2020

GSP Team:

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

WATER AND NATURAL RESOURCES DEPARTMENT

JULIA D. BERRY
DIRECTOR

200 W. Fourth St.
Suite 3100
Madera, CA 93637
(559) 675-7821
FAX (559) 675-6573
mcwater@madera-county.com

January 27, 2017

To Whom it May Concern,

The County of Madera (County) is writing to inform your agency of the County's decision to initiate the process to become a Groundwater Sustainability Agency (GSA) for a portion of the lands within the Chowchilla Subbasin boundary, see Exhibit A. The County is comprised of three subbasins: (1) the Madera Subbasin, (2) the Delta-Mendota Subbasin and (3) the Chowchilla Subbasin. The Sustainable Groundwater Management Act (SGMA) requires local public agencies who want to manage groundwater to follow a public process to become a GSA. Any local agency that has land use, water supply, or water management responsibilities can elect to become a GSA within its political boundaries.

The County intends to commence the GSA formation process, see enclosed notification. The commencement of this process is part of an overall strategy by the County to file with the Department of Water Resources after the other agencies in each subbasin completed or initiated the GSA formation process. This strategy was followed with a goal of insuring coverage for the entire subbasins to achieve compliance with SGMA. Madera County looks forward to cooperating with your agency in the development and implementation of the Groundwater Sustainability Plan (GSP) to preserve our local resources.

Sincerely,

Julia D. Berry
Director, Madera County
Water and Natural Resources Department

Enclosures: Exhibit A – GSA Boundaries
Madera County Service Area
Notice of Intent

Exhibit A

County of Madera Resolution Electing to Form the Madera County Groundwater Sustainability Agency Within the Chowchilla Groundwater Subbasin and Map

BEFORE
THE BOARD OF SUPERVISORS
OF THE COUNTY OF MADERA
STATE OF CALIFORNIA

In the Matter of	)	Resolution No.: 2017 - 014
	)	
THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT	)	A RESOLUTION ELECTING TO SERVE AS THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE CHOWCHILLA SUBBASIN
	)	
Madera County – Chowchilla Subbasin	)	
	)	

WHEREAS, the Sustainable Groundwater Management Act of 2014 Water Code Sections 10720-10737.8 ("the Act") was signed into law on September 16, 2014; and

WHEREAS, the Act requires that each California groundwater basin be managed by a Groundwater Sustainability Agency ("GSA"), or multiple GSAs, and that such management be implemented pursuant to an approved Groundwater Sustainability Plan ("GSP") or multiple GSPs; and

WHEREAS, Madera County encompasses the Chowchilla Subbasin (Basin No. 5-22.05) in the San Joaquin Valley Groundwater basin, an unadjudicated groundwater basin; and.

WHEREAS, Madera County is a public agency as defined in section 10721 of the Water Code; and

WHEREAS, the County is authorized to be a GSA for portions of the Chowchilla Subbasin pursuant to section 10723(a); and

WHEREAS, notice of a public hearing to consider whether the District should become a GSA was published in the Chowchilla News newspaper Notice as required by section 6066 of the Government Code and is attached hereto as "Exhibit A"; and

WHEREAS, the County held a public hearing at which the County Board of Supervisors

considered whether the County should be a GSA for the Basin; and

NOW, THEREFORE, BE IT RESOLVED by the Board of Supervisors of the County of Madera, State of California, that:

1. Madera County elects to be the exclusive Groundwater Sustainability Agency for a portion of the Chowchilla Subbasin, shown on the map attached hereto as "Exhibit B" and incorporated herein by reference.
2. Within 30 days of the date of this resolution, the Director of the County Department of Water and Natural Resources is directed to submit a notice of intent to the Department of Water Resources, pursuant to Water Code section 10723.8(a).
3. The Director shall after complying with Water Code section 10727.8, begin the process of developing the Groundwater Sustainability Plan for the basin in accordance with tall applicable statutes and regulations.
4. The Director shall report on an ongoing basis the progress of implementation of the Act to the County Board of Supervisors.

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The foregoing Resolution was adopted this 24th day of January, 2017, by the following vote:

Supervisor Frazier voted yes

Supervisor Rogers voted: yes

Supervisor Poythress voted: yes

Supervisor Rodriguez voted: yes

Supervisor Wheeler voted: yes

Chairman, Board of Supervisors

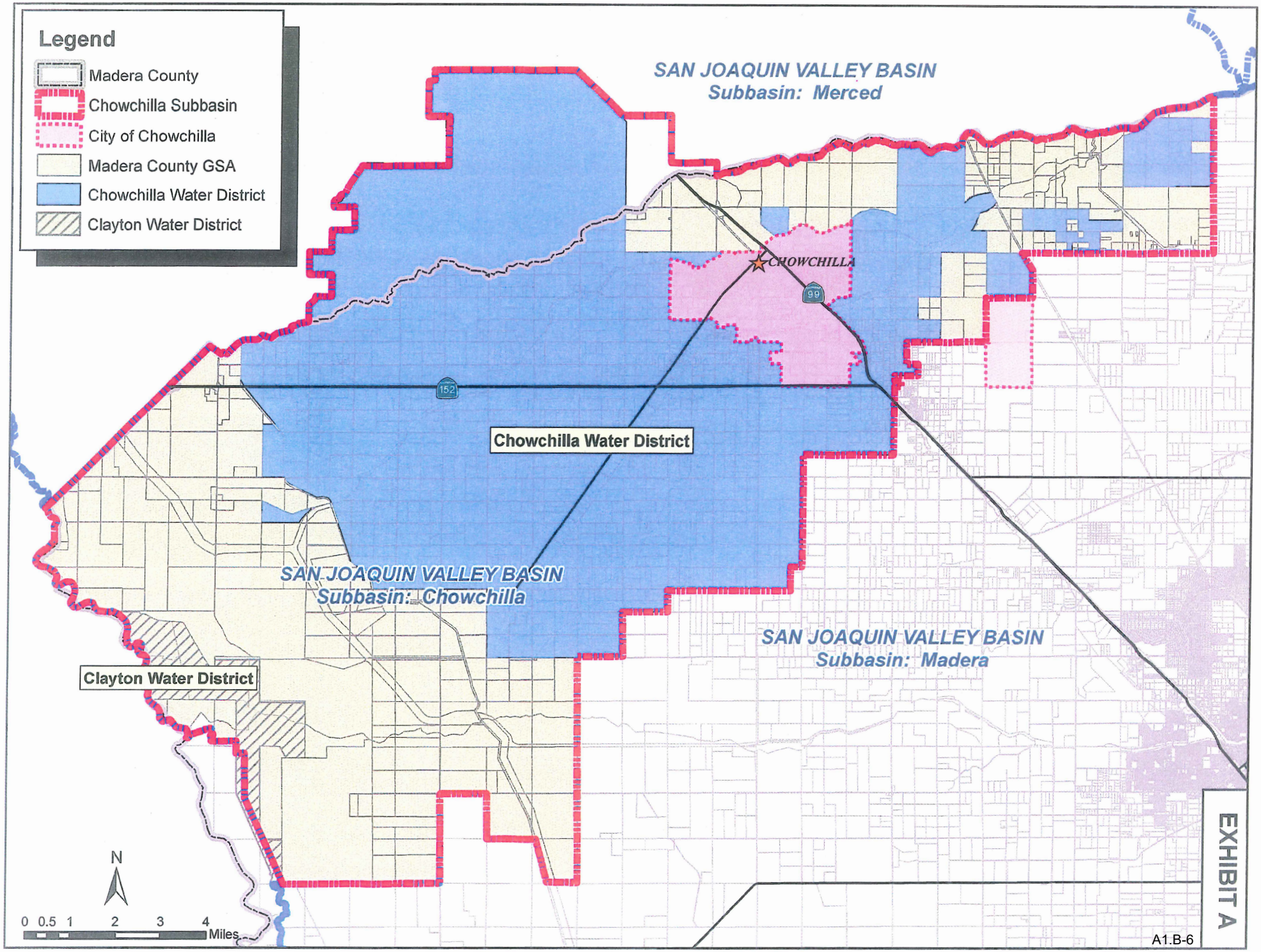
ATTEST:

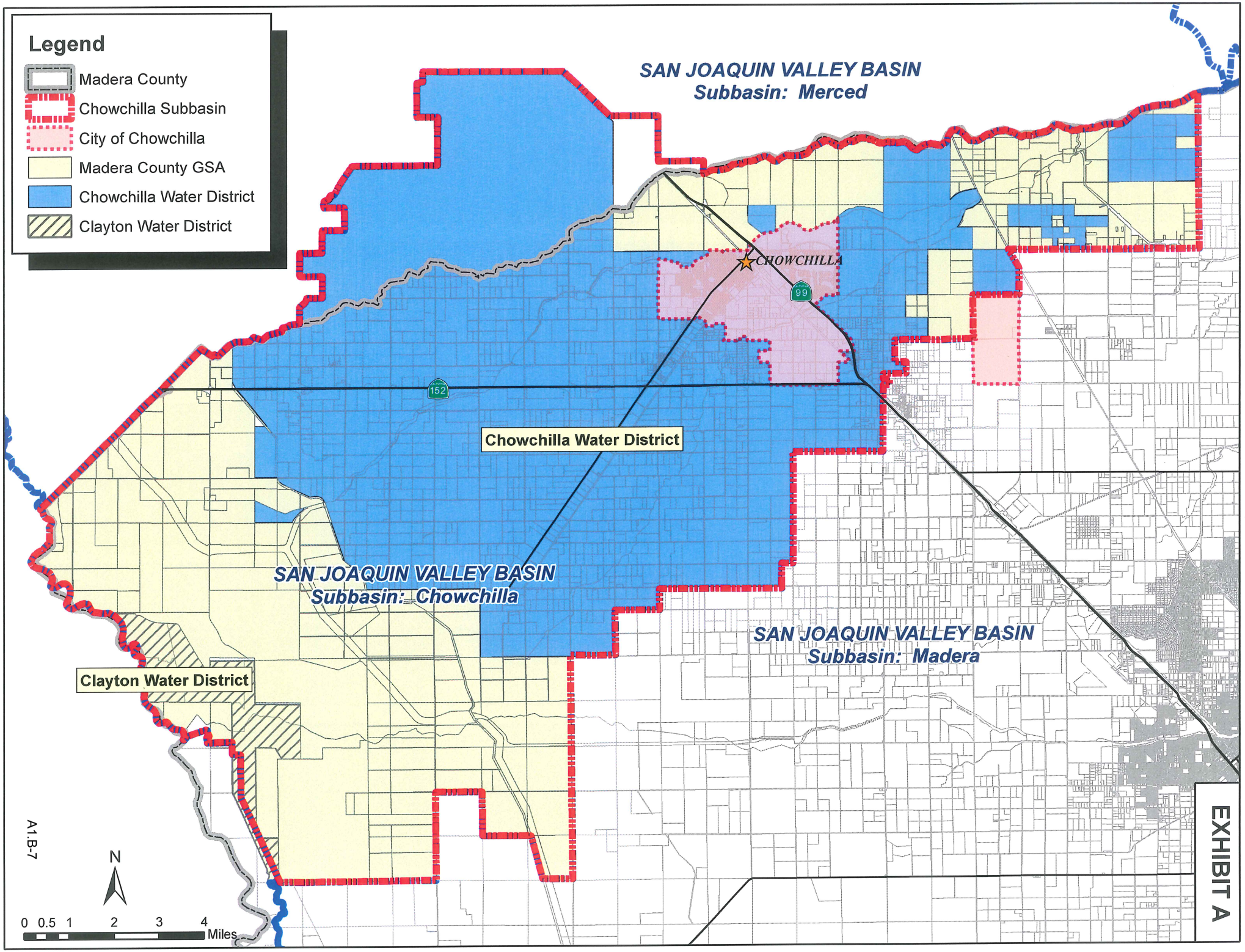
Clerk, Board of Supervisors

Approved as to Legal Form:
COUNTY COUNSEL

By Dale E. Bacigalupi

Digitally signed by: Dale E. Bacigalupi
DN: CN = Dale E. Bacigalupi email = dbacigalupi@lozanosmith.com C = US
Date: 2016.11.16 13:14:37 -08'00'


Legend
Madera County
Chowchilla Subbasin
City of Chowchilla
Madera County GSA
Chowchilla Water District
Clayton Water District
SAN JOAQUIN VALLEY BASIN
Subbasin: Merced
CHOWCHILLA
99
152
Chowchilla Water District
SAN JOAQUIN VALLEY BASIN
Subbasin: Chowchilla
SAN JOAQUIN VALLEY BASIN
Subbasin: Madera
Clayton Water District
N
0 0.5 1 2 3 4
Miles
EXHIBIT A
A1.B-6


Legend
Madera County
Chowchilla Subbasin
City of Chowchilla
Madera County GSA
Chowchilla Water District
Clayton Water District
SAN JOAQUIN VALLEY BASIN
Subbasin: Merced
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99
152
Chowchilla Water District
SAN JOAQUIN VALLEY BASIN
Subbasin: Chowchilla
SAN JOAQUIN VALLEY BASIN
Subbasin: Madera
Clayton Water District
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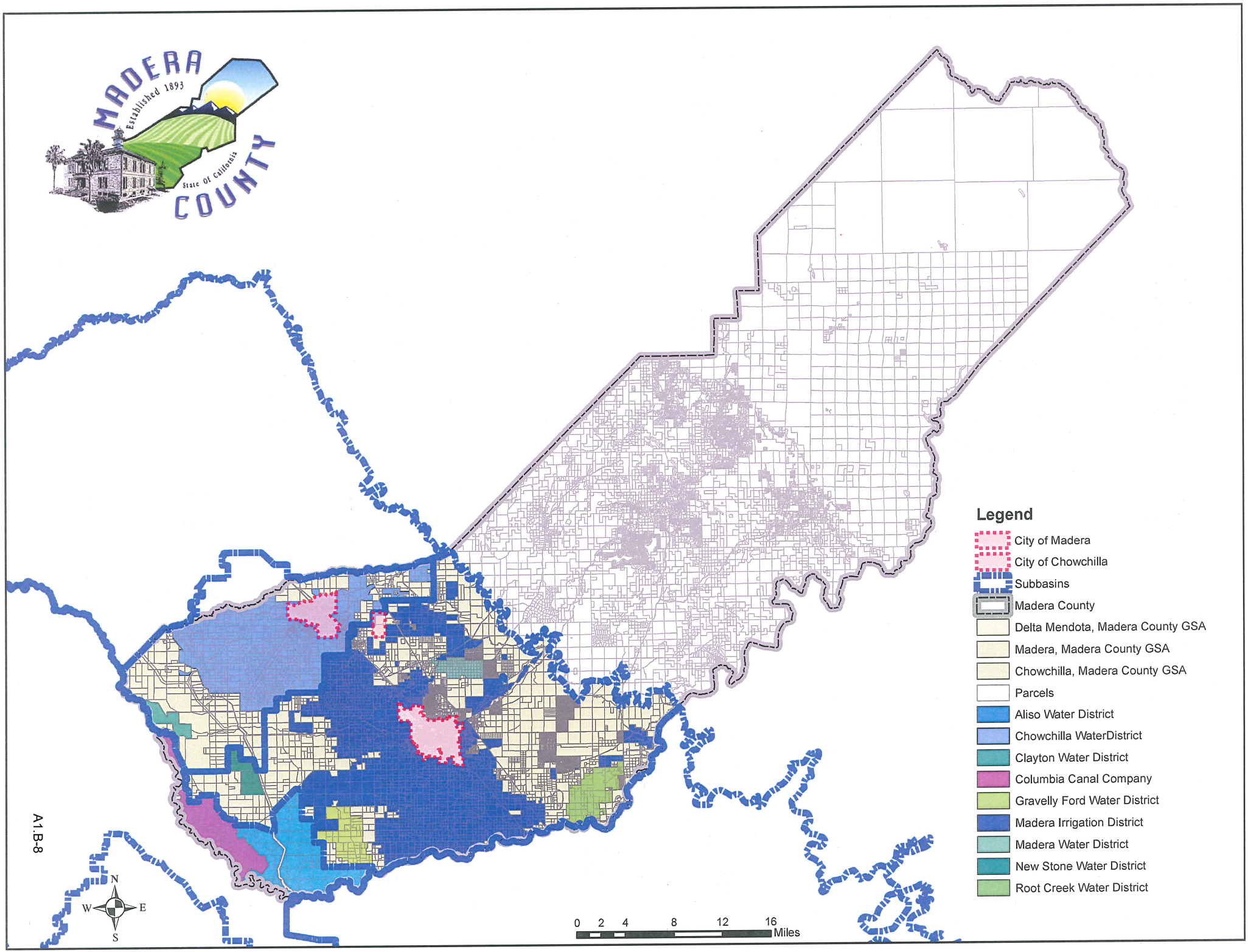
EXHIBIT A


MADERA COUNTY
Established 1893
State Of California
Legend
City of Madera
City of Chowchilla
Subbasins
Madera County
Delta Mendota, Madera County GSA
Madera, Madera County GSA
Chowchilla, Madera County GSA
Parcels
Aliso Water District
Chowchilla WaterDistrict
Clayton Water District
Columbia Canal Company
Gravelly Ford Water District
Madera Irrigation District
Madera Water District
New Stone Water District
Root Creek Water District
A1.B-8
N
W
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S
0 2 4 8 12 16
Miles

Exhibit B

Notice of Public Hearing

MERCED SUN-STAR | ENTERPRISE

CHOWCHILLA NEWS | Chronicle | Atwater Signal | Vida

AFFIDAVIT OF PUBLICATION

Account #	Ad Number	Identification	PO	Cols	Lines
337639	0002846803	HEARING CHOWCHILLA SUBBASIN ANNETTE KEPHART	ARING SUBBASIN ANNETTE KEI	1	40

Attention:

MADERA COUNTY PLANNING - LEGALS
200 W. 4TH STREET, SUITE 3100
MADERA, CA 93637

NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that on January 24, 2017 at their regular meeting in the Board of Supervisors' Chambers located at the Madera County Government Center, 200 West 4th Street, Madera, California, the Board of Supervisors will hold a public hearing to consider the following application:

10:00 A.M.: Hearing, pursuant to Water Code Section 10723, to determine whether the County will become a Groundwater Sustainability Agency for a portion of the Chowchilla Subbasin of the San Joaquin Valley Groundwater Basin. Written comments may be submitted to the County, Attn: Julia Berry, Department of Water and Natural Resources, 3rd floor of the County Administration Building, or via email: mcwater@madera-county.com, no later than 3:00 PM January 20, 2017. Members of the public will be allowed to make oral comments in addition to written comments submitted before making a decision. Oral comments will be limited to 3 minutes per individual.

Dated: December 28th, 2016

RHONDA CARGILL, Chief Clerk of the Board of Supervisors in and for the County of Madera, State of California.
CN- 2846803 12/28, 4

RECEIVED
JAN
MADERA COUNTY
PLANNING

Declaration of Publication
2015.5 C.C.P.

STATE OF CALIFORNIA)
) ss.
County of Madera)

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the Chowchilla News, a newspaper of general circulation, printed and published in the city of Chowchilla, County of Madera, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Madera, State of California, under the date of June 10, 1918 Case Number 1943 that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

December 28, 2016, January 04, 2017

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Chowchilla, California on:

Date: 4th, day of January, 2017

Pat Mandell

Signature

Ad Order Information

Ad Number	Ad Type	Production Method	Production Notes
0002846803-01	MER-Legal Liner	AdBooker	

External Ad Number	Ad Attributes	Ad Released	Pick Up
		No	

Ad Size	Color
1 X 40 li	

Product	Placement	Times Run	Schedule Cost
MER-Chowchilla News	0300 - Legals Classified	2	$117.60

Run Schedule Invoice Text	Position
HEARING CHOWCHILLA SUBBASIN ANNETTE KI	0301 - Legals & Public Notices

Run Dates
12/28/2016, 01/04/2017

NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that on January 24, 2017 at their regular meeting in the Board of Supervisors' Chambers located at the Madera County Government Center, 200 West 4th Street, Madera, California, the Board of Supervisors will hold a public hearing to consider the following application:

10:00 A.M., Hearing, pursuant to Water Code Section 10723, to determine whether the County will become a Groundwater Sustainability Agency for a portion of the Chowchilla Subbasin of the San Joaquin Valley Groundwater Basin. Written comments may be submitted to the County, Attn: Julia Berry, Department of Water and Natural Resources, 3rd floor of the County Administration Building, or via email: mcwater@madera-county.com, no later than 3:00 PM January 20, 2017. Members of the public will be allowed to make oral comments in addition to written comments submitted before making a decision. Oral comments will be limited to 3 minutes per individual.

Dated: December 28th, 2016

RHONDA CARGILL, Chief Clerk of the Board of Supervisors in and for the County of Madera, State of California.
CN- 2846803 12/28, 1

EXHIBIT C

LIST OF INTERESTED PARTIES

WATER AND NATURAL RESOURCES DEPARTMENT

JULIA D. BERRY
DIRECTOR

200 W. Fourth St.
Suite 3100
Madera, CA 93637
(559) 675-7821
FAX (559) 675-6573
mcwater@madera-county.com

January 27, 2017

Via Email & U.S. Mail

Mr. Mark Nordberg, GSA Project Manager
Senior Engineering Geologist
California Department of Water Resources
901 P Street, Room 213-B
P.O. Box 942836
Sacramento, CA 94236
Mark.Nordberg@water.ca.gov

Mr. Dane Mathis
Sup. Engineering Geologist
3374 East Shield Avenue
Fresno, CA 93726
Dane.Mathis@water.ca.gov

Mr. Mike McKenzie
Senior Engineering Geologist
3374 East Shields Avenue
Fresno, CA 93726
Charles.McKenzie@water.ca.gov

RE: *Notice of Madera County's Intent to Serve as Groundwater Sustainability Agency for a portion of the Chowchilla Subbasin*

To Whom it May Concern,

This letter constitutes notice to the Department of Water Resources (DWR) of the County of Madera's (County) intent to undertake sustainable groundwater management in the Chowchilla Subbasin (Basin) as a Groundwater Sustainability Agency (GSA) pursuant to the Sustainability Groundwater Management Act (SGMA). Madera County is a political subdivision of the State of California established under the state Constitution, and is eligible to serve as a GSA. This notice of intent is timely filed within 30 days of the date Madera County's Board of Supervisor's (Board) approved its January 24, 2017 resolution electing to serve as a GSA.

This notice also includes all information required to be submitted pursuant to Section 10723.8(a) of the Water Code. This notice encloses a map depicting the County's proposed GSA management area. (Water Code,§ 10723.8, subd. (a)(1).) The County's proposed management area is within the County's service area. It is not the intention of Madera County to overlap any neighboring agencies which have formed or are in the process of forming GSAs. Groundwater Sustainability Agencies in the Chowchilla Subbasin will include: (1) Chowchilla Water District/City of Chowchilla, (2) Merced County and the (3) County of Madera/Clayton Water District.

The County's resolution electing to form a GSA is also enclosed. Also, attached to the resolution is the "Proof of Publication" for public noticing. No new bylaws, ordinances, or other new authorities were adopted in connection with this resolution to serve as a GSA.

Pursuant to Section 10723.8(a)(4) of the Water Code, the following is a list of "interested parties developed pursuant to Water Code Section 10723.2 and an explanation of how their interests will be considered in the development and operation of the groundwater sustainability agency and the development and implementation of the sustainability plan."

Specifically, Section 10723.2 of the Water Code requires a GSA to "consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing GSPs," including the following interests:

(a) *Holders of overlying groundwater rights, including:*

(1) *Agricultural users.*

- The area to be managed by Madera County is comprised of many agricultural users of groundwater who rely on groundwater solely for irrigation purposes. The County will engage agricultural groundwater users in the process through public outreach, including the Madera County Water Association and the Madera County Farm Bureau.

(2) *Domestic Well owners.*

- The area includes domestic well users. The County intends to reach out and engage this portion of groundwater users.

(b) *Municipal well operators.*

- There are no municipal well operators.

(c) *Public water systems.*

- There are two (2) Public Water Systems and one Mutual Water Company in the Madera County Responsible Area, which will be considered and engaged in the process.

(d) *Local land use planning agencies.*

- Madera County is the local land use authority in the boundary to be managed by the Groundwater Sustainability Agency.

(e) *Environmental users of groundwater.*

- Not applicable.

(f) *Surface water users, if there is a hydrologic connection between surface and groundwater bodies.*

- There is no hydrologic connection between surface water and groundwater flows. The surface water features in and near the County's service area: the San Joaquin River, the Fresno River, and the Chowchilla Bypass.

(g) *The federal government, including, but not limited to, the military and managers of federal lands.*

- Not applicable.

(h) *California Native American Tribes.*

- Not applicable.

(i) *Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems.*

- Alview School is a Disadvantaged Community which will be engaged in this process.

(j) *Entities listed in Section 10927 that are monitoring.*

- The Madera-Chowchilla CASGEM Group currently covers the County service area, and Madera County participates in the reporting.

Interested parties will have several opportunities, both formally and informally, to provide input to Madera County throughout the process of developing, operating, and implementing the GSA including, but not limited to, comment during regularly scheduled County Board of Supervisor's hearings, and at other times to be determined and noticed pursuant to Water Code section 10727.8(a).

Should you have any further questions, feel free to contact me at (559) 675-7821.

Sincerely,

Julia D. Berry

Julia D. Berry
Director, Madera County
Water and Natural Resources Department

APPENDIX 1.C. MERCED COUNTY'S GROUNDWATER SUSTAINABILITY AGENCY FORMATION NOTICE

Prepared as part of the

Groundwater Sustainability Plan
Chowchilla Subbasin

January 2020

GSP Team:

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

MERCED COUNTY

COUNTY EXECUTIVE OFFICE

James L. Brown
County Executive Officer

2222 "M" Street
Merced, CA 95340
(209) 385-7637
(209) 385-7375 Fax
www.co.merced.ca.us

Equal Opportunity Employer

March 9, 2017

Via Email and U.S. Mail

Mr. Mark Nordberg, GSA Project Manager
Sustainable Groundwater Management Program
California Department of Water Resources
901 P Street, Room 213-B
P. O. Box 942836
Sacramento, CA 94236

Mr. Mike McKenzie, Senior Engineering Geologist
South Central Region
California Department of Water Resources
3374 East Shields Avenue
Fresno, CA 93726

RE: ***Notice of the County of Merced's intent to serve as Groundwater Sustainability Agency for a portion of the Chowchilla Groundwater Subbasin***

Dear Mr. Nordberg and Mr. McKenzie:

This letter constitutes notice to the Department of Water Resources (DWR), pursuant to Water Code sections 10723(d) and 10723.8, of the County of Merced's (Merced County) intent to undertake sustainable groundwater management of a portion of the Chowchilla Subbasin as a Groundwater Sustainability Agency (GSA) pursuant to the Sustainable Groundwater Management Act (SGMA). Merced County is a public agency with land use authority for the portion of the Chowchilla Subbasin located within the boundaries of the county. This notice of intent is timely filed within 30 days of the County of Merced Board of Supervisors approving a resolution electing to serve as a GSA. The resolution is attached hereto as Exhibit A and a map showing the proposed Merced County GSA management area, which includes all of the unmanaged, "white area" in the Chowchilla Subbasin within Merced County is attached to the resolution as an exhibit. No new bylaws, ordinances, or other new authorities were adopted in connection with this resolution to serve as a GSA.

The proposed Merced County GSA management area is approximately 1,300 acres, located fully within Merced County's portion of the Chowchilla Subbasin and outside the Chowchilla Water District's service area and GSA. The proposed GSAs in the Chowchilla Subbasin are: 1) the County of Madera, 2) Chowchilla Water District and 3) the County of Merced. There is no intentional overlap in the proposed management area of this GSA. The majority of the Merced County GSA service area will be within the Sierra Vista Mutual Water Company service area. Merced County will coordinate with the Sierra Vista Mutual Water Company on the groundwater management within the common area.

Merced County has been participating in coordination efforts with other local agencies and interests in the Chowchilla Subbasin and intends to enter into a memorandum of understanding or other form of agreement with these parties to coordinate preparation of a single Groundwater Sustainability Plan (GSP) for the Chowchilla Subbasin.

Merced County has met with the Sierra Vista Mutual Water Company regarding the intent to form a GSA and

has received support from the Sierra Vista Mutual Water Company. On February 21, 2017, Merced County held a public hearing to receive comment on the proposed GSA. Notice of this hearing was provided in compliance with Water Code Section 10723(b) and Government Code Section 6066, attached as Exhibit B.

Merced County is committed to an open and inclusive process to implement SGMA. As required by Water Code section 10723.8(a)(4), Exhibit C outlines a list of interested parties who will be included in the development of a GSP. In compliance with SGMA, the Merced County GSA will consider all beneficial uses and users of groundwater within the GSA's proposed service area.

If you have any questions regarding this notice, please contact Lacey Kiriakou, Water Resources Coordinator, at (209) 385-7654.

Sincerely,

James L. Brown
County Executive Officer

Enclosures

Exhibit A

County of Merced Resolution Electing to Form the Merced County Groundwater Sustainability Agency Within the Chowchilla Groundwater Subbasin and Map

BEFORE THE BOARD OF SUPERVISORS
OF THE COUNTY OF MERCED, STATE OF CALIFORNIA

In the Matter of

RESOLUTION ELECTING TO FORM THE MERCED COUNTY GROUNDWATER SUSTAINABILITY AGENCY WITHIN THE CHOWCHILLA GROUNDWATER SUBBASIN	))))	RESOLUTION NO. **2017-15**

WHEREAS, the Sustainable Groundwater Management Act (SGMA) was signed into law on September 16, 2014 and adopted as California Water Code, section 10720, et. seq.; and,

WHEREAS, the purpose of SGMA is to provide sustainable management of groundwater basins and enhance local management of groundwater through empowering local management agencies with authority, technical, and financial assistance necessary to sustainably manage groundwater; and,

WHEREAS, SGMA requires high and medium priority basins to be managed by one or more groundwater sustainability agencies (GSA) and such agency/agencies must be formed by June 30, 2017; and,

WHEREAS, Water Code section 10723(a) authorizes any local agency with water or land management authority overlying a basin to elect to be the GSA for that basin; and,

WHEREAS, Water Code section 10724(a) presumes that any area not within the management area of a GSA will be managed by the county, as the GSA for that area; and,

WHEREAS, Water Code section 10735.2(a) provides that the State Water Resources Control Board may designate the basin as probationary if any portion of the basin is not covered by a GSA before June 30, 2017; and,

WHEREAS, the County of Merced is located in the Chowchilla Subbasin as defined in the California Department of Water Resources Bulletin 118; and,

WHEREAS, the County of Merced is a local agency that is eligible to elect to become a GSA pursuant to SGMA; and,

WHEREAS, Water Code section 10723.2 requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and,

WHEREAS, the County of Merced is committed to working with regional partners to sustainably manage the groundwater resources; and,

WHEREAS, retaining local jurisdiction and control over groundwater management is beneficial to the health, safety, and water supply reliability of the County of Merced and its customers and constituents; and,

WHEREAS, the County of Merced wishes to exercise the powers and authorities of a GSA granted by SGMA; and,

WHEREAS, Water Code section 10723.8 requires a local public agency electing to be a GSA to notify the California Department of Water Resources of its election and intention to undertake sustainable groundwater management within a subbasin; and,

WHEREAS, Water Code section 10723(b) requires a public hearing be held before to the decision to become a GSA and the publication of notice pursuant to section 6066 of the Government Code; and,

WHEREAS, pursuant to Government Code section 6066, notices of a public hearing regarding whether to adopt a Resolution to elect to become a GSA were published in the Merced Sun Star; and,

WHEREAS, the County of Merced held a public hearing on February 21, 2017 to consider adoption of this Resolution; and,

WHEREAS, adoption of this Resolution does not constitute a project under the California Environmental Quality Act because it does not result in any direct or indirect physical change in the environment; and,

NOW THEREFORE, BE IT RESOLVED that the County of Merced hereby elects to become a GSA for those portions of the Chowchilla Subbasin shown in the map attached hereto as Exhibit A; and

BE IT FURTHER RESOLVED that the Merced County GSA hereby created shall establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements, and availability of draft plans, maps, and other relevant documents; and,

BE IT FURTHER RESOLVED that the County of Merced authorizes its staff to, within 30 days from the date of this Resolution, provide notification of this election to the California Department of Water Resources, including a copy of this Resolution and additional information required by Water Code section 10723.8, in the manner required by law.

I, JAMES L. BROWN, Clerk of the Board of Supervisors of the County of Merced, do hereby certify that the foregoing Resolution was regularly introduced, passed, and adopted by said Board at a regular meeting thereof held on this 21st day of February, 2017 by the following vote:

SUPERVISORS:

AYES: Daron McDaniel, Rodrigo Espinoza, Lee Lor, Lloyd Pareira, Jerry O'Banion

NOES: None

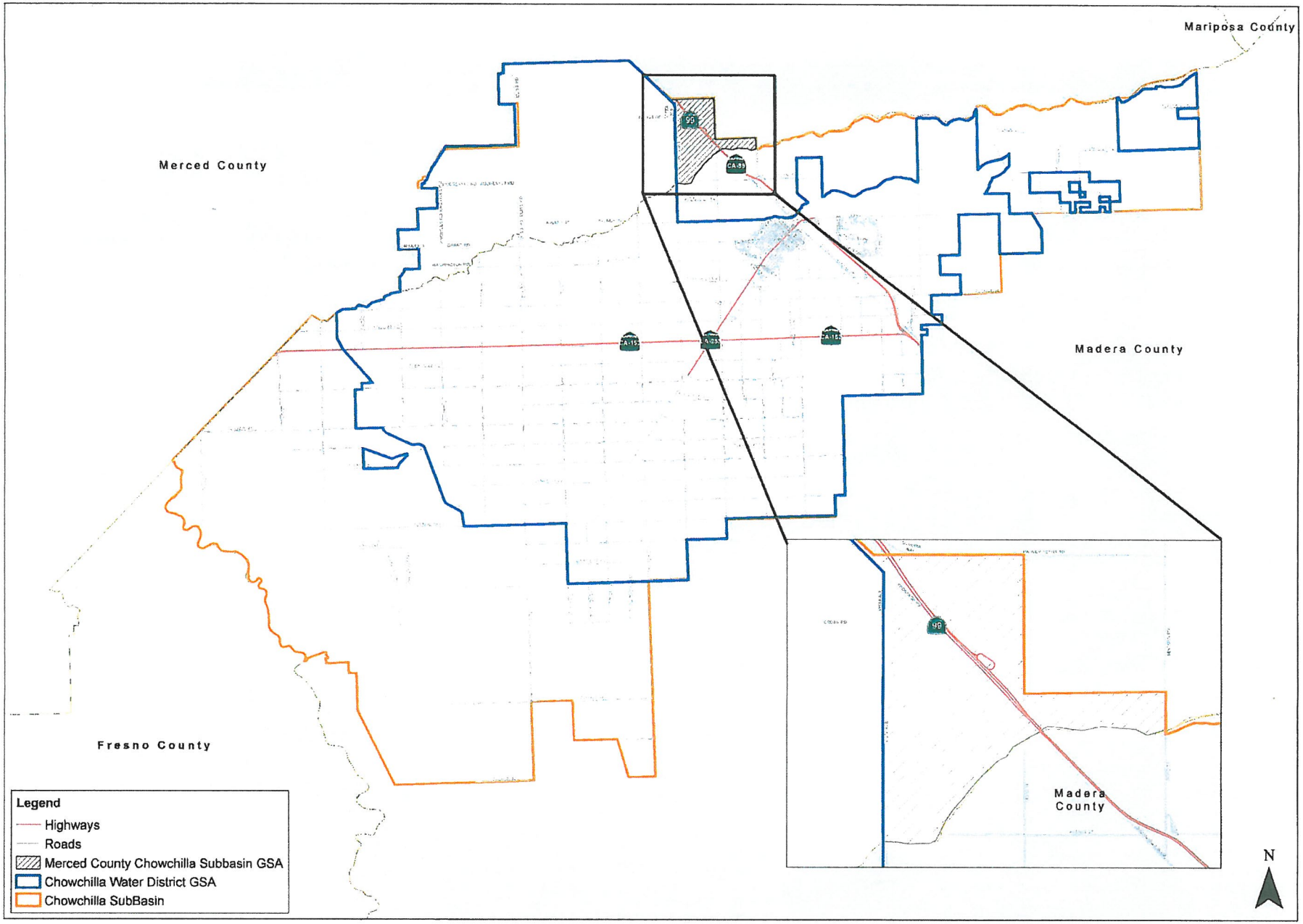
ABSENT: None

WITNESS my hand and the Seal of this Board this 21st day of February, 2017.

MERCED COUNTY 18 55

JAMES L. BROWN, CLERK

By: _____
Deputy



Merced County Chowchilla Subbasin GSA

Date: 1/9/2017

MERCED COUNTY

Exhibit A

A1.C-6

Exhibit B

Notice of Public Hearing

MERCED SUN-STAR | Los Banos Enterprise
Chowchilla News | Chronicle | Atwater Signal | Vida

AFFIDAVIT OF PUBLICATION

Account #	Ad Number	Identification	PO	Cols	Lines
337617	0002910477	HEARING GSA TERESA HALEY		1	32

Attention:

MERCED COUNTY PLANNING
2222 M STREET
MERCED, CA 95340

NOTICE OF PUBLIC HEARING

A Public Hearing will be held by the Board of Supervisors of the County of Merced, State of California, on Tuesday, February 21, 2017, at 10:00 a.m. in the Board Room, Third Floor, County Administration Building, 2222 "M" Street, Merced, California, to consider a resolution electing to form the Merced County Groundwater Sustainability Agency in the Chowchilla Groundwater Subbasin.

Pursuant to California Water Code section 10723(b), the County of Merced Board of Supervisors shall hold a public hearing to consider and determine whether the County of Merced shall file to form a Groundwater Sustainability Agency pursuant to the Sustainable Groundwater Management Act in a portion of the Chowchilla Subbasin.

All persons interested are invited to attend and will be given an opportunity to be heard. Community & Economic Development Department, By Mark J. Hendrickson, Director.
MER- 2910477 2/7, 14

Declaration of Publication
2015.5 C.C.P.

STATE OF CALIFORNIA)
) ss.
County of Merced)

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the Merced Sun-Star, a newspaper of general circulation, printed and published in the city of Merced, County of Merced, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Merced, State of California, under the date of July 14, 1964 Case Number 33224 that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

February 07, 2017, February 14, 2017

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Merced, California on:

Date: 14th, day of February, 2017

Signature

Exhibit C

List of Interested Parties

List of Interested Parties

Interested parties within Merced County's proposed GSA management area in the Chowchilla Subbasin, as determined pursuant to Water Code section 10723.2, include:

(a) Holders of overlying groundwater rights, including:

(1) Agricultural users.

The Merced County proposed GSA management area is composed almost entirely of agricultural users.

(2) Domestic Well owners.

There are no known domestic wells within the proposed GSA management area.

(b) Municipal well operators.

There are no municipal well operators within the proposed GSA management area.

(c) Public water systems.

There are no public water systems within the proposed GSA management area.

(d) Local land use planning agencies.

The County of Merced is the only local land use planning agency within the proposed GSA management area

(e) Environmental users of groundwater

There are no known environmental users within the proposed GSA management area.

(f) Surface water users, if there is a hydrologic connection between surface and groundwater bodies.

The Sierra Vista Mutual Water Company holds prescriptive water rights on the Chowchilla River, which are administered by Chowchilla Water District.

(g) The federal government, including but not limited to, the military and managers of federal lands.

The Federal government does not manage any area within the proposed GSA management area.

(h) California Native American Tribes.

There are no California Native American tribes, reservations or lands held in trust within the proposed GSA management area.

(i) Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems.

There is a disadvantaged community, Le Grand, near, but not within the proposed GSA management area.

(j) Entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the GSA.

The Merced Area Groundwater Pool Interests and the Madera-Chowchilla CASGEM Group both monitor and report groundwater elevation in all or part of the Chowchilla Subbasin.

The interests of the interested parties identified above will be considered in the development and operation of the GSA and the development and implementation of the GSP. Merced County is committed to an open and inclusive process to implement SGMA. Interested parties will have opportunities, both formal and informal, to provide input to the County throughout the process of developing , operating, and implementing the GSA and GSP. Such opportunities may include, but are not limited to, public workshops and comment periods required by SGMA (e.g. Water Code section 10728.4); opportunities for public comment during the County's regular Board of Supervisor meetings; and at other times to be determined and noticed pursuant to Water Code section 10727.8(a).

APPENDIX 1.D. TRIANGLE T WATER DISTRICT'S GROUNDWATER SUSTAINABILITY AGENCY FORMATION NOTICE

Prepared as part of the

Groundwater Sustainability Plan
Chowchilla Subbasin

January 2020

GSP Team:

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

Exhibit A
Resolution

TRIANGLE T WATER DISTRICT
RESOLUTION NO. 17-7

RESOLUTION OF THE TRIANGLE T WATER DISTRICT DECLARING ITS INTENTION TO BECOME A GROUNDWATER SUSTAINABILITY AGENCY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT FOR THE CHOWCHILLA SUBBASIN

WHEREAS, on September 16, 2014, Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act (SGMA); and

WHEREAS, SGMA went into effect on January 1, 2015; and

WHEREAS, SGMA requires all high and medium priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA); and

WHEREAS, the Central Valley Groundwater Basin (Basin) has been designated by DWR as a high priority basin; and

WHEREAS, SGMA authorizes any local agency overlying the Basin to elect to become a GSA within the Basin; and

WHEREAS, the Triangle T Water District (District) is a local agency as defined under the SGMA and is therefore eligible to serve as a GSA within the Basin; and

WHEREAS, Section 10723.2 of the SGMA requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and

WHEREAS, Section 10723.8 of the SGMA requires that a local agency electing to be a GSA to notify the DWR of its election and intention to undertake sustainable groundwater management within a basin; and

WHEREAS, the District held a public hearing on August 26, 2017 after publication of notice pursuant to Government Code section 6066 to consider the adoption of this Resolution; and

WHEREAS, the District wishes to exercise the powers and authorities of a GSA granted by the SGMA;

NOW, THEREFORE, BE IT RESOLVED that the Triangle T Water District hereby elects to become a groundwater sustainability agency for that portion of the Chowchilla Subbasin lying within its boundaries; and

BE IT FURTHER RESOLVED that the District will develop an outreach program to include all stakeholders to ensure that all beneficial uses and users of groundwater are considered; and

BE IT FURTHER RESOLVED that the Board Members of the Triangle T Water District are authorized to submit to the DWR on behalf of the District a notice of intent to undertake sustainable groundwater management in accordance with the SGMA (Part 2.74 of the Water Code); and

BE IT FURTHER RESOLVED that such notification shall include the boundaries of the Chowchilla Subbasin that the District intends to manage, which shall include the lands within the District boundaries, a copy of this resolution, a list of interested parties developed pursuant to Section 10723.2 of the SGMA, and an explanation of how their interests will be considered in the development and operation of the GSA and the development and implementation of the GSA's groundwater sustainability plan.

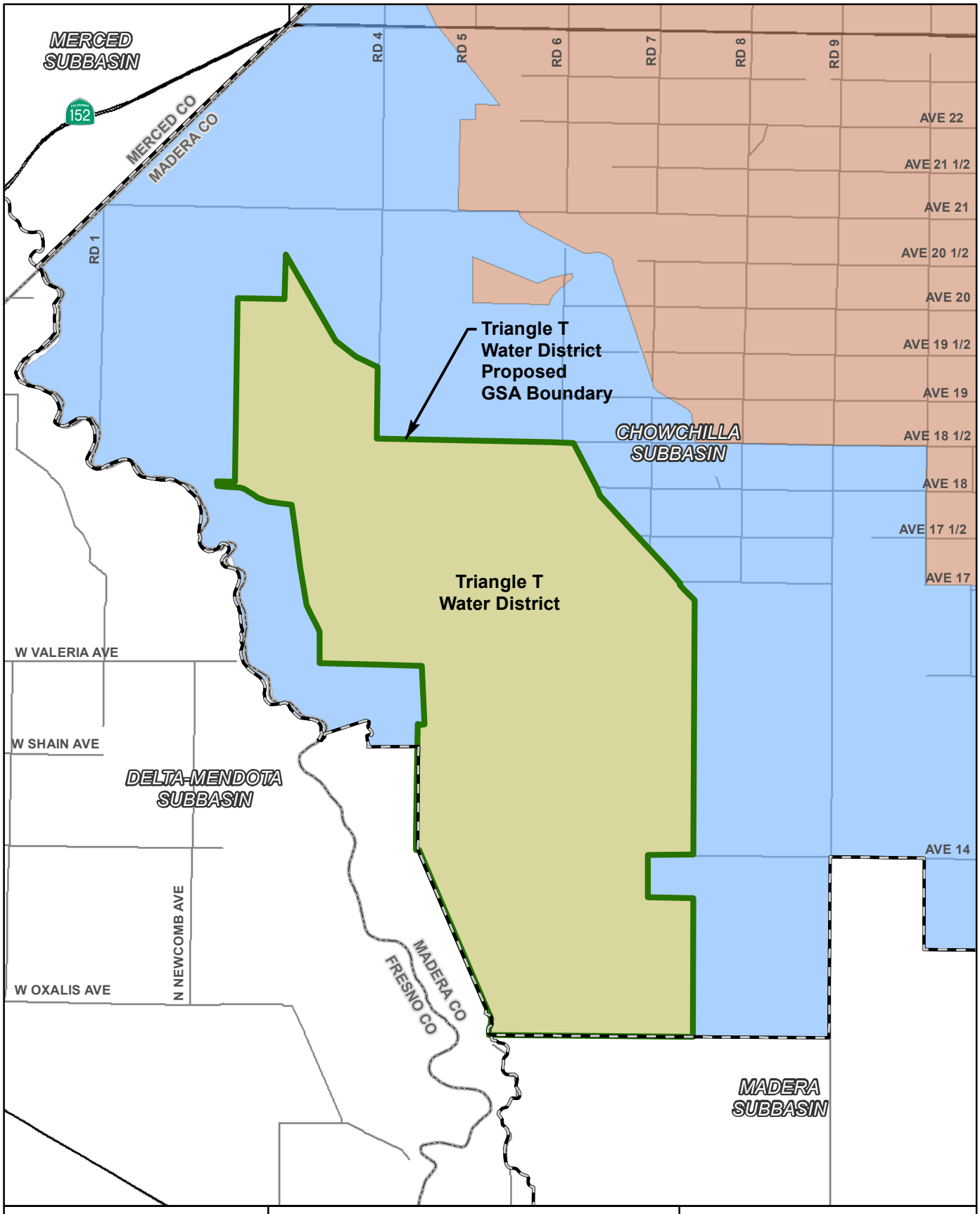
On motion by Lucas Avila and seconded by Dirk Vlot the forgoing resolution was passed and adopted on October 26, 2017 by the following vote.

AYES – 3
NOES – 0
ABSTAINS – 0
ABSENT – 2

By: _____
President

ATTEST:

By: _____
Secretary



EST. 1968
PROVOST& PRITCHARD
CONSULTING GROUP
An Employee Owned Company

N

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Miles

- Triangle T Water District and Proposed GSA
- ChowchillaWD_GSA
- County of Madera GSA
- B118 DWR Groundwater Subbasin Boundary
- County Boundary

Exhibit A

Triangle T Water District

GSA Boundary Map

10/13/2017 : G:\Hancock Farmland Services - 2517\251716002-Triangle T WD GM and GSA\GIS\Map\GSA Boundary Map -Tri-T WD.mxd

Exhibit B

Notice of Public Hearing

MERCED SUN-STAR | ENTERPRISE

CHOWCHILLA NEWS | Chronicle | Atwater Signal | Vida

AFFIDAVIT OF PUBLICATION

Account #	Ad Number	Identification	PO	Cols	Lines
624948	0003322569	HEARING TRIANGLE T LAURIE SALES	EARING TRIANGLE T LAURIE S/	1	26

Attention:

PROVOST & PRITCHARD CONSULTING GROUP
2505 ALLUVIAL AVE
CLOVIS, CA 93611

NOTICE OF PUBLIC HEARING
NOTICE IS HEREBY GIVEN that the Board of Directors of the Triangle T Water District will hold a public hearing during a Special Meeting on October 26, at 3 PM at the Triangle T Ranch office, 4400 Hayes Drive, Chowchilla, California 93610.
The purpose of this Public Hearing is to accept public testimony regarding the proposal that the Triangle T Water District act as the Groundwater Sustainability Agency under Water Code Section 10723 for the portion of the Chowchilla Groundwater Sub-basin within the Triangle T Water District, prior to the board adopting a resolution.
The hearing is open to the public and any person present will have the opportunity to be heard. For further information regarding this matter, please contact Brad Samuelson, at (209) 658-8487.
CN- 3322569 10/11, 18

Declaration of Publication
2015.5 C.C.P.

STATE OF CALIFORNIA)
) ss.
County of Madera)

I am a citizen of the United States; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the Chowchilla News, a newspaper of general circulation, printed and published in the city of Chowchilla, County of Madera, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Madera, State of California, under the date of June 10, 1918 Case Number 1943 that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

October 11, 2017, October 18, 2017

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Chowchilla, California on:

Date: 18th, day of October, 2017

Cynthia A. McNamara

Signature

Proof of Publication

(2015.5 C.C.P.)

NOTICE OF HEARING

PROVOST & PRITCHARD CONSULTING

TRIANGLE T WATER DISTRICT

STATE OF CALIFORNIA)

) ss.

County of Madera)

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the Madera Tribune, a newspaper of general circulation, published in the City of Madera, County of Madera, and which newspaper has been adjudged a newspaper of General circulation by the Superior Court of the County of Madera, State of California, under the date of November 9, 1966, Case Number 4875 that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that the Board of Directors of the Triangle T Water District will hold a public hearing during a Special Meeting on October 26, at 3 PM at the Triangle T Ranch office, 4400 Hayes Drive, Chowchilla, California 93610.
The purpose of this Public Hearing is to accept public testimony regarding the proposal that the Triangle T Water District act as the Groundwater Sustainability Agency under Water Code Section 10723 for the portion of the Chowchilla Groundwater Sub-basin within the Triangle T Water District, prior to the board adopting a resolution.
The hearing is open to the public and any person present will have the opportunity to be heard. For further information regarding this matter, please contact Brad Samuelson, at (209) 658-8487.
No.1063 - October 11, 18, 2017

OCTOBER 11, 18, 2017

I certify or declare under penalty of perjury that the foregoing is true and correct.

Signature

Date: OCTOBER 18, 2017

Exhibit C

List of Interested Parties

Triangle T Water District GSA
List of Interested Parties

As required by Water Code section 10723.8(a)(4), the Triangle T Water District developed a list of interested parties, and this list will continue to be amended as necessary during the Groundwater Sustainability Plan ("GSP") development process. As required by the Sustainability Groundwater Management Act ("SGMA"), the District will consider all beneficial uses and users of groundwater within the Subbasin, as well as those responsible for developing GSPs. The District will solicit feedback and participate in discussions with interested parties during GSP development. These interests include, but are not limited to the following:

- *Holders of overlying groundwater rights, including*:
  - *Agriculture users*.

  The District's Board of Directors is comprised of five members, each representing the agricultural water users within the district. Therefore, agricultural users are exclusively represented on the District's governing board.

  - *Domestic well owners*.

  There are domestic wells within the GSA, however, based on the understanding of groundwater conditions that currently exist, or are likely to exist in the foreseeable future, the GSA anticipates that the plan will exclude domestic wells.

- *Municipal well operators*.
  The City of Chowchilla and others operate municipal wells within the Subbasin, but not within the District's service area. The District has been meeting regularly with municipal well operations within the Subbasin to discuss implementation SGMA, and will continue to do so.

- *Public water systems*.
  The District has identified public water systems operated by Madera County, Alview-Dairyland School District and the City of Chowchilla within the Subbasin. The District will continue to work with these agencies and others identified at a later date throughout the SGMA implementation process.

- *Local land use planning agencies*.
  Again, the District has been meeting regularly with the City of Chowchilla and Merced and Madera County to discuss implementation SGMA, and will continue to do so.

- *Environmental users of groundwater*.
  The District is working to identify agencies advocating for environmental uses within the Basin and will work with those entities in developing the GSA.

- *Surface water users, if there is a hydrologic connection between surface and groundwater flows*.

The District has a working relationship with numerous surface water users, including the Chowchilla Water District and private riparian and appropriative water right holds, within the basin through its participation in the Chowchilla Subbasin GSA group.

- *The federal government, including, but not limited to, the military and managers of federal lands.* N/A

- *California Native American tribes.* N/A

- *Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems.*
  The District and Subbasin working group has identified disadvantaged communities within the basin from DWR's web page, and will cooperate with Madera and Merced Counties to work with any disadvantaged communities within the Subbasin relying on groundwater supplies.

- *Entities listed in Water Code section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the GSA.*
- Again, the District has been meeting regularly with the Chowchilla Water District, City of Chowchilla and Madera and Merced Counties to discuss implementation SGMA, and will continue to do so.

The District intends to work cooperatively with other agencies, water providers, and other interested stakeholders within Merced and Madera Counties, and the State of California, regarding the sustainable management of groundwater within the Subbasins. The District intends to use its existing Board of Directors for governance purposes.

APPENDIX 1.E. GSP ADOPTION RESOLUTIONS, MEETING MINUTES AND NOTICES.

Prepared as part of the

Groundwater Sustainability Plan
Chowchilla Subbasin

January 2020

GSP Team:

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

CHOWCHILLA WATER DISTRICT
GROUNDWATER SUSTAINABILITY AGENCY

RESOLUTION NO. GSA 2019 – 02

ADOPTION OF THE CHOWCHILLA SUBBASIN GROUNDWATER SUSTAINABILITY PLAN FOR THE CHOWCHILLA WATER DISTRICT GROUNDWATER SUSTAINABILITY AGENCY

WHEREAS, the California Legislature passed a statewide framework for sustainable groundwater management, known as the Sustainable Groundwater Management Act (California Water Code § 10720 *et seq.*), pursuant to Senate Bill 1168, Senate Bill 1319, and Assembly Bill 1739, which was approved by the Governor and Chaptered by the Secretary of State on September 16, 2014; and,

WHEREAS, the Sustainable Groundwater Management Act (SGMA) went into effect on January 1, 2015; and,

WHEREAS, SGMA requires all high- priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or multiple GSAs; and,

WHEREAS, the Chowchilla Groundwater Sub-basin has been designated by DWR as a high-priority basin and in critical groundwater overdraft (DWR Bulletin 118 Groundwater Basin: 5-022.05); and,

WHEREAS, the District elected on December 14, 2016, to become a GSA for certain portions of the Chowchilla Groundwater Sub-basin; and,

WHEREAS, pursuant to Water Code section 10727 SGMA requires that a Groundwater Sustainability Plan (GSP) or multiple GSPs be developed and implemented by January 31, 2020 for each high-priority basin; and,

WHEREAS, Chowchilla Water District GSA, Madera County Chowchilla GSA, Triangle T Water District GSA and Merced County Chowchilla GSA have collaboratively prepared a single GSP for the Chowchilla Subbasin in accordance with Water Code section 10727.2 to include all the components required by SGMA; and,

WHEREAS, the four GSAs in the Chowchilla Subbasin have entered into a memorandum of understanding for cost sharing and GSP development through a GSP Advisory Committee; and,

WHEREAS, Chowchilla Water District GSA, on behalf of all the GSAs in the Chowchilla Subbasin, gave notice on August 15, 2019, pursuant to Water Code section 10728.4 to affected cities and counties regarding the intent of the GSAs to each adopt the GSP; and

WHEREAS, Chowchilla Water District GSA published a notice on November 27, 2019 and December 4, 2019 in the Chowchilla News and the Merced Sun Star, newspapers of general circulation, published and circulated in Merced and Mariposa Counties and Chowchilla in northern Madera County, giving notice that a public hearing (Hearing) would be held on December 11, 2019 for the purpose of considering adoption of a GSP for its portion of the Chowchilla Groundwater Sub-basin; and,

WHEREAS, upon adoption of a GSP, Water Code section 10733.4 requires that GSP to be submitted to DWR for review.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of Chowchilla Water District GSA as follows:

1. The foregoing is true and correct.

2. The GSP in the form presented at the Hearing is hereby approved and adopted.

3. The General Manager is authorized and directed to timely provide notification of this approval and adoption to DWR, including a copy of this Resolution, the approved GSP, and any additional information required by law.

PASSED AND ADOPTED by the Board of Directors of the Chowchilla Water District GSA, this 11th day of December, 2019 by the following vote:

AYES: Upton, Taylor, Harris, ~~Maddalena~~, Mandala

NOES:

ABSENT: Maddalena

ABSTAIN:

Kole Upton, President

CERTIFICATE OF SECRETARY

The undersigned, Secretary of the Chowchilla Water District, hereby certifies that the foregoing Resolution was adopted by the Board of Directors of said District at a meeting thereof, duly and specially held on December 11th 2019 at which meeting a quorum of the Board of Directors was at all times present and acting.

IN WITNESS WHEREOF, I have set my hand this 11th day of December, 2019.

Brandon Tomlinson, Secretary

(DISTRICT SEAL)

MERCED SUN-STAR www.mercedsunstar.com
LOS BANOS ENTERPRISE www.losbanosenterprise.com
CHOWCHILLA NEWS www.chowchillanews.com
Livingston Chronicle
Atwater Signal
Vida en el valle

Order Confirmation

Customer
CHOWCHILLA WATER DISTRICT - LEGALS

Customer Account
336260

Customer Address
PO BOX 905
CHOWCHILLA CA 93610 USA

Customer Phone
559-665-3747

Customer Fax

Sales Rep
lcordero@mcclatchy.com

Payor Customer
CHOWCHILLA WATER DISTRICT - LEGALS

Payor Account
336260

Payor Address
PO BOX 905
CHOWCHILLA CA 93610 USA

Payor Phone
559-665-3747

Customer EMail

Order Taker
lcordero@mcclatchy.com

PO Number	Payment Method	Blind Box	Tear Sheets	Proofs	Affidavits
Notice of Hearing	Invoice		0	0	1

Net Amount	Tax Amount	Total Amount	Payment Amount	Amount Due
$171.12	$0.00	$171.12	$0.00	$171.12

Ad Order Number
0004445384

Order Source

Ordered By
Lela Beatty

Special Pricing

Invoice Text
Notice of Hearing

Promo Type

Package Buy

Materials

Ad Order Information

Ad Number	Ad Type	Production Method	Production Notes
0004445384-01	MER-Legal Liner	AdBooker	

External Ad Number	Ad Attributes	Ad Released	Pick Up
		No	

Ad Size	Color
1 X 48 li	

Product	Placement	Times Run	Schedule Cost
MER-Chowchilla News	0300 - Legals Classified	2	$141.12

Run Schedule Invoice Text
PUBLIC NOTICE NOTICE OF PUBLIC HEARING F

Position
0301 - Legals & Public Notices

Run Dates
11/27/2019, 12/04/2019

Product	Placement	Times Run	Schedule Cost
MER-upsell.mercedsunstar.com	0300 - Legals Classified	2	$30.00

Run Schedule Invoice Text
PUBLIC NOTICE NOTICE OF PUBLIC HEARING F

Position
0301 - Legals & Public Notices

Run Dates
11/27/2019, 12/04/2019

PUBLIC NOTICE

NOTICE OF PUBLIC HEARING FOR ADOPTION OF THE GROUNDWATER SUSTAINABILITY PLAN FOR THE CHOWCHILLA WATER DISTRICT GROUNDWATER SUSTAINABILITY AGENCY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

Pursuant to California Water Code Section 10728.4, the Chowchilla Water District Groundwater Sustainability Agency Board of Directors shall hold a public hearing to consider adoption of a Groundwater Sustainability Plan (GSP) for its portion of the Chowchilla Subbasin (DWR Bulletin 118 Groundwater Basin: 5-022.05). This GSP was prepared in response to passage of the Sustainable Groundwater Management Act of 2014 and applies to the Chowchilla Subbasin bounded in the south and east by the Madera Subbasin, in the west by the San Joaquin River and the Delta-Mendota Subbasin, and in the north by the Merced Subbasin. The public, agencies and other interested parties are invited to attend the December 11, 2019, 1:30 p.m. public hearing at Chowchilla Water District, 327 S. Chowchilla Blvd., Chowchilla, CA and provide written and verbal comments. Comments received during the public hearing will be considered by the Board of Directors for its determination to adopt the proposed GSP. For additional details and to download a copy of the final Groundwater Sustainability Plan, visit cwdwater.com. For more information, contact Douglas Welch, 559-665-3747, dwelch@cwdwater.com.

BEFORE THE BOARD OF SUPERVISORS
OF THE COUNTY OF MERCED, STATE OF CALIFORNIA, SITTING AS THE GOVERNING BOARD FOR THE COUNTY OF MERCED CHOWCHILLA GROUNDWATER SUSTAINABILITY AGENCY

In the Matter of

RESOLUTION AUTHORIZING THE ADOPTION OF THE CHOWCHILLA GROUNDWATER SUSTAINABILITY PLAN BY THE COUNTY OF MERCED CHOWCHILLA GROUNDWATER SUSTAINABILITY AGENCY	)	RESOLUTION NO. **2019-120**

WHEREAS, the California Legislature passed a statewide framework for sustainable groundwater management, known as the Sustainable Groundwater Management Act (California Water Code § 10720 et seq.), pursuant to Senate Bill 1168, Senate Bill 1319, and Assembly Bill 1739, which was approved by the Governor and Chaptered by the Secretary of State on September 16, 2014; and,

WHEREAS, the Sustainable Groundwater Management Act (SGMA) went into effect on January 1, 2015; and,

WHEREAS, SGMA requires all high- priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or multiple GSAs; and,

WHEREAS, the Chowchilla Groundwater Subbasin has been designated by DWR as a high-priority basin and in critical groundwater overdraft (DWR Bulletin 118 Groundwater Basin: 5-022.05); and,

WHEREAS, the County of Merced elected on February 21, 2017, to become the County of Merced GSA – Chowchilla (also referred to as the County of Merced Chowchilla GSA) for certain portions of the Chowchilla Groundwater Subbasin; and,

WHEREAS, pursuant to Water Code section 10727 SGMA requires that a Groundwater Sustainability Plan (GSP) or multiple GSPs be developed and implemented by January 31, 2020 for each high-priority basin; and,

WHEREAS, Chowchilla Water District GSA, Madera County Chowchilla GSA, Triangle T Water District GSA and County of Merced Chowchilla GSA have collaboratively prepared a single GSP for the Chowchilla Subbasin in accordance with Water Code section 10727.2 to include all the components required by SGMA; and,

WHEREAS, the Chowchilla Water District General Resources Manager is the Plan Manager for the Chowchilla GSP; and,

WHEREAS, the four GSAs in the Chowchilla Subbasin have entered into a memorandum of understanding for cost sharing and GSP development through a GSP Advisory Committee; and,

WHEREAS, Chowchilla Water District GSA, on behalf of all the GSAs in the Chowchilla Subbasin, gave notice on August 15, 2019, pursuant to Water Code section 10728.4 to affected cities and counties regarding the intent of the GSAs to each adopt the GSP; and

WHEREAS, the County of Merced Chowchilla GSA published a notice on November 26, 2019 and December 3, 2019 in the Merced Sun Star, a newspaper of general circulation, published and circulated in Merced and Mariposa Counties, giving notice that a public hearing would be held on December 10, 2019 for the purpose of considering adoption of a GSP for its portion of the Chowchilla Groundwater Subbasin; and,

WHEREAS, upon adoption of a GSP, Water Code section 10733.4 requires that GSP to be submitted to DWR for review.

NOW, THEREFORE, BE IT RESOLVED the Governing Board of the County of Merced Chowchilla GSA hereby approves and adopts the Chowchilla Subbasin GSP for the portions of the County of Merced Chowchilla GSA within the Plan Area; and

BE IT FURTHER RESOLVED, that the Governing Board authorizes the Plan Manager to take such other actions as may be reasonably necessary to file the Chowchilla GSP with DWR by January 31, 2020, and implement the purpose of this Resolution.

I, JAMES L. BROWN, Clerk of the Board of Supervisors of the County of Merced, do hereby certify that the foregoing Resolution was regularly introduced, passed, and adopted by said Board at a regular meeting thereof held on this 10th day of December, 2019 by the following vote:

SUPERVISORS:

AYES: Lloyd Pareira, Rodrigo Espinoza, Lee Lor, Scott Silveira

NOES: None

ABSENT: Daron McDaniel

WITNESS my hand and the Seal of this Board this 10 day of December, 2019.

JAMES L. BROWN, CLERK

By: Angie Ruiz
Deputy

TRIANGLE T WATER DISTRICT GROUNDWATER SUSTAINABLITY AGENCY
MINUTES OF THE REGULAR SCHEDULED MEETING
BOARD OF DIRECTORS
December 12, 2019

Those present at the meeting included

Directors:	Lucas Avila	HNRG
	Dirk Vlot	Vlot Family Farms
	Molly Thurman	HNRG
Others:	Sarah Woolf	Water Wise
	Chase Hurley	WLS
	Brad Samuelson	WLS
	Bill Littleton	Fairmead Farms
	Jeannie Habben	Madera County
	Clay Haynes	Haynes Farms
	Phil Janzen	Agriland Farming
	Jose Ochoa	HNRG
	Michael Peters	Kaweah Pump
	George Park	Lone Tree MWC
	Carl Evers Jr.	HNRG
	Mark Hutson	

Roll Call: President Avila called the meeting to order at 10:00 AM and asked for self-introductions.

Public Comment: Mark Hutson commented that the Regional Conservation District (RCD) is looking for projects to work on with area landowners.

Minutes
A motion to pass the Minutes of November 14, 2019 was made by Director Dirk Vlot and seconded by Director Lucas Avila. The motion passed unanimously.

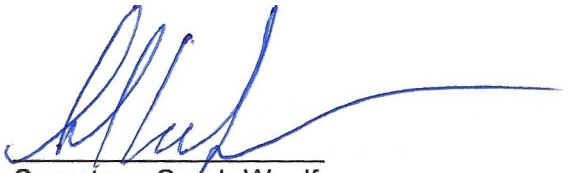
Public Hearing for Chowchilla Subbasin GSP
The public hearing was opened for discussion of the Draft Chowchilla Subbasin GSP. Brad Samuelson provided opportunity for individuals to ask question on the Draft GSP. A discussion occurred regarding the goals of moving forward after the GSP is submitted to DWR. Further focus on the need for reduced pumping below the Corcoran clay layer in the Chowchilla Subbasin Red Top Management Area is needed. TTWDGSA will continue to work in partnership with the county on reducing the pumping. The public hearing was closed.

Director Molly Thurman moved to approve the Chowchilla Subbasin GSP. The motioned was seconded by Director Dirk Vlot and approved unanimously.

Other Business

Adjournment
Meeting was adjourned at 10:30 AM.

_____
Secretary: Sarah Woolf



Secretary: Sarah Woolf

BEFORE
THE BOARD OF DIRECTORS
FOR THE COUNTY OF MADERA
GROUNDWATER SUSTAINABILITY AGENCY
CHOWCHILLA SUBBASIN

In the Matter of	)	Resolution No.: 2019 - 183
	)	
THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT	)	RESOLUTION ADOPTING GROUNDWATER SUSTAINABILITY PLAN
	)	
Chowchilla Subbasin	)	
	)	
	)	

WHEREAS, the Sustainable Groundwater Management Act of 2014, Water Code sections 10720-10737.8 ("SGMA") was signed into law on September 16, 2014; and

WHEREAS, SGMA requires that each groundwater basin be managed by a Groundwater Sustainability Agency ("GSA"), or multiple GSAs, and that such management be pursuant to an approved Groundwater Sustainability Plan ("GSP"), or multiple GSPs; and

WHEREAS, on January 24, 2017, the Board of Supervisors for the County of Madera ("Board") elected to have the County of Madera become the exclusive GSA for the portions of the Chowchilla Subbasin that are in unincorporated areas of Madera County, and not otherwise covered by another public agency; and

WHEREAS, on or about May 13, 2017, the County of Madera became the exclusive GSA for the relevant portions of the Chowchilla Subbasin (hereinafter "Madera County Chowchilla GSA"); and

WHEREAS, pursuant to Water Code section 10727, SGMA requires that a Groundwater Sustainability Plan ("GSP"), or multiple GSPs, be developed and implemented by January 31, 2020 for each high-priority basin; and,

WHEREAS, the Madera County GSA, the Chowchilla Water District GSA, the Triangle T Water District GSA, and Merced County Chowchilla GSA have collaboratively prepared a single GSP for the Chowchilla Subbasin in accordance with Water Code section 10727.2 to include all the components required by SGMA; and

WHEREAS, the aforementioned GSAs in the Chowchilla Subbasin have entered into a memorandum of understanding for cost sharing and GSP development through a GSP Advisory Committee; and,

WHEREAS, the Chowchilla Water District GSA, on behalf of all the GSAs in the Chowchilla Subbasin, gave notice on August 15, 2019, pursuant to Water Code section 10728.4, to affected cities and counties regarding the intent of the GSAs to each to adopt the GSP; and

WHEREAS, the Madera County Chowchilla GSA published a notice on December 4, 2019 and December 11, 2019 in the Madera Tribune, a newspaper of general circulation in Madera County and the Chowchilla Subbasin, giving notice that a public hearing (Hearing) would be held on December 17, 2019 for the purpose of considering adoption of a GSP for its portion of the Chowchilla Groundwater Subbasin; and,

WHEREAS, upon adoption of a GSP, Water Code section 10733.4 requires that the GSP be submitted to DWR for review.

NOW, THEREFORE, BE IT RESOLVED by the Board of Supervisors of the County of Madera, State of California, sitting as Board of Directors for the County of Madera GSA for the Chowchilla Subbasin, as follows:

1. The above Recitals are hereby incorporated by reference and are made a substantive part of this Resolution.
2. The GSP in the form presented at the Hearing is hereby approved and adopted.
3. The Director of the County Department of Water and Natural Resources ("Department Director") is hereby authorized and directed to timely provide notification of this approval and adoption to DWR, including a copy of this Resolution, the approved GSP, and any additional information required by law.

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The foregoing Resolution was adopted this 17th day of December, 2019, by the following vote:

Director Frazier voted: YES

Director Rogers voted: YES

Director Poythress voted: YES

Director Rodriguez voted: YES

Director Wheeler voted: YES

Chairman, Board of Directors

ATTEST:

Clerk, Board of Supervisors

Approved as to Legal Form:
COUNTY COUNSEL

By _____
MICHAEL LIMBERT, DEPUTY

J:\wdocs\01246\040\RES\00699621.DOCX

Chowchilla Subbasin GSP Revisions

Resolutions - July 2022

CHOWCHILLA WATER DISTRICT
GROUNDWATER SUSTAINABILITY AGENCY

RESOLUTION NO. GSA 2022- 02

ADOPTION OF THE CHOWCHILLA SUBBASIN GROUNDWATER SUSTAINABILITY PLAN FOR THE CHOWCHILLA WATER DISTRICT GROUNDWATER SUSTAINABILITY AGENCY

WHEREAS, the California Legislature passed a statewide framework for sustainable groundwater management, known as the Sustainable Groundwater Management Act (California Water Code§ 10720 *et seq.),* pursuant to Senate Bill 1168, Senate Bill 1319, and Assembly Bill 1739, which was approved by the Governor and Chaptered by the Secretary of State on September 16, 2014; and,

WHEREAS, the Sustainable Groundwater Management Act (SGMA) went into effect on January 1, 2015; and,

WHEREAS, SGMA requires all high- priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or multiple GSAs; and,

WHEREAS, the Chowchilla Groundwater Sub-basin has been designated by DWR as a high-priority basin and in critical groundwater overdraft (DWR Bulletin 118 Groundwater Basin: 5-022.05); and,

WHEREAS, the District elected on December 14, 2016, to become a GSA for certain portions of the Chowchi1la Groundwater Sub-basin; and,

WHEREAS, pursuant to Water Code section 10727 SGMA requires that a Groundwater Sustainability Plan (GSP) or multiple GSPs be developed and implemented by January 31, 2020 for each high-priority basin; and,

WHEREAS, Chowchilla Water District GSA, Madera County Chowchilla GSA, Triangle T Water District GSA and Merced County Chowchilla GSA have collaboratively prepared a single GSP for the Chowchilla Subbasin in accordance wi1h Water Code section 10727.2 to include all the components required by SGMA; and,

WHEREAS, The Chowchilla Subbasin Groundwater Sustainability Plan (Chowchilla GSP) was adopted and forwarded to the Department of Water Resources (DWR) in January of 2020; and,

WHEREAS, DWR completed a review of the Chowchilla GSP and released an incomplete determination of the Chowchilla Subbasin GSP, initiating a 180-day consultation period between January 28, 2022, and July 27, 2022.

WHEREAS, the four GSAs in the Chowchilla Subbasin have revised the Chowchilla GSP in response to the incomplete determination made by DWR; and,

WHEREAS, Chowchilla Water District GSA, on behalf of all the GSAs in the Chowchilla Subbasin, gave notice on April 18, 2022, pursuant to Water Code section 10728.4 to affected cities and counties regarding the intent of the GSAs to each adopt the revised GSP; and,

WHEREAS, Chowchilla Water District GSA published a notice on June 29, 2022 and July 6, 2022 in the Chowchilla News and the Merced Sun Star, newspapers of general circulation, published and circulated in Merced and Mariposa Counties and Chowchilla in northern Madera County, giving notice that a public hearing (Hearing) would be held on July 13, 2022 for the purpose of considering adoption of a GSP for its portion of the Chowchilla Groundwater Sub-basin; and,

WHEREAS, upon adoption of a GSP, Water Code section 10733.4 requires that GSP to be submitted to DWR for review.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of Chowchilla Water District GSA as follows:

1. The foregoing is true and correct.

2. The GSP in the form presented at the Hearing is hereby approved and adopted.

3. The General Manager is authorized and directed to timely provide notification of this approval and adoption to DWR, including a copy of this Resolution, the approved GSP, and any additional information required by law.

PASSED AND ADOPTED by the Board of Directors of the Chowchilla Water District GSA, this 13th day of July 2022 by the following vote:

AYES: Upton, Taylor, Mandala, Harris, Schuh

NOES:

ABSENT:

ABSTAIN:

Kole Upton, President

BEFORE THE BOARD OF SUPERVISORS
OF THE COUNTY OF MERCED, STATE OF CALIFORNIA

IN THE MATTER OF:
RESOLUTION AUTHORIZING THE ADOPTION OF THE CHOWCHILLA GROUNDWATER SUSTAINABILITY PLAN BY THE COUNTY OF MERCED GSA - CHOWCHILLA

RESOLUTION NO. 2022-75

WHEREAS, in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act ("SGMA") "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d)); and

WHEREAS, SGMA requires all high-priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed by a Groundwater Sustainability Agency (GSA) or multiple GSAs; and

WHEREAS, the Chowchilla Groundwater Subbasin has been designated by DWR as a high-priority basin and in critical groundwater overdraft (DWR Bulletin 118 Groundwater Basin: 5-022.05); and

WHEREAS, the County of Merced elected on February 21, 2017, to become the County of Merced GSA – Chowchilla (also referred to as the County of Merced Chowchilla GSA) for certain portions of the Chowchilla Groundwater Subbasin; and

WHEREAS, pursuant to Water Code section 10727 SGMA requires that a Groundwater Sustainability Plan (GSP) or multiple GSPs be developed and implemented by January 31, 2020 for each high-priority basin; and

WHEREAS, the Chowchilla Water District GSA, Madera County Chowchilla GSA, Triangle T Water District GSA and County of Merced GSA - Chowchilla have collaboratively prepared a single GSP for the Chowchilla Subbasin in accordance with Water Code section 10727.2 to include all the components required by SGMA.; and

WHEREAS, the Chowchilla Water District General Resources Manager is the Plan Manager for the Chowchilla Subbasin GSP; and

WHEREAS, the four GSAs in the Chowchilla Subbasin have entered into a memorandum of understanding for cost sharing and GSP development through a GSP Advisory Committee; and

WHEREAS, on January 28, 2022, DWR completed its review of the Chowchilla Subbasin GSP and released a letter determining that the GSP was "Incomplete" and identified deficiencies and corrective actions for the GSAs in the Chowchilla Subbasin to take. The amended or modified GSP addressing the corrective actions must be submitted to DWR by July 27, 2022; and

WHEREAS, the Chowchilla Water District GSA, on behalf of all the GSAs in the Chowchilla Subbasin provided a 90-day notice to the cities and county located within and adjacent to the Plan Area of the Chowchilla GSP, that they intend to conduct a public hearing to adopt the amended GSP; and

NOW, THEREFORE, BE IT RESOLVED THAT, the Governing Board of the County of Merced GSA - Chowchilla hereby approves and adopts the amended Chowchilla Subbasin GSP for the portions of the County of Merced GSA – Chowchilla within the Plan Area; and

BE IT FURTHER RESOLVED that the Governing Board authorizes the Plan Manager to take such other actions as may be reasonably necessary to file the amended Chowchilla Subbasin GSP with DWR by July 27, 2022, and implement the purpose of this Resolution.

I, **RAUL LOMELI MENDEZ,** Clerk of the Board of Supervisors of the County of Merced, do hereby certify that the foregoing resolution was regularly introduced, passed and adopted by said Board at a regular meeting thereof held on the 19th of July, 2022 by the following vote:

SUPERVISORS:

AYES: Lloyd Pareira, Rodrigo Espinoza, Josh Pedrozo, Daron McDaniel, Scott Silveira

NOES: None

ABSENT: None

ABSTENTIONS: None

WITNESS my hand and the Seal of this Board this 19th day of July, 2022.

Raul Lomeli Mendez, Clerk

By: Stacy Goolsby
Deputy

MERCED 18 55 COUNTY

RESOLUTION NO. 2022-03

RESOLUTION ADOPTING AMENDED GRONDWATER SUSTAINABILTIY PLAN FOR THE CHOWCHILLA SUBBASIN

WHEREAS, the Sustainable Groundwater Management Act of 2014, Water Code sections 10720-10737.8 ("SGMA") was signed into law on September 16, 2014; and

WHEREAS, SGMA requires that each California Groundwater subbasin be managed by a Groundwater Sustainability Agency ("GSA"), or multiple GSAs, and that such management be implemented pursuant to an approved Groundwater Sustainability Plan ("GSP"), or multiple GSPs; and

WHEREAS, the Triangle T Water District GSA is a GSA under SGMA for areas within Chowchilla Subbasin; and

WHEREAS, the Triangle T Water District GSA, the Chowchilla Water District GSA, the Madera County GSA, and the Merced County Chowchilla GSA collaboratively prepared a single GSP for the Chowchilla Subbasin in accordance with Water Code section 10727.2 to include all the components required by SGMA; and

WHEREAS, on December 17, 2019, the Triangle T Water District GSA, the County GSA, the Chowchilla Water District GSA, and Merced County GSA for the Chowchilla Subbasin, adopted a GSP for the Chowchilla Subbasin; and

WHEREAS, on or about January 29, 2020, the GSP for the Chowchilla Subbasin was submitted to the Department of Water Resources ("DWR") for review, public comment, and approval; and

WHEREAS, on January 28, 2022, DWR sent a letter to the Chowchilla Subbasin GSP Plan Manager stating that the GSP was determined to be incomplete because the GSP has not defined sustainable management criteria in the manner required by SGMA and the GSP regulations related to subsidence, and the Chowchilla Subbasin GSAs did not sufficiently demonstrate that interconnected surface water or undesirable results related to depletions of interconnected surface water are not present and are not likely to occur in the Chowchilla Subbasin; and

WHEREAS, the Chowchilla Subbasin GSP has been amended to address the deficiencies outline in the January 28, 2022, letter form DWR and

WHEREAS, the Chowchilla Water District GSA, on behalf of all the GSAs in the Chowchilla Subbasin, gave notice on April 18, 2022, pursuant to Water Code section 10728.4 to affected cities and counties regarding the intent of the GSAs to each adopt the revised GSP, and,

WHEREAS, Triangle T Water District GSA will hold a public hearing on July 14, 2022 at 10:00 AM for the purpose of considering adoption of the amended GSP for it portion of the Chowchilla Groundwater Subbasin, and

WHEREAS, upon adoption of a GSP, Water Code section 10733.4 requires that the GSP be submitted to DWR for review.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors for the Triangle T Water District GSA, as follows:

1) The foregoing is true and correct.
2) The GSP in the form presented at the Hearing is hereby approved and adopted.
3) The District Secretary is authorized and directed to timely provide notification of this approval and adoption to DWR, including a copy of this Resolution, the approved GSP, and any additional information required by law.

Passed and adopted at a meeting of the Triangle T Water District GSA on July 14, 2022, by the following vote:

AYES: 3

NAYS: ~~0~~

ABSTAIN: ~~0~~

ABSENT: 2

Lucas Avila, President

Sarah Woolf, Secretary/Treasurer

BEFORE
THE BOARD OF DIRECTORS
FOR THE COUNTY OF MADERA
GROUNDWATER SUSTAINABILITY AGENCY
CHOWCHILLA SUBBASIN

In the Matter of	)	Resolution No.: 2022 - 104
	)	
THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT	)	RESOLUTION ADOPTING AMENDED GROUNDWATER SUSTAINABILITY PLAN
	)	
Chowchilla Subbasin	)	
	)	
	)	

WHEREAS, the Sustainable Groundwater Management Act of 2014, Water Code sections 10720-10737.8 ("SGMA") was signed into law on September 16, 2014; and

WHEREAS, SGMA requires that each groundwater basin be managed by a Groundwater Sustainability Agency ("GSA"), or multiple GSAs, and that such management be pursuant to an approved Groundwater Sustainability Plan ("GSP"), or multiple GSPs; and

WHEREAS, on January 24, 2017, the Board of Supervisors for the County of Madera ("Board") elected to have the County of Madera become the exclusive GSA for the portions of the Chowchilla Subbasin that are in unincorporated areas of Madera County, and not otherwise covered by another public agency; and

WHEREAS, on or about May 13, 2017, the County of Madera became the exclusive GSA for portions of the Chowchilla Subbasin not otherwise covered by another public agency (hereinafter "Madera County Chowchilla GSA"); and

WHEREAS, pursuant to Water Code section 10727, SGMA requires that a Groundwater Sustainability Plan ("GSP"), or multiple GSPs, be developed and implemented by January 31, 2020 for each high-priority basin; and,

WHEREAS, the Madera County GSA, the Chowchilla Water District GSA, the Triangle T Water District GSA, and Merced County Chowchilla GSA collaboratively prepared a single GSP for the Chowchilla Subbasin in accordance with Water Code section 10727.2 to include all the components required by SGMA; and

WHEREAS, on December 17, 2019, the County GSA, along with the Chowchilla Water District GSA, the Triangle T Water District GSA, and Merced County GSA for the Chowchilla Subbasin, adopted a GSP for the Chowchilla Subbasin; and

WHEREAS, on or about January 29, 2020, the GSP for the Chowchilla Subbasin was submitted to the Department of Water Resources ("DWR") for review, public comment, and approval; and,

WHEREAS, on November 18, 2021, DWR sent a letter to the Chowchilla Subbasin GSP Plan Manager (Doug Welch of the Chowchilla Water District GSA), indicating that DWR staff had substantially completed the initial review of the Chowchilla Subbasin GSP, and that there were potential deficiencies that might preclude DWR from approving the GSP; and

WHEREAS, on January 28, 2022, DWR sent a letter to the Chowchilla Subbasin GSP Plan Manager stating that the GSP was determined to be incomplete because the GSP has not defined sustainable management criteria in the manner required by SGMA and the GSP Regulations related to subsidence, and the Chowchilla Subbasin GSAs did not sufficiently demonstrate that interconnected surface water or undesirable results

related to depletions of interconnected surface water are not present and are not likely to occur in the Chowchilla Subbasin; and

WHEREAS, in the January 28, 2022 letter, DWR represented that the deficiencies identified in the letter were not addressed by July 27, 2022, DWR, after consultation with the State Water Resources Control Board, would determine the GSP to be inadequate, possibly triggering the state intervention process outlined in SGMA; and

WHEREAS, the Chowchilla Subbasin GSP has been amended to address the deficiencies outlined in the January 28, 2022 letter from DWR; and

WHEREAS, the Chowchilla Subbasin Plan Manager, on behalf of all the GSAs in the Chowchilla Subbasin, gave notice on April 18, 2022, pursuant to Water Code section 10728.4, to affected cities and counties regarding the intent of the GSAs to each to adopt the GSP; and

WHEREAS, the Madera County Chowchilla GSA published a notice on July 9, 2022 and in the Madera Tribune, a newspaper of general circulation in Madera County and the Chowchilla Subbasin, giving notice that a public hearing (Hearing) would be held on July 26, 2022, at 10:30 a.m., for the purpose of considering adoption of the amended GSP for its portion of the Chowchilla Groundwater Subbasin; and,

WHEREAS, upon adoption of a GSP, Water Code section 10733.4 requires that the GSP be submitted to DWR for review.

NOW, THEREFORE, BE IT RESOLVED by the Board of Supervisors of the County of Madera, State of California, sitting as Board of Directors for the County of Madera GSA for the Chowchilla Subbasin, as follows:

1. The above Recitals are hereby incorporated by reference and are made a substantive part of this Resolution.
2. The amended GSP in the form presented at the Hearing is hereby approved and adopted.
3. The Director of the County Department of Water and Natural Resources ("Department Director") is hereby authorized and directed to timely provide notification of this approval and adoption to DWR, including a copy of this Resolution, the approved GSP, and any additional information required by law.

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The foregoing Resolution was adopted this 26TH day of JULY, 2022, by the following vote:

Director Frazier voted: Yes

Director Rogers voted: Yes

Director Poythress voted: Yes

Director Gonzalez voted: absent

Director Wheeler voted: Yes

Chairman, Board of Directors

ATTEST:

Clerk, Board of Directors

Approved as to Legal Form:
COUNTY COUNSEL

By Michael R. Linden

Digitally signed by: Michael R. Linden
DN: CN = Michael R. Linden email = mlinden@lozanosmith.com C = US O = LOZANO SMITH
Date: 2022.07.08 11:51:21 -07'00'

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APPENDIX 1.F. GLOSSARY: SGMA DEFINITIONS

Prepared as part of the

Groundwater Sustainability Plan
Chowchilla Subbasin

January 2020

GSP Team:

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

GLOSSARY

This Glossary includes terms from a variety of legal and administrative sources relevant to SGMA and GSP development. These sources include:

- California Water Code Section 10721, Sustainable Groundwater Management Definitions **(CWC Section 10721)**
- California Code of Regulations Title 23 Section 341, Groundwater Basin Boundaries Definitions **(23 CCR Section 341)**
- California Code of Regulations Title 23 Section 351, Groundwater Sustainability Plan Definitions **(23 CCR Section 351)**
- DWR Bulletin 118 Definitions, updated 2003 **(B118, 2003)**
- Locally defined terms used in the GSP

The source of each term is provided in the citation following that term. Page numbers are included when a definition is not found in the referenced document's definitions or glossary. Additional information regarding each source are summarized at the end of this glossary.

Adjudication Action. The action filed in the superior or federal district court to determine the rights to extract groundwater from a basin or store water within a basin, including, but not limited to, actions to quiet title respecting rights to extract or store groundwater or an action brought to impose a physical solution on a basin. **(CWC Section 10721)**

***Administrative Adjustment*.** The basin or subbasin boundary adjustment by the Department that either (1) amends existing basin or subbasin boundary data files to accurately reflect an unambiguous written basin or subbasin boundary description as defined in Bulletin 118 or amended pursuant to this Part, or (2) restates the description of a basin or subbasin boundary to more precisely reflect a mapped basin or subbasin boundary consistent with the original description. **(B118, 2003)**

***Agency*.** The groundwater sustainability agency as defined in the Act. **(23 CCR Section 351)**

Agricultural Water Management Plan. The plan adopted pursuant to the Agricultural Water Management Planning Act as described in Part 2.8 of Division 6 of the Water Code, commencing with Section 10800 et seq. **(23 CCR Section 351)**

***Alternative*.** The alternative to a Plan described in Water Code Section 10733.6. **(23 CCR Section 351)**

Annual Report. The report required by Water Code §10728. **(23 CCR Section 351)**

Aquifer. The three-dimensional body of porous and permeable sediment or sedimentary rock that contains sufficient saturated material to yield significant quantities of groundwater to wells and springs, as further defined or characterized in Bulletin 118. **(B118, 2003)**

Baseline or Baseline Conditions. The historical information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin. **(23 CCR Section 351)**

Basin Setting. The information about the physical setting, characteristics, and current conditions of the basin as described by the Agency in the hydrogeologic conceptual model, the groundwater conditions, and the water budget, pursuant to Sub article 2 of Article 5. **(23 CCR Section 351)**

Basin. Defined in the Sustainable Groundwater Management Act as a groundwater basin or subbasin identified and defined in Bulletin 118. Unless the context indicates otherwise, those terms are further

defined as follows: (1) The term ***basin*** shall refer to an area specifically defined as a basin or ***groundwater basin*** in Bulletin 118, and shall refer generally to an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom, as further defined or characterized in Bulletin 118. (2) The term ***subbasin*** shall refer to an area specifically defined as a subbasin or ***groundwater subbasin*** in Bulletin 118 and shall refer generally to any subdivision of a basin based on geologic and hydrologic barriers or institutional boundaries, as further described or defined in Bulletin 118. **(B118, 2003)**

Basin. The groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Water Code 10722 et seq. **(23 CCR Section 351)**

Beneficial Use. Water in Bulletin 118 references 23 categories of water uses identified by the State Water Resource Control Board and are listed and briefly described in Appendix E. **(B118, 2003)**

Best Available Science. The use of sufficient and credible information and data, specific to the decision being made and the time frame available for making that decision, that is consistent with scientific and engineering professional standards of practice. **(23 CCR Section 351)**

Best Management Practice. The practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science. §351. **(23 CCR Section 351)**

***Board*.** The State Water Resources Control Board. **(23 CCR Section 351)**

Bulletin 118. The department's report entitled "California's Groundwater: Bulletin 118" updated in 2003, as it may be subsequently updated or revised in accordance with § 12924. **(CWC Section 10721)**

CASGEM. The California Statewide Groundwater Elevation Monitoring Program developed by the Department pursuant to Water Code Section 10920 et seq., or as amended. **(23 CCR Section 351)**

Condition of Long-Term Overdraft. The condition of a groundwater basin where the average annual amount of water extracted for a long-term period, generally 10 years or more, exceeds the long-term average annual supply of water to the basin, plus any temporary surplus. Overdraft during a period of drought is not sufficient to establish a condition of long-term overdraft if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods. **(CWC Section 10721)**

Coordination Agreement. The legal agreement adopted between two or more groundwater sustainability agencies that provides the basis for coordinating multiple agencies or groundwater sustainability plans within a basin pursuant to this part. **(CWC Section 10721)**

Data Gap. The lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a basin is being sustainably managed. **(23 CCR Section 351)**

Existing Stored Groundwater. Groundwater that is already underground from centuries of accumulated native groundwater. Historic pumping has been diminishing the existing stored groundwater at rates greater than the native groundwater can sustain, causing overdraft and unsustainable conditions. If more water is pumped from a basin than what is added from Native Groundwater and Introduced Groundwater, this water comes from the Existing Stored Groundwater. Continuing to use this previously stored groundwater will continue to exacerbate overdraft conditions. Temporarily using some of this water during the transition to sustainability will likely continue to cause lowering of groundwater levels.

***Groundwater Dependent Ecosystem*.** The ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. **(23 CCR Section 351)**

Groundwater Flow. The volume and direction of groundwater movement into, out of, or throughout a basin. **(23 CCR Section 351)**

Groundwater in Storage. The quantity of water in the zone of saturation. **(B118, 2003)**

Groundwater Overdraft. The condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions. **(B118, 2003)**

Groundwater Recharge or Recharge. The augmentation of groundwater by natural or artificial means. **(CWC Section 10721)**

Groundwater Storage Capacity. The volume of void space that can be occupied by water in a given volume of a formation, aquifer, or groundwater basin. **(B118, 2003)**

Groundwater Sustainability Agency*.** One or more local agencies that implement the provisions of this part. For purposes of imposing fees pursuant to Chapter 8 (commencing with Section 10730) or taking action to enforce a groundwater sustainability plan, ***Groundwater Sustainability Agency also means each local agency comprising the groundwater sustainability agency if the plan authorizes separate agency action. **(CWC Section 10721)**

Groundwater. Water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water but does not include water that flows in known and definite channels. **(CWC Section 10721)**

Hydrogeologic Conceptual Model. The description of the geologic and hydrologic framework governing the occurrence of groundwater and its flow through and across the boundaries of a basin and the general groundwater conditions in a basin or subbasin. **(23 CCR Section 341)**

Interconnected Surface Water. The surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. **(23 CCR Section 351)**

***Interested Parties*.** The persons and entities on the list of interested persons established by the Agency pursuant to Water Code Section 10723.4. **(23 CCR Section 351)**

Interim Milestone. The target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan. **(23 CCR Section 351)**

Introduced Groundwater. Water that is added to the sustainable yield of groundwater supply derived from percolation of imported surface water. This can be the directly through groundwater replenishment projects or groundwater banking or can be indirectly through percolation from irrigation and unlined canals.

Management Area. The 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. **(23 CCR Section 351)**

Measurable Objectives. The specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin. **(23 CCR Section 351)**

Minimum Threshold. The numeric value for each sustainability indicator used to define undesirable results. **(23 CCR Section 351)**

***Monitoring Protocols*.** Designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin. The monitoring protocols shall be designed to generate information that promotes efficient and effective groundwater management. §10727.2. Required Plan Elements. **(CWC Section 10721)**

NAD83. The North American Datum of 1983 computed by the National Geodetic Survey, or as modified.

Native Groundwater. Water naturally infiltrating into the groundwater from precipitation and runoff. This is the average quantity of water annually added to the groundwater budget from rain, rivers, and streams, and reflects the portion of estimated sustainable yield of the groundwater supply that is not derived from imported surface water.

NAVD88. The North American Vertical Datum of 1988 computed by the National Geodetic Survey, or as modified. **(23 CCR Section 351)**

***Plain Language*.** The language that the intended audience can readily understand and use because that language is concise, well-organized, uses simple vocabulary, avoids excessive acronyms and technical language, and follows other best practices of plain language writing. **(23 CCR Section 351)**

Plan Implementation. The Agency's exercise of the powers and authorities described in the Act, which commences after an Agency adopts and submits a Plan or Alternative to the Department and begins exercising such powers and authorities. **(23 CCR Section 351)**

***Plan Manager*.** An employee or authorized representative of an Agency, or Agencies, appointed through a coordination agreement or other agreement, who has been delegated management authority for submitting the Plan and serving as the point of contact between the Agency and the Department. **(23 CCR Section 351)**

***Plan*.** The groundwater sustainability plan as defined in the Act. **(23 CCR Section 351)**

Planning and Implementation Horizon. The 50-year time period over which a groundwater sustainability agency determines that plans and measures will be implemented in a basin to ensure that the basin is operated within its sustainable yield. **(CWC Section 10721)**

Principal Aquifers. The aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. **(23 CCR Section 351)**

Qualified Map. The geologic map of a scale no smaller than 1:250,000 that is published by the U. S. Geological Survey or the California Geological Survey, or is a map published as part of a geologic investigation conducted by a state or federal agency, or is a geologic map prepared and signed by a Professional Geologist that is acceptable to the Department. **(23 CCR Section 341)**

Recharge Area. The area that supplies water to an aquifer in a groundwater basin. **(CWC Section 10721)**

Reference Point. The permanent, stationary and readily identifiable mark or point on a well, such as the top of casing, from which groundwater level measurements are taken, or other monitoring site. **(23 CCR Section 351)**

Representative Monitoring. The monitoring site within a broader network of sites that typifies one or more conditions within the basin or an area of the basin. **(23 CCR Section 351)**

Safe Yield. The maximum quantity of water that can be continuously withdrawn from a groundwater basin without adverse effect. **(B118, 2003)**

Saturated Zone. The zone in which all interconnected openings are filled with water, usually underlying the unsaturated zone. **(B118, 2003)**

Seasonal High. The highest annual static groundwater elevation that is typically measured in the Spring and associated with stable aquifer conditions following a period of lowest annual groundwater demand. **(23 CCR Section 351)**

Seasonal Low. The lowest annual static groundwater elevation that is typically measured in the Summer or Fall and associated with a period of stable aquifer conditions following a period of highest annual groundwater demand. **(23 CCR Section 351)**

Seawater Intrusion. The advancement of seawater into a groundwater supply that results in degradation of water quality in the basin and includes seawater from any source. **(23 CCR Section 351)**

Statutory Deadline. The date by which an Agency must be managing a basin pursuant to an adopted Plan, as described in Water Code Sections 10720.7 or 10722.4. **(23 CCR Section 351)**

Sustainability Goal. The existence and implementation of one or more groundwater sustainability plans that achieve sustainable groundwater management by identifying and causing the implementation of measures targeted to ensure that the applicable basin is operated within its sustainable yield. **(CWC Section 10721)**

Sustainability Indicator. The effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results, as described in Water Code §10721(x). **(23 CCR Section 351)**

Sustainable Groundwater Management. The management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results. **(CWC Section 10721)**

Sustainable Yield. The maximum quantity of water calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result. **(CWC Section 10721)**

Technical Study. The geologic or hydrologic report prepared and published by a state or federal agency, or a study published in a peer-reviewed scientific journal, or a report prepared and signed by a Professional Geologist or by a Professional Engineer. **(23 CCR Section 341)**

Uncertainty. The lack of understanding of the basin setting that significantly affects an Agency's ability to develop sustainable management criteria and appropriate projects and management actions in a Plan, or to evaluate the efficacy of Plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed. **(23 CCR Section 351)**

Undesirable Result. One or more of the following effects caused by groundwater conditions occurring throughout the basin: (1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods. (2) Significant and unreasonable reduction of groundwater storage. (3) Significant and unreasonable seawater intrusion. (4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies. (5) Significant and unreasonable land

subsidence that substantially interferes with surface land uses. (6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water. **(CWC Section 10721)**

Urban Water Management Plan. The plan adopted pursuant to the Urban Water Management Planning Act as described in Part 2.6 of Division 6 of the Water Code, commencing with Section 10610 et seq. **(23 CCR Section 351)**

Water Budget. The accounting of the total groundwater and surface water entering and leaving a basin including the changes in the amount of water stored. **(CWC Section 10721)**

Water Source Type. The source from which water is derived to meet the applied beneficial uses, including groundwater, recycled water, reused water, and surface water sources identified as Central Valley Project, the State Water Project, the Colorado River Project, local supplies, and local imported supplies. **(23 CCR Section 351)**

Water Use Sector. The categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation. **(23 CCR Section 351)**

Water Year Type. The classification provided by the Department to assess the amount of annual precipitation in a basin. **(23 CCR Section 351)**

Water Year. The period from October 1 through the following September 30, inclusive. **(CWC Section 10721)**

Water Year. The period from October 1 through the following September 30, inclusive, as defined in the Act. **(23 CCR Section 351)**

Wellhead Protection Area. The surface and subsurface area surrounding a water well or well field that supplies a public water system through which contaminants are reasonably likely to migrate toward the water well or well field. **(CWC Section 10721)**

REFERENCES

California Code of Regulations. Title 23, Section 341.

California Code of Regulations. Title 23, Section 351.

California Department of Water Resources (DWR). 2003. Bulletin 118: California's Groundwater.

California Water Code. Division 6. Part 2.74. Section 10721. Chapter 2. Definitions. (Amended by Stats. 2018, Ch. 255, Sec. 1. (AB 1944) Effective January 1, 2019.)

CHOWCHILLA SUBBASIN

Sustainable Groundwater Management Act (SGMA)

Groundwater Sustainability Plan

APPENDIX 2. PLAN AREA AND BASIN SETTING

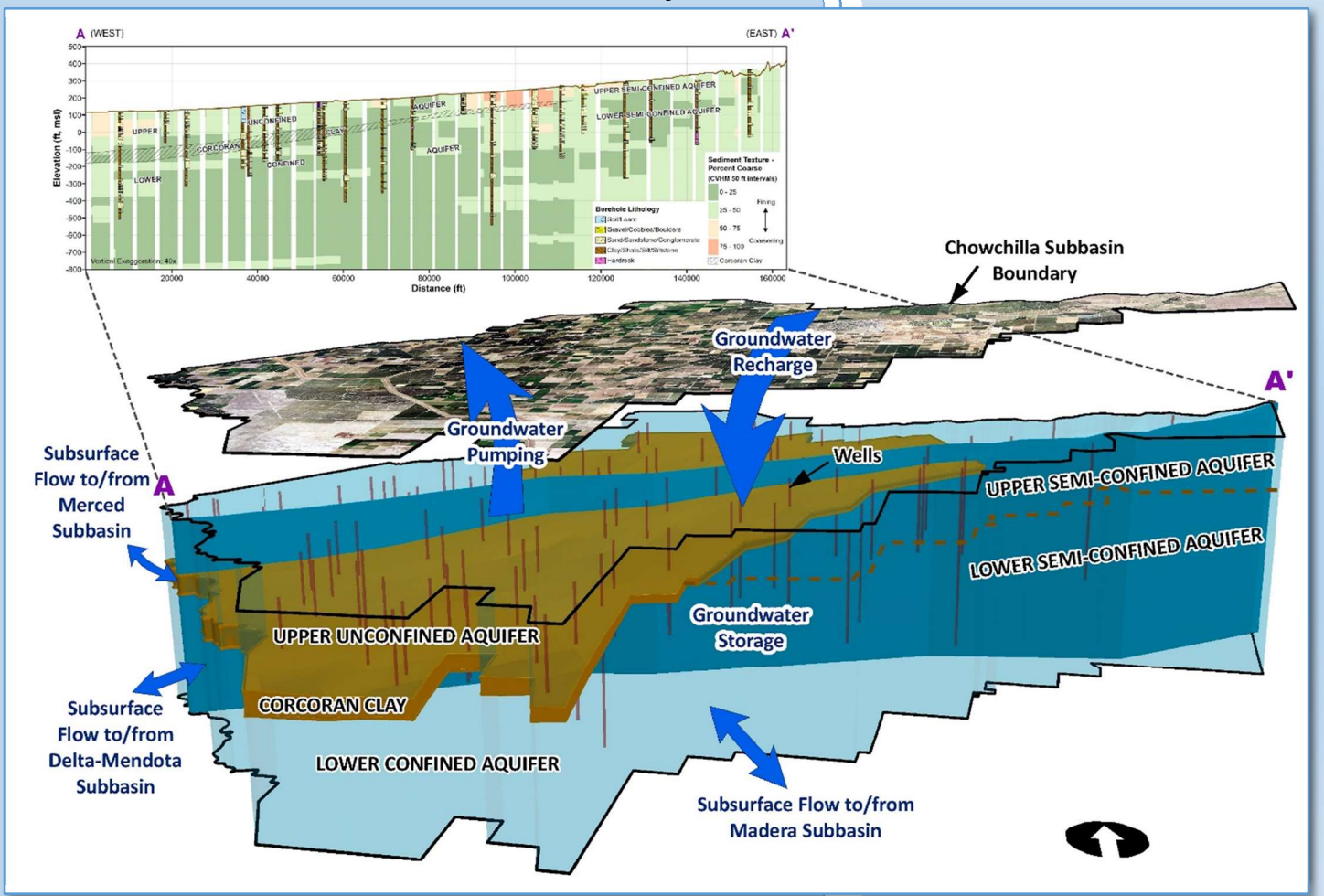
Technical Appendices 2.A. through 2.G.

January 2020

Revised July 2022

Prepared by

Davids Engineering, Inc (Revised GSP)
Luhdorff & Scalmanini (Revised GSP)
ERA Economics
Stillwater Sciences and
California State University, Sacramento



FINAL

Chowchilla Subbasin

Sustainable Groundwater Management Act

Groundwater Sustainability Plan

Technical Appendices 2.A. through 2.G.

January 2020
Revised July 2022

Prepared For

Chowchilla Subbasin GSP Advisory Committee

Prepared By

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

APPENDIX 2. PLAN AREA AND BASIN SETTING

2.A. Chowchilla Subbasin Annual Spatial Land Use

2.B. Assessment of Groundwater Dependent Ecosystems

2.C. Notice and Communication

- 2.C.a. Chowchilla Subbasin Stakeholders Communication and Engagement Plan
- 2.C.b. Chowchilla Subbasin Interested Parties List
- 2.C.c. Chowchilla Subbasin Engagement Matrix
- 2.C.d. Chowchilla Subbasin Stakeholder Input Matrix
- 2.C.e. Chowchilla Subbasin Responses to Comments

2.D. Hydrogeologic Conceptual Model

2.E. Current and Historical Groundwater Conditions

2.F. Water Budget Information

- 2.F.a. Surface Water System Water Budget: Chowchilla Water District GSA
- 2.F.b. Surface Water System Water Budget: Madera County East GSA
- 2.F.c. Surface Water System Water Budget: Madera County West GSA
- 2.F.d. Surface Water System Water Budget: Sierra Vista Mutual Water Company
- 2.F.e. Surface Water System Water Budget: Triangle T Water District GSA
- 2.F.f. Daily Reference Evapotranspiration and Precipitation Quality Control
- 2.F.g. Development of Daily Time Step IDC Root Zone Water Budget Model

2.G. Chowchilla Subbasin Domestic Well Inventory

APPENDIX 2.A. CHOWCHILLA SUBBASIN ANNUAL SPATIAL LAND USE

Prepared as part of the

Groundwater Sustainability Plan
Chowchilla Subbasin

January 2020

GSP Team:

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

To support GSP development, land use areas in the Chowchilla Subbasin were identified from available data in Madera and Merced Counties, which include the entire Chowchilla Subbasin.

Annual land use estimates were primarily based on spatially distributed land use information from DWR Land Use surveys for Madera County (1995, 2001, and 2011) and Merced County (1995, 2002, and 2012), and Land IQ[1] remote sensing-based land use identification for 2014. County Agriculture Commission land use areas were used to interpolate between years with available spatial land use information. Lands in the District were assigned to one of 17 land use classes.

The following five steps were used to develop the county-wide annual, spatial land use datasets.

1.) Developed spatial land use coverages for:
Madera County: 1995, 2001, 2011, and 2014
Merced County: 1995, 2002, 2012, and 2014,
and made adjustments to the spatial coverage, including:
   a) Filled missing area from Land IQ coverage with 2011 DWR coverage (native, semi-agricultural, urban, and water account for 86% of the missing area in Madera County and 95% of missing area in Merced County)
   b) In Madera County: Used the water area from 2001 for the 1995 DWR survey (water surfaces were not included in the 1995 DWR survey).
2.) Calculated agricultural area:
   a) Assumed county data does not include idle land (county data has zero idle area in all years)
   b) Excluded idle land from DWR agricultural totals to be consistent with county totals
   c) Calculated the ratio of the DWR agricultural total area (not including idle lands) to county agricultural production area for years with DWR (or Land IQ) land use data
   d) Estimated agricultural area for missing years between the first and last available county data by interpolating the ratio calculated in step (c)
   e) Estimated agricultural area for missing years outside the available county data by extending the annual trend or estimating as equal to the nearest available county data
3.) Multiplied county agricultural acres for each crop by the ratio calculated in in step 2 (c) to adjust county agricultural areas for each crop scaling each crop area in each year by an estimate of the difference between the areas in the DWR land use surveys and County Commissioner reports. This procedure assumes DWR areas are the most accurate.
   a) Interpolated native, semi-agricultural, urban, and water land uses between DWR years.
   b) Calculated idle area as the remaining area (total DWR land use minus total cropped area)
4.) Reviewed calculated idle and crop area graphs and adjusted individual annual crop areas with abnormal area shifts based on professional judgement to eliminate calculated negative idle area.
Madera County:
   a) 1996 adjustments--replaced high miscellaneous truck areas with interpolated values between 1995 and 1997
   b) 2002, 2003, 2004 and 2005 adjustments--replaced high areas for mixed pasture and alfalfa between 2001 and 2011 DWR areas by interpolating areas between 2001 and 2011.
   c) 2012 adjustments--replaced high miscellaneous deciduous, field and truck with interpolated value between 2011 and 2013

Merced County:
   a) Almond acreage adjustments--interpolated years 2013 and 2015 using 2012 and 2014 land use coverages.
   b) Citrus and Subtropical acreage adjustments--interpolated between 2002 and 2015 using 2002, 2012, and 2014 land use surveys

[1] Land IQ is a firm that was contracted by DWR to use remote sensing methodologies to identify crops in fields.

c) Grain and Hay Crops--interpolated years 2013 and 2015 using 2012 and 2014 land use coverages
d) Grapes--interpolated between 1989 and 2015 using land use surveys
e) Miscellaneous Field Crops--replaced low acreage in 1991 by interpolating between 1990 and 1992
f) Miscellaneous Truck Crop--interpolated years 2006, 2009, 2010, 2013, and 2015 based on land use surveys
g) Water--assumed acreage from 1995 DWR survey for 1989 through 1994

5.) Implemented the DWR Land Use interpolation tool to create annual spatial cropping data sets for 1989 through 2017.

Table A2.A-1 summarizes the land use sector and average acreage of each land use class in the Chowchilla Subbasin based on the above land use analysis.

Table A2.A-1. Average Land Use Acreages in Chowchilla Subbasin, 1989 to 2014.

Land Use Sector	Land Use Class	Acres
Agricultural	Alfalfa	22,743
	Almonds	26,296
	Citrus and Subtropical	65
	Corn (double crop)	17,325
	Grain and Hay Crops	5,642
	Grapes	9,976
	Idle	6,624
	Miscellaneous Deciduous	3,791
	Miscellaneous Field Crops	14,377
	Miscellaneous Truck Crops	1,537
	Mixed Pasture	6,424
	Pistachios	3,951
	Walnuts	315
Native Vegetation	Native	17,702
	Water	1,397
Urban	Urban	4,691
	Semi-agricultural	3,467
Total		146,323

References

DWR. 2011. “Madera County land use survey data.” State of California, Department of Water Resources. Available online: https://water.ca.gov/Programs/Water-Use-And-Efficiency/Land-And-Water-Use/Land-Use-Surveys. Also published in 1995 and 2001.

DWR. 2012. “Merced County land use survey data.” State of California, Department of Water Resources. Available online: https://water.ca.gov/Programs/Water-Use-And-Efficiency/Land-And-Water-Use/Land-Use-Surveys. Also published in 1995 and 2002.

Land IQ. 2014. “Statewide Crop Mapping 2014.” Land IQ, LLC, and State of California, Department of Water Resources. Available online: https://gis.water.ca.gov/app/CADWRLandUseViewer/.

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APPENDIX 2.B. ASSESSMENT OF GROUNDWATER DEPENDENT ECOSYSTEMS

Prepared as part of the

Groundwater Sustainability Plan
Chowchilla Subbasin

January 2020

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TECHNICAL APPENDIX ◦ NOVEMBER 2019

Assessment of Groundwater Dependent Ecosystems for the Chowchilla Subbasin Groundwater Sustainability Plan

PREPARED FOR

Groundwater Sustainability Plan
Chowchilla Subbasin

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1 GDE IDENTIFICATION

Groundwater dependent ecosystems (GDEs) are defined in California's Sustainable Groundwater Management Act (SGMA) as "ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (23 CCR § 351(m)). As described in The Nature Conservancy's guidance for GDE analysis (Rohde et al. 2018), a GDE's dependence on groundwater refers to reliance of GDE species and/or communities on groundwater for all or a portion of their water needs. In this section, we detail the information sources used, new information gathered, and methods applied to make determinations and to describe the conditions of GDEs identified in the Chowchilla Subbasin. We used Rohde et al. (2018) as well as the text of SGMA itself as primary guides.

1.1 GDE Mapping and Methods

We began the process of identifying the GDE units in the Chowchilla Subbasin using the California Department of Water Resources' (DWR) iGDE (GDE indicators) database, published online and referred to as the Natural Communities Commonly Associated with Groundwater dataset (Klausmeyer et al. 2018). We augmented these data with other relevant spatial vegetation data, aerial imagery, information on vegetation types, depth to groundwater, plant and animal species distributions in the area, plant species rooting depths, and field observations. Data analysis was conducted through a series of steps to augment, filter, classify and finalize the GDE units within the Chowchilla Subbasin.

1.1.1 Data sources

This section includes brief descriptions of the data and other information sources used to identify and aggregate potential GDEs into final GDE units.

Our starting point for GDE identification and analysis was the iGDE database (Klausmeyer et al. 2018). We downloaded the iGDE geodatabase from the DWR website (https://gis.water.ca.gov/app/NCDatasetViewer/#) and incorporated it into the project geographic information system (GIS) to create a preliminary map to serve as the primary basis for initial identification of potential GDEs. This data set is a combination of the best available data obtained from multiple publicly available sources:

- VegCAMP – Vegetation Classification and Mapping Program, California Department of Fish and Wildlife (CDFW 2018) – Areas mapped to the alliance level and with a minimum mapping unit (MMU) of 1.0 and 0.25 acres for natural uplands and wetlands/ riparian areas, respectively; mapped using 2012 imagery from the National Agriculture Imagery Program (NAIP) for the Southern San Joaquin Valley.
- NWI v2.0. – National Wetlands Inventory (Version 2.0), U.S. Fish and Wildlife Service (USFWS 2018); MMU = 0.5 acres.
- CalVeg – Landsat-based classification and assessment of visible ecological groupings, USDA Forest Service (March 2007) – vegetation mapping to the alliance level that is cross-walked to VegCAMP; MMU = 2.5 acres.

In addition, we added a more recent vegetation mapping source for the San Joaquin River riparian corridor, developed by Stillwater Sciences under contract with the Bureau of Reclamation for the San Joaquin River Restoration Program (Bureau of Reclamation 2014). This dataset represents an update to the Geographic Information Center's 2009 vegetation map, prepared for DWR's

Central Valley Flood Protection Program; this update used 2012 NAIP imagery and 2013 field observations. Vegetation was mapped to the alliance level with an MMU of 0.25 acres (Bureau of Reclamation 2014).

Klausmeyer et al. (2018) created the iGDE dataset as a starting point to identify potential GDEs across the state. Per the authors, this dataset requires careful review and refinement with local information since it was created at the state scale and broad decisions were made without consideration of local conditions. Thus, we reviewed all areas included in the iGDE dataset and scanned the full area of the Chowchilla Subbasin, using aerial imagery and existing vegetation mapping, to check for potential GDEs that might have been omitted or mischaracterized during creation of the statewide iGDE dataset.

To inform the assessment of GDE condition and potential effects (Sections 2 and 3), we obtained mapped plant community and wetland types detailed in the original VegCAMP, NWI, and CalVeg datasets as well as the San Joaquin River Riparian Vegetation dataset, the latter of which was available in-house. We evaluated and incorporated information on depth to groundwater and plant species rooting depth into this analysis to help inform subsequent assessment of potential sensitivity of vegetated GDEs to changes in groundwater. Published information on depth of rooting for riparian and wetland plant species was obtained in the form of a database (spreadsheet) collated and made publicly available online by TNC at The Nature Conservancy's Groundwater Resource Hub (https://groundwaterresourcehub.org/gde-tools/gde-rooting-depths-database-for-gdes/). Where data were missing, Stillwater's vegetation ecologists conducted literature searches to update this database for phreatophyte species occurring within the Chowchilla Subbasin. Depth to groundwater in the regional aquifer was estimated and mapped by LSCE based on existing well data, as described in Section 2.2.2 of this Groundwater Sustainability Plan (GSP) and provided as a geodatabase. Information on hydrogeology was used to better understand the distribution of other perched/mounded groundwater in the subbasin (Davids Engineering and LSCE 2017).

1.1.2 Procedure

In general, we followed the steps for defining and mapping GDEs outlined in Rohde et al. (2018). Throughout this process, we applied a decision tree to determine when species or biological communities were considered groundwater dependent based on definitions found in SGMA and Rohde et al. (2018). This decision tree, created to systematically and consistently address the range of conditions encountered, is summarized below, where the term 'unit' refers to an area with consistent vegetation and hydrology:

The unit is a GDE if groundwater is:

1. An important hydrologic input to the unit during some time of the year, AND
2. Important to survival and/or natural history of inhabiting species, AND
3. Associated with:
    a. A perched/mounded[1] unconfined aquifer, OR
    b. A regional aquifer used as a regionally important source of groundwater.

[1] The degree to which the shallow groundwater is perched or mounded atop shallow clay layers. Mounding is often pronounced underneath rivers which are often the source of the mounded water.

The unit is not a GDE if its hydrologic regime is primarily controlled by:

1. Surface discharge or drainage from an upslope human-made structure(s), such as irrigation canal, irrigated fields, reservoir, cattle pond, water treatment pond/facility.
2. Precipitation inputs directly to the unit surface. This excludes vernal pools from being GDEs where units are hydrologically supplied by direct precipitation and very local shallow subsurface flows from the immediately surrounding area.

For the Chowchilla Subbasin, shallow groundwater is perched/mounded above shallow clay layers rather than the regional aquifer. Specifics on these steps, as applied to the Chowchilla Subbasin, are provided below.

1.1.2.1 Identify communities supporting phreatophytic vegetation

After obtaining the relevant spatial data described above, we overlaid and evaluated these data in GIS to select the most recent and highest quality vegetation and water body mapping information. In this case, consistent with Klausmeyer et al. (2018), we prioritized the most recent and highest resolution mapping over earlier and coarser scale mapping information. Thus, the order of priority, from first to last, was: San Joaquin River Riparian (Bureau of Reclamation 2014), VegCAMP, NWI v2.0, CalVeg. The highest priority mapped vegetation type polygons that overlapped with the iGDE polygons were summarized by vegetation type and total acreage. These vegetation types were reviewed by one of our experienced wetland and riparian ecologists to remove vegetation types adapted to well drained, upland conditions (i.e., those not considered phreatophytes[2]) from the working GIS layer, such as blue oak woodland (*Quercus douglasii*).

1.1.2.2 Identify potential GDEs based on potential hydrologic connection to groundwater

GDEs rely on shallow groundwater in the Chowchilla Subbasin. For much of the subbasin, the regional aquifer is very deep, and the shallow groundwater that GDEs rely on is perched or mounded atop shallow clay layers. Because the potential hydrologic connection between the shallow groundwater and deep groundwater is often unknown, we conservatively assumed that shallow groundwater could potentially be influenced by pumping. We removed iGDEs without a potential hydrological connection to groundwater from the original dataset using spatially extrapolated or interpolated empirical measurements of depth to groundwater (DTW) for winter/spring of water years 2014 and 2016. DTW mapping for 2015 was not used due to limitations resulting from few available water level measurements. The 2014 and 2016 DTW data were the most accurate and recent DTW data available for the Chowchilla Subbasin. While the 2016 data represent conditions after the 2015 SGMA baseline, the use of shallow groundwater data from both years was deemed appropriate because it provided a more conservative (i.e., more inclusive) indicator of potential GDEs than the use of a data from a single year.

A DTW of 30 feet was used as one of the primary criteria in the initial screening of potential GDEs. The use of a 30-foot DTW criterion to screen potential GDEs corresponds to the maximum rooting depth of valley oak, *Quercus lobata* (Lewis and Burgy 1964), one of the species that compose iGDEs in the subbasin and is consistent with guidance provided by The Nature Conservancy (Rohde et al. 2018) for identifying GDEs. Potential GDEs were retained for

[2] A phreatophyte is a deep-rooted plant that obtains its water from the phreatic zone (zone of saturation) or the capillary fringe above the phreatic zone (Rohde et al. 2018). Phreatophytes grow where precipitation is insufficient for their persistence and groundwater is therefore required for long-term survival (Naumberg et al. 2005). Phreatophytes are often, but not always, found in riparian areas and wetlands.

further analysis if the underlying DTW in either winter/spring 2014 or winter/spring 2016 was equal to or shallower than 30 feet. In addition, we evaluated DTW under the San Joaquin and Chowchilla rivers during 2014 and 2016 in relation to river flow to assess the potential connection between surface flow and groundwater levels. If there was evidence that the surface water was connected to groundwater (i.e., a gaining stream), that reach would be eligible for inclusion as a potential GDE. Because the vast majority of rivers in the subbasin are not perennial and all are in a net-losing hydrological condition (i.e., losing water to the groundwater system), this criterion excluded most of the smaller river channels and associated terrestrial vegetation from consideration as GDEs. Thus, we generated a draft map of the potential GDEs that occur in areas where DTW was less than or equal to 30 feet in either water year 2014 or 2016. We used 2012 geospatial vernal pool mapping data (Witham et al. 2014) in combination with aerial photographic analysis to identify vernal pools mapped in the iGDE data set and remove them from the working GIS layer and draft map. Other surface water features such as stock ponds that we determined were not connected to groundwater were removed based on review of aerial photographs and other available information.

1.1.2.3 Refine potential GDE map

We reviewed for accuracy the mapped vegetation cover in remaining polygons identified as potential GDEs using visual analysis of Google Earth and NAIP imagery. These potential GDE polygons were primarily those dominated by terrestrial vegetation (i.e., vegetated potential GDEs). We removed from the potential GDE map those areas that had, since vegetation mapping occurred, changed land use from natural vegetation to developed uses (urban, roads, or agriculture). During this heads-up review of the potential GDEs, areas supporting riparian or wetland vegetation that were not in the original iGDE geodatabase, but were included in other high-quality datasets (e.g., VegCAMP or San Joaquin River Riparian mapping [Bureau of Reclamation 2014]) and have the potential to be hydrologically linked to groundwater (i.e., located in an area where the depth to water is less than or equal to 30 feet or along a gaining river or stream reach), were added to the potential GDE geodatabase and map. Polygons on the potential GDE map were labeled and color-coded as “kept,” “added” or “removed” from the original iGDE data set according to the above described criteria (Figure A2.B-1).

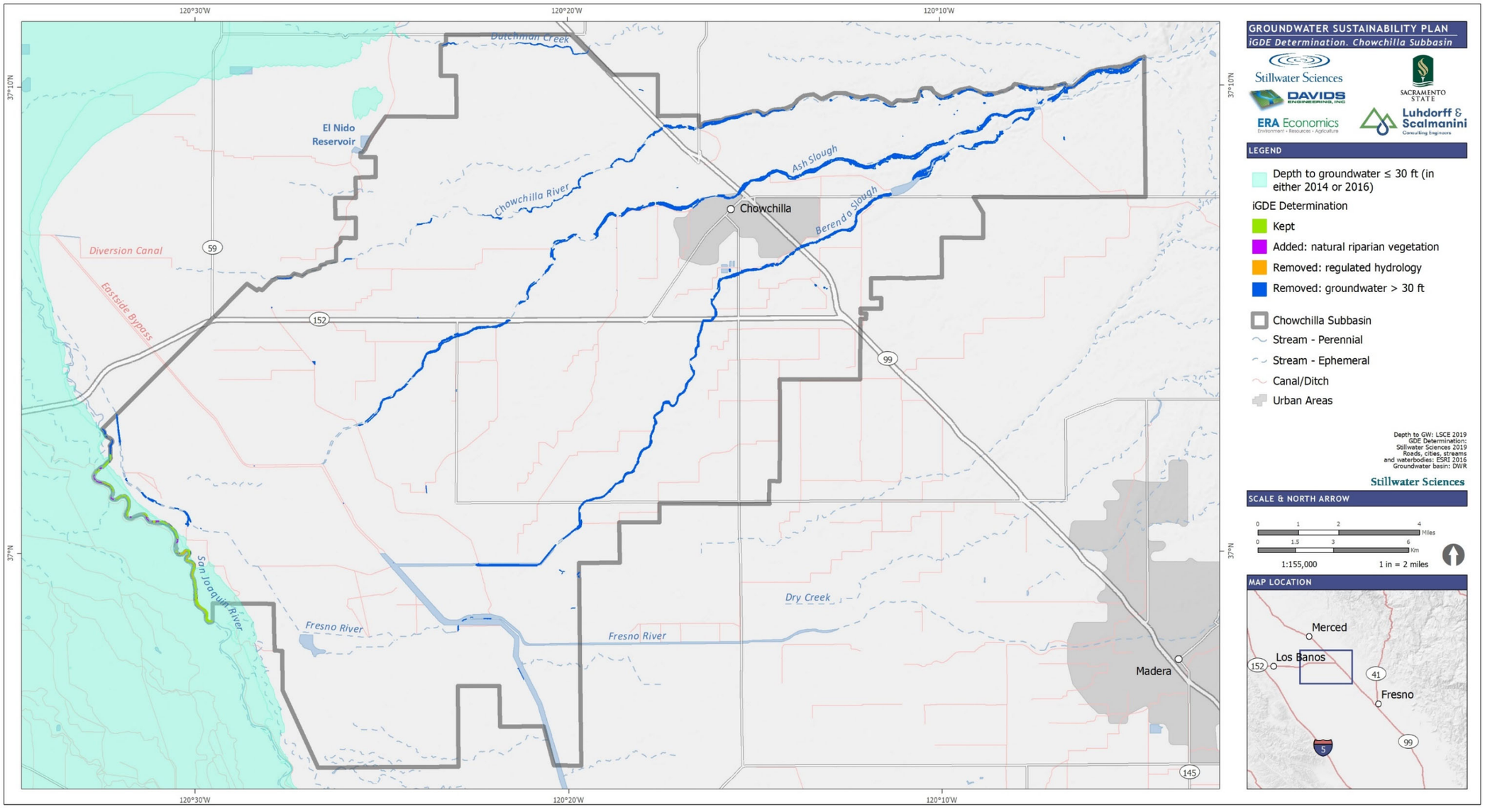

Figure A2.B-1. Potential GDEs in the Chowchilla Subbasin, showing iGDE polygons kept, added, or removed from the DWR Natural Communities Commonly Associated with Groundwater dataset.

1.1.2.4 Identify potentially associated sensitive species and community types

Stillwater Sciences' ecologists queried existing databases on regional and local occurrences and spatial distributions of special-status species. Databases accessed include CNDDB (2019), CNPS (2019), and eBird (2019). Spatial database queries were centered on the potential GDEs plus a 5-mile buffer. Stillwater's ecologists reviewed the database query results and identified species and community types with the potential to occur within or to be associated with the vegetation and aquatic communities in or immediately adjacent to the potential GDEs. Stillwater's ecologists then consolidated a list of these sensitive species and community types, along with summaries of habitat preferences and any known occurrence reports, for field review.

1.1.2.5 Ground truth vegetation type and condition in field surveys

On May 1, 2019, two Stillwater Sciences biologists, one with expertise in vegetation and the other in wildlife, performed a reconnaissance level survey of portions of the areas mapped as potential GDEs. The Stillwater team loaded spatial data on potential GDE locations, sensitive species occurrences, and DTW estimates onto a GPS equipped field tablet. The field crew also brought field maps and other information on potential special-status species to the field and visited a subset of the potential GDEs, selected to represent the range of potential GDE vegetation and hydrologic types in the subbasin. At each site, the field biologists recorded dominant vegetation types and plant species, estimates of percent cover for native and non-native plants by vegetation layer, indications of hydrologic connectivity with surface and/or groundwater, and indications of site alteration (e.g., cattle use, human disturbance, land use changes). Based on field observations, the field crew confirmed or refined mapped vegetation types, qualitatively evaluated the ecological condition, and qualitatively assessed habitat conditions for sensitive species at each representative site. The field crew recorded notes on the ecological conditions of each site visited, such as information on the proportion of live vs. senescent canopy, evidence of native species recruitment, and vegetation density. Habitat conditions for each species were assessed by comparing each species' habitat preferences (e.g., large trees, open water or herbaceous cover, etc.) to conditions present at the site. The field crew also recorded observations to help inform or verify potential linkages to groundwater, such as indications of standing water, water emerging from the ground, or flowing into or off of the site from a contributing area.

1.1.2.6 Refine vegetation and aquifer association for potential GDEs

We updated our geodatabase with field refinements in mapped vegetation types and extents, as well as location and extent of newly observed potential GDEs identified within the subbasin during the site survey. We then assigned the potential GDE units to aquifers based on DTW data and field observations.

1.1.2.7 Document changes to iGDE map and create final GDE map

We consolidated the remaining GDE polygons by type (e.g., vegetated, riparian) and proximity to one another, giving each grouping a descriptive name. Changes made to the original iGDE map were recorded as they were made, based on desktop or field observation of changes in vegetation type or land use, indications of no hydrologic linkage to groundwater, or areas where the hydrologic regime is dominated by human intervention, including canals. The final GDE map (Figure A2.B-2) shows these consolidated GDEs, grouped into GDE units, each with a unique color and name. A single unit, the San Joaquin River Riparian GDE Unit, occurs in the Chowchilla Subbasin. Figure A2.B-3 shows the GDE unit in greater detail.

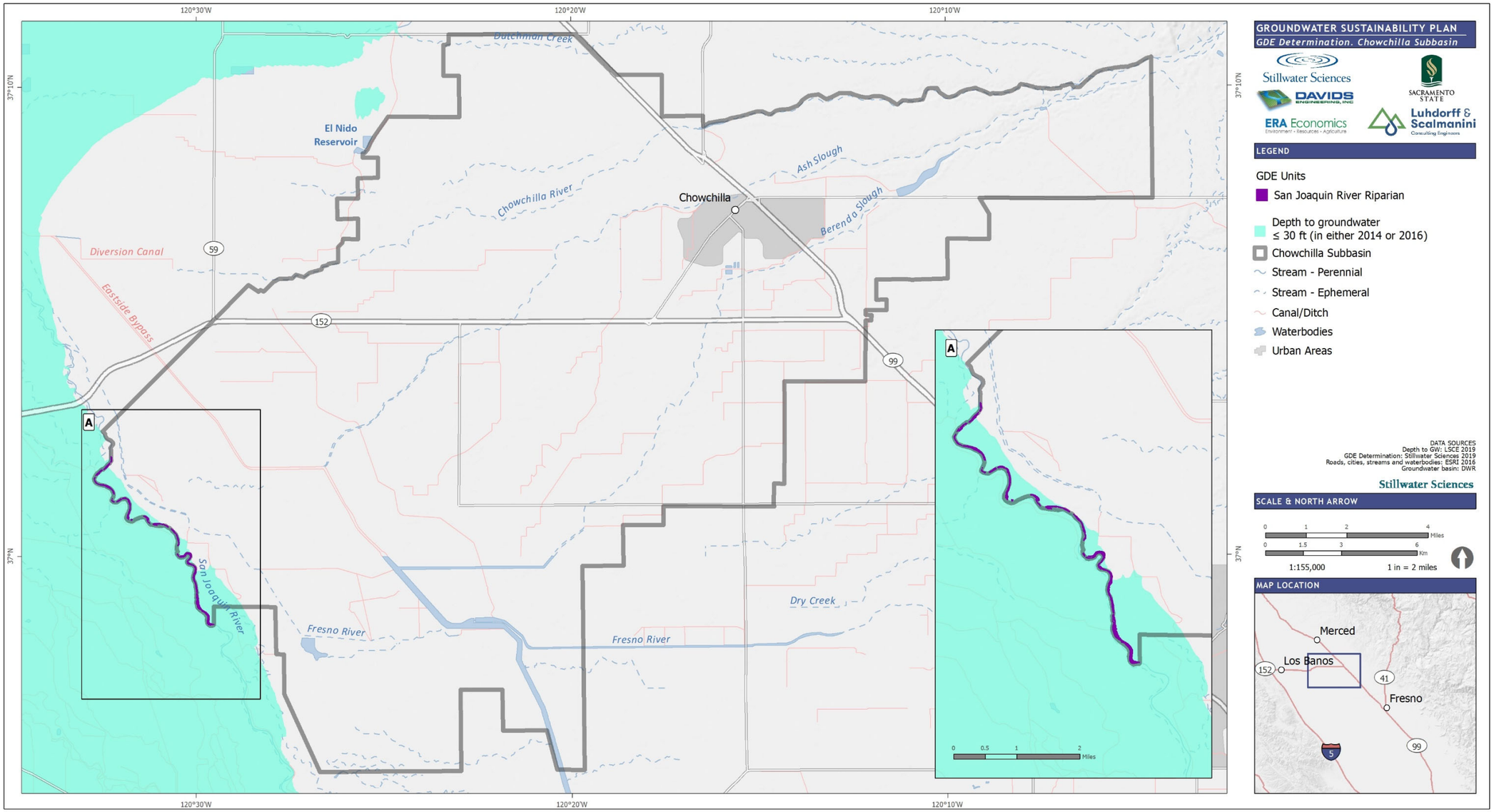

Figure A2.B-2. GDE units and depth to groundwater in the Chowchilla Subbasin.

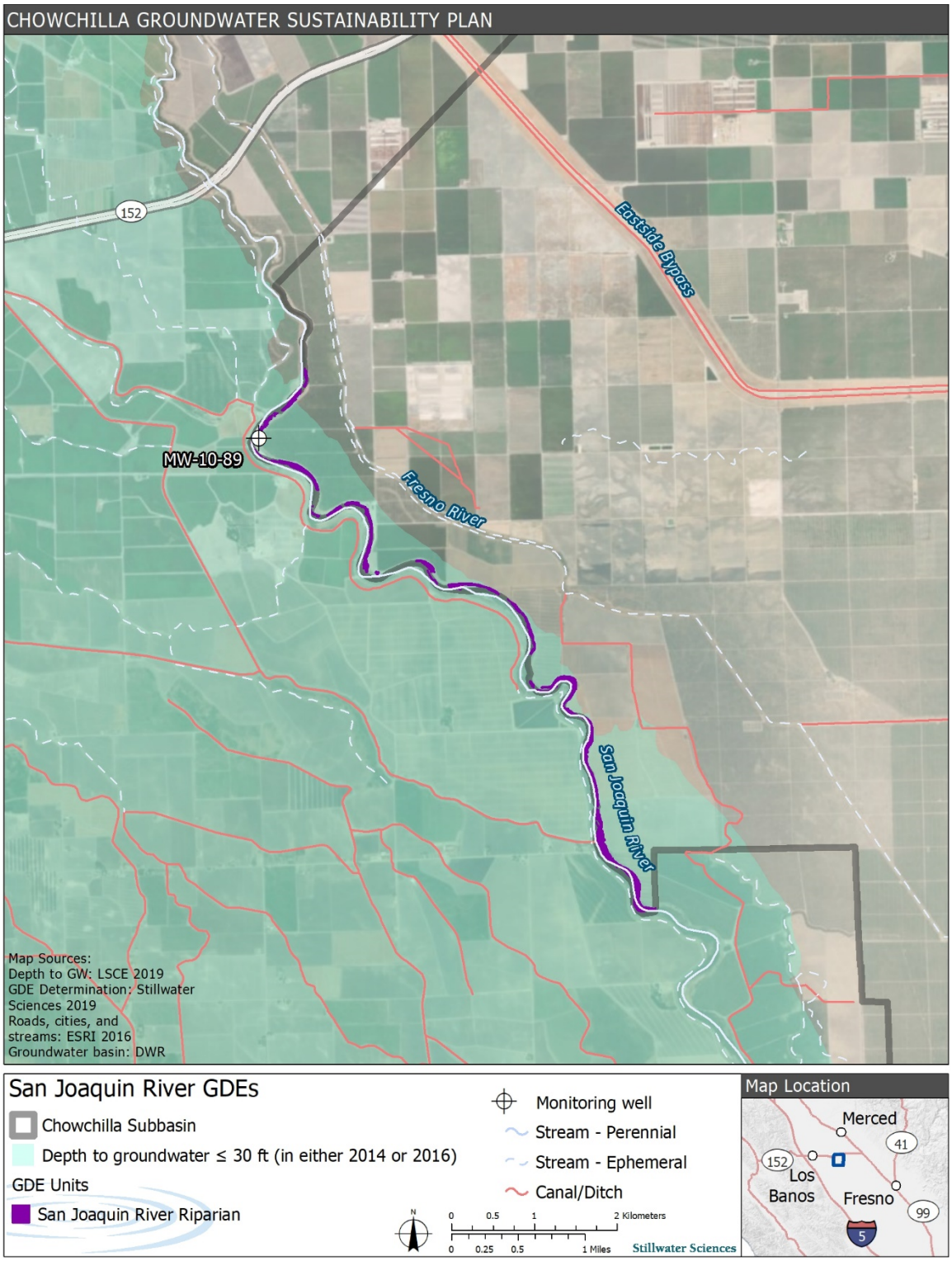

Figure A2.B-3. San Joaquin River Riparian GDE Unit, and the location of the San Joaquin River Restoration Program (SJRRP) monitoring well MW-10-89.

2 GDE CONDITION

In this section we characterize the San Joaquin River Riparian GDE Unit based on its hydrologic and ecological conditions and assign a relative ecological value to the unit by evaluating its ecological assets and their vulnerability to changes in groundwater (Rohde et al. 2018).

2.1 Hydrologic Conditions

The San Joaquin River Riparian GDE Unit is located along the western boundary of the Chowchilla Subbasin. Flows in this reach of the San Joaquin River are largely controlled by releases from Friant Dam and Mendota Pool. The unit is underlain by interbedded sands and silt/clays and the Corcoran Clay is over 200 feet below the ground surface (see Chapter 2.2.1 of this GSP).

Groundwater was less than 30 feet deep in 2014 and 2016 under the GDE unit (Figure A2.B-3). This is too deep for the surface flow of the San Joaquin River to be continuously connected to groundwater, but within the maximum rooting depth of riparian plants. The groundwater may connect to the river during sustained high flows in the San Joaquin River. Groundwater perched/mounded atop the upper clay likely originates from infiltration of surface water, agricultural runoff and infiltration, and potentially leakage from the canals in close proximity to the channel. Underneath the San Joaquin River, the groundwater is perched or mounded atop the shallow clay but there is no unsaturated zone below the perched/mounded aquifer. It is therefore possible that changes to the regional aquifer could affect the shallower perched/mounded aquifer that maintains the GDE, but this connection is unknown. Simulations using C2VSIM, a groundwater-surface water modeling system designed by DWR for the entire Central Valley, suggest the San Joaquin River in this reach was a gaining stream, on average from the 1920s through 2000 (TNC 2014). The average element size for the C2VSIM modeling was 0.64 mi^2, a much coarser grid than used for the modeling conducted as part of this GSP, and hence the C2VSIM model has a much larger uncertainty in its results.

Flows in the San Joaquin River changed following the San Joaquin River Restoration Settlement Agreement in 2006. Prior to the settlement minimum releases from Friant Dam were required to deliver 5 cfs to Gravelly Ford, located upstream in the Madera Subbasin. Interim flow releases from Friant Dam began in October 2009, and restoration flows began January 1, 2014, but were curtailed during critically dry conditions from March 2014–February 2016. Restoration flows in the San Joaquin River were reinitiated in 2016.

To determine hydrologic conditions, groundwater depth was modeled at San Joaquin River Restoration Program (SJRRP) monitoring well SJRRP_MW-10-89. The historical condition (1988–2015) is illustrated in Figure A2.B-4. This well is located adjacent to the river within 50 feet of the GDE unit (Figure A2.B-3). Two other shallow SJRRP wells, SJRRP_MW-11-161 and SJRRP_MW-11-163, which are located approximately 1,800 feet upstream of Sack Dam (and approximately 5 miles upstream of SJRRP MW-10-89), are ¼ mile east of the San Joaquin River Riparian GDE. These more distal wells can be used to assess groundwater changes near the upstream end of the GDE.

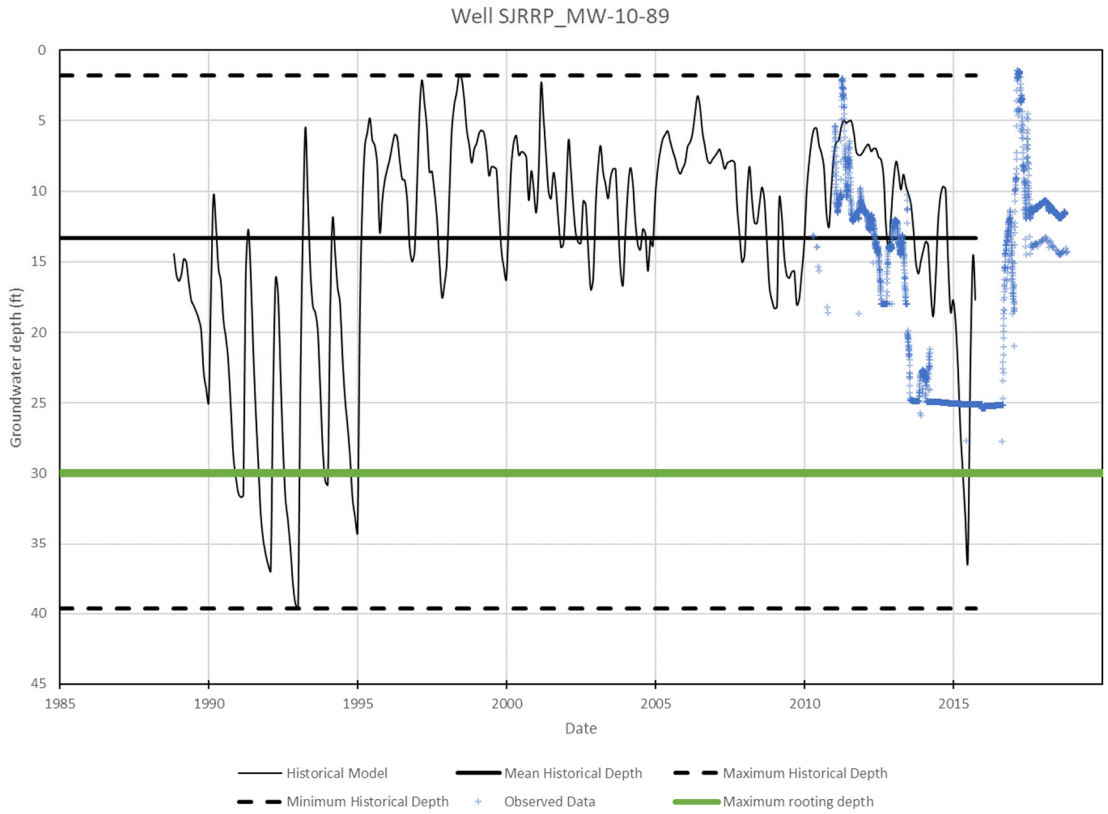

Figure A2.B-4. Modeled and observed groundwater elevations from well SJRRP_MW-10-89 located at the northwest section of the San Joaquin River Riparian GDE Unit.

Figure A2.B-4 shows the modeled depth for the finer-scale modeling results for 1988–2015 conducted as part of this GSP (black lines), groundwater depth measurements (blue plus symbols), the mean groundwater depth for 1988–2015 (horizontal solid line), and the minimum and maximum modeled depths for 1988–2015 (dashed horizontal lines) for SJRRP_MW-10-89. The model results are linked to known hydrologic inputs from 1988–2015 and observed data recorded from April 2010–October 2018 for the SJRRP_MW-10-89 well. Because the well is screened from 10 to 25 feet below the ground surface, the persistent water depths near 25 feet from 2013–2016 (Figure A2.B-4) indicate that water depth was at least 25 feet deep, but the actual depth is unknown. The SJRRP restoration flows in the San Joaquin River are likely critical to maintaining shallow groundwater elevations associated with the GDE unit. With the exception of the dry period from 2013–2016 (when the observations do not reflect changes in groundwater level because the groundwater depth exceeded 25 feet), the model does a reasonable job capturing the timing of changes in groundwater level. The magnitudes of change differ by generally about 5 feet but the model results were at least 15 feet higher than the observations in 2014. The model does a much better job representing the 2012–2016 period in wells SJRRP_MW-11-161 and SJRRP_MW-11-163. From October 1988–December 1994 the shallow groundwater was very deep and highly variable. To some degree this is due to the drought during this period in combination with the lack of interim or restoration flow releases from Friant Dam prior to 2009.

The minimum modeled groundwater depth was 36.2 feet during the drought in November 1992. The deep groundwater depths prior to 1995 were due to a combination of drought conditions in

the subbasin and very low flow releases to the San Joaquin River. The mean modeled groundwater depth form 1989–2015 was 7.9 feet and the groundwater depth ranged from 1.8–39.6 feet. Over this period, the groundwater depth exceeded 30 feet (the maximum depth at which GDE connection to groundwater is likely) for 22 months (6.8% of the monthly data). The shallowest well depths indicate that the surface water may be temporarily connected with the perched/mounded groundwater beneath the well. Because the groundwater inputs are dependent on inflow from the San Joaquin River, groundwater elevations decline during low flow periods and increase during high flows.

2.2 Ecological Conditions

The San Joaquin River Riparian GDE Unit is located along the San Joaquin River on the western margin of the Chowchilla Subbasin (Figures A2.B-2 and A2.B-3) and is composed of a mix of riparian forest, shrub, and herbaceous habitat types totaling approximately 70 acres. Analysis of existing vegetation mapping data (Klausmeyer et al. 2018), color aerial imagery (ESRI 2017), and May 2019 field reconnaissance conducted in representative portions of the unit determined the quality of riparian habitat in this unit to be generally good but with habitat patches ranging from somewhat degraded to excellent quality. The width, complexity, and relative percentage of native vegetation in the riparian corridor varied along the length of the San Joaquin River in this unit, as observed during the May 2019 field survey and past surveys of the area by Stillwater Sciences' ecologists, as well as review of aerial imagery. The riverine, aquatic habitat of the San Joaquin River is not contained within the GDE unit because, although surface flows in the San Joaquin River likely contribute to shallow groundwater in the unit via infiltration (see Section 2.2.2.5 of this GSP), available hydrologic data indicates no substantial groundwater contribution to the surface flow in the river (i.e., this reach of the San Joaquin River does not gain but rather loses water to the groundwater system). However, the riparian vegetation community of the San Joaquin River Riparian GDE Unit fulfills several essential ecosystem functions or provides important habitat elements, such as large wood and riparian shade, on which both semi-aquatic species of the GDE unit and aquatic species of the San Joaquin River depend for completing essential life behaviors. The Water Quality Control Plan (Basin Plan) for the San Joaquin River Basin (CRWQCB 2018) identifies the San Joaquin River adjacent to the GDE unit as having the following beneficial uses for fish and wildlife:

- Warm freshwater habitat (WARM);
- Warm and cold migration habitat (MIGR);
- Warmwater spawning habitat (SPWN); and
- Wildlife habitat (WILD).

Designated fish and wildlife beneficial uses of other surface water bodies in the Chowchilla Subbasin, including the Fresno River and Chowchilla River, are limited to warm freshwater habitat (WARM) and wildlife habitat (WILD). The Basin Plan also lists coldwater spawning habitat (SPWN) for salmon and trout as a potential beneficial use for this portion of the San Joaquin River. Because certain special-status aquatic species and habitat elements present in the San Joaquin River may rely in part on inputs and functions provided by vegetation in the GDE unit, these contributions are considered beneficial uses warranting consideration under SGMA. Accordingly, certain special-status species and their habitat in the San Joaquin River are included in the analyses of potential effects on the San Joaquin River Riparian GDE Unit presented below.

The reconnaissance-level biological assessment of representative portions of the San Joaquin River Riparian GDE Unit conducted in May 2019 identified areas of mature riparian forest with a stratified canopy and moderately open understory, overhanging vegetation along the riverbank, and downed wood (Figure A2.B-5). Vegetation at the site provided over 90% native cover in the shrub and tree layer and 15–25% native cover in the herbaceous ground cover, with the balance occupied by non-native species. Dominant vegetation included Fremont cottonwood (*Populus fremontii*) and Goodding's willow (*Salix gooddingii*) in the overstory and narrow-leaved willow (*Salix exigua*) in the shrub layer, interspersed with herbaceous ground cover dominated by European grasses and emergent vegetation (tules, cattails) lining the channel edge. Wildlife observed within the San Joaquin River Riparian GDE Unit included white-faced ibis, barn swallow, ash-throated flycatcher, Canada goose, spotted towhee, and house wren.

Figure A2.B-5. High-quality riparian habitat in the San Joaquin River Riparian GDE Unit. Photo taken May 1, 2019 by Stillwater Sciences.

The potential for special-status species and their habitat to occur in the San Joaquin River Riparian GDE Unit was determined by querying databases on regional and local occurrences and spatial distributions of special-status species, including CNDDB (2019), CNPS (2019), and eBird (2019). Spatial database queries were centered on the potential GDE plus a 5-mi buffer. Database query results of local and regional occurrences were combined with known habitat requirements of identified special-status species to develop a list of special-status species that satisfy one or more of the following criteria: (1) known to occur in the region and suitable habitat present in the GDE unit, (2) documented occurrence within the GDE Unit, and (3) directly observed during the May 1, 2019 reconnaissance survey (Table A2.B-1).

This GDE unit does not contain or overlap any critical habitat for federally listed species (USFWS 2019, NMFS 2016) but the adjacent San Joaquin River contains Essential Fish Habitat (EFH) for Chinook salmon which is partially dependent on riparian inputs to provide important

salmon habitat elements including shade, overhead cover, nutrients, and woody material for instream cover and habitat complexity (PFMC 2014). The PG&E San Joaquin Valley Operations and Maintenance Habitat Conservation Plan (Jones & Stokes 2006) includes covered lands within the San Joaquin River Riparian GDE Unit and covers some of the same species identified in our queries as potentially occurring within the unit. However, the queries and field reconnaissance we conducted for this analysis provide more recent and site-specific data on the presence or potential for special status species to occur in the GDE unit, as well as the overall ecological value, ecological condition trend, and vulnerability to future groundwater changes. Therefore, the information contained in the PG&E Habitat Conservation Plan was not incorporated into our analysis. The unit does not include any known protected lands (CPAD 2019).

2.3 Ecological Value

The San Joaquin River Riparian GDE Unit was determined to have **high ecological value** because of: (1) the known occurrence and presence of suitable habitat for several special-status species (Table A2.B-1); and (2) the vulnerability of these species and their habitat to changes in groundwater levels (Rohde et al. 2018). The unit's high ecological value is also related to its contributions to the ecological function of adjacent riverine habitat that supports special-status salmonids and other species.

Table A2.B-1. Special-status species with known occurrence, or presence of suitable habitat in the San Joaquin River Riparian GDE Unit.

Common name *Scientific name*	Status[1]	Association with GDE Unit	Source	Habitat and occurrence
Birds				
Bald eagle *Haliaeetus leucocephalus*	FD, SFP	Likely	regional occurrence (CNDDB, eBird)	moderately suitable perching and limited nesting habitat; many documented occurrences in region; suitable foraging habitat in adjacent San Joaquin River
Swainson's hawk *Buteo swainsoni*	ST	Likely	regional occurrence (CNDDB, eBird)	highly suitable nest trees and nearby foraging habitat; many documented occurrences in Madera County
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	FT, SE	Unlikely	regional occurrence (CNDDB, eBird)	although rare, species is known or believed to occur in Madera County (USFWS 2019); moderately suitable nesting and foraging habitat present
Mammals				
Pallid bat *Antrozous pallidas*	SSC	Likely	regional occurrence (CNDDB, eBird)	suitable foraging habitat and numerous large trees for roosting; small structures moderately suitable for roosting in the vicinity
Western red bat *Lasiurus blossevillii*	SSC	Likely	regional occurrence (CNDDB, eBird)	suitable foraging habitat and numerous large trees for roosting
Amphibians and reptiles				
Western pond turtle *Emys marmorata*	SSC	Nesting stage likely; foraging may occur in adjacent San Joaquin River)	regional occurrence (CNDDB)	suitable nesting habitat
Fish				
Central Valley Spring-Run Chinook Salmon *Oncorhynchus tshawytscha*	FT	Not in GDE Unit but occupies adjacent San Joaquin River	known occurrence in San Joaquin River[2]	Suitable habitat present (migration, rearing); species known to occur in San Joaquin River and is sustained by San Joaquin River Restoration Program
Central Valley Steelhead *Oncorhynchus mykiss*	FT	Not in GDE Unit but likely in adjacent San Joaquin River	local/regional occurrence in San Joaquin River (CNDDB, NMFS)	Suitable habitat present (migration, rearing); species known to occur in San Joaquin River
Hardhead *Mylopharodon conocephalus*	SSC	Not in GDE Unit but likely in adjacent San Joaquin River	local/regional occurrence in San Joaquin River (CNDDB)	Suitable habitat present; species known to occur in San Joaquin River
Plants				
Sanford's arrowhead *Sagittaria sanfordii*	1B.2, S3, G3, not state or federally listed	Likely	regional occurrence (CNDDB)	Emergent vegetation along backwater areas of channel edge could support this species.
California satintail *Imperata brevifolia*	2B.1, S3, G4, not state or federally listed	Likely	regional occurrence (CNDDB)	Occurs on stream banks and floodplains and therefore could be supported along these banks of the San Joaquin.
Brittlescale *Atriplex depressa*	1B.2, S2, G2, not state or federally listed	Likely	local occurrence (CNDDB)	Meadows, seeps, playas, vernal pools, alkaline soil, perennial grasslands, and backwater/oxbow depressions with saline soil could support this species; all CNDDB observations within buffer area are in grasslands and/or vernal pool areas; none in riparian corridor
Heartscale *Atriplex cordulata var. cordulata*	1B.2, S2, G3, not state or federally listed	Likely	local occurrence (CNDDB)	Found on saline or alkaline soils; occurs in annual grasslands, seeps, and backwater/oxbow depressions with saline soil; all CNDDB observations within buffer area are in grasslands and/or vernal pool areas; none in riparian corridor
Munz's tidy-tips *Layia munzii*	1B.2	Unlikely	local occurrence (CNDDB)	Chenopod scrub, grasslands, found on alkaline clay soils; last reported in area in 1941
Palmate-bracted bird's-beak *Chloropyron palmatum*	1B.1, FE, SE,	Likely	local occurrence (CNDDB)	Chenopod Scrub, alkaline soils, found in alkaline flats but multiple semi-recent sightings in the vicinity

Common name *Scientific name*	Status[1]	Association with GDE Unit	Source	Habitat and occurrence
Spiny-sepaled button-celery *Eryngium spinosepalum*	1B.2, S2, G2, not state or federally listed	Likely	local occurrence (CNDDB)	Valley grassland, freshwater wetlands, wetland-riparian, vernal pools. Many CNDDB observations within buffer area are in grasslands such as those along San Joaquin riparian corridor
California alkali grass *Puccinellia simplex*	1B.2, S2, G3, not state or federally listed	Likely	local occurrence (CNDDB)	Valley grassland, wetland-riparian, Meadows, seeps, vernal pools, vernally mesic, sinks, lake margins however most CNDDB sightings are on alkali soils and/or vernal pools
Valley Sacaton Grassland	S1.1, G1	Likely	local occurrence (CNDDB)	Alkali-saline soil, and wetland found along riparian zones in California and southwest
Sycamore Alluvial Woodland	S1.1, G1	Likely	Regional occurrence (CNDDB)	Riparian, floodplain, and wetland

[1] Status codes:

G = Global

Federal
FT = Listed as threatened under the federal Endangered Species Act
FD = Federally delisted

State
S = Sensitive
SE = Listed as Endangered under the California Endangered Species Act
ST = Listed as Threatened under the California Endangered Species Act
SSC = CDFW species of special concern
SFP = CDFW fully protected species

Global Rank
1 Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
2 Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
3 Vulnerable — At moderate risk of extinction or elimination due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
4 Apparently Secure — Uncommon but not rare; some cause for long-term concern due to declines or other factors.

California Rare Plant Rank
1B Plants rare, threatened, or endangered in California and elsewhere
2B Plants rare, threatened, or endangered in California, but more common elsewhere
3 More information needed about this plant, a review list
4 Plants of limited distribution, a watch list
CBR Considered but rejected

CRPR Threat Ranks:
0.1 Seriously threatened in California (high degree/immediacy of threat)
0.2 Fairly threatened in California (moderate degree/immediacy of threat)
0.3 Not very threatened in California (low degree/immediacy of threats or no current threats known)

[2] San Joaquin River Restoration Program. 2017. Fisheries Framework: Spring-run and Fall-run Chinook Salmon. June 2017. http://www.restoresjr.net/?wpfb_dl=1055

3 POTENTIAL EFFECTS ON GDEs

This section presents the methods and results of our analysis to identify how groundwater management could affect GDEs in the Chowchilla Subbasin. Adverse effects (impacts) on GDEs are considered undesirable results under SGMA (State of California 2014). The analysis is based on the hydrologic conditions affecting GDEs and their susceptibility to changing groundwater conditions, trends in biological condition of the GDEs, and anticipated conditions or management actions likely to affect GDEs in the future.

3.1 Summary

This section provides a summary of potential effects for the San Joaquin River Riparian GDE Unit. The methods used to determine the GDE unit's current ecological condition and its susceptibility to changing groundwater conditions are described in Section 3.2 below. The analyses and rationale for these assessments are described in Sections 3.3, 3.4, and 3.5.

The San Joaquin River Riparian GDE Unit is characterized as having high ecological value with moderate susceptibility to changing groundwater conditions. The perched/mounded shallow groundwater associated with this unit has a potential connection with the regional aquifer and could be affected by groundwater pumping. Reconnaissance level biological assessment, aerial photograph analysis, and NDVI/NDMI data indicate the ecosystem structure and functions of the San Joaquin River Riparian GDE Unit are relatively intact and within the range of natural variability (Biological Condition Gradient Level 2 – Minimal Changes) and adverse impacts are not likely occurring in the unit as a result of current groundwater management (Table A2.B-2).

Projected future trends in depth to water indicate a modest decline in the average groundwater depth in the unit and an increase in the frequency and duration with which groundwater depth is expected to exceed historical lows. Adverse impacts related to future groundwater management are therefore possible.

Table A2.B-2. Summary of ecological value, susceptibility, and condition gradient in the San Joaquin River Riparian GDE Unit.

Ecological value	Rationale
High	1. Presence of special-status species 2. Vulnerability of special-status species and their habitat to changes in groundwater
Susceptibility to changing groundwater conditions	**Rationale**
Moderate	Current groundwater conditions (since 2015) are within the baseline range (1988–2015) but future changes in groundwater conditions may cause it to fall outside the baseline range.
Biological condition gradient	**Rationale**
Level 2—Minimal Changes	1. No change observed in NDVI/NDMI trends over the period 1985–2018 2. Relatively intact biotic structure and function as deduced from reconnaissance level assessment of riparian vegetation community condition 3. Suitable habitat present for those special-status species with likelihood to occur

3.2 Methods

SGMA describes six groundwater conditions that could cause undesirable results, including adverse impacts on GDEs. These are (1) chronic lowering of groundwater levels, (2) reduction of groundwater storage, (3) seawater intrusion, (4) degraded water quality, (5) land subsidence, and (6) depletions of interconnected surface water. Rohde et al. (2018) identify chronic lowering of groundwater levels, degraded water quality, and depletions of interconnected surface water as the most likely conditions to have direct effects on GDEs, potentially leading to an undesirable result. Following this guidance and based on available information for the Chowchilla Subbasin, we have eliminated reduction of groundwater storage, seawater intrusion (the subbasin is not located near or hydrologically connected to the ocean), and land subsidence from consideration. Current evidence indicates that groundwater pumping from the regional aquifer is unlikely to affect surface water flows in the subbasin, thus depletion of interconnected surface water is considered unlikely. The San Joaquin River is adjacent to, but not a part of, the San Joaquin River Riparian GDE Unit and is in a net-losing condition, with surface flow likely contributing directly to the shallow groundwater system that supports the vegetation in the unit. However, the shallow groundwater system adjacent to and disconnected from the San Joaquin River, which supports the GDE unit, does have at least the potential (albeit quite muted) to be affected by regional groundwater pumping.

This section evaluates the potential for chronic lowering of groundwater levels and degraded groundwater quality to cause direct effects on GDEs compared to baseline conditions), with a focus on effects related to groundwater levels. First, we identified baseline hydrologic conditions for the GDE unit using available information (see Section 2.2.2 of this GSP). The primary baseline hydrological condition metric used for our analysis was depth to groundwater. Next, we determined each GDE unit's susceptibility to changing groundwater conditions using available

hydrologic data and the GDE susceptibility classifications (Rohde et al. 2018) summarized in Table A2.B-3.

Table A2.B-3. Susceptibility classifications developed for evaluation of a GDE's susceptibility to changing groundwater conditions (Rohde et al. 2018).

Susceptibility classifications	
High Susceptibility	Current groundwater conditions for the selected hydrologic data fall outside the baseline range.
Moderate Susceptibility	Current groundwater conditions for the selected hydrologic data fall within the baseline range but future changes in groundwater conditions are likely to cause it to fall outside the baseline range. The future conditions could be due to planned or anticipated activities that increase or shift groundwater production, causing a potential effect on a GDE.
Low Susceptibility	Current groundwater conditions for the selected hydrologic data fall within the baseline range and no future changes in groundwater conditions are likely to cause the hydrologic data to fall outside the baseline range.

We used these susceptibility classifications to trigger further evaluation of potential effects on GDEs by integrating existing biological data, field reconnaissance assessments, and aerial photography analysis. If we determined a GDE unit to have moderate or high susceptibility to changing groundwater conditions, we used biological information to assess whether evidence exists of a biological response to changing groundwater levels or degraded water quality. The biological response analysis consisted of a combined approach of reconnaissance-level biological assessments in representative areas of each GDE unit, and quantitative trend analysis of Normalized Difference Vegetation Index (NDVI) and Normalized Difference Moisture Index (NDMI) data for individual vegetation polygons within the GDE unit (Klausmeyer et al. 2019). The polygons correspond to different GDE mapping units (i.e., different species compositions) and the size of the GDE polygons varied.

NDVI, which estimates vegetation greenness, and NDMI, which estimates vegetation moisture, were generated from surface reflectance corrected multispectral Landsat imagery corresponding to the period July 9 to September 7 of each year, which represents the period when GDE species are most likely to use groundwater (see Klausmeyer et al. 2019 for further description of methods). Vegetation with higher NDVI values indicate increased density of chlorophyll and photosynthetic capacity in the canopy, an indicator of vigorous, growing vegetation. Similarly, high NDMI values indicate that the vegetation canopy has high water content and is therefore not drought stressed. These indices are both commonly used proxies for vegetation health in analyses of temporal trends in health of groundwater dependent vegetation (Rouse et al. 1974, Jiang et al. 2006; as cited in Klausmeyer et al. 2019). NDVI and NDMI trend analysis included compilation of NDVI and NDMI trend data from 1985 to 2018 for all delineated GDE polygons from the GDE Pulse Interactive Map (TNC 2019) that are within the GDE unit boundary. These data were used to calculate mean NDVI and NDMI, and 95% confidence intervals, by year for the GDE unit as a whole, and then change in mean NDVI/NDMI was visually inspected to identify increasing, decreasing, or no change in temporal trends over the period 1985 to 2018. Negligible changes were identified as those that failed to exceed the level of uncertainty in mean values as indicated by 95% confidence intervals.

To examine the effect of variable precipitation on NDVI/NDMI, annual precipitation data for each GDE was downloaded from the GDE Pulse Interactive Map (TNC 2019), and multiple linear regression analysis was used to evaluate potential relationships between precipitation and vegetation health. A weak correlation was interpreted as a weak coupling between precipitation and NDVI/NDMI, suggesting a comparatively stronger influence of groundwater conditions on NDVI/NDMI. We also evaluated the effect of surface water flows on NDVI/NDMI using the San Joaquin Valley Index (SJVI), which is calculated by DWR and is a function of San Joaquin flow into Millerton Reservoir, Merced River flow into Lake McClure, Tuolumne River flow to New Don Pedro Reservoir, and Stanislaus River flow into New Melones Reservoir (CDEC 2019). The index is used to determine water year type and flow releases in the San Joaquin River and its major tributaries. Because the SJVI is used to determine flow releases into the San Joaquin Valley and includes the previous year's hydrologic condition, it is a good proxy for hydrologic conditions experienced by GDEs located along San Joaquin Valley rivers.

Reconnaissance level biological assessments were used to determine the overall condition of riparian vegetation within the GDE unit, assess evidence of recent riparian tree recruitment, and detect biological indications of degraded water quality. Field observations were augmented with analysis of recent (2017 and 2018) aerial photographs to assess the degree to which field observations were consistent with trends detected in aerial photographs as well as spatial variability across the GDE unit.

These field-based, and remotely sensed biological data sources were used to determine any apparent trends in biological condition of the vegetation composing the GDE unit. These trends were evaluated over the period 1985–2018 (NDVI/NDMI) and 2017–2019 (using field-based and aerial photograph analyses) within the Biological Condition Gradient classification scheme (USEPA 2016) (Table A2.B-4). To assess impacts to GDEs, minimal or evident changes (Levels 2 and 3) were considered to indicate the potential for impacts due to changing groundwater conditions, with further data collection and analysis (i.e., monitoring) needed to evaluate the connection between impacts and groundwater management, if any. Moderate to severe changes (Levels 4–6), if detected, were considered to indicate adverse impacts to GDEs and therefore undesirable results in the subbasin.

Table A2.B-4. Classifications of the Biological Condition Gradient, a conceptual framework developed for interpretation of biological responses to effects of water quality stressors (USEPA 2016).

Biological condition gradient classifications	
Level 1—Natural or Native Condition	Native structural, functional, and taxonomic integrity is preserved. Ecosystem function is preserved within the range of natural variability. Functions are processes required for the normal performance of a biological system and may be applied to any level of biological organization.
Level 2—Minimal Changes	Minimal changes in the structure of the biotic community and minimal changes in ecosystem function. Most native taxa are maintained with some changes in biomass and/or abundance. Ecosystem functions are fully maintained within the range of natural variability.
Level 3—Evident Changes	Evident changes in the structure of the biotic community and minimal changes in ecosystem function. Evident changes in the structure due to loss of some highly sensitive native taxa; shifts in relative abundance of taxa, but sensitive ubiquitous taxa are common and relatively abundant. Ecosystem functions are fully maintained through redundant attributes of the system.
Level 4—Moderate Changes	Moderate changes in the structure of the biotic community with minimal changes in ecosystem function. Moderate changes in the structure due to the replacement of some intermediate sensitive taxa by more tolerant taxa, but reproducing populations of some sensitive taxa are maintained; overall balanced distribution of all expected major groups. Ecosystem functions largely maintained through redundant attributes.
Level 5—Major Changes	Major changes in the structure of the biotic community and moderate changes in ecosystem function. Sensitive taxa are markedly diminished or missing; organism condition shows signs of physiological stress. Ecosystem function shows reduced complexity and redundancy.
Level 6—Severe Changes	Severe changes in the structure of the biotic community and major loss of ecosystem function. Extreme changes in structure, wholesale changes in taxonomic composition, extreme alterations from normal densities and distributions, and organism condition is often poor. Ecosystem functions are severely altered.

3.3 Hydrologic Data

3.3.1 Baseline conditions

The baseline hydrologic conditions for the San Joaquin River Riparian GDE were assessed using the modeled period from October 1988 to September 2015 (water years 1989–2015). Because the shallow groundwater elevations are tied to flows in the San Joaquin River, changes to the operations of Friant Dam have the potential to alter shallow groundwater levels. In particular, SJRRP interim flow releases beginning in 2009 and restoration flow releases beginning in 2014, and from 2017 to present, will likely help to maintain shallower groundwater elevations in the GDE compared with the scant flow releases in the San Joaquin River prior to 2009. Nevertheless,

we use the entire 1988–2015 period as the baseline condition because it incorporates two droughts, which are most likely to impact the health of the GDE. Moreover, releases from Friant Dam generally aid the GDE, but have been curtailed during critically dry years typical of droughts.

The minimum modeled groundwater depth for 1988–2015 is an inverse function of the SJVI (Figure A2.B-6), which is integrates runoff in the San Joaquin Basin for a given water year and hydrologic conditions the previous year. Low values of the SJVI are correlated with drier conditions and higher values reflect wetter conditions. Groundwater is deepest for San SJVI values less than 2.1, which correspond to critically dry water years. Modeled groundwater depths were more variable.

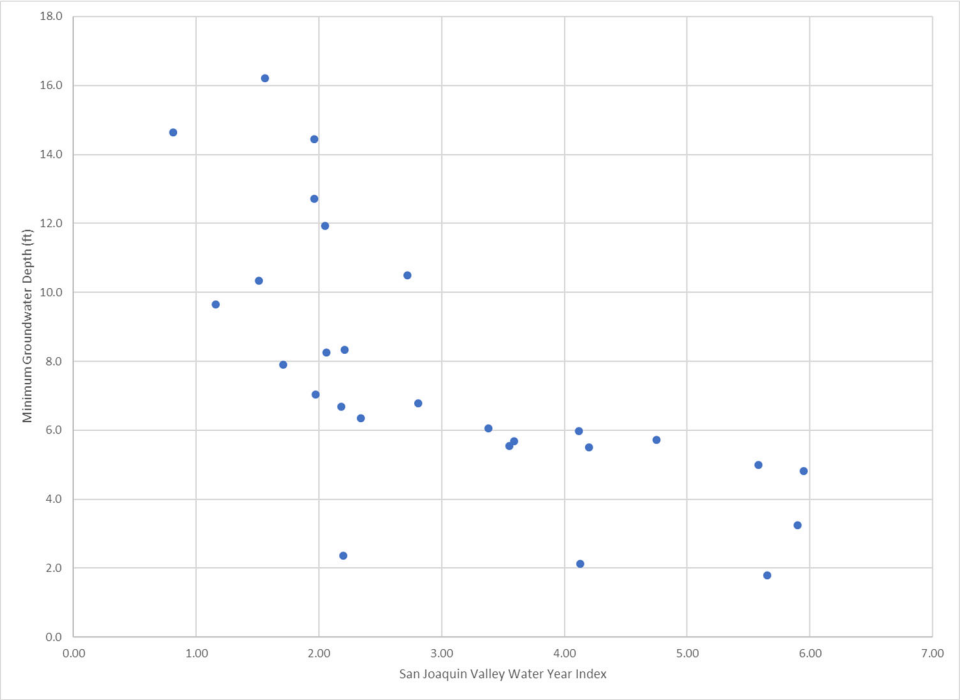

Figure A2.B-6. Minimum modeled groundwater depth for well SJRRP_MW-10-89 relative to San Joaquin Valley water year index, 1988-2015.

Groundwater quality data is available for multiple wells and constituents near the San Joaquin River Riparian GDE Unit (see Chapter 2.2.2.3 of this GSP). Maximum total dissolved solids (TDS) concentrations in the shallow groundwater of the GDE unit is elevated (>1,000 mg/L) at some locations, but other nearby wells indicate much lower values from 251–500 mg/L. High TDS conditions may be a result of naturally-occurring salinity in the groundwater system, especially in Coast Range-sourced sediments, which have marine origin. Other constituents, including nitrate, fall below applicable thresholds for environmental protection and human health at wells near the GDE unit.

The hydrologic baseline for the San Joaquin River Riparian GDE Unit is represented by the period from 1988–2015. This period experienced two droughts during which shallow groundwater depths likely were below the maximum rooting depth of riparian plants, but groundwater levels recovered once flows increased. There was no trend in shallow groundwater

levels near the San Joaquin River Riparian GDE during the hydrologic baseline, rather the groundwater responded to surface hydrologic conditions, with monitoring and modeling results showing the groundwater very close to the ground surface during wet periods. While the San Joaquin River may be hydrologically connected to the groundwater during high flow events, this connection is likely very short-lived and likely reflects high runoff in the San Joaquin Basin. Since its construction in 1942, Friant Dam has diverted San Joaquin River water for agriculture. Operations were altered starting in 2009 to increase surface water flows for restoration and may help to maintain shallow groundwater elevations.

3.3.2 Susceptibility to potential effects

Future groundwater conditions were simulated by others for purposes of this GSP using MCSim, the same groundwater model used to assess the historical period shown in Figure A2.B-4. The future modeling was developed for use in GSP analyses assuming that the GSA will implement groundwater recharge projects, decrease groundwater demand, and to a lesser extent replace groundwater use with surface water use. As discussed in Chapter 3 of this GSP, the climate data used to model the first 20 years after implementation included a series of wet, average, and dry years that reflected the long-term historical average hydrologic conditions for the subbasin, but does not include a continuous series of dry or wet years. Following the implementation period (i.e., 2020–2040), historical hydrology from 1965–2015 is used for 2041–2090 and includes groupings of wet years and dry years (i.e., short- and longer-term droughts). Climate change was incorporated into the model following DWR guidelines (e.g., DWR 2018). In addition, model projections include a 10-year drought from 2060–2070 that is longer than the droughts experienced in the Chowchilla Subbasin during the historical modeling period, to explore the effects of a severe drought on groundwater sustainability.

Figure A2.B-7 shows the simulated and observed groundwater elevations for well SJRRP MW-10-89 from 1988–2090. The observed and simulated groundwater elevations for the historical (baseline) period (1988–2015) are identical to Figure A2.B-4, but Figure A2.B-7 includes the future simulation described above. Relative to the modeled baseline (1988–2015), the mean simulated shallow groundwater depth from 2020–2090 declines by 1.6 feet, from 13.3 in the baseline period to 14.9 ft in the implementation and sustainability periods (Figure A2.B-7 and Table A2.B-5). For the implementation period (2020–2040), which does not include the simulated 2060–2070 drought, the mean modeled groundwater elevation was 14.2 feet, between the 1988–2015 mean depth and the 2020–2090 mean depth. The range of simulated groundwater depth also increased as the minimum depth was closer to the surface (from 1.8 to 0.7 feet) and the maximum depth increases from 39.6 to 47.1 feet. As a consequence, the standard deviation of depth increases from 7.9 to 8.3 feet for the baseline and future conditions, respectively (Table A2.B-5). The fraction of months with groundwater depth greater than 30 feet increased from 6.8% for the baseline period to 9.2% for the implementation and sustainability periods (2020–2090).

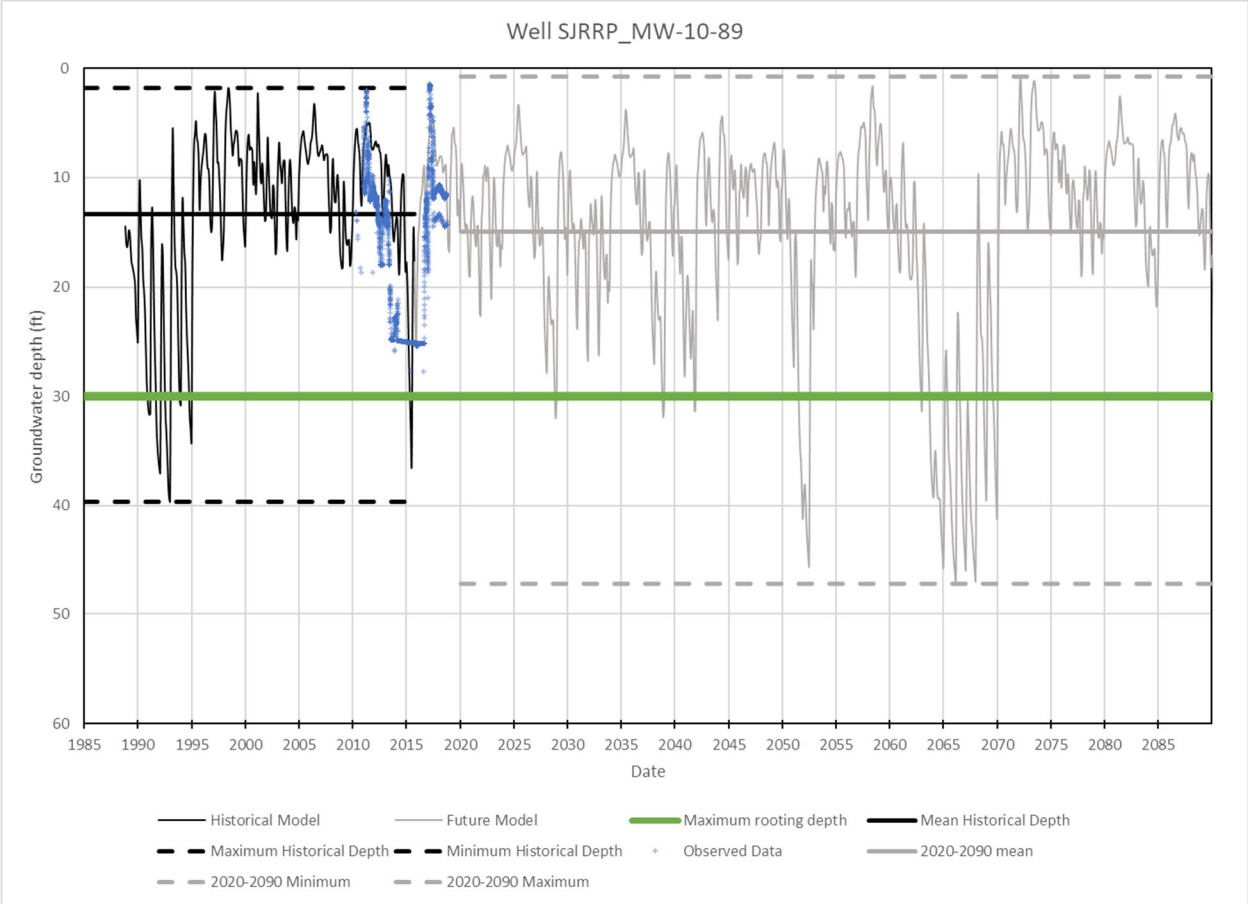

Figure A2.B-7. Simulated historical (black line 1988–2015) and modeled projected (grey line 2016–2090) monthly groundwater depth for well SJRRP_MW-10-89. Observed data (blue plus signs) were recorded hourly. The solid horizontal lines represent the mean modeled groundwater depth for the historical (black) and projected post-implementation (2020-2090) (grey) periods, while the horizontal dashed lines represent the maximum and minimum groundwater depth for the historical (black) and projected (grey) periods. The horizontal green line represents the maximum depth (30 feet) at which phreatophytic plants can access groundwater.

Table A2.B-5. Statistics of monthly modeled well depth for the SJRRP_MW-10-89 well.

Date range	Number of months	Mean depth (ft)	Standard deviation (ft)	Maximum depth (ft)	Minimum depth (ft)	Days depth>30 ft	% of days where depth>30 ft
1988–2015	324	13.3	7.9	39.6	1.8	22	6.8
2020–2090	849	14.9	9.3	47.1	0.7	78	9.2

During the implementation and sustainability periods, groundwater elevations are projected to show significant seasonal variation. On average, the groundwater depth varies by 12.0 feet within a water year from 1988–2015 and 12.2 feet from 2020–2090 (Figure A2.B-7). The simulated maximum groundwater elevation change was 34.1 feet in 1988–2015 and 37.2 feet from 2020–2090, while the minimum variation in monthly water elevations within a year was 4.0 feet for

both the historical and future periods. Seasonal variation in groundwater depth is typically highest during the wettest or driest years. During the wettest years, the minimum groundwater depths are very shallow, while during the driest years, the maximum depths are very deep. Both the observed and model data show that shallow groundwater at well SJRRP_MW-10-89 can decline significantly during droughts but responds very quickly once San Joaquin River discharge increases. This response pattern is illustrated in Figures A2.B-6 and A2.B-7.

Combined, annual trends in depth to water during the observed and projected time periods indicate relatively stable groundwater conditions in the San Joaquin River Riparian GDE Unit. The small drop in mean groundwater depth is unlikely to have an adverse effect on the GDE, but the potential for more severe and longer-lived droughts may cause a decline in the health and extent of the San Joaquin River Riparian GDE. Groundwater modeling, however, provides evidence for an increase in the portion of months where depth to water exceeds the 30-foot rooting depth criterion (Section 1). The San Joaquin River Riparian GDE has persisted through droughts before, but the degree to which a threshold exists where the GDE is unable to recover is not known. If it exists, such a threshold effect could include replacement of native vegetation with more xeric non-native species or a reduced extent of the GDE. Either of these outcomes would have associated impacts to species relying on riparian vegetation for habitat and other ecological functions. As a result, the San Joaquin River Riparian GDE Unit was determined to be **moderately susceptible** (Table A2.B-3) to groundwater conditions falling outside the baseline range.

3.4 Biological Data

Average summer NDVI and NDMI for the period 1985–2018 indicate little to no overall change and modest fluctuations in both indices in the San Joaquin River Riparian GDE Unit (Figures A2.B-8 andA2.B-9). NDVI for individual, mapped polygons ranges from approximately 0.10 to 0.70, and mean NDVI for all polygons was lowest in 1992 (0.36) and highest in 2018 (0.54) (Figure A2.B-8). Change in NDVI between 1985 and 2018 showed a negligible increase (0.09) for mean NDVI. NDVI tends to decline during drier periods as indicated by the SJVI. For example, mean NDVI declined from 0.44 to 0.36 from 1985–1992 (Figure A2.B-8). A similar trend occurred from 2007–2010 and 2012–2016. In contrast, NDVI tends to increase during the wettest years. NDMI for individual, mapped polygons shows a similar trend to NDVI but with values ranging from approximately -0.2 to 0.45 (Figure A2.B-9). Mean NDMI for all polygons was also lowest in 1992 (-0.005), and highest in 2018 (0.17). Like NDVI, mean NDMI also showed a negligible increase (0.08) between 1985 and 2018. While there were interannual fluctuations in both NDVI and NDMI, lack of any long-term trend in either of these indicators of vegetation health suggests that the vegetation health in the San Joaquin River Riparian GDE has been stable throughout this period. Other factors may also influence NDVI and NDMI, including channel migration and erosion/deposition of sediment during floods.

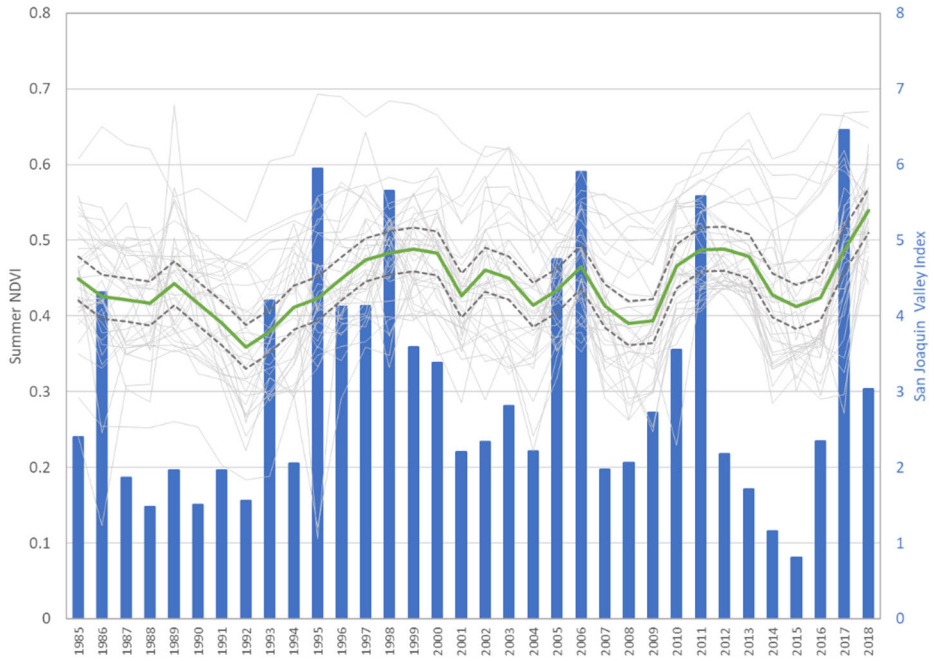

Figure A2.B-8. Summer NDVI for all GDE polygons identified in the GDE Pulse Interactive Map comprising the San Joaquin River Riparian GDE Unit from 1985–2018 (light grey lines). Mean NDVI (green line), and 95% confidence intervals of the mean NDVI (dashed black lines). The blue bars show the San Joaquin Valley Index, with low values corresponding to drier years and high values corresponding to wetter years.

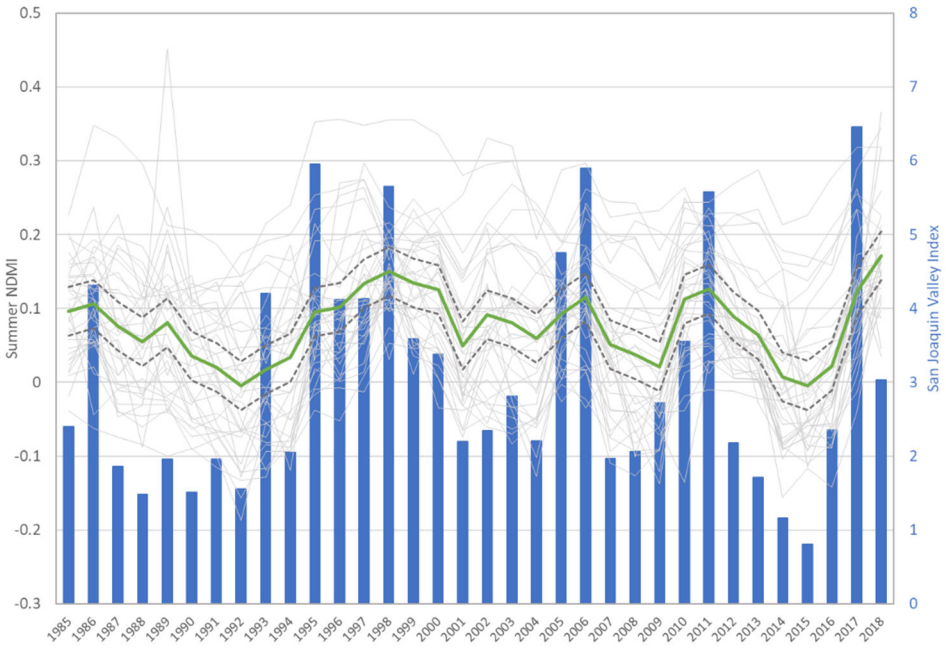

Figure A2.B-9. Summer NDMI for all GDE polygons identified in the GDE Pulse Interactive Map comprising the San Joaquin River Riparian GDE Unit from 1985–2018 (light grey lines). Mean NDMI (green line), and 95% confidence intervals of the mean NDMI (dashed black lines). The blue bars show the San Joaquin Valley Index, with low values corresponding to drier years and high values corresponding to wetter years.

Multiple linear regression was used to assess the effect of year, and annual precipitation on NDVI/NDMI. Annual precipitation was not a statistically significant predictor variable of mean NDVI ($p = 0.35$), and explained little, if any, of the variation in NDVI ($R^2 = 0.03$). Conversely, annual precipitation was a statistically significant predictor variable of mean NDMI ($p = 0.01$), but still showed little explanatory power of the variation in NDMI ($R^2 = 0.18$)

A reconnaissance field assessment of the San Joaquin River Riparian GDE Unit documented presence of recent riparian tree recruitment at representative sites in May 2019 as part of this study and also in 2013 as documented in Bureau of Reclamation (2014). The riparian vegetation observed in May 2019 appeared very healthy, with dense, green canopies at multiple layers with evidence of recent growth and saplings less than five years of age indicating recent recruitment of native riparian trees. Analysis of recent satellite imagery corroborates these field observations.

3.5 Potential Effects

Reconnaissance level biological assessments, aerial photograph analysis, and NDVI/NDMI data indicate adverse impacts are not likely occurring in the San Joaquin River Riparian GDE Unit as a result of changes in groundwater levels or degraded groundwater quality. However, detection of some types of adverse impacts may be precluded by insufficient data on the extent to which groundwater management may be influencing shallow groundwater underlying the GDE unit, and the potential for concomitant effects on riparian vegetation dynamics and habitat for special status species.

Groundwater in the San Joaquin River Riparian GDE Unit is tightly coupled with surface flow and runoff, and is generally maintained at depths within the maximum rooting depth of riparian species present in the unit (see Section 2.2.2 of this GSP). In the Chowchilla Subbasin, the San Joaquin River flows adjacent to the San Joaquin River Riparian GDE Unit and is in a net-losing condition, with surface flow likely contributing directly to the shallow groundwater system that supports the vegetation in the unit. Evidence of recent riparian tree recruitment (within 5 years) observed in the San Joaquin River Riparian GDE Unit, along with high-density, healthy vegetation at multiple layers, and the presence of these attributes throughout the unit suggests that baseline groundwater levels (i.e., those occurring since 1988 are sufficient to maintain ecosystem functions essential for the survival and reproduction of riparian plant species. In addition, trends in NDVI/NDMI show little to no change in overall vegetation health within the unit, and although past fluctuations in these indices appear correlated with periods of drought in the San Joaquin Basin (e.g., 2012–2016), both indices have rebounded following 2107 which was a wet water year. Based on these recent historical response patterns, it appears the dominant native vegetation composing the San Joaquin River Riparian GDE Unit is sufficiently resilient to maintain ecosystem integrity and function in the face of predicted fluctuations in groundwater conditions around the recent historical baseline level. The observed vegetation response following the 2012–2016 drought suggests that the ecological integrity of the GDE Unit would be maintained following periods of drought predicted to occur within the next 30–50 years, although adverse impacts ranging from short-term (e.g., water stress) to prolonged (reduced growth and recruitment, habitat loss) are possible (Rohde et al. 2018). The extent to which the late-1980s-early1990s drought impacted the GDE is not known, but we observed several cottonwood and oak trees in the GDE unit that likely pre-date that drought.

Riparian vegetation condition and NDVI/NDMI trends within the GDE unit also indicate groundwater quality is not limiting ecosystem functions essential for the survival and reproduction of riparian plant species. Rohde et al. (2018) list declining NDVI/NDMI, reduced

tree canopy and understory, shifts in vegetation type, tree mortality, and habitat fragmentation as indicators of adverse impacts; however, none of these was detected within the GDE unit. Because the NDVI assessment was confined to the GDEs mostly mapped in 2014, our analysis does not account for potential reduction in the extent of riparian vegetation (and hence a reduction in the area of the polygons) prior to the vegetation mapping.

The response of perennial, resident wildlife and vegetation species, including those with protected status, and overall species composition to groundwater dynamics in the San Joaquin River Riparian GDE Unit is not well understood because population dynamics during the baseline period are not known. Many of these species survived the droughts in the early 1990s and the mid-2010s, but the effects on the species and their susceptibility to future changes are unknown. Appropriate data for evaluating these relationships is not readily available but, if obtained, could provide insight to additional interactions between groundwater conditions and biological responses, leading to a more complete evaluation of potential adverse impacts. Recommendations for monitoring to provide additional data for this purpose are included below in Section 5.

4 SUSTAINABLE MANAGEMENT CRITERIA

Sustainable management criteria for the Chowchilla Subbasin were developed using information from stakeholder and public input, correspondence with the GSAs, public meetings, hydrogeologic analysis, and meetings with GSA technical experts. The sustainable management criteria and methods used to establish them are described in Chapter 3 of this GSP.

4.1 Sustainability Goal

The sustainability goal developed for the Chowchilla GSP is expected to maintain the ecological integrity and function of the San Joaquin River Riparian GDE Unit. This includes maintenance of riparian habitat conditions for special-status species and other native species in the unit or those likely to occur, and provision of important ecosystem support functions for Central Valley spring-run Chinook salmon, Central Valley steelhead, and other special-status species and native aquatic species in the adjacent San Joaquin River. The GSP's sustainability goal would be achieved by implementing a package of projects and management actions that will, by 2040, balance long-term groundwater system inflows with outflows based on a 50-year period representative of average historical hydrologic conditions.

4.2 Minimum Thresholds for Sustainability Indicators

Minimum thresholds for the applicable sustainability indicators are described in Section 3.3 of this GSP. The minimum thresholds for chronic lowering of groundwater levels, the sustainability indicator most likely to affect GDEs in the subbasin, are based on selection of representative monitoring sites from among existing production and monitoring wells located throughout the subbasin and screened in both the Upper and Lower Aquifers. Of the representative monitoring sites for the subbasin, three are located in the Upper Aquifer and in close proximity to the San Joaquin River Riparian GDE Unit and one, SJRRP_MW-10-89, is considered to best represent shallow groundwater conditions potentially affecting the GDE unit. The proposed minimum threshold for groundwater levels in this well is 48 feet below ground surface (Section 3.3 of this GSP). Although the minimum threshold depth is greater than the 30-foot maximum rooting depth of the dominant native woody riparian plant species composing the GDE, modeled historical lows also show depths to water exceeding 30 feet. This is an indication that the dominant vegetation in

the GDE unit is able to survive short-term declines in water levels, possibly due in part to the presence of a capillary fringe above the water table. The modeled future exceedances of the 30-foot rooting depth threshold (i.e., depth to water approaching each well's minimum threshold for this sustainability indicator) are projected to be of relatively short duration (1–5 years) and to occur only once or twice during the 70 years that include the 20-year implementation period and the 50-year sustainability period. If these projected reductions in groundwater levels occur, effects on GDEs could include short-term adverse impacts such as water stress and could also lead to longer-term impacts such as reduced growth and recruitment, and potential branch dieback or some tree mortality resulting in some loss of vegetation structure, ecological function, and habitat for special-status species. However, given their relatively low projected frequency and short duration, coupled with the inherent uncertainty in model projections and response of the GDE to the recent multi-year drought, longer-term impacts are unlikely. Historical model results for well SJRRP_MW-10-89 reflect shallow groundwater conditions under which the GDE vegetation currently composing the unit has persisted since 1985 with no apparent adverse effects, suggesting that similar conditions in the future (and possibly deeper water levels) would continue to support the GDEs. In addition, restoration flows in the San Joaquin River under the SJRRP are expected to provide continued hydrologic inputs contributing to long-term support of the San Joaquin River Riparian GDE unit.

Based on this information, the native vegetation communities composing the San Joaquin River Riparian GDE are expected to be maintained in good health by sustainable groundwater management in the Chowchilla Subbasin and therefore resilient to short-term adverse impacts, thus the minimum thresholds are not expected to cause substantial adverse impacts to GDEs.

4.3 Measurable Objectives and Interim Milestones

Measurable objectives and interim milestones for the applicable sustainability indicators are described in Section 3.3 of this GSP. Measurable objectives and interim milestones for groundwater levels, the sustainability indicator most likely to affect GDEs in the subbasin, are proposed for representative monitoring sites in the subbasin including well SJRRP_MW-10-89, which best represents groundwater conditions associated with the San Joaquin River Riparian GDE Unit. The proposed measurable objectives and interim milestones for groundwater levels in these three wells range from 8–14 ft below ground surface (Section 3.3 of this GSP). The groundwater level objectives and milestones are well within the range of maximum vegetation rooting depth and are expected to maintain or increase the spatial extent of the GDE unit, with no net loss of native plant species dominance. These characteristics can be assessed through monitoring to measure the areal extent of the vegetated GDE unit and the ecological condition of phreatophytic vegetation.

5 GDE MONITORING

Data on San Joaquin River riparian forest condition and extent, as well as surface water and shallow groundwater hydrology of the San Joaquin River, are among the types of information that have been collected, analyzed, and reported under the auspices of the SJRRP. The SJRRP is currently monitoring shallow groundwater in several wells along the San Joaquin River in the Chowchilla Subbasin. However, the ecological characteristics and hydrologic dependencies of the San Joaquin River Riparian GDE unit are not currently the subject of regular, systematic monitoring as part of any known program. Actions to improve the existing monitoring network may be warranted so that GDE conditions can be thoroughly documented and impacts to GDEs

can be detected. Biological data should be collected with sufficient spatial and temporal coverage to adequately characterize the GDE's reliance on groundwater and, together with evaluation of associated hydrologic data, to monitor the response of GDEs to groundwater management, including projects and management actions proposed to be implemented under this GSP (Section 6).

The San Joaquin River Riparian GDE is moderately susceptible to changing groundwater conditions and has high ecological value, thus the following types of monitoring recommended by Rohde et al. (2018) should be considered:

- Annual desktop monitoring using simple biological indicators such as remote sensing indexes (NDVI/NDMI) and aerial photograph analysis to monitor changes in vegetation condition, growth, and the spatial extent of the GDE.
- Biological surveys (e.g., vegetation transects) conducted at regular intervals (minimum every 5 years or more frequently if needed based on the desktop surveys or biological surveys that indicate the GDE condition or extent has declined) to document baseline biological conditions and changes corresponding to GSP implementation and groundwater management.

Biological monitoring data should be evaluated as part of an adaptive management framework to facilitate improvements in the monitoring program and refinement of projects and management actions or implementation of new actions to avoid adverse impacts to GDEs.

6 PROJECTS AND MANAGEMENT ACTIONS

Implementation of the GSP will require the Chowchilla Subbasin to be operated within its sustainable yield by 2040. To ensure the subbasin meets its sustainability goal by 2040, the GSAs have proposed projects and management actions to address undesirable results (see Chapters 3 and 4 of this GSP). To achieve this, GSAs may implement projects to increase groundwater recharge, reduce groundwater pumping, or both.

Because no undesirable results were identified for the San Joaquin River Riparian GDE Unit under baseline, existing, or projected future with-project conditions, no GDE-specific projects or management actions were developed for this GSP. Effects on GDEs resulting from increased groundwater recharge and reduced groundwater pumping are expected to be beneficial, as groundwater levels accessed by vegetation in the San Joaquin River Riparian GDE Unit are expected to remain relatively similar to historical and recent baseline conditions, thus maintaining an accessible and reliable water source.

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APPENDIX 2.C. NOTICE AND COMMUNICATION

Prepared as part of the

Groundwater Sustainability Plan
Chowchilla Subbasin

January 2020

GSP Team:

Davids Engineering, Inc
Luhdorff & Scalmanini
ERA Economics
Stillwater Sciences and
California State University, Sacramento

2.C. Notice and Communication

2.C.a. Chowchilla Subbasin Stakeholders Communication and Engagement Plan

2.C.b. Chowchilla Subbasin Interested Parties List

2.C.c. Chowchilla Subbasin Engagement Matrix

2.C.d. Chowchilla Subbasin Stakeholder Input Matrix

2.C.e. Responses to Comments

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Chowchilla Subbasin

Communication and Engagement Plan

August 2019

Prepared by the
California State University Sacramento
College of Continuing Education
Consensus and Collaboration Program

Contents

Chowchilla Subbasin Stakeholder Communication and Engagement Plan
August 2019

Purpose
The purpose of this Communication and Engagement Plan is to assist Chowchilla Subbasin Groundwater Sustainability Agencies (GSAs) in their efforts to develop general and strategic communications to engage stakeholders in groundwater management activities.

Overview and Background
California's Sustainable Groundwater Management Act (SGMA) of 2014 requires broad and diverse stakeholder involvement in GSA activities and the development and implementation of Groundwater Sustainability Plans (GSP) for groundwater basins around the state, including the Chowchilla Subbasin (Subbasin). The intent of SGMA is to ensure successful, sustainable management of groundwater resources at the local level. Success will require cooperation by all stakeholders, and cooperation is far more likely if stakeholders have consistent messaging of valid information and are provided with opportunities to help shape the path forward.

Chowchilla Subbasin
The Chowchilla Subbasin has been identified by the California Department of Water Resources (DWR) as a high-priority and critically-overdrafted subbasin with conditions of historical groundwater level declines, land subsidence, and groundwater quality degradation. The area has a substantial agricultural community heavily reliant on groundwater. Nearly 79 percent of the Subbasin is designated as part of a severely disadvantaged community (SDAC) and approximately 30 percent of the Subbasin (primarily in the northern and southern central parts of the Subbasins and also around the City of Chowchilla) is designated as part of a DAC.

Subbasin Governance
Four GSAs have formed to ensure local control of groundwater management in the Subbasin: Chowchilla Water District, Madera County, Merced County and Triangle T Water District. The GSAs are developing a single GSP for the Subbasin. The four GSAs together with other local agencies have developed a set of six guiding principles as a foundation for developing the GSA for the entire Subbasin. The other local agencies include the City of Chowchilla, Clayton Water District and Sierra Vista Mutual Water Company. The Chowchilla Water District, County of Madera, County of Merced, Triangle T Water District and Sierra Vista Mutual Water Company entered into a Memorandum of Understanding with respect to the preparation of the GSP for the Subbasin.

The Chowchilla Subbasin GSP Advisory Committee (Advisory Committee) was formed in 2018 to bring together local agencies and related parties vested with the authority and/or ability to support implementation of SGMA in the Subbasin. Representatives from Merced County, Merced Irrigation District, Madera County, CWD, Madera Farm Bureau, Triangle T Water District, Clayton Water District and City of Chowchilla regularly attend the Advisory Committee meetings. The Advisory Committee has been meeting approximately monthly since its formation.

The GSAs agreed to hire a professional facilitator from California State University, Sacramento, to provide third-party facilitation support for GSP development and implementation, particularly to advance the GSAs' stakeholder engagement efforts.

Communication and Engagement Plan

The purpose of the Communication and Engagement Plan (Plan) is:

- To provide GSAs, community leaders, and other beneficial users a roadmap to follow to ensure consistent messaging of SGMA requirements and related Chowchilla Subbasin information and data.
- To provide a roadmap to GSAs and community leaders to follow to ensure stakeholders have meaningful input into GSA decision-making, including GSP development.
- Ensure the roadmap demonstrates a process that is widely seen by stakeholders as fair and respectful to the range of interested parties.
- To make transparent to stakeholders their opportunities to contribute to the development of a GSP that can effectively address groundwater management within the Chowchilla Subbasin.

Communication Plan Goals

The Plan seeks to accomplish the following goals:

1. Educate stakeholders about:
    a. SGMA and its requirements.
    b. Individual GSAs within the Subbasin as management units.
    c. Potential changes to current groundwater management under SGMA.
    d. How stakeholders will be represented in their respective GSAs.
2. Communicate important SGMA deadlines and dates.
3. Coordinate outreach and engagement activities between GSAs to ensure efficiencies and to support stakeholders in GSP development.
4. Articulate strategies and channels for gaining ongoing stakeholder input and feedback to inform GSP design and development.
5. Encourage stakeholder engagement by communicating dedicated SGMA outreach strategies and channels, including meeting and workshop dates and content, as opportunities for stakeholders to provide input in the GSA decision-making process and GPS planning process.

Major Audiences

A Chowchilla Subbasin stakeholder is a "beneficial user" as described by SGMA. Under the requirements of SGMA, all beneficial uses and users of groundwater must be considered in the development of GSPs, and GSAs must encourage the active involvement of diverse social, cultural, and economic elements of the population. Beneficial users, therefore, are any stakeholder who has an interest in groundwater use and management in the Chowchilla Subbasin community. Their interest may be GSA activities, GSP development and implementation, and/or water access and management in general.

To assist in determining who the specific SGMA stakeholders and beneficial users are, DWR has issued a Stakeholder Engagement Chart (Table 1) for GSP Development in their 2017 *GSP Stakeholder Communication and Engagement Guidance Document*. This table was modified to fit the circumstances and stakeholders of the Chowchilla Subbasin, and will continue to be updated during the planning process.

Table 1: Stakeholder Engagement Chart for GSP Development

Category of Interest	Examples of Stakeholder Groups	Engagement purpose
General Public	• Citizens groups • Community leaders	Inform to improve public awareness of sustainable groundwater management
Land Use	• Municipalities (City, County planning departments): City of Chowchilla • Regional land use agencies	Consult and involve to ensure land use policies are supporting GSPs
Private users	• Private pumpers • Domestic users • School systems: Chowchilla Elementary School District • Hospitals: Chowchilla Memorial Health Care District	Inform and involve to avoid negative impact to these users
Urban/ Agriculture users	• Water agencies • Irrigation districts • Mutual water companies • Resource conservation districts: Chowchilla Red Top RCD • Farm Bureau: Merced Farm Bureau, Madera County Farm Bureau	Collaborate to ensure sustainable management of groundwater
Industrial users	• Commercial and industrial self-supplier • Local trade association or group	Inform and involve to avoid negative impact to these users
Environmental and Ecosystem	• Federal and State agencies - CDFW • Environmental groups	Inform and involve to sustain a vital ecosystem
Economic Development	• Chambers of commerce: Chowchilla District Chamber of Commerce • Business groups/associations • Elected officials (Board of Supervisors, City Council) • State Assembly members • State Senators	Inform and involve to support a stable economy
Human right to water	• Disadvantaged Communities • Small community systems • Environmental Justice Groups: Leadership Council for Justice and Accountability, Self-Help Enterprises, Community Water Center	Inform and involve to provide a safe and secure groundwater supplies to all communities reliant on groundwater
Tribes	• Federally Recognized Tribes and non-federally recognized Tribes with Lands or potential interests in Chowchilla Subbasin	Inform, involve and consult with tribal government
Federal lands	• Bureau of Reclamation (USBR) • Bureau of Land Management	Inform, involve and collaborate to ensure basin sustainability
Integrated Water Management	• Regional water management groups (IRWM regions) • Flood agencies	Inform, involve and collaborate to improve regional sustainability

Key Messages

As GSAs begin the process of reaching out to stakeholders to inform and engage them in groundwater management issues and items, it is critical that GSAs share clear and consistent key messages to avoid confusion and misunderstanding. Key messages are as follows:

1. Four GSAs have formed to ensure local control of groundwater management in the Chowchilla Subbasin:
    a. Chowchilla Water District
    b. Madera County
    c. Merced County
    d. Triangle T Water District
2. Management elements include GSP decision-making, funding, implementation and enforcement.
3. GSAs are committed to proactively and sustainably manage groundwater in the Subbasin.
4. GSAs shall ensure compliance with SGMA to prevent State intervention.
5. GSAs seek to coordinate efforts in managing their respective portion of the Subbasin to achieve compliance with SGMA.
6. GSAs will develop a single GSP for the Subbasin.
7. GSAs are committed to proactive and transparent outreach and engagement with stakeholders and Subbasin community members during the GSP planning process, implementation and beyond.

Decision-Making

Decision-making and communication about said decision-making will comply with all requirements of Section 354.10 of the State's GSP regulations.

Recommended Communication Strategies and Mechanisms

GSAs representatives and staff will engage with Subbasin beneficial users, and will be responsible to track the needs of their local communities. GSAs will consider stakeholder input gathered from outreach efforts as they move through GSP development and implementation processes. Three sets of strategies are important to consider when planning outreach and engagement activities, included in the following categories:

- SGMA-required: the law requires GSAs to undertake specific types of outreach and engagement activities.
- Essential strategies centrally communicated at the Subbasin and GSA Management Area level (if Management Areas are deemed appropriate by the GSAs): activities proven to successfully engage stakeholders.
- Secondary strategies locally communicated at the GSA Management Area and beneficial user level: activities that will enhance engagement efforts on a local and as needed basis.

SGMA-Required Strategies

SGMA strongly encourages broad stakeholder engagement in development and implementation of GSPs. According to SGMA:

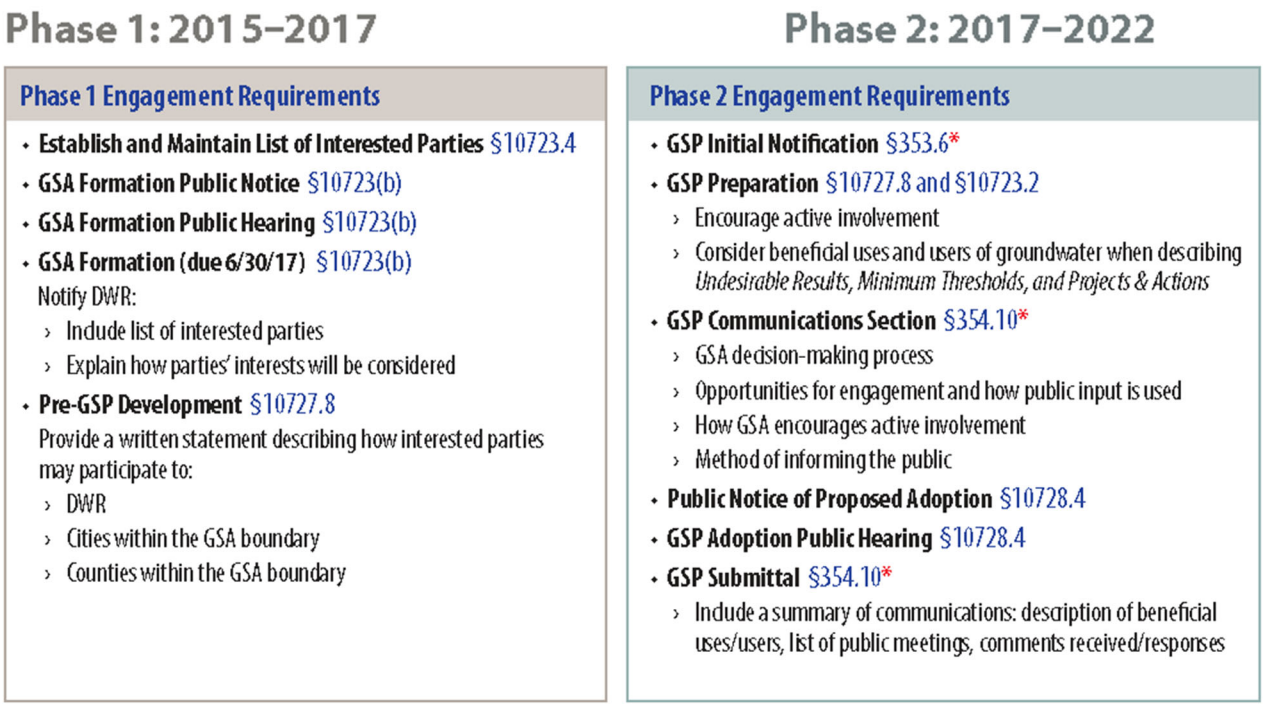
- "The groundwater sustainability agency shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin prior to and during the development and implementation of the groundwater sustainability plan." [CA Water Code Sec. 10727.8(a)]
- "The groundwater sustainability agency shall consider the interests of all beneficial uses and users of groundwater." [CA Water Code Sec. 10723.2]

GSAs are given broad discretion in the methods and processes utilized to meet engagement requirements. SGMA explicitly authorizes GSAs to form Public Advisory Committees if they choose, but does not require them to do so. The decision to form an advisory committee is left to the individual GSA based on need and effectiveness of these processes within their communities. However, SGMA does have several GSA-specific requirements regarding public notice, public hearings, and public meetings. Requirements include:

1. Within 30 days of electing to be (or forming) a GSA, the GSA must inform the State of this development and its intent to manage groundwater sustainably. In doing so, the GSA must:
    a. Include a list of parties who wish to receive "plan preparation, meeting announcements, and availability of draft plans, maps, and other relevant documents"; and
    b. Explain how the interested parties' perspectives will be considered, both during the development and operation of the GSA and during development and implementation of the GSP. This information must also be sent to the legislative bodies of any city and county in the area covered by the plan.

    Illuminating the term "interested parties," SGMA requires that GSAs consider the interests of "all beneficial uses and users of groundwater," along with entities expected to share responsibilities for implementing GSPs. As a starting point, SGMA specifies a number of types of "interested parties." The GSA must maintain its list of interested parties on an ongoing basis. Anyone who wishes to be put on this list can do so upon making this request in writing. [CA Water Code Section 10730. (b) (2); 10723.2; 10723.4; and 10723.8. (a)]

2. GSAs planning to develop a GSP must provide notice of their intent to do so to the public and the State before proceeding. The notice must describe opportunities for interested parties to participate in the development and implementation of the GSP. This written notice must be provided to the legislative bodies of any city or county located within the basin to be managed by the GSP. [CA Water Code Section 10727.8. (a)]



3. A GSA seeking to adopt or amend a GSP must provide notice to cities and counties within the area encompassed by the proposed plan or amendment, and consider comments provided by the cities and counties. Cities and counties receiving the notice may request consultation with the GSA, in which case the GSA must accommodate that request within 30 days. The GSA also must hold a public hearing prior to adopting or amending a GSP. There must be at least 90 days between the notice issued to cities and counties and the public hearing. [CA Water Code Section 10728.4]

4. If a GSA intends to impose or increase a fee, it must first hold at least one public meeting, at which attendees may make oral or written comments. This public notice must include:
    a. Information about the time and place of the meeting and a general explanation of the topic to be discussed.
    b. Public notice must be posted on the GSA's website and mailed to any interested party who submits a written request for mailed notice of meetings on new or increased fees. (The GSA must establish and maintain a list of interested parties, and the list is subject to renewal by April 1 of each year.)
    c. The public notice must also be consistent with Section 6066 of the Government Code.
    d. In addition, the GSA must share with the public the data upon which the proposed fee is based, and this must be done at least ten days before the public meeting takes place. [CA Water Code Section 10730.(b)(1),(2), and (3)]