APPENDIX I

WATER SUPPLY ASSESSMENT

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CITY OF MADERA
VILLAGE D SPECIFIC PLAN PROJECT
SB 610 WATER SUPPLY ASSESSMENT

for the Environmental Impact Report prepared by LSA Associates, Inc.

FEBRUARY 2021

PREPARED BY:
MKN & ASSOCIATES
8405 N. FRESNO ST. SUITE 120
FRESNO, CA 93720
559-500-4750

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Prepared by:

REGISTERED PROFESSIONAL ENGINEER
HENRY W. LIANG
No. C68442
Exp. 09/30/21
CIVIL
STATE OF CALIFORNIA

Henry Liang, PE C68442
Principal
MKN & Associates, Inc.

mkn
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1.0 Introduction

1.1 General

Senate Bill 610 (Chapter 643, Statutes of 2001) and Senate Bill 221 (Chapter 642, Statutes of 2001) improves the link between water supply availability and certain land use decisions made by cities and counties. SB 610 and SB 221 are companion measures that seek to promote more collaborative planning between local water suppliers, cities, and counties. Both statutes require detailed information regarding water availability to be provided to the local agency decision-makers prior to approval of specified large development projects. Both statutes also require this detailed water supply information to be included in the administrative record in order to serve as the evidentiary basis for an approval action by the local agency on such projects. Both measures recognize local control and decision-making regarding the availability of water for projects and the approval of projects.

Under SB 610, water assessments must be furnished to local governments for inclusion in any environmental documentation for certain projects (as defined in Water Code 10912[a]) subject to the California Environmental Quality Act (CEQA). Under SB 221, approval by an agency of certain developments requires an affirmative written verification of sufficient water supply. However, not every project that is subject to the requirements of SB 610 is subject to the mandatory water verification of SB 221. Conversely, not every project that is subject to the requirements of SB 221 is subject to the requirement that environmental document contain an SB 610 water assessment.

A foundational document for compliance with both SB 610 and SB 221 is the Urban Water Management Plan (UWMP). Both of these statutes repeatedly identify the UWMP as a planning document that, if properly prepared, can be used by a water supplier to meet the standards set forth in the statutes. UWMPs also serve as important source documents for cities and counties as they update their General Plan. Conversely, General Plans are source documents that are used when water suppliers update their UWMPs. These planning documents are linked, and their accuracy and usefulness are interdependent.

The City of Madera (City) adopted an UWMP for the year 2015. The UWMP is provided in Appendix B. The City of Madera has also completed an update to their Water System Master Plan (WMP)[1] in 2014. The Madera Integrated regional Water Management Plan (IRWMP) is included in Appendix D.

Another foundational document for compliance with both SB 610 and SB 221 is the 2020 Madera Subbasin Joint Groundwater Sustainability Plan (GSP)[2]. In September 2014, the Sustainable Groundwater Management Act (SGMA) was passed by the California Government, mandating that local agencies establish governance of their subbasins by forming Groundwater Sustainability Agencies (GSAs). These Agencies have the authority to adopt a Groundwater Sustainability Plan for the subbasin which aims to maintain or achieve sustainable groundwater management within 20 years.

[1] *2014 City of Madera Water System Master Plan (WMP):* *https://www.madera.gov/home/departments/public-works/water/#tr-drought-preparedness-water-conservation-239901*

[2] *2020 Madera Subbasin Joint Groundwater Sustainability Plan:* *https://www.maderacountywater.com/madera-subbasin/*

1.2 Project

The Villages at Almond Grove development (Village at Almond Grove/Development) is one of the developments planned entirely within the Village D Specific Plan Area identified in the City's General Plan. The development is located near the western boundary of the City. In October 2018, the Madera County Local Agency Formation Commission (LAFCO) approved the expansion of the City's Sphere of Influence to include the Specific Plan Area. (Resolution No. 2018-009) The approximately 1,883-acre project site is generally located north of the Fresno River, south of Avenue 17, west of Road 24, and east of Road 21.

The project site is bordered by primarily agricultural land on the northern and western boundaries. The Fresno River runs along the southern border of the site in an east-west direction with agricultural land to the south. The Madera Airport and the Madera Municipal Golf Course, along with residential land, are located directly north of the project site. The existing City limit is along the eastern edge of the project site.

1.3 Project Authorization

The City has authorized LSA Associates, Inc. and its subconsultant MKN & Associates, Inc. (MKN) to prepare a water supply assessment for the Villages at Almond Grove Development. The water supply assessment relies upon information documented in the 2020 Madera Subbasin Joint Groundwater Sustainability Plan, 2018 Villages at Almond Grove Specific Plan, the 2014 City of Madera Water System Master Plan (WMP), the 2017 City of Madera Urban Water Management Plan (UWMP), the 2019 Madera Integrated Regional Water Management Plan Update (IRWMP), 2014 Madera Regional Groundwater Management Plan (GWMP) as well as information supplied by the City to assess the projected water supply sufficiency to meet the demands of the proposed Almond Grove Development for the next 20 years.

1.4 Assessment Format

The Department of Water Resources (DWR) has prepared the "Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001" which was used in developing this water supply assessment. Relevant sections of the Water Code identifying requirements for water supply assessments precedes each section of this report. Chapter 643, Statutes of 2001 (SB 610) is also included in its entirety in Appendix A.

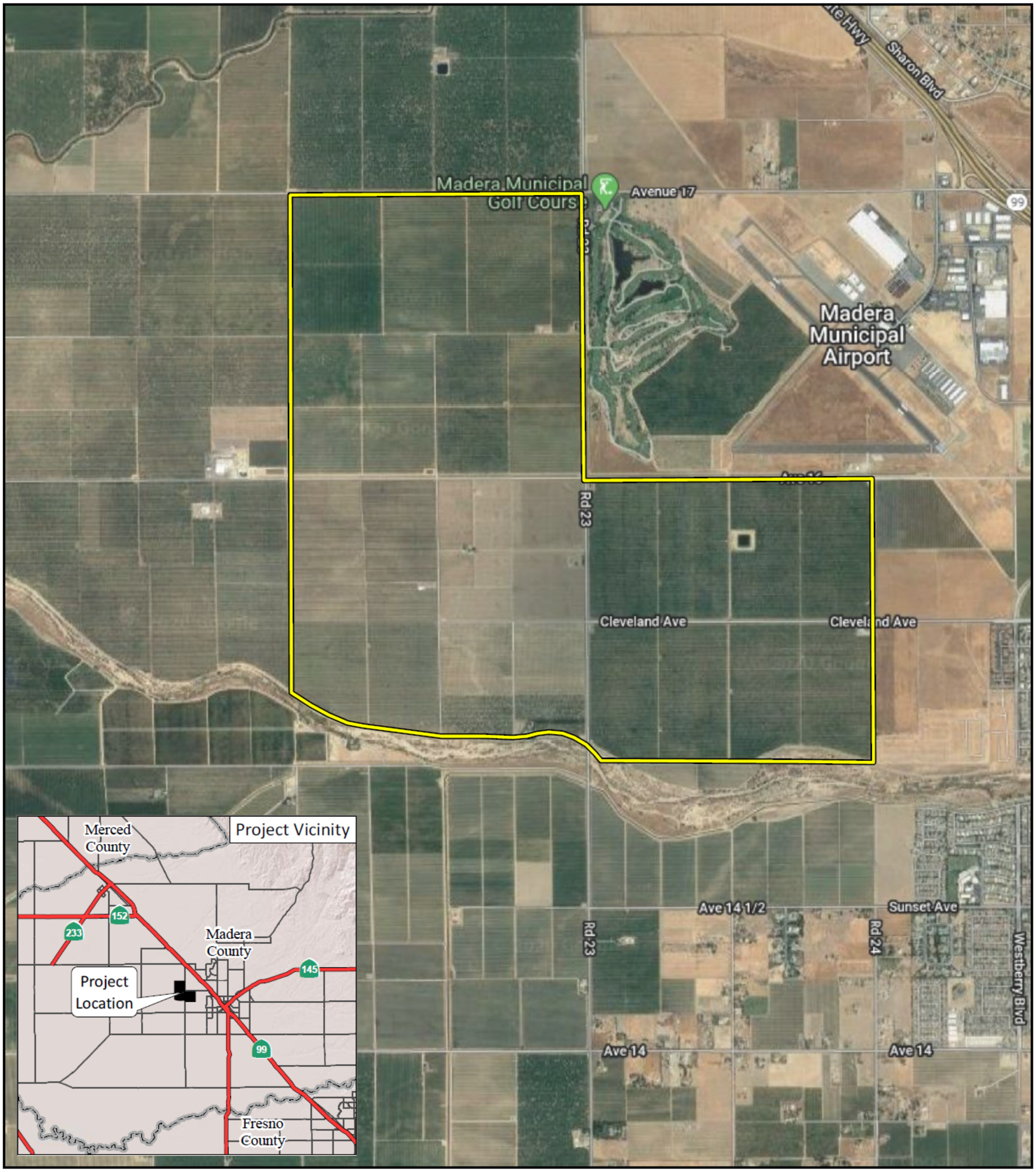

Figure 1-1 - Project location and regional vicinity map. Source: Environmental Impact Report by LSA

2.0 Water Supply

Water Code Section 10910

(d)(1) The assessment required by this section shall include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts.

(2) An identification of existing water supply entitlements, water rights, or water service contracts held by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall be demonstrated by providing information related to all of the following:

(A) Written contracts or other proof of entitlement to an identified water supply.

(B) Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system.

(C) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply.

(D) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply.

The City of Madera currently pumps and delivers groundwater to meet the demands of its service area. The Almond Grove Development is included in this service area, but is not yet served or developed. The Project plans for the new development to be served by the City's water system. The following section describes the City's water system, groundwater basin, and additional supply opportunities.

2.1 Groundwater

Water Code Section 10910

(f) If a water supply for a proposed project includes groundwater, the following additional information shall be included in the water assessment:

> *(1) A review of any information contained in the urban water management plan relevant to the identified water supply for the proposed project.*
>
> *(2) A description of any groundwater basin or basins from which the proposed project will be supplied. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has been projected that the basin will become overdrafted if present management conditions continue, in the most current bulletin of the department that characterizes the condition of the groundwater basin, and a detailed description by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), of the efforts being undertaken in the basin or basins to eliminate the long-term overdraft condition.*
>
> *(3) A detailed description and analysis of the amount and location of groundwater pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), for the past five years from any groundwater basin from which the proposed project will be supplied. The description*

and analysis shall be based on information that is reasonable available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), from any basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(5) An analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project. A water assessment shall not be required to include the information required by this paragraph if the public water system determines, as part of the review required by paragraph (1), that the sufficiency of groundwater necessary to meet the initial and projected water demand associated with the Project was addressed in the description and analysis required by paragraph (4) of subdivision (b) of Section 10631.

2.1.1 City of Madera Water Supply

The City's water distribution system is supplied solely by groundwater wells. The system includes 20 groundwater wells (including offline wells 16 and 27) with a total pumping capacity of 20,931 gpm, 187 miles of pipeline, and a one-million-gallon elevated storage tank. The distribution mains are typically 16-inches and smaller. The quality of the water pumped currently meets all California Code of Regulations primary and secondary drinking water standards.

The Project proposes to extend the City's water distribution system to serve the Project. The Project will install low flow fixtures and appliances and will also install water meters at all service connections involved with the project. The expanded water distribution system shall be capable of supplying a required fire flow of 2000 gpm for a minimum of two hours. The major water facilities proposed for the project include 8 new well sites located around the perimeter of the Villages at Almond Grove Specific Plan Area, along with approximately 70,000 feet of proposed pipeline. The 8 new well sites and 70,000 feet of pipeline are buildout conditions. These proposed improvements will be developed as the project development progresses.

This water supply assessment does not include an evaluation of the water system infrastructure required to connect the City's existing water distribution system to the proposed Project system. This assessment focuses on water supply and does not include an analysis of the system hydraulics necessary to meet minimum pressure standards, including fire flow requirements.

2.1.2 Groundwater Basin

The City is located in the San Joaquin River Hydrologic Region (groundwater basin) and extracts its groundwater from the Madera Groundwater Subbasin. Figure 2-1 shows the Madera Groundwater Subbasin and the different Groundwater Sustainability Agencies established within the Madera Groundwater Subbasin. DWR Bulletin 118 contains a detailed description of the Madera Groundwater Subbasin and its characteristics and conditions. A copy of Bulletin 118 is included in Appendix C.

The San Joaquin River Groundwater Basin is not adjudicated, and portions of the San Joaquin River Groundwater Basin have been in a state of overdraft for many years. The 2020 Madera Subbasin Joint GSP estimated the annual average groundwater overdraft in the Madera Subbasin to be anywhere from 100,000 to 163,000 AFY for 1988 to 2016, assuming a range of specific yield values from 8 to 13 percent. According to the GSP, between 1980 and 2011, groundwater levels have generally declined between 30 and 150 feet throughout Madera County. The GSP includes a detailed description of groundwater conditions in Madera County and collaborative regionalized strategies being implemented to help preserve the groundwater supply.

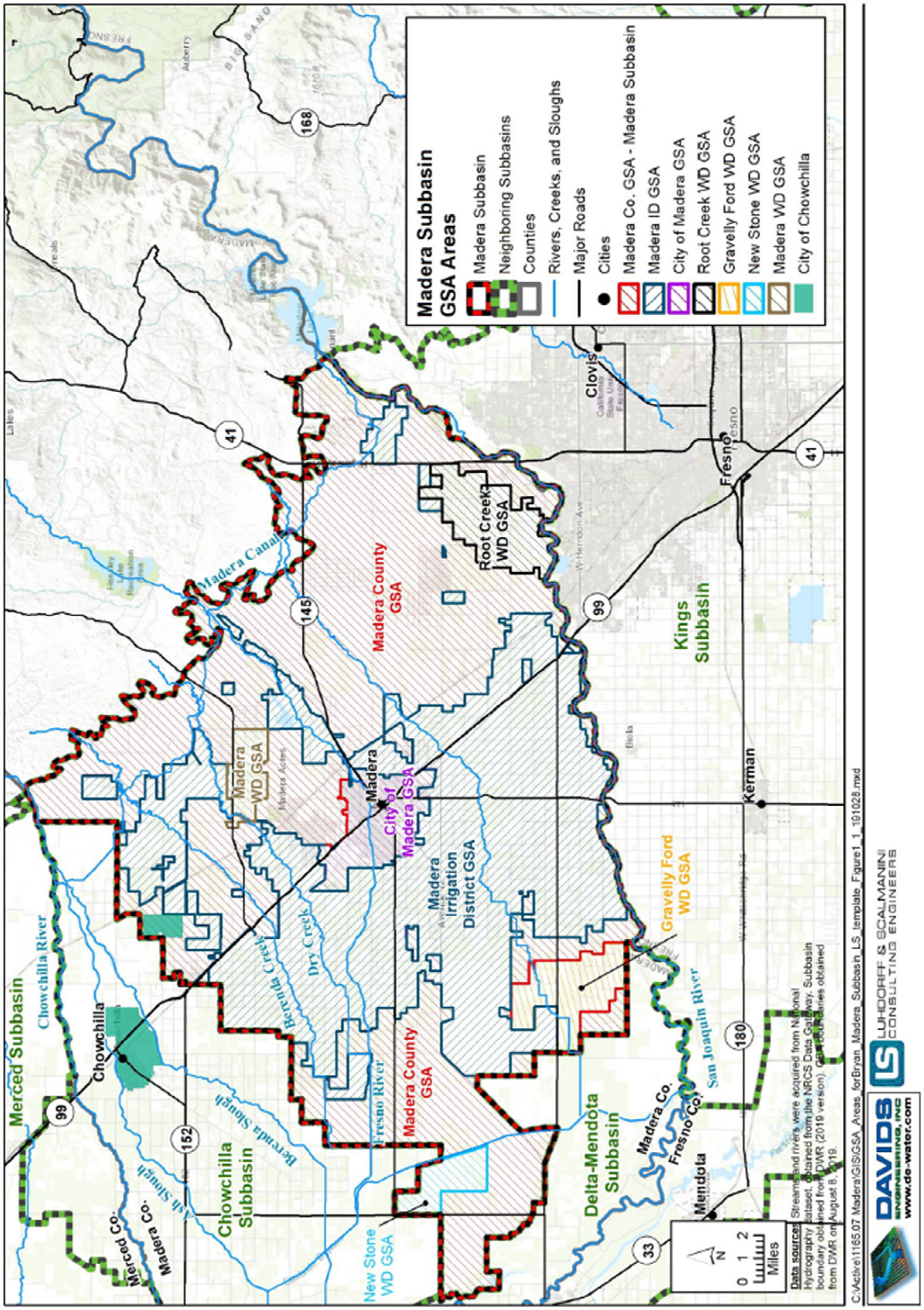

Figure 2-1 Madera Groundwater Subbasin GSA Areas Map. Source: 2020 Madera Subbasin Joint Groundwater Sustainability Plan (GSP)

2.1.3 City Groundwater Use Data and Estimates

The amount of groundwater pumped by the City since 2011 is shown in Table 2-1. The amount of groundwater projected to be pumped in 5-year intervals from 2020 to 2040 is shown in Table 2-2 and is based on projections found in the UWMP. Pumping estimates shown in Table 2-2 are based on the projected land use and assume that the water use characteristics will remain constant, although it is hoped that through the City's conservation efforts, water use policies, and the implementation of the GSP, water use will decrease in the future. Pumping estimates also assume that the City will continue to rely solely on groundwater for its supply since it currently has no surface water supplies or entitlements. As of 2019, the City is about 98 percent metered. The City will use this data to monitor specific consumption at all connections.

Table 2-1 Amount of Groundwater Pumped by the City[1] (AFY)

Basin Name	2011	2012	2013	2014	2015	2019[2]
Madera Subbasin	11,396	11,743	10,855	10,636	9,314	8,275
Percent of Total Supply	100	100	100	100	100	100

[1] 2015 Urban Water Management Plan

[2] 2020 Madera Subbasin Joint Groundwater Sustainability Plan Annual Report

Table 2-2 Future Estimates of Groundwater Pumping by the City[1] (AFY)

Basin Name	2020	2025	2030	2035	2040
Madera Subbasin	10,100[2]	17,400	19,200	21,100	23,400
Percent of Total Supply	100	100	100	100	100

[1] 2015 Urban Water Management Plan

[2] Groundwater pumping estimate provided by City

2.1.4 Regional Efforts to Eliminate or Reduce Overdraft

The 2020 Madera Subbasin Joint Groundwater Sustainability Plan (GSP) is the current primary effort to eliminate or reduce overdraft. Four (4) of the seven (7) total GSAs representing approximately 94% of the subbasin area have developed this Joint GSP. These four (4) GSAs include the City of Madera GSA, Madera County GSA, Madera Irrigation District GSA, and Madera Water District GSA. The Madera Subbasin Joint GSP defines groundwater conditions in the entire Madera Subbasin, analyzes overdraft conditions and establishes goals for sustainability. The Joint GSP satisfies the requirements laid out by SGMA and DWR and covers the approach by which the GSAs will achieve sustainable groundwater by 2040.

Prior to the GSP, the City of Madera was part of a regional groundwater management plan in which each municipality involved aimed to actively manage their water systems and water use in an attempt to reduce or eliminate overdraft. Madera's Regional GWMP was a collaborative effort between the City of Chowchilla, City of Madera, Madera Irrigation District (MID), Chowchilla Water District, Madera County and South-East Madera County United.

Another regional effort to eliminate or reduce overdraft is the Integrated Regional Water Management Plan (IRWMP). Similar to the GWMP, the IRWMP establishes objectives for the region along with performance measures. This IRWMP consists of a collaborative effort among the Madera Regional Water Management Group (RWMG), along with other agencies who are interested in Madera County's water resources management. Each municipality involved with Madera's Regional GWMP (listed in the paragraph above) along with the following are voting members of the RWMG: Fairmead Community and Friends, Gravelly Ford Water District, Madera Valley Water Company, Madera Water District, North Fork – Mono Rancheria, and Self Help Enterprises. Other Participating agencies include: Chowchilla Red Top

Resource Conservation District, Coarsegold Resource Conservation District, South East Madera United and Root Creek Water District

2.1.5 2020 Madera Subbasin Joint Groundwater Sustainability Plan (GSP)

In 2014, SGMA required the development of GSAs and a GSP within local subbasin areas. The main purpose of developing the GSP is to ultimately achieve a sustainable groundwater supply by the year 2040. The Joint GSAs, including the City of Madera, plan to do this by implementing projects and management actions that will help to bring the current net recharge to balance. Together, the GSAs have proposed a total of 25 projects and management actions in the Joint GSP. Many of these projects had begun prior to the submittal of the GSP, and many others will begin between 2020 and 2025. The City of Madera GSA in particular has included two projects within the GSP. One project, Berry Basin, has already been completed and required implementing a recharge basin in cooperation with MID. The second project the City plans to implement is Installation of Water Meters and Volumetric Billing. Each year, the Joint GSAs are to develop an Annual Report[3], breaking down groundwater levels and usage numbers and reporting on progress.

This GSP has been developed by the Madera Subbasin GSAs with the help of local agencies, agricultural water users, municipal water users, and other stakeholders. Help from these groups and individuals has come in the form of feedback from public meetings and workshops with the GSAs. With this GSP comes many efforts to reduce and eliminate overdraft.

2.1.6 2014 Madera Regional Groundwater Management Plan (GWMP)

The purpose of developing Madera's GWMP[4] is to identify and implement a number of actions to help preserve, develop, stabilize, and protect groundwater resources in the Madera Groundwater Subbasin. In general, the objective of the GWMP is to help participants meet the following goals: Develop new surface water sources and the necessary infrastructure to bring the water table within the GWMP area to a balance; stabilize groundwater levels in order to minimize pumping costs and energy use; maximize the use of surface water, including available flood water; protect groundwater quality, import clean surface water, and prevent intrusion of poor quality groundwater; and maintain a groundwater-monitoring program; among others. The 2014 Madera Regional Groundwater Management Plan was developed to identify and implement actions to help preserve, develop, stabilize, and protect the Madera Groundwater Subbasin. The majority of the findings in the Plan are now superseded by the 2020 GSP.

2.1.7 2019 Integrated Regional Water Management Plan Update (IRWMP)

The IRWMP (Appendix D) has developed regional goals and objectives in order to bring focus to their planned intentions. This is the core subject of the IRWMP itself. Each objective listed within the IRWMP has individual goals associated with it; and each goes into great detail. The Regional Goals and Measurable Objectives for the Valley, set forth by the RWMG, are summarized below:

- Protect and enhance the quality of surface and groundwater.
- Promote community stewardship of our Region's water resources.
- Provide reliable and sustainable water resources, both surface and groundwater, of sufficient quality and quantity to meet the existing and future needs of the Region.
- Share those resources to protect and enhance the environmental resources of the Regions watersheds.

[3] *Madera Subbasin Joint Groundwater Sustainability Plan First Annual Report: https://www.maderacountywater.com/madera-subbasin/*
[4] *2014 Madera Regional Groundwater Management Plan: https://www.maderacountywater.com/wp-content/uploads/2018/08/Madera-Regional-Groundwater-Management-Plan-2014.pdf*

- Develop the necessary projects and operations to manage the flood water in the Region to reduce the impact to people, property and environmental resources.

2.1.8 Additional Overdraft Reduction Measures

Aquifer recharge occurs in the numerous stormwater retention basins scattered throughout the City that collect stormwater runoff and percolate stormwater into the groundwater basin. The existing stormwater does not count as additional recharge, but the City is exploring opportunities to obtain surface water supplies and using the stormwater basins to recharge the groundwater basin with new water sources.

Recharge also occurs from percolation ponds at the WWTP, seepage from unlined canals, stream flow percolation from the San Joaquin River, Chowchilla River, Fresno River, and other creeks and sloughs. The exact amount of recharge is unknown; therefore, an analysis of how much water is being recharged to the aquifer is not part of this evaluation.

Any water-savings measures required of new development, such as the use of water saving irrigation systems, low-water-use plantings in all public landscaped areas, and use of recycled water and dual plumbing systems, will additionally reduce overdraft. The Project proposes to utilize reclaimed water for outdoor irrigation. Assuming about 7% of the total influent flow to the WWTP is lost through the treatment process, approximately 1.9 MGD, or 2,128 AFY, of daily effluent will be available for reclaimed uses. Actual losses should be validated when the City begins to reclaim wastewater in the future to determine volumetric recycled water availability.

2.1.9 2015 City of Madera Urban Water Management Plan

The UWMP is a tool used to help the City maximize its groundwater resources through water-conserving measures. In 2017, the City completed such a report. This report can be found in Appendix B. The report mentioned several demand management measures (DMMs) that the City adopted in an effort to reduce water use and therefore reduce the overdraft in the subbasin. The City has initiated the following DMMs:

- Water Waste Prevention Ordinances
- Metering
- Conservation Pricing
- Public Education and Outreach
- Programs to Assess and Manage Distribution System Real Loss
- Water Conservation Program Coordination and Staffing Support
- Rebate Programs
- Water Survey Programs for Single-Family and Multi-Family Residential Customers
- Residential Plumbing Retrofit
- System Water Audits
- Large Landscape Conservation programs
- Conservation Programs for Commercial, Industrial, and Institutional (CII) Accounts
- Wholesale Agency Programs

2.2 Reliability of Supply

2.2.1 Reliability of Groundwater Supply

The climatic conditions of Madera County in the San Joaquin Valley are characterized by typically low amounts of rainfall, a short rainy season, and high temperatures that frequently occur in the summer months. The average annual precipitation for the Madera area is approximately 11 inches; and the average annual precipitation throughout the majority of the subbasin is also 11 inches. Drought conditions are not uncommon and can last for multiple years. Summer water consumption varies directly with daily temperature maximums, and on average the Madera region experiences over 100 days a year with maximum daily temperatures over 90 degrees. The reliability and vulnerability of the City's water supply to seasonal or climatic changes can be qualified, but reliability and vulnerability are difficult to quantify. Because the City relies entirely on groundwater using multiple extraction wells, water level declines will be more severe during drought periods and high mean temperature years.

As growth in the area continues and increased demands are placed on the groundwater resources of the area groundwater, water levels will continue to decline unless measures or programs are established and implemented to reduce the overdraft as discussed in Section 2.1.4. Without water savings programs or measures to reduce overdraft as recommended in the 2017 UWMP, 2014 GWMP and the 2019 IRWMP Update, this drawdown may eventually reach a critical point. This critical point is not expected to occur for many years. City well production records show that all of the City wells are still producing water. The City has not reported any recent outages with its current wells in operation. Recharge, conservation, and seeking new imported water sources will all reduce vulnerability and increase the long-term reliability of groundwater supplies.

Water quality is a factor that could potentially affect the reliability of the City's water supply. Currently, the quality of groundwater pumped by the City meets all regulatory standards without treatment, with the exception of water produced at Well 27. Well 27 has historically exceeded regulatory limits for dibromochloropropane (DBCP), ethylene dibromide (EDB) and nitrate, and is not in use due to these water quality concerns. It currently has GAC treatment for DBCP and EDB. The City monitors the quality of all water produced from its wells and reports this data annually to the State and its customers through its Consumer Confidence Reports.

Table 2-3 shows where the City plans to source their water to meet demands in normal, dry, and multiple dry years. The supply is shown as a percentage of the demand. A recent example of a multiple dry year cycle occurred from 2013 to 2017. During that period, the City was able to meet all its water demands using groundwater. Furthermore, the impact of an extreme single dry year, such as 1977, did not impact the ability of the city to meet all of its water demands. The reliability of water service, which is subject to proper operation and maintenance of the water distribution system and its ability to deliver the water, is discussed later in the following section. The City's multiple well groundwater supply system has proven to be an effective means of drought protection for its customers.

Table 2-3 Supply Reliability[1]

Water Supplier	Water Supply Source	Normal Water Year	Single Dry Water Year	Multiple Dry Water Years			
				1	2	3	4
City of Madera	100%	100%	100%	100%	100%	100%	100%

[1]Supply represented as a percentage of the demand.

2.2.2 Distribution System Reliability

The City's water distribution system historically has provided a very reliable delivery system. Proper maintenance and continued expansion of the system to meet the continued planned growth of the City is essential to maintaining the reliability of the water system. City improvement standards are in place that meet or exceed American Water Works Standards ensuring that system reliability does not diminish as it is expanded into new service areas. Funds to maintain and expand the system to meet the continued growth in water demand are collected through water rates and development fees. One example of reliability planning is that in preparation for possible electrical service interruptions, the City has made emergency generator hookups available on seven of its wells. Four wells are gas-powered and are also available in the case of electrical service interruptions.

The municipal water well system that supplies the City's water has historically been a consistent and reliable source. In the event that any portion of the City's system can no longer provide consistent potable water, the location of new wells, as recommended in the 2014 WMP, could be reprioritized to address system shortfalls. Although the implemented GSP is designed to cover the measures and programs necessary to address a declining water level in the area of the City water system, it may still be necessary for the City to periodically lower pump bowls or construct new deeper wells to maintain required system capacity. With deeper wells the potential of water quality problems is also increased in certain parts of the City service areas. Therefore, as the City pumps from deeper aquifers the need for treatment may increase. Chapter three of the 2019 IRWMP Update identifies the following groundwater contaminants that currently impact groundwater usage or have the potential to impact future groundwater usage in the Foothills, Mountains, and Valley Floor areas:

- High Salinity (Total Dissolved Solids)
- Nitrate
- Uranium
- Arsenic
- Methane gas
- Iron
- Manganese
- Slime production
- Dibromochloropropane (DBCP)
- Hydrogen sulfide gas
- Methylbutylethylene (MBTE)

2.3 Transfer and Exchange Opportunities

The City does not possess any water treatment facilities; therefore, the purchase and delivery of any surface water is not feasible for this project. The opportunity to purchase surface water from nearby irrigation districts, such as MID, for short-term use or on an emergency basis is limited. This water source may be considered for groundwater recharge purposes to assist in regional recharge efforts but not as a reliable supply source. In 2019, the City of Madera jointly operated Berry Recharge Basin with MID to provide approximately 470 AF of recharge for the City.

2.4 Water Supplies Never Used Before

Water Code Section 10910

> *(e) If no water has been received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts, the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall also include in its water assessment pursuant to subdivision (c), an identification of the other public water system or water service contract holders that receive a water supply or have existing water supply entitlements, water rights, or water service contracts, to the same source of water as the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has identified as a source of water supply within its water assessments.*

The Project does not propose to use any new water supplies, and this water supply assessment does not rely on any sources of water that have never been used before. The City has historically pumped groundwater to meet their respective service area water demands.

3.0 Water Demands

Water Code Section 10910

(c) (2) *If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g).*

(3) *If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water assessment for the Project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.*

This section describes the City's current and future water demands in 5-year intervals to 2040. The water demands of the Project are also estimated in 5-year intervals through buildout in 2040. The section concludes with a comparison of the City's estimated water supply and demands through the year 2040 to determine the adequacy of the supply to meet all demands for the City, including the Project's water demands.

This overview of the City's water supply/demand analysis does not include evaluation of the condition of the existing water system infrastructure and its ability to deliver water to the Project. An analysis of the additional water system infrastructure required to serve the Project is also not a part of this water assessment. This water assessment only evaluates the adequacy of the City's available water supply and the ability to meet Project demands.

3.1 Water Service Area

3.1.1 Geographic Characteristics

The City is located approximately 20 miles northwest of the City of Fresno and about 150 miles south of the City of Sacramento. The City occupies an area of about 16 square miles (approximately 10,100 acres). Incorporation of the City occurred in 1907, and water service is provided to all residential, commercial, and industrial customers, as well as for environmental and fire protection uses. Madera has a generally flat topography and lies within the San Joaquin Valley, which is about 225 miles long and averages 50 miles wide. About 10 miles east of Madera, the terrain slopes upward with the foothills of the Sierra Nevada mountain range; 40 miles west of the City are the foothills of the Coastal Mountain Range.

3.1.2 Climate

The climate of Madera is dry and mild in winter and hot in the summer. Nearly nine-tenths of the annual precipitation falls between the months of November and April. Rainfall in the summer is rare and very light. Snow is a rare occurrence. Madera enjoys a very high percentage of sunshine, receiving more than 80 percent of the possible amount during all but the four months of November, December, January, and February. Reduction of sunshine during these months is caused by fog and short periods of stormy weather.

Due to clear skies during the summer and the protection of the San Joaquin Valley from marine effects, the normal daily maximum temperature reaches the high 90s during the latter part of July with many days over 100 degrees. Relative humidity readings of 15 percent are common on summer afternoons, and readings as low as 8 percent have been recorded. In contrast, humidity readings average 90 percent during the morning hours of December and January.

As a result of high temperatures and low humidity in the summer months, water usage is generally much higher during the summer months.

Winter temperatures are usually mild with infrequent cold spells dropping the readings below freezing. Heavy frost occurs almost every year, and the first frost usually occurs during the last week of November. The last frost in spring is usually in early March, but will occasionally occur in early April.

Winds flow with the major axis of the San Joaquin Valley, generally from the northwest. During the warmest months, the northwest winds increase during the evenings.

Average monthly and annual climate data for the City of Madera is presented in Table 3-1.

Table 3-1 Climate Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Standard Monthly Avg Evapotranspiration (ETo)[1] (in.)	1.5	2.4	4.2	5.8	7.8	8.7	9.6	8.5	6.4	4.2	2.2	1.3	62.7
Avg. Rainfall [2] (in.)	1.98	1.92	1.81	1.08	0.39	0.09	0.01	0.02	0.14	0.58	1.18	1.78	10.99
Avg. Max. Temp. [2] (F)	54	61	67	75	84	92	98	96	91	80	66	55	77
Avg. Min. Temp. [2] (F)	36	39	42	46	51	57	61	60	55	48	40	36	48

[1] California Irrigation Management Information System (CIMIS) data for Station 145 – Madera (CIMIS, 2010). Represents monthly average ETo from May 1988 to April 2011.

[2] Western Regional Climate Center (WRCC) Station 045233 – Madera. Represents monthly average data from January 1928 to January 2015.

3.1.3 Population Projection

Madera is experiencing small population growth and future projections anticipate further growth at about the same as the current rate. Manufacturing, retail trade, and agricultural services are currently the largest segments contributing to the City's labor force. Table 3-2 summarizes population projections through 2040. The 2010 population was taken from 2010 US Census data. The 2015 UWMP (prepared in 2017) reported an average growth of 2.0 percent and reported population projections accordingly. The requirements for SB610 state that this evaluation should use the 20-year period going forward. It is therefore necessary to project the City's population through 2040.

Table 3-2 City of Madera Population Projections

	2010[1]	2015[2]	2020[3]	2025[3]	2030[3]	2035[3]	2040[3]
City of Madera Population	61,416	64,810	71,555	79,003	87,226	96,304	106,328

[1] 2010 U.S. Census population

[2] City of Madera Population according to 2015 UWMP.

[3] Projected population growth as stated in the UWMP.

3.2 Service Area Water Demands

Production records from Table 2-1 indicate that City water production decreased approximately 27 percent between 2011-2019. This decrease is largely attributed to the City's effort of implementing water conservation measures as well as the installation of water meters. However, as Madera grows, the annual water production is estimated to increase. Future water production (use) estimates from the 2015 UWMP are used for this water assessment. These estimates assume the water use characteristics will remain constant and that the population growth rate will be approximately

2.0 percent per year. It is anticipated that the water use can be reduced through conservation efforts by the City and its water users by adhering to the GSP discussed in Section 2.1.4.

Table 3-3 provides information on current and future water production for the system by water use sectors as shown in the 2015 Madera UWMP. Water use projections assume that the current water use characteristics will remain constant through 2040 and that the water demands will continue to grow at a rate of 2.0 percent annually as the City population continues to grow. The water use data is displayed in 5-year increments.

Table 3-3 City of Madera Actual and Projected Water Use by Sector (AFY) from 2015 UWMP

Use Type	2015[1]	2020	2025	2030	2035	2040
Single Family Residential	5,295	-	9,900	10,900	12,000	13,300
Multi Family Residential	1,596	-	3,000	3,300	3,600	4,000
Commercial/Institutional	1,503	-	2,800	3,100	3,400	3,800
Industrial	44	-	100	100	100	100
Losses	652	-	1,200	1,300	1,500	1,600
Total	**9,314**	**10,100**[2]	**17,400**	**19,200**	**21,100**	**23,400**

[1] Actual water use data recorded by the City.

[2] Groundwater pumping estimate provided by City. Estimate was not broken down by water use sector.

3.3 Project Water Demands

The Project site is approximately 1,883 acres and includes residential, retail, potential school sites, and open space offering a variety of uses. In addition, the Project site includes a few existing residential and agricultural support structures. The land use is summarized as follows:

- 36 acres of Village Country Estates
- 911 acres of low-density Village
- 318 acres of medium density Village
- 105 acres of high-density Village
- 120 acres of mixed-use Village
- 164 acres of parks
- 54 acres of potential schools
- 17 acres of open space
- 30 acres of business park
- 128 acres of major roadways

The Project consists of approximately 10,783 dwelling units. Project buildout is planned to occur through the year 2035. The Project's estimated annual average indoor water demand at full buildout is approximately 2,254 AFY as shown in Table 3-4. The water use coefficient values for the various land use categories are based on water demands in the 2020 Infrastructure Master Plan (IMP) and are representative of indoor water usage only. The Project plans to use reclaimed water to meet outdoor irrigation demands and will not utilize the City's groundwater wells to supply irrigation demands. Table 3-5 shows the estimated indoor water demand during the planned buildout of the Project in 5-year increments through 2040. Buildout of the project is going to be dictated by market conditions. For the purposes of this study, buildout demands were allocated based on three sections of development (Southeast, Northwest, & Southwest) outlined in the Infrastructure Master Plan. Each section will take five years to buildout. Occupancy of the Southeast section is assumed to occur at the end of 2025 and is projected to be completed in 2030. The Northwest section is projected to be completed in the year 2035.

Table 3-4 Project Area Indoor Water Demands at Full Buildout within Project Area

Project-Specific Land Use[1]	Land Use Type[2]	Total Units	UNIT	Water Use Coefficient		Annual Water Demand (AFY)	Annual Water Demand (gpm)	Maximum Day Demand[4] (gpm)
				(gpd/UNIT)	(AFY/UNIT)			
	Project Related Water Demands							
Village Country Estates	VCE	54	DU	170	0.19	10.3	6.4	12.7
Village Low Density	VLDR	4,784	DU	160	0.18	857.4	531.6	1,063.1
Village Medium Density	VMDR	3,579	DU	160	0.18	641.4	397.7	795.3
Village High Density	VHDR	2,366	DU	134	0.15	355.1	220.2	440.3
Village Mixed Use	VMU	120	AC	700	0.78	94.1	58.3	116.7
Village Business Park	VBP	1,293,454	SQ FT	0.08	0.00009	115.9	71.9	143.7
Elementary School Sites	SCHOOL	3,656	Student	8	0.009	32.8	12.3	40.6
Unaccounted-For Water[5]	-	-	-	-	-	147.5	91.4	182.9
Total Water Demand	-	-	-	-	-	**2,254.5**	**1,397.7**	**2,795.4**

[1] Project-specific land use types taken from 2020 Almond Grove Specific Plan
[2] Land use types taken from 2020 Infrastructure Master Plan
[3] Water use coefficients from 2020 Infrastructure Master Plan
[4] Assumes the 2014 WMP maximum day to average day demand factor of 2.0
[5] Assumes 7% of total system water demand

Table 3-5 Project Water Demands Through 2040[1]

Year	Estimated Water Demand (AF)
2020	0
2025	0
2030	776.6
2035	1562.8
2040[2]	2254.5

[1] Buildout demands were allocated based on three sections of development outlined in the Infrastructure Master Plan. The Southeast Section is estimated to be completed in 2030; the Northwest Section is estimated to be completed in 2035.
[2] Water demands for the completed Southwest section are captured in year 2040 until construction phasing information becomes available.

3.4 Project Irrigation Demands

The Project will be utilizing reclaimed wastewater for outdoor irrigation. Based on the Project Infrastructure Master Plan, approximately 1.9 MGD, or 2,128 AFY, of the daily treated wastewater effluent will be available for reclaimed uses. About 1.84 MGD, or 2,065 AFY is needed to satisfy irrigation demands at average day. Max day and peak hour demands will be met by utilizing storage structures such as tanks or reservoirs. Therefore, reclaimed wastewater can be used to meet the Project's entire irrigation demand at buildout.

3.5 Comparison of Water Demands and Supplies

SB 610 and prudent planning require that all existing and projected water demand for the next 20 years be considered in analyzing the sufficiency of the water supply to meet existing and future demand, not just Project demand. SB 610 also requires the water supplier to analyze and compare water supplies in water short years (dry years) with current and projected water demand. However, as previously discussed, the City relies solely on groundwater to meet their demands, and the groundwater supply (availability) has been determined to be sufficient to meet the demand of the City for at least the next 20 years in all water year types, including normal, single dry years and multiple dry years.

Table 3-6 compares the City projected water demand and the Project water demand through 2040. Table 3-6 also shows the percentage of the City total projected increase in water demand represented by the Project water demand in 5-year increments. The Project water demand represents approximately 4.1 to 9.6 percent of the City's total projected water demands, depending on the year.

Table 3-6 Comparison of the Water Demand and Project Water Demand

	2015[1]	2020	2025	2030	2035	2040[3]
Total City water demand (AF)	9,314	10,100[4]	17,400	19,200	21,100	23,400
Project related water demand served by City (AF)[2]	0	0	0	776.6	1,562.8	2,254.5
Project demand as percentage of total City demand (%)	0	0	0	4.1	7.4	9.6

[1] 2015 water usage is the actual production measured by the City as recorded in the 2015 Madera UMWP.

[2] Buildout demands were allocated based on projections outlined in the Infrastructure Master Plan. Buildout is projected to be completed in year 2030. Occupancy of the Southeast section is assumed to occur at the end of 2025.

[3] Water demands for the completed Southwest section are captured in year 2040 until construction phasing information becomes available.

[4] Groundwater pumping estimate provided by City.

3.6 Water System Capacity

Typically, municipal water systems are designed such that the minimum water supply capacity (pumping capacity) is capable of meeting the maximum day demand (MDD) with the primary supply offline. MDD is calculated by applying a peaking factor to the average day demand (ADD). ADD is defined as the average of the total water used throughout the year. The City of Madera applies a peaking factor of 2.0 to its ADD to determine its MDD. Peak instantaneous demand is usually met through the use of additional wells and/or storage tanks. The City's WMP utilizes these criteria in analyzing the City's water system and in determining pipeline sizes and storage tank requirements.

As previously stated, the current pumping capacity for the City's active wells is 20,931 gpm. Based on data provided in the 2014 City of Madera WMP, the largest ADD between 2005 and 2010 occurred in 2007 and was approximately 8,710 gpm. Based on the peaking factor criteria stated in the 2014 WMP, the 2007 MDD is approximately 17,420 gpm. The estimated total MDD of the completed Project is about 2,795 gpm as shown in Table 3-4. Table 3-7 presents the estimated Project MDD and the existing and projected MDD for the City's water system. The City's firm capacity is based on future improvements recommended in the 2014 WMP. The 2014 WMP includes the Project site demand in its analysis. The Project MDD is included in the projections for the system MDD.

Table 3-7 Maximum Day Demands and System Capacity (gpm)

	2015	**2020**	**2025**	**2030**	**2035**	**2040**[3]
Project MDD to be Served by City	0	0	0	1,252.7	2,520.8	3,636.5
City MDD	11,549	19,467	21,575	23,806	26,162	29,014
City MDD Plus Project MDD[1]	11,549	19,467	21,575	25,058.7	28,682.8	32,650.5
City System Firm Capacity[2]	25,140	20,931[4]	54,583	57,708	75,278	80,833

[1] System MDD assumes a peaking factor of 2.0 as stated in the 2014 WMP.

[2] Based on existing and proposed infrastructure improvements identified within all planning villages listed in the 2014 City of Madera WMP recommended capital improvement program. (except for 2020)

[3] Water demands for the completed Southwest section are captured in year 2040 until construction phasing information becomes available.

[4] Based on the City of Madera Imminent Development Supply Analysis 2020 found in Appendix E

Municipal water systems must have redundancy (safety factor) built into the system to allow for failures and downtime for maintenance and repairs. Additional City wells may be required in the future to maintain the required safety factor and to meet future MDDs. The Capital Improvement Program proposed in the 2014 Water System Master Plan includes 114 miles of pipeline improvements, 23 new wells, two new storage reservoirs, and two new booster stations. The CIP will increase system capacity to 116.4 MGD at buildout. These improvements were recommended based on a population growth of 3.5%; however, the City’s projected rate of growth identified in the Urban Water Management Plan is 2.0%. The implementation of the Capital Improvement Program will proceed in accordance with the City’s needs and may be at a slower pace than anticipated.

4.0 Final SB 610 Assessment

Water Code Section 10910

(g)(1) Subject to paragraph (2), the governing body of each public water system shall submit the assessment to the city or county not later than 90 days from the date on which the request was received. The governing body of each public water system, or the city or county if either is required to comply with this act pursuant to subdivision (b), shall approve the assessment prepared pursuant to this section at a regular or special meeting.

Water Code Section 10911

(a) If, as a result of its assessment, the public water system concludes that its water supplies are, or will be, insufficient, the public water system shall provide to the city or county its plans for acquiring additional water supplies, setting forth the measures that are being undertaken to acquire and develop those water supplies. If the city or county, if either is required to comply with this part pursuant to subdivision (b), concludes as a result of its assessment, that water supplies are, or will be, insufficient, the city or county shall include in its water assessment its plans for acquiring additional water supplies, setting forth the measures that are being undertaken to acquire and develop those water supplies. Those plans may include, but are not limited to, information concerning all of the following:

(1) The estimated total costs, and the proposed method of financing the costs, associated with acquiring the additional water supplies.

(2) All federal, state, and local permits, approvals, or entitlements that are anticipated to be required in order to acquire and develop the additional water supplies.

(3) Based on the considerations set forth in paragraphs (1) and (2), the estimated timeframes within which the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), expects to be able to acquire additional water supplies.

4.1 Sufficiency of Supply

The 2020 GSP concluded that the groundwater basin is capable of supplying the water required to meet the City's water demands through 2040. Although the existing City water distribution system is not capable of supplying the water required to meet the City and Project demands through 2040, the master planned water system infrastructure does provide the City the ability to meet the City and Project demands through 2040. This analysis assumes:

- The City will be supplying water to the Project area.
- The City will continue to utilize groundwater as their sole source of water.
- The City will continue to construct required groundwater facilities as outlined in current and future Water Master Plans.
- The City will replace or deepen wells as necessary and provide wellhead treatment on wells that develop water quality problems.
- The Project will utilize reclaimed water to meet irrigation demands and lower groundwater pumping.

It is also noted that the Madera Subbasin, including the area in and around the City of Madera, is in a state of overdraft and that measures and programs as discussed in this water assessment and the referenced documents must be implemented to protect the long-term viability of the groundwater resources in the subbasin. It is anticipated that the City of Madera GSA and their joint GSAs will work together in order to meet the requirements and goals of reaching sustainable groundwater supply by 2040 as laid out in the GSP.

4.2 Final SB 610 Assessment Action by Lead Agency

Water Code Section 10911

(b) The city or county shall include the water assessment provided pursuant to Section 10910, and any information provided pursuant to subdivision (a), in any environmental document prepared for the Project pursuant to Division 13 (commencing with Section 21000) of the Public Resources Code.

(c) The city or county may include in any environmental document an evaluation of any information included in that environmental document provided pursuant to subdivision (b). The city or county shall determine, based on the entire record, whether projected water supplies will be sufficient to satisfy the demands of the Project, in addition to existing and planned future uses. If the city or county determines that water supplies will not be sufficient, the city or county shall include that determination in its findings for the Project.

The lead agency (City of Madera) for CEQA shall review the water supplier's (City of Madera) assessment of supply and must decide whether additional water supply information is needed for its consideration of the Project. The City must include this water assessment in the environmental document (EIR) prepared for the Project pursuant to Division 13 (commencing with Section 21000) of the Public Resources Code. Evaluation of this water assessment, additional supply information, and any related documents may be included in the EIR.

If the City decides that the water supply is insufficient, it may still approve the Project, but it must include that determination, based on the entire record, in the findings for the Project. It must include substantial evidence in the record to support its approval of the Project. The City shall determine, based on the entire record, whether projected water supplies will be sufficient to satisfy the demands of the Project in addition to existing and planned future water demands. The City will approve or disapprove the Project based on a number of factors including, but not limited to, this water supply assessment.

Appendix A

Chapter 643, Statutes of 2001 (Senate Bill 610)

An act to amend Section 21151.9 of the Public Resources Code, and to amend Sections 10631, 10656, 10910, 10911, 10912, and 10915 of, to repeal Section 10913 of, and to add and repeal Section 10657 of, the Water Code, relating to water. Approved by Governor October 9, 2001. Filed with Secretary of State October 9, 2001.

The people of the State of California do enact as follows:

SECTION 1. (a) The Legislature finds and declares all of the following:
(1) The length and severity of droughts in California cannot be predicted with any accuracy.

(2) There are various factors that affect the ability to ensure that adequate water supplies are available to meet all of California's water demands, now and in the future.

(3) Because of these factors, it is not possible to guarantee a permanent water supply for all water users in California in the amounts requested.

(4) Therefore, it is critical that California's water agencies carefully assess the reliability of their water supply and delivery systems.

(5) Furthermore, California's overall water delivery system has become less reliable over the last 20 years because demand for water has continued to grow while new supplies have not been developed in amounts sufficient to meet the increased demand.

(6) There are a variety of measures for developing new water supplies including water reclamation, water conservation, conjunctive use, water transfers, seawater desalination, and surface water and groundwater storage.

(7) With increasing frequency, California's water agencies are required to impose water rationing on their residential and business customers during this state's frequent and severe periods of drought.

(8) The identification and development of water supplies needed during multiple-year droughts is vital to California's business climate, as well as to the health of the agricultural industry, environment, rural communities, and residents who continue to face the possibility of severe water cutbacks during water shortage periods.

(9) A recent study indicates that the water supply and land use planning linkage, established by Part 2.10 (commencing with Section 10910) of Division 6 of the Water Code, has not been implemented in a manner that ensures the appropriate level of communication between water agencies and planning agencies, and this act is intended to remedy that deficiency in communication.

(b) It is the intent of the Legislature to strengthen the process pursuant to which local agencies determine the adequacy of existing and planned future water supplies to meet existing and planned future demands on those water supplies.

SEC. 2. Section 21151.9 of the Public Resources Code is amended to read:
21151.9. Whenever a city or county determines that a project, as defined in Section 10912 of the Water Code, is subject to this division, it shall comply with Part 2.10 (commencing with Section 10910) of Division 6 of the Water Code.

SEC. 3. Section 10631 of the Water Code is amended to read:
10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments as described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the amount and location of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the location, amount, and sufficiency of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(1) An average water year.
(2) A single dry water year.
(3) Multiple dry water years.

For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to replace that source with alternative sources or water demand management measures, to the extent practicable.

(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:

(A) Single-family residential.
(B) Multifamily.
(C) Commercial
(D) Industrial.
(E) Institutional and governmental.
(F) Landscape.
(G) Sales to other agencies.
(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.
(I) Agricultural.

(2) The water use projections shall be in the same five-year increments as described in subdivision (a). (f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers.
(B) Residential plumbing retrofit.
(C) System water audits, leak detection, and repair.
(D) Metering with commodity rates for all new connections and retrofit of existing connections.
(E) Large landscape conservation programs and incentives.
(F) High-efficiency washing machine rebate programs.
(G) Public information programs.
(H) School education programs.
(I) Conservation programs for commercial, industrial, and institutional accounts.
(J) Wholesale agency programs.
(K) Conservation pricing.
(L) Water conservation coordinator.
(M) Water waste prohibition.
(N) Residential ultra-low-flush toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of such savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and non-economic factors, including environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

(4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.

(h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single dry, and multiple dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(i) Urban water suppliers that are members of the California Urban Water Conservation Council and submit annual reports to that council in accordance with the ‘‘Memorandum of Understanding Regarding Urban Water Conservation in California,’’ dated September 1991, may submit the annual reports identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirements of subdivisions (f) and (g).

SEC. 3.5. Section 10631 of the Water Code is amended to read:
10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments as described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(1) An average water year.

(2) A single dry water year.

(3) Multiple dry water years. For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:

(A) Single-family residential.
(B) Multifamily.
(C) Commercial.
(D) Industrial
(E) Institutional and governmental.
(F) Landscape.
(G) Sales to other agencies.
(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.
(I) Agricultural.

(2) The water use projections shall be in the same five-year increments as described in subdivision (a).

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers.
(B) Residential plumbing retrofit.
(C) System water audits, leak detection, and repair.
(D) Metering with commodity rates for all new connections and retrofit of existing connections.
(E) Large landscape conservation programs and incentives.
(F) High-efficiency washing machine rebate programs.
(G) Public information programs.
(H) School education programs.
(I) Conservation programs for commercial, industrial, and institutional accounts.
(J) Wholesale agency programs.
(K) Conservation pricing.
(L) Water conservation coordinator.
(M) Water waste prohibition.
(N) Residential ultra-low-flush toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

(4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.

(h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single dry, and multiple dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(i) Urban water suppliers that are members of the California Urban Water Conservation Council and submit annual reports to that council in accordance with the ''Memorandum of Understanding Regarding Urban Water Conservation in California,'' dated September 1991, may submit the annual reports identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirements of subdivisions (f) and (g).
SEC. 4. Section 10656 of the Water Code is amended to read:
10656. An urban water supplier that does not prepare, adopt, and submit its urban water management plan to the department in accordance with this part, is ineligible to receive funding pursuant to Division 24 (commencing with Section 78500) or Division 26 (commencing with Section 79000), or receive drought assistance from the state until the urban water management plan is submitted pursuant to this article.

SEC. 4.3. Section 10657 is added to the Water Code, to read:
10657. (a) The department shall take into consideration whether the urban water supplier has submitted an updated urban water management plan that is consistent with Section 10631, as amended by the act that adds this section, in determining whether the urban water supplier is eligible for funds made available pursuant to any program administered by the department.

(b) This section shall remain in effect only until January 1, 2006, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2006, deletes or extends that date.

SEC. 4.5. Section 10910 of the Water Code is amended to read:
10910. (a) Any city or county that determines that a project, as defined in Section 10912, is subject to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) under Section 21080 of the Public Resources Code shall comply with this part.

(b) The city or county, at the time that it determines whether an environmental impact report, a negative declaration, or a mitigated negative declaration is required for any project subject to the California Environmental Quality Act pursuant to Section 21080.1 of the Public Resources Code, shall identify any water system that is, or may become as a result of supplying water to the project identified pursuant to this subdivision, a public water system, as defined in Section 10912, that may supply water for the project. If the city or county is not able to identify any public water system that may supply water for the project, the city or county shall prepare the water assessment required by this part after consulting with any entity serving domestic water supplies whose service area includes the project site, the local agency formation commission, and any public water system adjacent to the project site.

(c) (1) The city or county, at the time it makes the determination required under Section 21080.1 of the Public Resources Code, shall request each public water system identified pursuant to subdivision (b) to determine whether the projected water demand associated with a proposed project was included as part of the most recently adopted urban water management plan adopted pursuant to Part 2.6 (commencing with Section 10610).

(2) If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g).

(3) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.

(4) If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses.

(d) (1) The assessment required by this section shall include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts.

(2) An identification of existing water supply entitlements, water rights, or water service contracts held by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall be demonstrated by providing information related to all of the following:

(A) Written contracts or other proof of entitlement to an identified water supply.

(B) Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system.

(C) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply.

(D) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply.

(e) If no water has been received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts, the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall also include in its water supply assessment pursuant to subdivision (c), an identification of the other public water systems or water service contract-holders that receive a water supply or have existing water supply entitlements, water rights, or water service contracts, to the same source of water as the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has identified as a source of water supply within its water supply assessments.

(f) If a water supply for a proposed project includes groundwater, the following additional information shall be included in the water supply assessment:

(1) A review of any information contained in the urban water management plan relevant to the identified water supply for the proposed project.

(2) A description of any groundwater basin or basins from which the proposed project will be supplied. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current bulletin of the department that characterizes the condition of the groundwater basin, and a detailed description by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), of the efforts being undertaken in the basin or basins to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the amount and location of groundwater pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), for the past five years from any groundwater basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), from any basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(5) An analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project. A water supply assessment shall not be required to include the information required by this paragraph if the public water system determines, as part of the review required by paragraph (1), that the sufficiency of groundwater necessary to meet the initial and projected water demand associated with the project was addressed in the description and analysis required by paragraph (4) of subdivision (b) of Section 10631.

(g) (1) Subject to paragraph (2), the governing body of each public water system shall submit the assessment to the city or county not later than 90 days from the date on which the request was received. The governing body of each public water system, or the city or county if either is required to comply with this act pursuant to subdivision (b), shall approve the assessment prepared pursuant to this section at a regular or special meeting.

(2) Prior to the expiration of the 90-day period, if the public water system intends to request an extension of time to prepare and adopt the assessment, the public water system shall meet with the city or county to request an extension of time, which shall not exceed 30 days, to prepare and adopt the assessment.

(3) If the public water system fails to request an extension of time, or fails to submit the assessment notwithstanding the extension of time granted pursuant to paragraph (2), the city or county may seek a writ of mandamus to compel the governing body of the public water system to comply with the requirements of this part relating to the submission of the water supply assessment.

(h) Notwithstanding any other provision of this part, if a project has been the subject of a water supply assessment that complies with the requirements of this part, no additional water supply assessment shall be required for subsequent projects that were part of a larger project for which a water supply assessment was completed and that has complied with the requirements of this part and for which the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has concluded that its water supplies are sufficient to meet the projected water demand associated with the proposed project, in addition to the existing and planned future uses, including, but not limited to, agricultural and industrial uses, unless one or more of the following changes occurs:

(1) Changes in the project that result in a substantial increase in water demand for the project.

(2) Changes in the circumstances or conditions substantially affecting the ability of the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), to provide a sufficient supply of water for the project.

(3) Significant new information becomes available which was not known and could not have been known at the time when the assessment was prepared.

SEC. 5. Section 10911 of the Water Code is amended to read:
10911. (a) If, as a result of its assessment, the public water system concludes that its water supplies are, or will be, insufficient, the public water system shall provide to the city or county its plans for acquiring additional water supplies, setting forth the measures that are being undertaken to acquire and develop those water supplies. If the city or county, if either is required to comply with this part pursuant to subdivision (b), concludes as a result of its assessment, that water supplies are, or will be, insufficient, the city or county shall include in its water supply assessment its plans for acquiring additional water supplies, setting forth the measures that are being undertaken to acquire and develop those water supplies. Those plans may include, but are not limited to, information concerning all of the following:

(1) The estimated total costs, and the proposed method of financing the costs, associated with acquiring the additional water supplies.

(2) All federal, state, and local permits, approvals, or entitlements that are anticipated to be required in order to acquire and develop the additional water supplies.

(3) Based on the considerations set forth in paragraphs (1) and (2), the estimated timeframes within which the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), expects to be able to acquire additional water supplies.

(b) The city or county shall include the water supply assessment provided pursuant to Section 10910, and any information provided pursuant to subdivision (a), in any environmental document prepared for the project pursuant to Division 13 (commencing with Section 21000) of the Public Resources Code.

(c) The city or county may include in any environmental document an evaluation of any information included in that environmental document provided pursuant to subdivision (b). The city or county shall determine, based on the entire record, whether projected water supplies will be sufficient to satisfy the demands of the project, in addition to existing and planned future uses. If the city or county determines that water supplies will not be sufficient, the city or county shall include that determination in its findings for the project.

SEC. 6. Section 10912 of the Water Code is amended to read:
10912. For the purposes of this part, the following terms have the following meanings:

(a) ‘‘Project’’ means any of the following:

(1) A proposed residential development of more than 500 dwelling units.

(2) A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.

(3) A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.

(4) A proposed hotel or motel, or both, having more than 500 rooms.

(5) A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.

(6) A mixed-use project that includes one or more of the projects specified in this subdivision.

(7) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.

(b) If a public water system has fewer than 5,000 service connections, then ‘‘project’’ means any proposed residential, business, commercial, hotel or motel, or industrial development that would account for an increase of 10 percent or more in the number of the public water system’s existing service connections, or a mixed-use project that would demand an amount of water equivalent to, or greater than, the amount of water required by residential development that would represent an increase of 10 percent or more in the number of the public water system’s existing service connections.

(c) ‘‘Public water system’’ means a system for the provision of piped water to the public for human consumption that has 3000 or more service connections. A public water system includes all of the following:

(1) Any collection, treatment, storage, and distribution facility under control of the operator of the system which is used primarily in connection with the system.

(2) Any collection or pretreatment storage facility not under the control of the operator that is used primarily in connection with the system.

(3) Any person who treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption.

SEC. 7. Section 10913 of the Water Code is repealed.

SEC. 8. Section 10915 of the Water Code is amended to read:
10915. The County of San Diego is deemed to comply with this part if the Office of Planning and Research determines that all of the following conditions have been met:

(a) Proposition C, as approved by the voters of the County of San Diego in November 1988, requires the development of a regional growth management plan and directs the establishment of a regional planning and growth management review board.

(b) The County of San Diego and the cities in the county, by agreement, designate the San Diego Association of Governments as that review board.

(c) A regional growth management strategy that provides for a comprehensive regional strategy and a coordinated economic development and growth management program has been developed pursuant to Proposition C.

(d) The regional growth management strategy includes a water element to coordinate planning for water that is consistent with the requirements of this part.

(e) The San Diego County Water Authority, by agreement with the San Diego Association of Governments in its capacity as the review board, uses the association’s most recent regional growth forecasts for planning purposes and to implement the water element of the strategy.

(f) The procedures established by the review board for the development and approval of the regional growth management strategy, including the water element and any certification process established to ensure that a project is consistent with that element, comply with the requirements of this part.

(g) The environmental documents for a project located in the County of San Diego include information that accomplishes the same purposes as a water supply assessment that is prepared pursuant to Section 10910.

SEC. 9.
Section 3.5 of this bill incorporates amendments to Section 10631 of the Water Code proposed by both this bill and AB 901. It shall only become operative if (1) both bills are enacted and become effective on or before January 1, 2002, (2) each bill amends Section 10631 of the Water Code, and (3) this bill is enacted after AB 901, in which case Section 3 of this bill shall not become operative.

SEC. 10.
No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because a local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act, within the meaning of Section 17556 of the Government Code.

Appendix B

URBAN WATER MANAGEMENT PLAN

2015 UPDATE

City of Madera

March 2017

DRAFT

Date Signed________________

DRAFT

DATE SIGNED:__________________

Prepared by:
Provost & Pritchard Consulting Group
2505 Alluvial Avenue
Clovis, CA 93611-9166

City of Madera
2015 Urban Water Management Plan

Contact Sheet

Date plan submitted to the Department of Water Resources: [--------------------]

Name of person(s) preparing this plan:

Mr. Danny Martin
Water and Sewer Operations Manager
Phone: (559) 661-5466
Fax: (559) 661-0760
Email: dmartin@cityofmadera.com

Owen Kubit, PE, Project Manager
Provost & Pritchard Consulting Group
Phone: (559) 326-1100
Fax: (559) 326-1090
Email: okubit@ppeng.com

The Water supplier is a: **City**

The Water supplier is a: **Retailer**

Utility services provided by the water supplier include: **Water, Wastewater**

Is This Agency a Bureau of Reclamation Contractor? **No**

Is This Agency a State Water Project Contractor? **No**

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APPENDIX

List of Abbreviations

AB	Assembly Bill
ADD	Average Day Demand
AF	Acre Feet
AFY	Acre Feet per Year
AWWA	American Water Works Association
BMO	Basin Management Objective
BMP	Best Management Practices
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CCF	hundred cubic feet
CDR	Center for Demographic Research
CII	Commercial, Industrial and Institutional water use sectors
CIMIS	California Irrigation Management Information System
CIP	Capital Improvement Plan
CRWQCB	California Regional Water Quality Control Board
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CWC	California Water Code
DBCP	dibromochloropropane
DMM	Demand Management Measures
DOF	Department of Finance
DPH	Department of Public Health
du/ac	Dwelling Units per Acre
DWR	Department of Water Resources
EDB	ethylene dibromide
ETo	Evapotranspiration
FAR	Floor Area Ratio
FY	Fiscal Year
GAC	Granular Activated Carbon
GIS	Geographic Information System
GMP	Groundwater Management Plan
gpcd	gallons per capita per day
gpd	gallons per day
gpm	Gallons per Minute
HECW	high efficiency clothes washer
HGL	Hydraulic Grade Line
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
MAF	Million Acre Feet
MCL	maximum contaminant level
MFR	Multi-Family Residential
MG	Million Gallons
mg/l	Milligrams per Liter
mgd	Million Gallons per Day
MID	Madera Irrigation District
MOU	Memorandum of Understanding
NPDES	National Pollutant Discharge Elimination System
PG&E	Pacific Gas & Electric
psi	pounds per square inch

PVC	poly-vinyl chloride
PWS	Public Water System
PWSS	Public Water System Survey
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SFR	Single Family Residential
SGMA	Sustainable Groundwater Management Act
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
ULFT	Ultra Low Flow Toilet
USEPA	United States Environmental Protection Agency
UWMP	Urban Water Management Plan
UWMPA	Urban Water Management Planning Act
WCS	Water Code Section
WDR	Waste Discharge Requirement
WMP	Water Master Plan
WRCC	Western Regional Climate Center
WRR	Water Recycling Requirement
WSCP	Water Shortage Contingency Plan
WSMP	Water System Master Plan
WWTF	Wastewater Treatment Facility

Executive Summary

This 2015 Urban Water Management Plan (UWMP) describes current and future water uses, reliability of water sources, and existing and planned water conservation measures for the City of Madera. Water resources and demographic data are provided for the years 2011-2015, and projected water supplies and demands up to 2040. This document is an update to the City's 2010 UWMP.

This UWMP complies with the Urban Water Management Planning Act (UWMPA). This planning act was established by Assembly Bill 797 (AB797), September 21, 1983. UWMPs must be prepared by any water supplier that provides water for 3,000 or more connections or delivers more than 3,000 acre-feet per year. UWMPs must be updated every five years. This UWMP satisfies new guidelines established by the State in 2016.

The City of Madera is a retail agency, providing water directly to customers. In 2015 they served 13,695 active residential, commercial, industrial and landscape connections. Currently, the City obtains 100% of their water supply from local groundwater.

This UWMP must address requirements of the Water Conservation Act of 2009 Senate Bill x7-7 (SBX7-7). SBX7-7 requires statewide per capita water use reduction of 20 percent by the year 2020. The City's 10-year baseline per capita water use is 245 gallons/capita/day (gpcd), with goals of 220 gpcd by 2015 and 196 gpcd by 2020. The actual per capita consumption in 2015 was 128 gpcd, which is well below the 2020 target. However, the recent drought conditions, reduced water table, new State mandates on water conservation, and the formation of the Madera groundwater sustainability authority "GSA" make it prudent to continue water conservation efforts.

The City has a large portfolio of water conservation programs that have been effective at reducing water demands during the recent drought. A city-wide meter installation program is 90% complete and has also helped to reduce water demands. The City also has a Water Shortage Contingency Plan that was revised in 2015 due to the extended drought. In 2015, water use per capita was roughly half what is was 20 years ago.

This UWMP provides a comprehensive overview of the City's water system. In addition to complying with the UWMPA and SBX7-7, it also serves as a short and long range planning document, a data source for the development of a regional water plan, a source document for preparing General Plans, and a key component to an Integrated Regional Water Management Plan. The UWMP also allows the City to maintain eligibility for certain State grants and loans.

1 Introduction and Overview

1.1 Overview

This document presents the 2015 Urban Water Management Plan (Plan or UWMP) for the City of Madera (City) service area. This chapter describes the general purpose of the Plan, background information on UWMP requirements, and the organization of the UWMP. This Plan satisfies requirements for a retail UWMP, and covers the years 2011 to 2015. This plan is also an update to the City's 2010 UWMP.

1.2 Purpose

The purpose of the UWMP is to help maintain efficient use of urban water supplies, continue to promote conservation programs and policies, verify that sufficient water supplies are available for future beneficial use, and provide a mechanism for response during drought conditions. This report, which was prepared in compliance with the California Water Code (CWC) and the guidelines and format established by the Department of Water Resources (DWR), constitutes the City of Madera 2015 UWMP.

An UWMP serves many purposes including:

- Long-range planning document
- Reference document for water resources data
- Reference document for project specific developments and water supply assessments
- Companion to an Integrated Regional Water Management Plan
- Allows the City to maintain eligibility for certain State grants, loans and drought assistance

1.3 Background

1.3.1 Urban Water Management Planning Act

In 1983, State Assembly Bill (AB) 797 modified the California Water Code Division 6, by creating the Urban Water Management Planning Act (UWMPA or Act). The UWMPA requires urban water suppliers within the state to prepare and adopt UWMPs for submission to the California Department of Water Resources. The UWMPs, which must be filed every five years, must satisfy the requirements of the UWMPA of 1983 including amendments that have been made to the Act. The UWMPA requires urban water suppliers servicing 3,000 or more connections, or supplying more than 3,000 acre-feet (AF) of water annually, to prepare an UWMP. **Appendix A** includes a copy of the UWMPA.

Several amendments to the original UWMPA have increased the data requirements and planning elements to be included in subsequent UWMPs. The most recent amendments have increased requirements to incorporate sections on recycled water use, demand management measures (DMMs), and water shortage contingency plans (WSCP). Recycled water use sections were added to assist in evaluation of alternate water supplies for future use when projects exceed the current water supplies. Demand management measures must be clearly described including which measures are being implemented and which are scheduled for implementation in the future. Water contingency plans are to be prepared and coordinated with other water suppliers in the area for use during times of drought. Pertinent bills that have passed are as follows.

Table 1-1: UWMP Related Legislation

Bill	Requirements
SB610 and AB901	Consideration of water availability when reviewing new large developments
SB318	Investigate possibilities of developing desalinated water
AB105	Submit UWMP to State Library
Water Conservation Bill (2009)	Urban water suppliers to reduce the statewide average per capita daily water consumption by 20% by December 31, 2020
AB 2067	Revises requirements on Demand Management Measures
SB 1420	Requires electronic submittal, standard forms and tables, and a report on distribution system losses
SB 1036	Urban suppliers to include energy-related information (optional) and analyze and define artificial water features

1.3.2 Previous Urban Water Management Plan

Pursuant to the UWMPA, the City previously prepared an UWMP in 2010, which was adopted by the City on September 21, 2011 and subsequently approved by DWR. This 2015 UWMP report serves as an update to the 2010 UWMP.

1.4 Report Organization

This 2015 UWMP is organized into the following chapters.

Chapter 1: Introduction and Overview
This chapter provides a discussion of the purpose and content of the 2015 UWMP and the extent of the City’s water management planning efforts.

Chapter 2: Plan Preparation and Adoption
This chapter provides information on the City’s development of the 2015 UWMP including the basis for plan preparation, UWMP characteristics, data format and coordination, and outreach to nearby agencies. This chapter also details the steps taken by the City to adopt the UWMP and make it available to the public.

Chapter 3: System Description
This chapter provides a description of the City’s water system including service area maps, climate information, service area population and demographic information.

Chapter 4: System Water Use
This chapter describes the City’s current and historic water uses, system losses, estimated water savings, and water use by lower income households.

Chapter 5: Baselines and Targets
This chapter includes a description of the City's chosen method for calculating their baseline, calculated baseline water use, 2015 interim and 2020 ultimate targets, and compliance with 2015 interim target. This chapter also includes an explanation on how the City plans to reach their 2020 target.

Chapter 6: System Supplies
This chapter includes a discussion of the City's water system supplies including groundwater and surface water, the City's future water projects, and a summary of existing and future water sources.

Chapter 7: Water Supply Reliability
This chapter describes the reliability of the City's water supply including a supply and demand assessment and discussions on regional reliability.

Chapter 8: Water Shortage Contingency Planning
This chapter provides a description of the City's Water Shortage Contingency Plan including stages of action, prohibitions, penalties, reduction methods, and catastrophic supply interruption.

Chapter 9: Demand Management Measures
This chapter explains the City's existing and historic efforts to promote water conservation and the City' plans to use Demand Management Measures to achieve their 2020 water use targets.

Chapter 10: Completed UWMP Checklist
Detailed UWMP checklist showing where each required topic is addressed in the UWMP.

Chapter 11: Bibliography/References
List of relevant reports, studies, references and data sources used in preparing the UWMP.

1.4.1 Report Tables

The Department of Water Resources has developed standardized tables to assist water managers in calculating per capita consumption, baseline consumption, water reduction targets, water use, etc. These tables are a required attachment to the UWMP document. However, they are not required in the body of the text and can be altered as needed to better reflect the water system. When appropriate and relevant, these tables have been included in the body of this text, but some are only found in **Appendix B – Standard UWMP Tables**. It should be noted that some of the tables in the body of this document are not identical to the tables provided by DWR. Titles and substance may vary.

1.5 Water System Master Plan

In 2014, Akel Engineering prepared the City of Madera Water System Master Plan (WSMP). The Master Plan included the following:

- Summary of the City's existing domestic water system facilities
- Documentation of planning growth assumptions and known future developments

- Projections of future domestic water demands
- Evaluation of the domestic water facilities needed to meet existing and projected demand requirements and fire flows
- Evaluation of the existing groundwater conditions
- Recommendations for a Capital Improvement Program (CIP) including an opinion of probable cost

The 2014 WSMP used a different methodology for estimating current and future per capita demands than the 2010 UWMP, and stated that demand estimates superseded those in the 2010 UWMP. This report uses data from the 2014 WSMP, as well as recent data from the City and California Department of Finance. As a result, the per capita demand analysis in this UWMP supersedes the analysis in the WSMP.

The WSMP includes a proposed $148 million CIP through the year 2050. The CIP is mentioned in this UWMP and will be the blueprint for future water system improvements in the City of Madera. The WSMP estimated future population growth of 3.5% annually, but this estimate has been revised down to 2% herein, so the proposed CIP may be implemented at a slower pace than presented in the CIP.

The WSMP and UWMP overlap in several areas, and some of the information in this UWMP was obtained from the WSMP.

2 Plan Preparation

2.1 Plan Characteristics

The City of Madera is a Public Water System (PWS), as defined by the California Health and Safety Code. The PWS number, and the number of connections and water delivered in 2015 are shown in the table below.

Table 2-1: Public Water System Information

Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied in 2015 (AF)
2010002	Madera-City	13,695	9,314

This UWMP was prepared individually for the City of Madera. Preparing a regional UWMP with other agencies was not feasible since Madera is isolated from other Cities large enough to require an UWMP. Data in this UWMP is reported in acre-feet (AF) for each calendar year.

Table 2-2: Plan Identification

☒	Individual UWMP
☐	Regional UWMP (checking this triggers the next line to appear)
N/A	Does this Regional UWMP include a Regional Alliance?

Table 2-3: Agency Identification

Name of Agency	City of Madera
☐	Agency is a wholesaler
☒	Agency is a retailer
Fiscal or Calendar Year	
☒	UWMP Tables Are in Calendar Years
☐	UWMP Tables Are in Fiscal Years
Units of Measure	
☒	Acre Feet (AF)
☐	Million Gallons (MG)
☐	Hundred Cubic Feet (CCF)

2.2 Coordination

Legal Requirements:

§10620(d)(2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.
§10621(b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by §10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from a city or county that receives notice pursuant to this subdivision.
§10635(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

The City is the sole water supplier for the area and therefore did not have an opportunity to participate in a regional UWMP. However the efforts to prepare this UWMP were coordinated with appropriate agencies to provide the most accurate and clear picture of the water situation in the City.

Table 2-4: Coordination with Appropriate Agencies

Coordinating Agencies	Participated in Developing the Plan	Commented on the Draft	Attended Public Meetings	Was Sent a Copy of the Draft Plan	Was Sent a Notice of Intention to Adopt
County of Madera				Planned	x
Madera Irrigation District				Planned	x
Madera County Farm Bureau				Planned	
Madera Valley Water Company				Planned	
Madera Unified School District				Planned	
Madera District Chamber of Commerce				Planned	
Madera Hispanic Chamber of Commerce				Planned	

2.3 Plan Adoption, Submittal, and Implementation

2.3.1 Notice of Public Hearing

Legal Requirements:

CWC 10621 (b)
Every urban water supplier required to prepare a plan shall… at least 60 days prior to the public hearing on the plan … notify any city or county within which the supplier provides waters supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.
CWC 10642
The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.

The UWMPA requires that the UWMP show the water agency solicited public participation. In accordance with the UWMPA, the City held a public hearing and adopted the 2015 UWMP on ______. A copy of the adopting resolution and resolution of intent to adopt are included in **Appendix C**. The hearing provided an opportunity for the City's customers, residents, and employees to learn and ask questions about the current and future water supply.

Pursuant to California Code Section 6066, a notification of the time and place of the public hearing was published in the local newspaper on ______. A copy of these notifications is included in **Appendix D**.

Table 2-5: Notification to Cities and Counties

Names of Cities and Counties	60 Day Notice (CWC 10621 (b))	Notice of Public Hearing (CWC 10642)
Madera County	☒	☐

2.3.2 Public Hearing and Adoption

Legal Requirements:

CWC 10642 Prior to adopting a plan, the urban water supplier …shall hold a public hearing thereon.
CWC 10608.26
(a) In complying with this part, an urban retail water supplier shall conduct at least one public hearing to accomplish all of the following:
(1) Allow community input regarding the urban retail water supplier's implementation plan for complying with this part.
(2) Consider the economic impacts of the urban retail water supplier's implementation plan for complying with this part.
(3) Adopt a method, pursuant to subdivision (b) of Section 10608.20 for determining its urban water use target.
CWC 10642
After the hearing, the plan shall be adopted as prepared or as modified after the hearing

The Draft 2015 UWMP was presented to the City of Madera City Council as an information item on _____. The 2015 UWMP was then adopted by resolution of the City of Madera City Council on _____, following a public hearing. This public hearing provided an opportunity for the City's customers, residents, and employees to learn and ask questions about the current and future water supply of the City of Madera. A copy of the adoption resolution is included in **Appendix C**.

2.3.3 Plan Submittal

Legal Requirements:

CWC 10621(d)
An urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.
CWC 10644(a)
An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption.
CWC 10635 (b)
The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

After the UWMP was adopted by the Madera City Council, the final report was uploaded electronically to the DWR website and a copy was sent to the California State Library.

2.3.4 Public Availability

Legal Requirements:

CWC 10645
Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

After adoption and submission of the 2015 City of Madera UWMP, the document was made available to the public on the City’s website _______, and in hard-copy form at the City’s office at 205 W. Fourth Street, Madera, CA 93637.

3 System Description

3.1 Service Area Physical Description

Legal Requirements:

§10631(a) Describe the service area of the supplier.
§10631(a) (Describe the service area) climate.

3.1.1 Location

The City of Madera, incorporated in 1907, is located along Highway 99 near the middle of the San Joaquin Valley in central California. The City covers 15.8 square miles or about 10,100 acres, as shown in **Figure 3.1**.

The City of Madera is the largest city in Madera County and serves as the County seat. The City was laid out in 1876 at the end of a lumber flume, which delivered timber from the Sierra Nevada Mountains to sawmills near the railroads. The City utilizes a Council and Administrator form of government. Six City Council members and a separately-elected Mayor address the legislative needs of the City. The City Administrator is appointed by the City Council to administer the overall city organization. Madera is a full-service city, operating its own water and wastewater systems, and hosting a full range of community-based programs and services. Strategic planning in the City is driven by Vision Madera 2025, a community-based visioning program completed in 2006, and by the City's Comprehensive General Plan.

The City lies within the San Joaquin Valley and consists of mostly flat topography. The foothills of the Sierra Nevada Mountains begin about 15 miles east of the City. The foothills of the Coastal Mountain Range are about 45 miles west of the City. As shown in **Figure 3.1**, the Fresno River flows through the City from the east. The river is dry for much of the year since the flow is dependent on water releases from upstream water impoundments.

Three unincorporated areas are found to the north, south and east of the City, respectively, including Madera Acres, Parkwood and Parksdale. None of these areas receive City water, however, portions of Parkwood are on the City sewer system.

The island of City of Madera property west of the main portion of the City and outside of the City's sphere of influence, as shown on **Figure 3.1**, is the City's wastewater treatment facility.

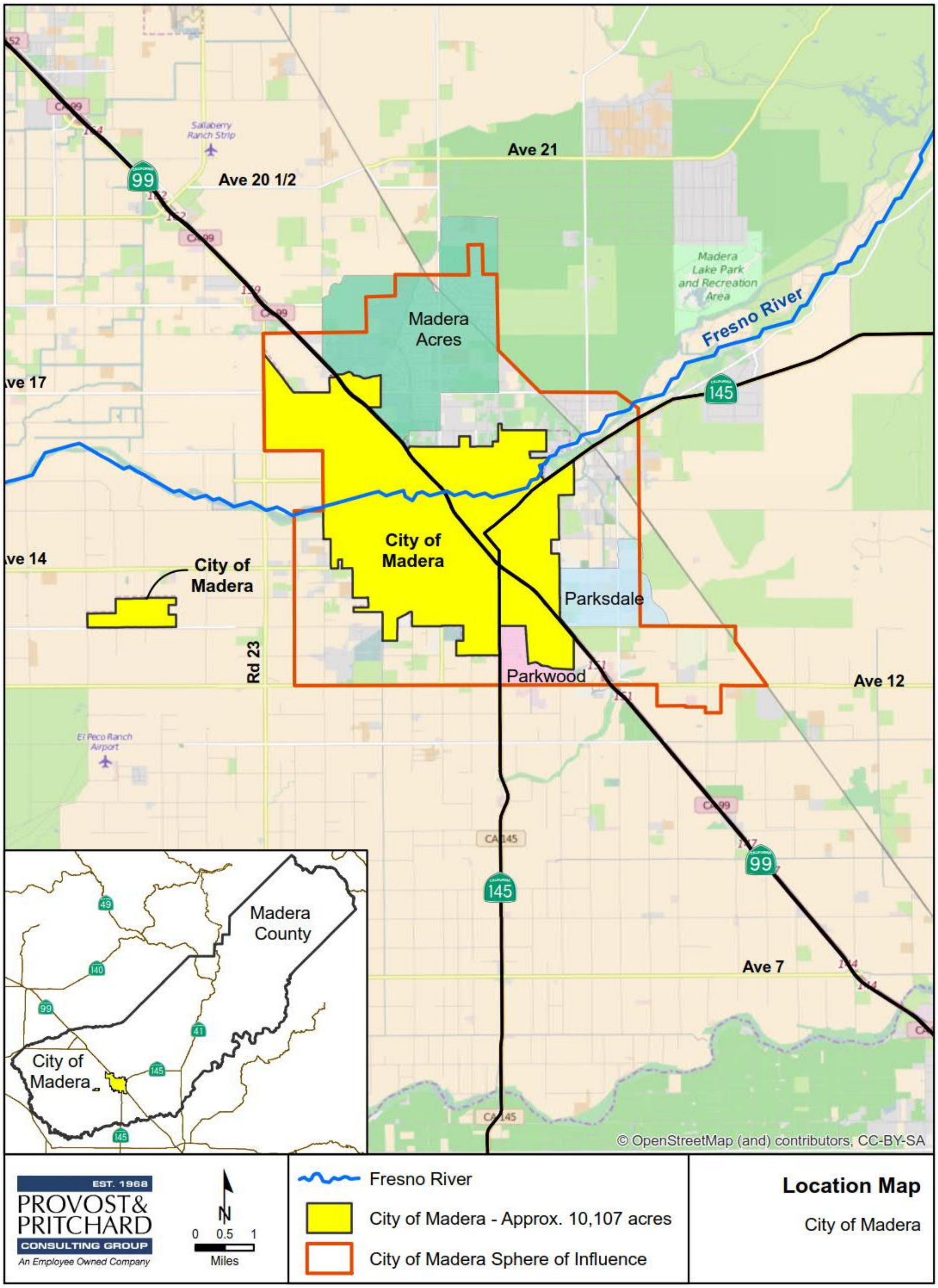

Figure 3-1: Location Map

3.1.2 Land Use

Land use in Madera in 2015 is shown in the table below.

Table 3-1: Land Use in Madera (2015)

Land use	Area(acres)	Percent of Total(%)
Commercial	1,270	12.6
Industrial	1,003	9.9
Very Low-Density Residential	45	0.4
Low-Density Residential	3,884	38.4
Medium-Density Residential	745	7.4
High-Density Residential	341	3.4
Office	134	1.3
Public and Semi-Public	1,417	14.0
Open Space	709	7.0
Resource Conservation	379	3.7
Freeway 99 R/W & Undesignated	180	1.8
Total	10,107	100%

Source: City of Madera Department of Community Development

According to the City's 2014 Groundwater Management Plan (Provost & Pritchard, 2014), the City had 1,100 acres of cropped land within the City limit. This cropping is generally just outside of urban areas.

3.1.3 Climate

The City's climate is generally dry with mild winters and hot summers. Historically, the daily maximum summer temperature has reached 115°F. During the summer relative humidity is typically around 15 percent, reaching as low as 8 percent. During winter months, relative humidity is typically around 90 percent with mild weather and some cold spells. Winds are generally from the northwest, following the layout of the San Joaquin Valley. The standard monthly average evapotranspiration (ETo) rates, rainfall, and temperature are summarized in **Table 3.2**.

Table 3-2: Climate Characteristics

Month	Standard Monthly Average ETo (inches)	Monthly Average Rainfall (inches)[2]	Monthly Average Temperature (ºF)[2]	
			Min.	Max.
January	1.5	1.98	36	54
February	2.4	1.92	39	61
March	4.2	1.81	42	67
April	5.8	1.08	46	75
May	7.8	0.39	51	84
June	8.7	0.09	57	92
July	9.6	0.01	61	98
August	8.5	0.02	60	96
September	6.4	0.14	55	91
October	4.2	0.58	48	80
November	2.2	1.18	40	66
December	1.3	1.78	36	55
Annual Total/Average	62.7	10.99	48	77

(1) California Irrigation Management Information System (CIMIS) Station 145 - Madera (CIMIS, 2010). Represents monthly average ETo from May 1998 to April 2011.
(2) Western Regional Climate Center (WRCC) Station 045233 - Madera. Represents monthly average data from January 1928 to January 2015.

As shown in the table above, the City's average low and high monthly temperatures have been measured to be 36°F and 98°F, respectively. ETo averages a total of 62.7 inches per year, while the average annual rainfall is only 11 inches. Most of the rainfall typically occurs during the period of November through April. Rainfall during the summer is minimal.

3.2 Service Area Population and Demographics

Legal Requirements:

CWC Section 10631 (a)
Describe the service area of the supplier, including current and projected population . . . The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

Population data for the City of Madera was obtained from the California Department of Finance (DOF), which reports census data in years it is collected, as well as population estimates in years between censuses. DOF population estimates were also used in the 2010 UWMP. DOF population estimates from 2001 to 2009 have been revised since the 2010 UWMP, so revised numbers are presented in this UWMP. In addition, the 2010 UWMP was prepared before 2010 census data was available. As a result, an estimated 2010 population of 58,243 was used for the 2010 UWMP, but this has been replaced with the actual 2010 census population of 61,416 in this 2015 UWMP.

Table 3.3 summarizes actual population growth for several periods as well as assumed growth rates from several reports.

Table 3-3: Population Growth - Actual and Estimates

Source	Population Growth Rate	Notes
2005 UWMP	3.60%	Assumed future rate
2010 UWMP	3.20%	Assumed future rate
1997 Water System Master Plan	3.20%	Assumed future rate
2014 Water System Master Plan	3.50%	Assumed future rate
2011-2015	1.08%	Actual growth rate
2000-2015	2.76%	Actual growth rate

Long-term population growth (2000-2015) has been 2.76%, below the predicted 3%+ growth rates presented in previous water plans. The most recent growth, between 2011 and 2015, has been fairly low at about 1.1%. This low growth rate may be a result of poor economic conditions. Based on an evaluation of the data in **Table 3-3**, the City elected to use a long-term population growth rate of 2.0%. This growth rate was applied to the DOF 2015 population estimate and projected to the year 2040. Current population and projected future growth are shown in **Table 3-4** below.

Table 3-4: Population – Current and Projected

	2015	2020	2025	2030	2035	2040
Service Area Population[1]	64,810	71,555	79,003	87,226	96,304	106,328

1 - Service area population defined as the population served by the City’s water system

Figure 3.1 graphs historical population since 1996 and projected population through 2040 using 2% compounded growth.

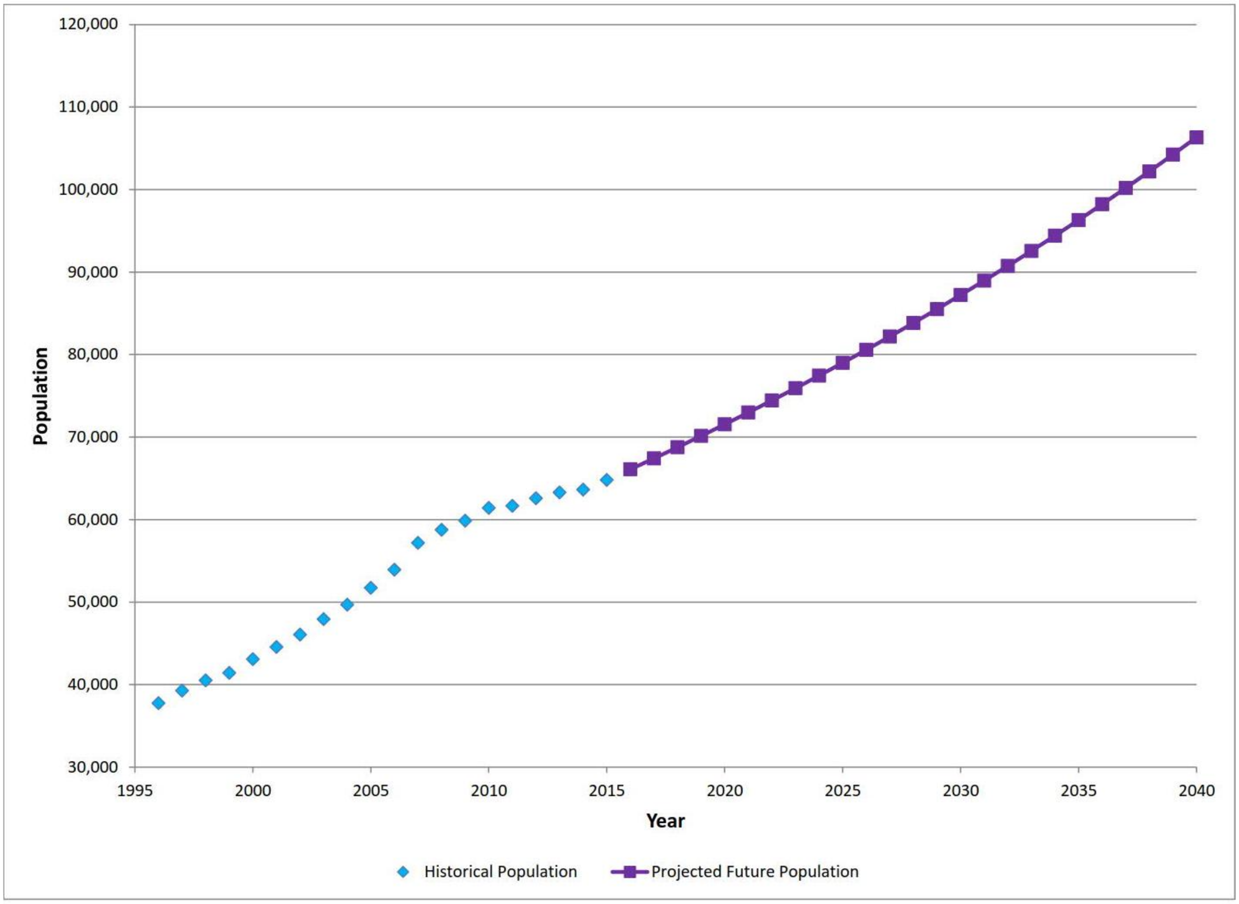

Figure 3-2: Historical and Estimated Future Population

4 System Water Use

This section describes the historical, current, and projected water use through year 2040. It also describes the types of customer accounts in the City and the breakdown of accounts throughout the system. Distribution system losses and low income household water use are also discussed. The City only uses treated domestic water, and does not use raw water or recycled water.

4.1 Water Use by Sector

Legal Requirements:

CWC 10631(e)
(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:
(A) Single-family residential.
(B) Multifamily.
(C) Commercial.
(D) Industrial.
(E) Institutional and governmental.
(F) Landscape.
(G) Sales to other agencies.
(H) Saline water intrusion barriers, groundwater recharge, or
conjunctive use, or any combination thereof.
(I) Agricultural.
(2) The water use projections shall be in the same five-year increments described in subdivision (a).

The City is now in the process of installing meters on all customer connections and is slated for completion in 2017 or 2018. **Table 4-1** shows the number of metered and unmetered accounts for each major customer category. In 2015, 91% of all connections were metered. **Figure 4-1**shows the percentage of water connections in each category in 2015.

Table 4-1: Water Accounts by Sector - Metered and Unmetered (2015)

Connections	Metered	Unmetered	Total	% Metered
Single Family Residential	11,721	181	11,902	98%
Multi-Family Residential	278	582	860	32%
Commercial/Institutional	350	469	819	43%
Industrial	17	1	18	94%
Landscape	86	10	96	90%
Total	12,452	1,243	13,695	91%

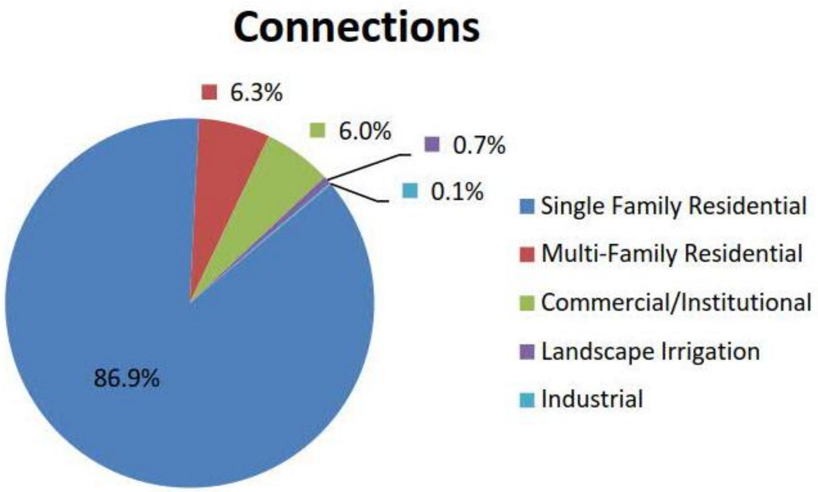

Figure 4-1: Connections by Water Sector

Figure 4-2 shows that population has increased significantly since 1996, but during this period water usage has actually declined. This occurred largely due to the City's successful conservation programs and water meter installations. Some of the recent declines may also be due to the State-imposed 2015 water conservation requirements brought about by an extended drought, and the results of an economic downturn.

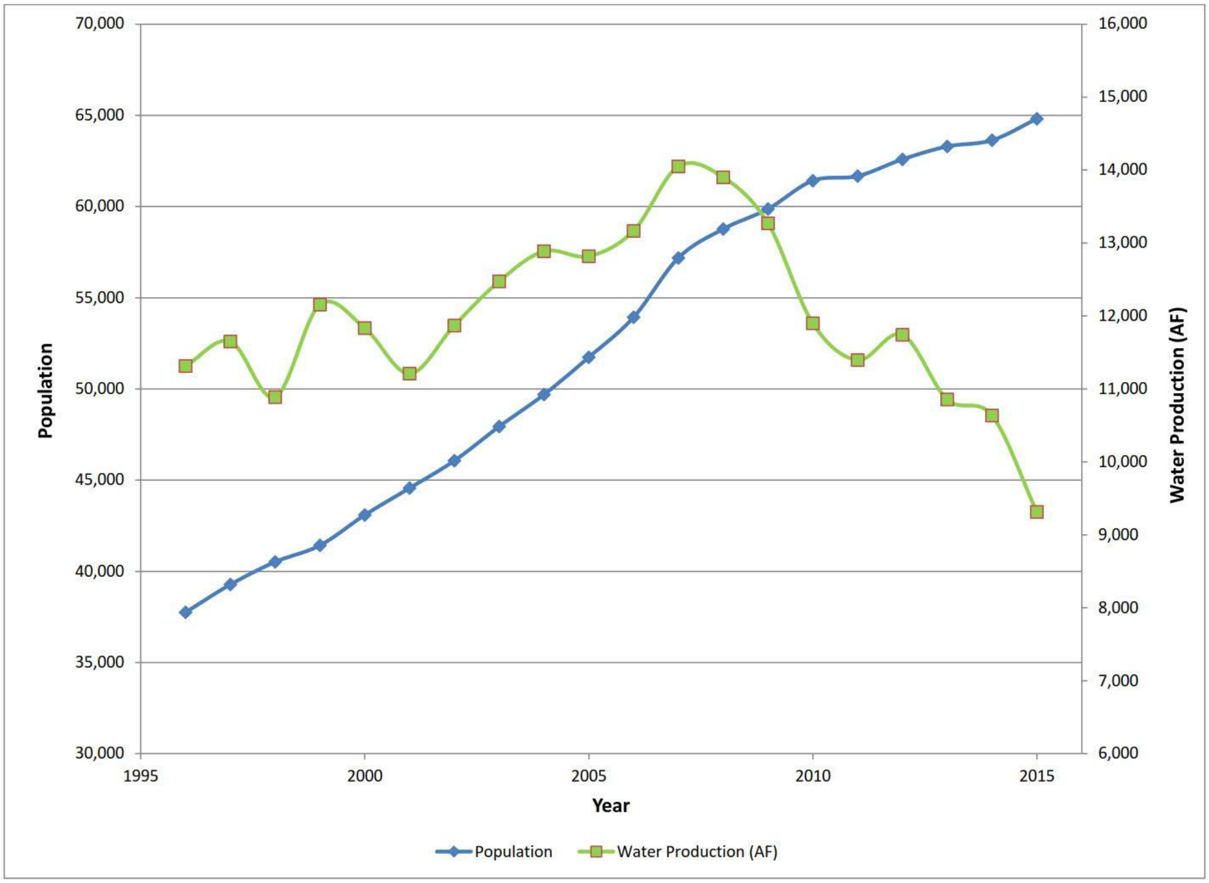

Figure 4-2: Population versus Production

For 2015, water use data was available for about 90% of the connections; however, water usage for the other connections had to be estimated. Losses are unknown since the system is not fully metered. A 7% total distribution-system loss rate was assumed to be consistent with the 2010 UWMP and 2014 WSMP.

The average water use per metered connection was calculated for each water sector. Unmetered connections typically use 10-20% more water than metered connections due to disincentives to conserve water. However, using this assumption, and accounting for the 7% losses, the total deliveries would be greater than the well pumping. In fact, if unmetered connections are assumed to use the same as metered connections, then metered deliveries would still exceed groundwater pumpage.

This problem was resolved by incorporating the discrepancy into the unmetered commercial/institutional, industrial and landscape connections. Water usage by such accounts can vary substantially over time, while residential accounts typically have similar water usage on an annual basis. As a result, unmetered residential accounts were assumed to have the same water usage as metered residential accounts, while unmetered commercial/institutional, industrial and landscape connections were assumed to have water usage 70% below the typical metered connections. While this may not be an accurate assumption, it was necessary to achieve a water balance. After the entire system is metered a more accurate picture of water use by sector can be determined.

Future water demands (2020 and later) are based on the City's 2020 per capita Target of 196 gpcd (See Chapter 5). This value is multiplied by the anticipated population (assuming long-term average growth of 2% per year). The distribution of water by water sector was based on the estimated percentage of water used in each sector in 2015, as shown below:

Table 4-2: Estimated Percent Water Use by Sector (2015)

Water Use Sector	Estimated Percent of Water Use
Single Family Residential	56.8%
Multi-Family Residential	17.1%
Commercial/Institutional	16.1%
Industrial	0.5%
Landscape Irrigation	2.4%
Losses	7.0%
Total	100.0%

These percentages will need to be refined in the future after the entire water system is metered. The percentage of water used by Single Family Residential may go up since they have made a large impact in drought-related conservation, while the percentage of multi-family residential may go down, since they typically have little to no landscaping and thus less ability to conserve water.

As shown later in Chapter 5, City water usage in 2015 is already well below 2020 goals. Yet, future water usage shown above is based on the 2020 goals. The 2020 goals represent minimum standards and are typically used to estimate future water use in an UWMP. In addition, usage could increase as the current drought ends and water conservation measures are relaxed.

Table 4-3: Demands for Potable and Raw Water- Actual and Projected

Use Type	2015 Actual			2020[1]	2025	2030	2035	2040
	No. of Connections	Level of Treatment	Volume					
Single Family Residential	11,902	Drinking	5,295	8,900	9,900	10,900	12,000	13,300
Multi Family Residential	860	Drinking	1,596	2,700	3,000	3,300	3,600	4,000
Commercial / Institutional	819	Drinking	1,503	2,500	2,800	3,100	3,400	3,800
Industrial	96	Drinking	44	100	100	100	100	100
Landscape	18	Drinking	224	400	400	500	500	600
Losses	-	Drinking	652	1,100	1,200	1,300	1,500	1,600
	13,695	-	9,314	15,700	17,400	19,200	21,100	23,400

1 – Water usage increases substantially in 2020 because it is assumed that 2020 water usage is the same as the 2020 Target (196 gpcd). 2015 usage was substantially below the 2020 Target at 128 gpcd.

4.2 Distribution System Water Losses

Legal Requirements:

CWC 10631(e)(1) and (2)
Quantify, to the extent records are available, past and current water use over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:…(J) Distribution system water loss
CWC 10631 (e)(3)
(A) For the 2015 urban water management plan update, the distribution-system water loss shall be quantified for the most recent 12-month period available. For all subsequent updates, the distribution-system water loss shall be quantified for each of the five years preceding the plan update.
(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water-loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

City water losses can be estimated using three different methodologies:

1. **Difference in Well Pumping and Customer Meter Readings.** This methodology was not used due to incomplete metering in the City. The City's wells are 100% metered, however, only 90% of the City's connections are metered, with the remaining expected to be metered in the next few years. This made a comparison of well pumping and deliveries infeasible.

2. **City Estimated Losses – Method Reported in UWMP.** The 2010 UWMP did not have data to measure estimated losses since most of the City was not metered in 2010. At the time, the City assumed 7% distribution system losses based on typical losses for similar systems. A 7% loss was also assumed in the City's 2014 WSMP. For estimating purposes and for consistency with these previous documents, this UWMP also assumes 7% system losses. This results in losses of 9,314 AF x 7% = 652 AF in 2015.

3. **AWWA Water Audit Software.** System water losses were calculated using American Water Works Association (AWWA) Free Water Audit Software (see results in **Appendix E**). The software uses inputs from volume of water supplied, volume of water delivered, metering error percentage, and metering confidence levels to calculate apparent, unauthorized, and real losses.

   The software provides default values for typical losses for a similar system. However, unlike the City estimated losses, the AWWA software does not include authorized, unmetered activities such as line flushing for mains and hydrants and firefighting. Losses are comprised of only unauthorized consumption, metering and data handling errors, and real loss. Using the spreadsheet, the calculated losses for the Madera system were 5.8%, or about 536 AF.

   The difference between volume supplied and volume delivered, minus any metering error adjustments, is the calculated loss. This value is then broken into apparent loss (caused by metering errors and data handling inaccuracies) and real loss, leakage, and unauthorized water consumption.

   The City was given an Infrastructure Leakage Index of 2.92. This represents the ratio of Real Losses to Unavoidable Real Losses. The Infrastructure Leakage Index is most efficient when maintained between 1 and 8. In Index value of 1 represents a 'top of the line' system with only unavoidable losses, and 8 being the maximum amount of loss feasible to maintain both water and financial resources.

   The City was also given a Water Audit Data Validity Score of 81 out of 100. This index scores the validity of the water use data based on factors such as metering, meter calibration, data management, auditing of customer records, etc.

Table 4-4: Water Loss Summary Most Recent 12 Month Period Available

Reporting Period Start Date (Month/Year)	Loss (AF)[1]
January, 2015	652

1 – Loss value based on assumed 7% total distribution system losses

4.3 Water Savings from Codes, Standards, Ordinances, and Plans

Legal Requirements:

CWC §10631 (e)(4)
(A) If available and applicable to an urban water supplier, water use projections may display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.
(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following: (i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

Ordinances and policies have been adopted to reduce water waste, and are described in Section 8 – Water Shortage Contingency Planning and Section 9 – Demand Management

Measures. Estimating water savings from ordinances and policies is an optional part of 2015 UWMPs, and was not performed largely due to the difficulty in assigning accurate savings estimates to specific ordinances.

4.4 Water Use for Lower Income Households

Legal Requirements:

CWC 10631.1(a)
The water use projections required by Section 10631 shall include projected water use for single family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.
California Health and Safety Code 50079.5 (a)
"Lower income households" means persons and families whose income does not exceed the qualifying limits for lower income families… In the event the federal standards are discontinued, the department shall, by regulation, establish income limits for lower income households for all geographic areas of the state at 80 percent of area median income, adjusted for family size and revised annually.

The UWMPA requires that the UWMP identify low income housing demands and developments within the agency's service area and develop demand projections for those units.

According to the area's Regional Housing Need Allocation[1], 22% of the population in Madera lives below the poverty level. This rate was assumed to be the same for single and multi-family homes, and be constant into the future, resulting in the low income water demands shown in **Table 4-5**.

Table 4-5: Low-Income Projected Water Demands

Low Income Water Demands	2015	2020	2025	2030	2035	2040
Single-family residential	1,200	2,000	2,200	2,400	2,600	2,900
Multi-family residential	400	600	700	700	800	900
Total	1,600	2,600	2,900	3,100	3,400	3,800
Units : Acre-feet, values rounded to nearest hundreds						

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[1] http://www.hcd.ca.gov/housing-policy-development/housing-resource-center/plan/he/

5 Baseline and Targets

This Chapter describes the estimated baseline water usage over a ten year period, the establishment of water conservation goals for 2015 and 2020, and the City's current status in meeting the 2015 goal. Refer to **Appendix B** for additional DWR tables with backup information and calculations.

As described in Senate Bill 7 of Special Extended Session 7 (SBX7-7), the California legislature set a statewide goal of a 20 percent per capita reduction in urban water use by 2020. SBX7-7 requires that retail water suppliers comply with its requirements. Consistent with SBX7-7, the 2015 UWMP must provide an estimate of Base Daily Per Capita Water Use, and comparison to the reduction goal established in the 2010 UWMP, as well as an interim conservation goal for 2015. This estimate utilizes information on population as well as base gross water use.

The per capita demands and future targets below replace those in the City's 2010 UWMP and 2014 Water System Master Plan (Akel, 2014).

5.1 Updated Calculations from 2010 UWMP

Legal Requirements:

CWC 10608.20
(g) An urban retail water supplier may update its 2020 urban water use target in its 2015 urban water management plan required pursuant to Part 2.6 (commencing with Section 10610).
Methodologies DWR 2010, Methodology 2 Service Area Population
Page 27 - Water suppliers may revise population estimates for baseline years between 2000 and 2010 when 2010 census information becomes available. DWR will examine discrepancy between the actual population estimate and DOF's projections for 2010; if significant discrepancies are discovered, DWR may require some or all suppliers to update their baseline population estimates.

The 2010 UWMP included population data and historical water usage to calculate per capita demands and future conservation targets. For this UWMP, the population data was updated with more recent estimates from the Department of Finance for the years 2001-2010. In addition, the City's 2014 Water System Master Plan had some refined water usage data for several years that replaced some values in the 2010 UWMP. Using this data, the per capita baseline and future conservation targets have been recalculated. The resulting changes were minor, with the baseline water usage reduced from 247 gpcd to 245 gpcd, and the 2020 Target reduced from 197 gpcd to 196 gpcd.

5.2 Baseline Periods

Legal Requirements:

CWC 10608.20
(e) An urban retail water supplier shall include in its urban water management plan due in 2015. . .the baseline daily per capita water use…along with the bases for determining those estimates, including references to supporting data.
(g) An urban retail water supplier may update its 2020 urban water use target in its 2015 urban water management plan required pursuant to Part 2.6 (commencing with Section 10610).

The baseline period has not been adjusted in the 2015 UWMP. However, baseline water usage did change because more recent Census population data was used, and refined water supply data was available in the 2014 Water System Master Plan. A discussion of the 10-year and 5-year baseline periods is provided below.

5.2.1 Determination of 10-15 Year Baseline Period (Baseline GPCD)

Legal Requirements:

CWC 10608.12
(b) "Base daily per capita water use" means any of the following:
(1) The urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous 10-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.
(2) For an urban retail water supplier that meets at least 10 percent of its 2008 measured retail water demand through recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier, the urban retail water supplier may extend the calculation described in paragraph (1) up to an additional five years to a maximum of a continuous 15-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

The 10-year baseline period ranges from 1995 to 2004, which was unchanged from the 2010 UWMP. This period was selected since it is recent and reflects current water use practices.

5.2.2 Determination of 5-Year Baseline Period (Target Confirmation)

Legal Requirements:

CWC 10608.12 (b)
(3) For the purposes of Section 10608.22, the urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous five-year period ending no earlier than December 31, 2007, and no later than December 31, 2010.

Urban retailers must also report daily per capita water use for a five-year period within the range of 2003 to 2010. The selected five year baseline period is from 2003 to 2007, which remains unchanged from the 2010 UWMP. This 5-year baseline period is compared to the 2020 Target to determine the ‘minimum’ water use reduction requirement. The Target established with the 10-year baseline period cannot be higher than 95% of the 5-year baseline period. The purpose of this second baseline period is to help ensure that the long-term 2020 target is at least slightly less than recent water usage.

5.3 Service Area Population

Legal Requirements:

CWC 10608.20
(e) An urban retail water supplier shall include in its urban water management plan…the baseline daily per capita water use,…along with the bases for determining those estimates, including references to supporting data.
(f) When calculating per capita values for the purposes of this chapter, an urban retail water supplier shall determine population using federal, state, and local population reports and projections.
CWC 10644 (a) (2)
The plan… shall include any standardized forms, tables, or displays specified by the department.

Population data for the City of Madera for years 2000 and 2010 were taken from the US Census. Years 2001 to 2009 and 2011 to 2015 were taken from the California Department of Finance. The DOF estimates population in years between decadal censuses based on factors such as housing construction, housing demolitions, vacancy rates, etc.

Deliveries of City water outside of its service area, or use of other water supplies within City limits, are estimated to be very minor, and include less than 1% of the connections. The US Census Data for the City is therefore considered an accurate representation of the City's customer population. The City population from 2000 to 2015 is shown in the table below.

Table 5-1: City Population (2000-2015)

Year	Population
2000	43,089
2001	44,565
2002	46,066
2003	47,939
2004	49,691
2005	51,735
2006	53,928
2007	57,181
2008	58,767
2009	59,868
2010	61,416
2011	61,670
2012	62,587
2013	63,293
2014	63,635
2015	64,810

5.4 Gross Water Use

Legal Requirements:

CWC 10608.12
(g) "Gross Water Use" means the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier, excluding all of the following:
(1) Recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier
(2) The net volume of water that the urban retail water supplier places into long term storage
(3) The volume of water the urban retail water supplier conveys for use by another urban water supplier
(4) The volume of water delivered for agricultural use, except as otherwise provided in subdivision (f) of Section 10608.24.
California Code of Regulations Title 23 Division 2 Chapter 5.1 Article
Section 596 (a) An urban retail water supplier that has a substantial percentage of industrial water use in its service area is eligible to exclude the process water use of existing industrial water customers from the calculation of its gross water use to avoid a disproportionate burden on another customer sector.

Gross water use for 2015 was determined from metered readings, an assumed 7% distribution system loss, and estimated water usage at unmetered connections (see Section 4.1). In previous years (2011-2014), fewer connections were metered and there is greater uncertainty in the breakdown of water usage by sector, so only total gross water use is reported.

Table 5-2: Gross Water Use (2011-2015)

Water Use	Year				
	2011[1]	2012[1]	2013[1]	2014[1]	2015
Single Family Residential	-	-	-	-	5,295
Multi-Family Residential	-	-	-	-	1,596
Commercial / Institutional	-	-	-	-	1,503
Industrial	-	-	-	-	44
Landscape Irrigation	-	-	-	-	224
System Losses	-	-	-	-	652
Total	11,396	11,743	10,855	10,636	9,314

1 – Only total deliveries are reported due to insufficient data to report or estimate water use in all sectors

5.5 Baseline Daily Per Capita Water Use

The 10-year baseline water use was recalculated to be 245 gpcd, as shown in the table below. In the 2010 UWMP, the baseline usage was 247 gpcd. Differences in baseline consumption were due to revised population and water usage numbers.

Table 5-3: Gallons Per Capita per Day

Baseline Year		Service Area Population	Annual Gross Water Use (AF)	Daily Per Capita Water Use (gpcd)
10 Year Baseline gpcd				
Year 1	1995	36,557	10,306	252
Year 2	1996	37,753	11,314	268
Year 3	1997	39,276	11,650	265
Year 4	1998	40,518	10,888	240
Year 5	1999	41,424	12,156	262
Year 6	2000	43,089	11,834	245
Year 7	2001	44,565	11,210	225
Year 8	2002	46,066	11,869	230
Year 9	2003	47,939	12,474	232
Year 10	2004	49,691	12,887	232
10 Year Average Baseline gpcd				**245**
2015 Compliance Year gpcd				
2015		64,810	9,314	**128**

5.6 2015 and 2020 Targets

Legal Requirements:

CWC 10608.20(e)
An urban retail water supplier shall include in its urban water management plan due in 2015. . .urban water use target, interim urban water use target,…along with the bases for determining those estimates, including references to supporting data (10608.20(e)).
CWC 10608.20
(g) An urban retail water supplier may update its 2020 urban water use target in its 2015 urban water management plan…

5.6.1 Selection of Target Method

DWR allows agencies to use one of four methods to determine their demand reduction targets for 2020. Below is a brief description of each method.

Method 1 – Baseline Reduction Method. The 2020 water conservation target for this method is defined as a 20 percent reduction of average per-capita demand during a 10-year continuous baseline period that should end between 2004 and 2010.

Method 2 – Efficiency Standard Method. The 2020 water conservation target for this method is based on calculating efficiency standards for indoor use separately from outdoor use for residential sectors and an overall reduction of 10 percent for commercial, industrial, and institutional (CII) sectors. The aggregated total of the efficiency standards in each area is then used to create a conservation target.

Method 3 – Hydrologic Region Method. This method uses the ten regional urban water use targets for the state. Based on the water supplier's region, a static water use conservation target for 2020 is assigned.

Method 4 – Savings by Water Sector. This method identifies water savings obtained through identified practices, and subtracts them from the base daily per capita water use value identified for the water supplier.

The actual water conservation targets derived for the City of Madera (City) are described for each method in the following paragraphs. This section is concluded with a recommended method that has been used to adjust the projected water demands with the minimum water conservation requirement per SBx7-7. The demand projections with water conservation are used for the water reliability calculations under normal, dry, and multiple dry year conditions are presented in Chapter 7.

Method 1 – 20% Reduction

Method 1 establishes a baseline water per-capita consumption using historical population and historical demands. Any 10-year consecutive period between 1995 and 2010 can be selected to establish the baseline per-capita demand for the water supplier using the average per-capita consumption from that 10-year period. If an agency uses 10 percent or more recycled water in year 2008, the baseline value can also be determined with a 15-year consecutive period between 1990 and 2010. The City does not serve recycled water so the baseline is limited to 10 years in length.

Under Method 1, the baseline value is reduced by twenty percent to determine the year 2020 conservation target. The intermediate target for year 2015 is the mid-point value between the baseline and year 2020 target values.

The population, total consumption, and the per-capita consumption of the 10-year baseline period are shown in **Table 5-3**. The average per-capita consumption during this period was 245 gpcd. Based on twenty percent reduction from this baseline period, the City's 2020 conservation target would be 196 gpcd.

Method 2 – Efficiency Standards

Method 2 uses performance standards for both indoor and outdoor usage to establish the supplier's 2020 water conservation target. Method 2 consists of a series of four steps and utilizes actual water use data and estimates from the water supplier. First, the method assumes a standard statewide indoor use target of 55 gpcd. Then, the landscaped area for the supplier's entire service area is determined. Commercial, institutional, and industrial water use is accounted for separately using historical billing data. The performance standards for outdoor landscape irrigation, based on acreage, and commercial, institution, and industrial use, based on demands, are then applied to those totals. Finally, the performance standards for all three sectors are added together to determine the Method 2 2020 conservation target.

There is insufficient data to calculate Method 2 for the City. Principally, the effort associated with digitizing or surveying the amount of irrigated landscape within the City's service area would represent a significant effort.

Method 3 – Hydrologic Regions

The State's 20 x 2020 water conservation plan has identified specific urban water use targets for 2015 and 2020 for each of the ten hydrologic regions shown in **Figure 5-1**. The City falls in Hydrologic Region 6 (San Joaquin) which has a target use of 174 gpcd for year 2020.

Figure 5-1: Hydrologic Regions

Method 4 – Savings by Water Sector

Method 4 was considered but not selected because it requires data not currently collected for the City of Madera, specifically water conservation values for specific Demand Management Measures.

Recommended Method

Method 1 – Baseline Reduction Method has a 2020 Target of 196 gpcd, and Method 3 – Hydrologic Regions has a 2020 Target of 174 gpcd. Methods 2 and 4 require data that is not available for the City and therefore cannot be used. Based on an evaluation of each method as described above, Method 1 provides the preferable conservation target for the City of Madera.

5.6.2 5-Year Baseline – 2020 Target Confirmation

Legal Requirements:

CWC 10608.22
Notwithstanding the method adopted by an urban retail water supplier pursuant to Section 10608.20, an urban retail water supplier's per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use as defined in paragraph (3) of subdivision (b) of Section 10608.12. This section does not apply to an urban retail water supplier with a base daily per capita water use at or below 100 gallons per capita per day.

The 5-year baseline target confirmation is used to verify that the calculated 2020 target is less than or equal to 95% of the 5-year baseline gpcd. 95% of the 5-year baseline is the maximum allowable 2020 target. The five year baseline usage from 2003 to 2007 was 224 gpcd, so the maximum allowable 2020 target is 224 gpcd X 0.95 = 213 gpcd. This is greater than the 2020 target of 196 gpcd, so no adjustments are needed.

5.6.3 2015 Interim Urban Water Use Target

The 2015 Interim Water Use Target is 90% of the baseline per capita use or 90% x 245 gpcd = 220 gpcd.

5.6.4 Baselines and Targets Summary

The baseline and targets are summarized in **Table 5.4** below.

Table 5-4: Summary of Baseline and Targets

Description	Value (gpcd)
10-Year Baseline	245
2015 Interim Target	220
2020 Target	196
2015 Actual Use	128

Average water use in the years 2011 through 2014 was 158 gpcd. As a result of the State's mandatory 35% water use reduction in 2014, and 28% reduction in 2015, Madera's use dropped nearly 20% overall in 2015, to 128 gpcd. Since achieving this rate of use required imposition of very strict outdoor watering restrictions, it is not considered sustainable over the long term, and use can be expected to return to near the 2011-2014 level. Despite that, it is anticipated that, with continued water conservation efforts and the completion of city-wide water metering, the City's average daily per capita water use in the future will very likely remain below the 196 gpcd conservation target of Year 2020.

5.7 2015 Compliance Daily per Capita Water Use

Legal Requirements:

CWC 10608.12 (e)
“Compliance daily per-capita water use” means the gross water use during the final year of the reporting period…
CWC 10608.24 (a)
Each urban retail water supplier shall meet its interim urban water use target by December 31,2015.
CWC 10608.20(e)
An urban retail water supplier shall include in its urban water management plan . . compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

5.7.1 Meeting the 2015 Target

The City of Madera has seen a steady decline in per capita demand, with 2015 per capita use about half of 1995 per capita use. The City began meeting their 2020 target in 2010 and was well below it in 2015. **Figure 5-2** shows annual gpcd for the City from 1995 to 2015 in comparison to the 2015 and 2020 Targets.

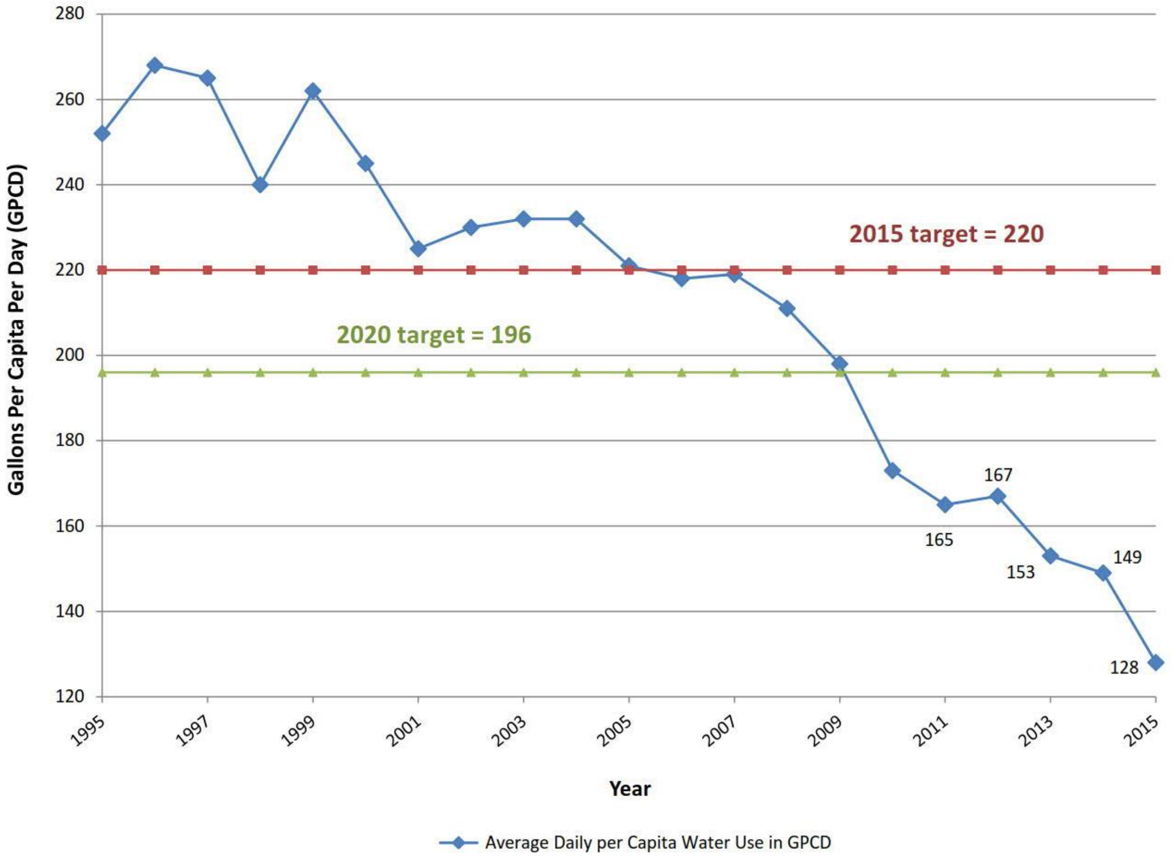


Figure 5-2: Per Capita Use versus Targets (1995-2015)

5.7.2 Adjustments to 2015 Gross Water Use

Legal Requirements:

CWC 10608.24 (d)
When determining compliance daily per capita water use, an urban retail water supplier may consider the following factors:
Differences in evapotranspiration and rainfall in the baseline period compared to the compliance reporting period.
Substantial changes to commercial or industrial water use resulting from increased business output and economic development that have occurred during the reporting period. Substantial changes to institutional water use resulting from fire suppression services or other extraordinary events, or from new or expanded operations, that have occurred during the reporting period. If the urban retail water supplier elects to adjust its estimate of compliance daily per capita water use due to one or more of the factors described in paragraph (1), it shall provide the basis for, and data supporting, the adjustment in the report required by Section 10608.40.
Methodology Document, Methodology 4
This section discusses adjustments to compliance-year GPCD because of changes in distribution area caused by mergers, annexation, and other scenarios that occur between the baseline and compliance years.

No adjustments were made to the 2015 gross water use due to the climate, industrial water use, fire suppression or other factors that would cause abnormal water usage.

6 System Supplies

Legal Requirements:

§10631(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a).

UWMPA requirements state that the water supplier must describe their existing and planned water supply sources for the next 20 years. The following description includes information on the City's water supplies, recycled water opportunities, and pertinent information on groundwater management.

6.1 Water Supply Facilities

The City currently receives potable water supplies exclusively from groundwater through 18 active wells. These wells all pump from the regional groundwater supply (the Madera Subbasin of the San Joaquin groundwater basin) directly into the distribution system to meet the City's demands.

The City's water distribution system consists of more than 200 miles of water mains, ranging from 2 to 14 inches in diameter and forming a single pressure zone. The City's older pipelines are primarily asbestos-cement and steel, while more recently constructed pipelines are mainly polyvinyl chloride (PVC). The City's generally flat topography slopes from east to west from 300 feet in the east to 240 feet in the west. With this generally flat topography, the City is maintained as a single pressure zone, with a single one-million-gallon elevated storage tank regulating system operation. No major water supply infrastructure has been constructed since 2010.

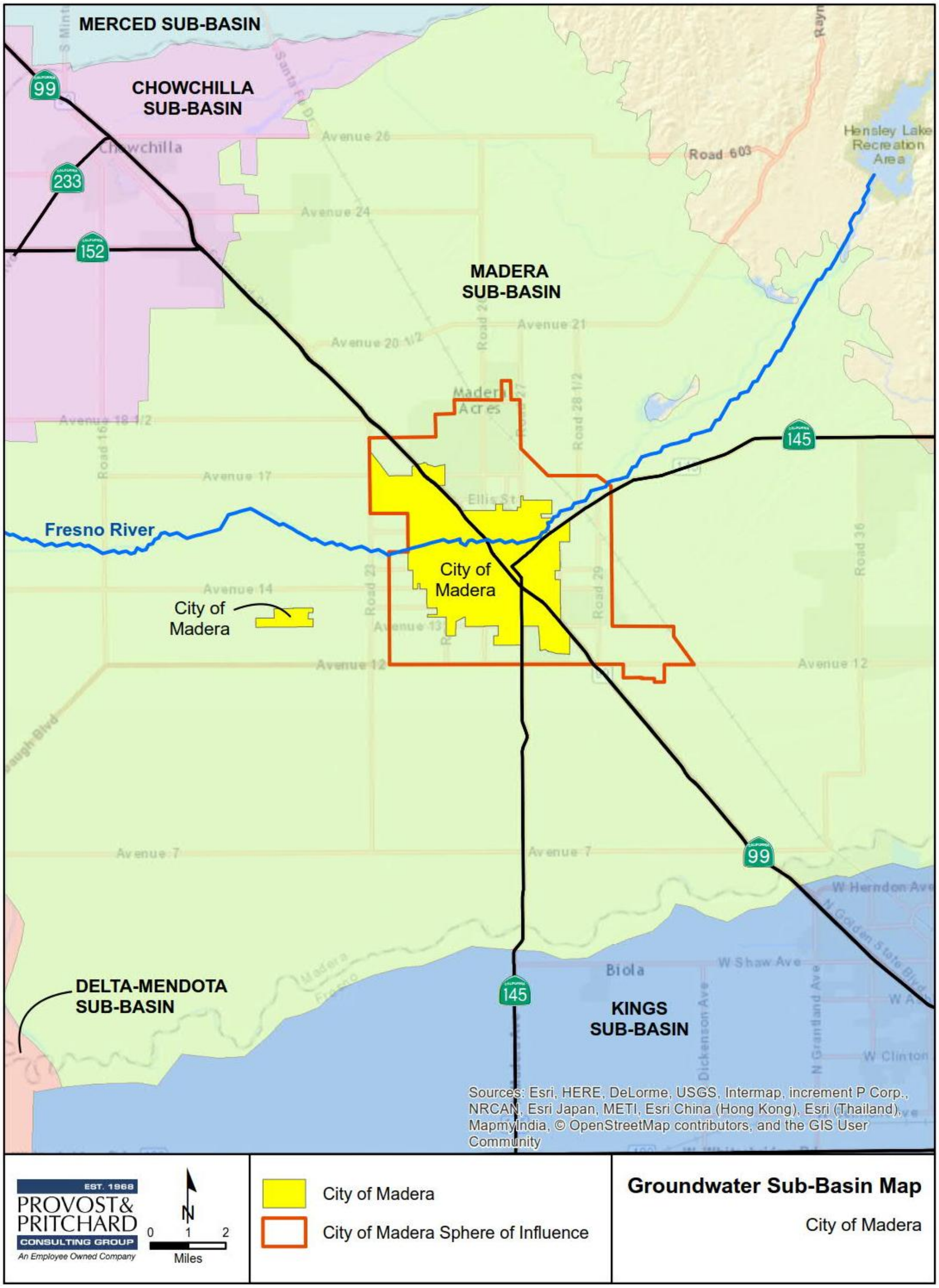
6.2 Groundwater

6.2.1 Groundwater Basin Description

Legal Requirements:

CWC 10631 (b) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan: (2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater.

The City is located in the San Joaquin River hydrologic region and extracts its groundwater from the Madera Subbasin, one of nine subbasins in the San Joaquin Valley Groundwater Basin. **Figure 6.1** shows the location of the City within the groundwater basin.



Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Figure 6-1: Groundwater Sub-Basin Map

The total surface area of the subbasin is 394,000 acres, or 614 square miles. The City occupies less than 3 percent of this total area. The Madera Subbasin consists of alluvium emanating from the Sierra Nevada range. The subbasin is bounded on the south by the San Joaquin River, on the west by the eastern boundary of the Columbia Canal Service Area, on the north by the southern boundary of the Chowchilla Subbasin, and on the east by the crystalline bedrock of the Sierra Nevada foothills.

The current volume of water in the entire basin, or in the basin underlying the City, is not precisely known at this time, and is dependent on groundwater levels and the base of fresh water. However, the groundwater basin has significant reserves. According to DWR's Bulletin 118 – California Groundwater (2004) the Madera Subbasin had a 12,600,000 AF of storage to a depth of 300 feet in 1995.

Aquifers in the Madera Subbasin consist of alluvial sediments composed of unconsolidated gravels, sands, silts, and clays. Major streams in the area include the San Joaquin and Fresno rivers. The Madera Subbasin has been in an overdraft condition for many years. DWR Bulletin 118 includes a detailed description of the Madera Subbasin and its characteristics and conditions (see **Appendix F**).

6.2.2 Groundwater Quality

Groundwater within the Madera Subbasin has generally been high quality. While total dissolved solids (TDS) ranges from 100 to 6,400 milligrams per liter (mg/L) within the subbasin, average TDS is 215 mg/L (DWR, 2003).

Groundwater is mainly of a bicarbonate type throughout most of the subbasin, transitioning from calcium- and calcium-magnesium-bicarbonate water in the east of the subbasin to sodium-bicarbonate water in the west of the subbasin. Sodium increases near the western edge of the subbasin along with increasing chloride, to produce poor quality sodium-chloride type water. Average TDS concentration increases in the western portion of the subbasin.

Nitrate, DBCP, iron and manganese are constituents of particular concern in the Madera Subbasin. Well No. 27 is not currently in use, but it is equipped with granular activated carbon (GAC) for treatment of DBCP and EDB.

The Madera Regional Groundwater Management Plan (Provost & Pritchard, 2014) provided a broad evaluation of groundwater quality in the Madera Water Master Plan sub-area, which includes the City of Madera and significant areas of primarily agricultural lands that surround the City, mainly to the south. This area extends beyond the City's current sphere of influence and planning area. Available water quality data indicate the following:

- **Arsenic –** concentrations are acceptable and below the MCL of 10 µg/L in the sub-area.
- **Boron –** concentrations are below 500 µg/L in the entire sub-area.
- **Total Dissolved Solids** – concentrations are generally acceptable within the sub-area, with the exception of several wells in the western portion, which have elevated concentrations of over 1,000 mg/L. No construction information (well logs, well construction reports, etc.) are available for these wells, but they are located to the southwest of the City and are located in an industrial area. Elevated TDS concentrations could be problematic for agricultural and domestic use.

- **Manganese** – concentrations appear to be acceptable and below the secondary MCL of 50 µg/L in the sub-area.
- **Nitrate (as NO_3)** – concentrations appears to be under the MCL of 45 mg/L, with the exception of the area southwest of the City where land use potentially affects the shallow aquifer water quality. A closer examination into the potential source for the elevated nitrate concentrations revealed that at these locations, high-density animal enclosures and/or fertilizer plants were in close proximity. Elevated nitrate concentrations can be harmful for domestic use, especially to young children.

For additional groundwater quality information, including groundwater quality maps, the reader is referred to the 2014 Water System Master Plan (Akel, 2014).

6.2.3 Groundwater Management

Legal Requirements:

CWC 10631 (b) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:
A copy of any groundwater management plan adopted by the urban water supplier… or any other specific authorization for groundwater management.…For basins that a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree.

In December 2014, the City of Madera and five partnering agencies completed the Madera Regional Groundwater Management Plan (Provost & Pritchard, 2014, see **Appendix G** for a copy). The partnering agencies included the City of Chowchilla, Chowchilla Water District, Madera County, Madera Irrigation District and South-East Madera County United. The Groundwater Management Plan (GMP) was the beginning of a cooperative and regional approach to groundwater management, which will be continued through efforts to comply with the Sustainable Groundwater Management Act (SGMA). For more information on SGMA refer to Section 7.1 – Constraints on Water Supplies.

The GMP Participants adopted several overarching Basin Management Objectives (BMO) that guided preparation of the recommendations in the GMP. BMOs are broad goals for improving the management of a local groundwater basin. BMOs were developed through a collaborative process with the other GMP Participants. This process included several general meetings on the GMP, as well as focused workshops specifically on BMOs. Six BMOs were established and are described below:

Stabilization of Groundwater Levels (by 2024): The overarching and highest-priority goal is to stabilize the groundwater levels by 2024. This will be accomplished through a combination of demand reduction, groundwater recharge, and acquisition of new surface water supplies.

Subsidence Mitigation: Subsidence mitigation is a regional goal. Although, subsidence is not currently a problem in the City of Madera, issues with subsidence exist in the northwestern portion of Madera County.

Recovery of Groundwater Levels after 2024: The goal is the recovery of groundwater levels to sustain a 5 year drought. The recovery of groundwater levels will inherently have multiple benefits such as improved groundwater quality, and reduced pumping cost. The storage needed to accommodate a 5-year drought will vary by area and drought severity, but could be 15 to 20 feet of groundwater.

Public Awareness and Education: The goal is to provide public education and awareness of groundwater conditions, provide recommendations for the next drought, better understanding of water resources, and causes and impacts of subsidence. A major focus of the educational program will be on K-12 education.

Economic Viability: The goal is to help ensure economic viability of the region by providing a reliable groundwater supply. Reliable groundwater supplies will benefit local agriculture and increase property values.

Collaborative Governance: Collaborative governance will be performed through a regional water agency or cooperative agreement. The City is currently working on this developing the most appropriate governance structure with other local agencies.

6.2.4 Overdraft Conditions

Legal Requirements:

CWC 10631(b)(2). For basins that have not been adjudicated, (provide) information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

The Madera Subbasin, like the San Joaquin Valley Groundwater Basin in general, has been in a state of overdraft for several decades. The Madera Subbasin is considered to be ‘critically overdrafted’ by the California Department of Water Resources. The San Joaquin Valley Groundwater Basin, and thus the Madera Subbasin, is not adjudicated and there are currently no limitations placed on groundwater pumping. The City, as well as DWR and Madera Irrigation District (MID), actively monitors groundwater levels.

According to the 2014 GMP, groundwater levels in the City of Madera ranged in elevation from about 20 to 80 feet above mean sea level. The 2014 GMP also estimated that groundwater level declines in the City were between 1 and about 2.5 feet/year from 1980 to 2011. During this period, some areas in Madera County had up to 5 feet of decline per year.

Overdraft within the City of Madera is not precisely known, and a detailed water balance for the City would be required to fully understand the rate of overdraft. The GMP did evaluate overdraft on a regional scale throughout Madera County. The 2008 Madera Integrated Regional Water Management Plan (IRWMP) calculated the cumulative overdraft in the Valley area of Madera County to be 99,000 AF/year. The area covered by the GMP covered most of the Valley area of Madera County, but excluded a few active districts that did not participate in the GMP. Overdraft was estimated to average 143,000 AF/year over the period from 1980-2011. Future overdraft (2014 and beyond) was estimated to be 259,000 AF/year, which indicates a serious regional problem with overdraft. The increase in overdraft is attributed primarily to increased conversion of previously-fallow lands to irrigated agriculture, maturation of existing tree crops, and impacts from the San Joaquin River Restoration. The City covers a relatively small portion of Madera County, so a regional approach to address overdraft is needed, with cooperation from all local agencies. The City can fulfill its own obligation to the regional effort by attempting to stabilize local groundwater levels through water conservation, and possibly recharging surface waters within the City.

The City identified the following as high priority strategies for addressing the local groundwater overdraft in the 2014 GMP:

- Groundwater recharge
- Flood and stormwater capture
- Identify and import new surface water supplies
- Increase surface water storage
- Increase conveyance capacity
- Surface water treatment
- Agricultural land conversion / reserve open space
- Work with adjacent entities
- Water use restrictions in droughts
- Urban water conservation
- New fees to fund recharge projects

6.2.5 Historical Pumping

Legal Requirements:

> **CWC 10631 (b)** If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan: 3) (Provide a) detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

The Madera Subbasin is the only source of groundwater in the region, and the City's overall demands are met with groundwater. All groundwater is pumped from the alluvial groundwater basin. No fractured bedrock aquifers are found in the City. Groundwater pumpage from 2011 to 2015 is shown in the table below.

Table 6-1: Volume of Groundwater Pumped

Basin	Sub-Basin	2011	2012	2013	2014	2015
San Joaquin Valley	Madera	11,396	11,743	10,855	10,636	9,314
Total		11,396	11,743	10,855	10,636	9,314
	Units : AF					

6.2.6 Groundwater Recharge, Storage and Banking

The City performs groundwater recharge through the purchase of small quantities of surface water from MID, and by keeping stormwater as long as possible in stormwater basins, while ensuring sufficient capacity to provide necessary stormwater flood protection.

The following forms of recharge also benefit the City of Madera:

- Stream flow percolation from the San Joaquin River, Chowchilla River, Fresno River, and other creeks and sloughs
- Infiltration and precipitation that falls on the Valley floor
- Subsurface inflow
- Seepage from unlined canals

The City does not currently participate in any groundwater banking projects.

6.3 Surface Water

The Fresno River flows through the City from the east; this section of river is mostly dry unless the river stage is high enough to spill over the John Franchi Diversion Dam. The Fresno River is an important source of natural groundwater recharge for the City. The City has no water rights for the Fresno River water, nor any surface water contracts with U.S. Department of the Interior, Bureau of Reclamation (Reclamation), State Water Project, or other surface water purveyors. Historically, its water supply has been almost 100 percent from groundwater. In the past, the City has purchased small quantities of surface water from Madera Irrigation District. Refer to Section 6.7 – Exchanges and Transfers for more information.

According to the Regional GMP, the City had 1,100 acres of cropped land within the City limit, generally just outside of the urban area. These lands had a total irrigation demand of 2,500 AF/year. They receive both surface water from Madera Irrigation District, estimated at 1,900 AF/year, and use groundwater from private wells, estimated at 600 AF/year, to meet demands. These supplies and demands are not considered in the UWMP's water supply analysis.

6.4 Stormwater

The City also has numerous stormwater basins. Some are connected to MID facilities and can receive surface water for recharge. Small quantities of MID surface water have been purchased and recharged in these basins. In recent years, the stormwater basins are operated to maximize the volume of stormwater that is captured and recharged locally, by keeping the stormwater in the basins for as long as possible for the purposes of maximizing percolation opportunities. The City may take actions to enhance the percolation and recharge opportunities, such as adding vertical percolation wells and turnout gates from MID facilities to storm drainage basins. In events where storm drainage basin capacity is potentially exceeded, water is sent to local streams and irrigation canals to allow basins to accommodate further runoff. No data is currently available on stormwater recharge volumes in the City.

6.5 Wastewater and Recycled Water

The City does not recycle water for direct use of any kind. Treated effluent from the wastewater treatment facility (WWTF) is disposed through on site percolation ponds. Although, this is not considered recycled water according to UWMP guidelines, it still helps to recharge the groundwater supply. This section describes the City's wastewater system and potential opportunities for recycled water.

6.5.1 Recycled Water Coordination

Legal Requirements:

CWC 10633
The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.

As part of the integrated master planning process, a recycled water feasibility study was completed by MWH Americas, Inc in 2013. This study evaluated the feasibility of constructing a new recycled water system for servicing selected users. The City coordinated with various water users and several were identified as part of the feasibility study, including Madera Unified School District, City parks, and the municipal golf course. Several alternatives were developed as part of the recycled water feasibility study. The study estimated that recycled water usage could eventually be as high as 3,300 AF/year. Recycling wastewater was found to be technically feasible and the study found there would be demand for the recycled water. However, all alternatives were considered to be cost-prohibitive at the time; the cost to treat and distribute the water would be far more than potential water fees collected at the rates the City believes could be charged. The report instead recommended that City Well 27, which has required treatment before potable use, be used to provide non-potable water to certain customers, thus conserving the City's supply of potable well water.

6.5.2 Wastewater Collection, Treatment, and Disposal

Legal Requirements:

CWC 10633 (a) (Describe) the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.
CWC 10633 (b) (Describe) the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

Wastewater is collected throughout the City of Madera via a network of sanitary sewer collection pipelines ranging from 8 to 48 inches in diameter. With the aid of five sewer lift stations, the influent is gravity-fed to the WWTF, located approximately seven miles west of the City limits. The WWTF was constructed in 1972, and provides primary and secondary treatment without disinfection. A plant expansion and upgrade was completed in 2007, which resulted in a treatment capacity of 10.1 mgd. The plant has 280 acres of land for incidental recharge and evaporation of effluent. The treatment process consists of screening, grit removal, sedimentation, an activated sludge process, and final clarification. Also included in the plant expansion were an odor control and a water reclamation system to provide water for plant purposes.

There are approximately 12,800 residential connections, each typically with a 4-inch sewer service connecting to the main. Commercial and industrial customers number just over 1,000 and are connected with service lines appropriate to handle their particular wastewater load. The average daily wastewater volume for 2015 was estimated to be approximately 4.8 mgd. The City of Madera has no facilities for extensive storage of the wastewater before treatment. Septic haulers from outside the City service area bring in an additional volume of wastewater. The most recent data show that outside septic waste collection contributes less than 1 percent of total volume, though the biological loading is disproportionately higher due to the higher strength of the septage versus domestic wastewater.

The effluent from the City of Madera's WWTF is disposed to fourteen 20-acre percolation/evaporation ponds. The WWTF Expansion Predesign Report by Boyle Engineering (July 2004) proposed a system of recovery wells that would pump groundwater from under the percolation ponds to an MID canal for agricultural irrigation. This pumping of percolate would be intended to reduce groundwater mounding under the WWTF and to control elevated concentrations of nitrate or other contaminants in the underlying groundwater. A recovery well has been installed, but the implementation of the project has encountered regulatory hurdles and the system has yet to be operated as planned.

In the 2010 UWMP, future wastewater collection and treatment data were generated by assuming a 50 percent return-to-sewer ratio for water use within the City. In 2015, the ratio was 58%, which likely reflects the anomalous and extensive 2015 State-mandated water conservation requirements, which primarily reduced outdoor water use.

Table 6-2: Wastewater Generated within Service Area in 2015

Wastewater Collection Agency	Wastewater Treatment Agency	Treatment Plant Name	Is WWTP Located Within Service Area?	Was Volume Measured or Estimated?	Volume of Wastewater Collected from the Service Area
City of Madera	City of Madera	Madera Wastewater Treatment Facility	No	Measured	16,503 MG

Table 6-3: Wastewater Treatment and Discharge within Service Area in 2015

Name of Wastewater Treatment Plant	Discharge Location Name or Identifier	Discharge Location Description	Method of Disposal	Does this Include Wastewater Generated Outside the Service Area?	Treatment Level	2015 Volumes (AF)				
						Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area, in other UWMP	Recycled Outside of Service Area, not in other UMWP
Madera Wastewater Treatment Facility	WWTF Percolation Ponds	280 acres at the WWTF	Percolation Ponds	Yes, Septage	Secondary Undisinfected	16,503	16,503	0	0	0

6.5.3 Recycled Water Systems

Legal Requirements:

CWC 10633(c) (Describe) the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

The City does not recycle water.

Treated effluent from the WWTP is disposed of through percolation ponds at the WWTFP, which, though not considered recycled water by the Department of Water Resources, still helps recharge the Madera Groundwater Subbasin.

6.5.4 Recycled Water Beneficial Uses

Legal Requirements:

CWC 10633(d) (Describe and quantify) the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.
CWC 10633(e) (Describe) the projected use of recycled water within the supplier's service area at the end of 5, 10, 15 and 20 years…
CWC 10633(e)
(Describe) the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

The City does not currently use recycled water within its service area.

The City completed a recycled water study, which found water recycling to be economically unfeasible at the time. Several potential beneficial uses exist, including industrial water usage, landscape and golf course irrigation, and agricultural irrigation. If economic conditions change, or the City can successfully secure grants for a major portion of the capital costs, the City may reconsider recycled water in the future.

Any potential use for recycled water would have to improve water balance from the current operation, which effectively allows most treated wastewater to percolate back to the drinking water aquifer. An application where recycled water could directly replace groundwater pumping would be a more efficient use of the water, and could be advantageous if the business case could be made.

6.5.5 Actions to Encourage and Optimize Future Recycled Water Use

Legal Requirements:

CWC 10633(f) (Describe the) actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre- feet of recycled water used per year.
CWC 10633(g) (Provide a) plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

While the City's earlier study found production and use of recycled water to be uneconomical, the City may reconsider a recycled water system if a significant portion of the capital costs can be funded through grants and if uses can be found which directly reduce use of potable water. The City can also provide assistance to industrial or commercial customers in developing recycling water on-site.

Table 6-4: Methods to Expand Future Recycled Water Use

Actions	Planned Implementation Year	Expected increase in recycled water supply (AFY)
Assist commercial and industrial customers with developing recycled water on-site	On-going	Unknown
Seek funding for capital costs if economics of recycled water improve	Unknown	3,300 AF

6.6 Desalinated Water Opportunities

Legal Requirements:

§10631(i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

The UWMPA requires that the UWMP address the opportunities for development of desalinated water, including ocean water, brackish water and groundwater.

6.6.1 Brackish Water and/or Groundwater Desalination

The groundwater that the City relies on is not brackish or in need of desalination. If this were to change in the future, the City will consider this option.

6.6.2 Seawater Desalination

Due to the geographic location of the City, desalination of seawater for use by the City is not practical or economically feasible.

6.7 Exchanges or Transfers

Legal Requirements:

§10631(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

The City occasionally purchases small quantities of surface water, typically a few hundred acre-feet at a time, from MID to recharge in City stormwater basins. Purchases are subject to approval by the MID Board of Directors. MID water supplies have been reduced due to the San Joaquin River Restoration Program, and it is expected that in the future they will only sell water in wet years when they have surplus supplies. There is currently no long-term agreement between the City and MID, and purchases are made on an ad hoc basis.

6.8 Future Water Projects

Legal Requirements:

CWC 10631(g) …The urban water supplier shall include a detailed description of expected future projects and programs… that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

Future water projects for the City of Madera are documented in their 2014 Groundwater Management Plan (GMP) and 2014 Water System Master Plan (WSMP).

Groundwater Management Plan

The GMP lists several projects that could help alleviate overdraft. These projects are listed below. Specific details on the projects are not included in the GMP.

- Airport Basin
- Ellis Basin
- Fresno River Dam in City of Madera
- Future basin sites
- Future stormwater collection/recharge sites
- Golf course basin sites
- Schmidt Creek Flood Control and Groundwater Recharge Project

Water System Master Plan

The WSMP proposed a Capital Improvement Program that includes approximately 114 miles of pipeline improvements, 23 new wells, two new storage reservoirs, and two new booster stations that will convey water from the west side of the City to the east, with a project cost totaling over $148 million dollars through 2050. These projects address both existing deficiencies and necessary expansions to accommodate planned growth. Projects will be implemented as needed, not strictly on the schedule in the WSMP. The 2014 WSMP was based on a 3.5% growth annual population rate and a static per-capita water consumption rate. Currently, the City’s growth rate is projected to be about 2.0% over time so Plan implementation may proceed at a slower pace than anticipated in the WSMP.

The number of projects and their specific yields are too large to list. Readers are referred to the WSMP for more details.

6.9 Summary of Existing and Planned Sources of Water

Legal Requirements

CWC 10631
(b)Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision 10631(a). (4) (Provide a) detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

The City plans to continue using groundwater to meet their water demands. The City has made extensive progress in reducing per capita demands, which has reduced stress on the groundwater aquifer. The City has occasionally purchased small quantities of surface water from the Madera Irrigation District for recharge in City stormwater basins. The City may continue or expand surface water purchases to help meet future demands, but there are currently no long-term agreements in place, and purchases are made on a year-to-year basis.

Table 6-5: Retail Water Supplies — Current and Projected

Water Source	2015		2020[1]	2025	2030	2035	2040
	Actual Volume	Level of Treatment of Source Water					
Purchased Water	0	-	0	0	0	0	0
Groundwater	9,314	Drinking Water	15,700	17,400	19,200	21,100	23,400
Imported Surface water	0	-	0	0	0	0	0
Recycled Water	0	-	0	0	0	0	0
Desalinated Water	0	-	0	0	0	0	0
Stormwater Use	0	-	0	0	0	0	0
Transfers	0	-	0	0	0	0	0
Exchanges	0	-	0	0	0	0	0
Total	9,314	-	15,700	17,400	19,200	21,100	23,400
Estimated Demands	9,314	-	15,700	17,400	19,200	21,100	23,400

1 – Water usage increases substantially in 2020 because it is assumed that 2020 water usage is the same as the 2020 Target (196 gpcd). 2015 usage was substantially below the 2020 Target at 128 gpcd

7 Water Supply Reliability

The Urban Water Management Planning Act requires that UWMPs address the reliability of the agency's water supplies. This includes supplies that are vulnerable to seasonal or climatic variations. The UWMPA also requires that the UWMP include information on the quality of water supplies and how this affects management strategies and supply reliability. In addition, an analysis must be included to address supply availability in a single dry year and in multiple dry years. The relevant sections of the UWMPA are presented below.

This chapter addresses these UWMPA requirements as follows. First, the reliability of the City's water supply sources is described. Secondly, a comparison of supply and demand under normal, single dry year, and multiple dry years is provided. Next, planned and potential future supply projects and programs that would impact overall supply availability and reliability are discussed. Lastly, factors impacting inconsistencies of supply are described.

7.1 Constraints on Water Sources

Legal Requirements:

CWC 10631(c)(2)
For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.
CWC Section 10634
The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

The City faces the same ongoing water supply challenges as other water purveyors in the San Joaquin Valley. Increased groundwater pumping and water quality concerns have resulted in a greater focus on pumping, overdraft, and reuse.

The 2014 Sustainable Groundwater Management Act (SGMA) will require that groundwater supplies be managed for long-term sustainability, with no net long-term overdraft. In other words, the Act will limit how much groundwater can be pumped. At the time of this UWMP, many provisions in SGMA have not yet gone into effect, and, throughout the state, water agencies are only in the preliminary planning stages for SGMA compliance. As a result, DWR does not require that SGMA be addressed in the 2015 UWMPs. The City of Madera is currently reviewing the SGMA guidelines and evaluating alternatives for complying with the new regulations. SGMA will be addressed in the City's 2020 UWMP. However, the City's tremendous success in reducing per capita demands will be a major factor in helping them comply with SGMA.

7.2 Reliability by Type of Year

Legal Requirements:

CWC 10631(c) (1)
Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following: (A) an average water year, (B) a single dry water year, (C) multiple dry water years.

There are two aspects of supply reliability that can be considered. The first relates to immediate service needs and is primarily a function of the availability and adequacy of the supply facilities. The second aspect is climate related, and involves the availability of water during mild or severe drought periods. This section compares water supplies and demands during three water scenarios: normal water year, single dry water year, and multiple dry water years. These scenarios are defined as follows.

Normal Year
The normal year is a year in the historical sequence that most closely represents median runoff levels and patterns. The supply quantities for this condition are derived from historical average yields.

Single Dry Year
This is defined as the year with the smallest available useable supply. The supply quantities for this condition are derived from the minimum historical annual yield.

Multiple Dry Years
This is defined as the three consecutive years with the smallest available useable supply. Individually, none of these years may be the driest on record. Rather, the requirement looks at the three actual consecutive years of record with the smallest available water supply. Water systems are more vulnerable to these droughts of long duration, because they deplete water storage reserves in local and state reservoirs and in groundwater basins.

Drought years were based on a comparison of local precipitation to the long-term average precipitation. Since the City does not have a surface water supply tied to runoff from a watershed, the local precipitation is considered a reasonable indicator of hydrologic conditions. Local precipitation is generally related to the amount of local recharge, surface water supplies available to surrounding areas, and reliance on groundwater supplies. Base years for different hydrologic year types are shown in the table below.

Table 7-1: Bases of Water Year Data

Water Year Type	Base Year(s)	Volume Availability (local rainfall)	% of Average Supply[1]
Average Water Year	1992	11.00 inches	100%
Single-Dry Water Year	2013	2.47 inches	22%
Multiple-Dry Water Years – 1st Year	2013	2.47 inches	22%
Multiple-Dry Water Years – 2nd Year	2014	5.42 inches	49%
Multiple-Dry Water Years - 3rd Year	2015	3.85 inches	35%

1 - Based on long-term average of 10.99 inches per year

7.3 Supply and Demand Assessment

Legal Requirements:

CWC 10635(a)
Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional or local agency population projections within the service area of the urban water supplier.

Normal Year
Normal year demand projections are presented in Chapter 4. Projections were generated by applying demands that incorporate conservation targets to projected population. As shown in the table below, current water supplies are anticipated to be sufficient to meet demands in normal year conditions through year 2040.

Table 7-2: Normal Year Supply and Demand Comparison

Water Use	Water Use (AFY)					
	2015	2020	2025	2030	2035	2040
Supply Totals	9,314	15,700	17,300	19,200	21,100	23,300
Demand Totals	9,314	15,700	17,300	19,200	21,100	23,300
Difference	0	0	0	0	0	0

Single-Dry-Year and Multiple-Dry-Years
Since the City does not have multiple supply sources, it is necessary for the City to pump groundwater to meet all projected demands. As shown in Tables below, anticipated supplies of groundwater are sufficient to meet all demands through year 2040 even under drought conditions.

It is important to consider that the Madera Subbasin has historically been in a state of critical overdraft. The tables below assume that the supply is equal to demand only because there is currently a sufficient volume of water within the subbasin to meet the projected demand. In order to continue to utilize groundwater, it is essential that the City continue its current efforts towards conservation, groundwater recharge, and groundwater management. Maintaining a low per capita water use, accomplishing groundwater recharge in collaboration with Madera Irrigation District, water metering, and possibly production and use of recycled water are all important components of ensuring the ongoing sufficiency of the Madera Subbasin. Groundwater banking for drought years is also a possible drought protection measure, ensuring that years with low surface runoff do not further harm the subbasin.

The City will need to continue developing additional demand management measures and water supply management strategies to assure the Subbasin aquifer is adequate to meet projected demands. As with the Basin Management Objectives identified in the Regional Groundwater Management Plan, success will be defined in part by reaching a point where demands do not exceed the annual recharge of the aquifer, and the groundwater elevation first stabilizes and then begins to recover.

Based on an analysis of historical data, the 2010 UWMP assumed that dry-year and multiple-dry-year demands would be 11% higher than normal years, due to higher evapotranspiration, lower soil moisture, and lower effective precipitation to satisfy landscape water needs. Absent regulatory intervention, this is a reasonable assumption and reflects past conditions. However, the City has aggressively pursued conservation measures, instilled a culture of water conservation, and has successfully implemented their Water Shortage Contingency Plans in recent droughts. Combined with the State's demonstrated willingness to impose tough outdoor water use restrictions in severe drought time, it is now considered more reasonable to assume that water demands will go down in drought years, due to implementation of the City's Water Shortage Contingency Plan and the effects of State requirements. The tables below assume that water demands go down 10% in a Single Dry year, 10% in each of the first two years of a 3-year drought, and 20% in the third year of a 3-year drought.

Table 7-3: Single Dry Year Supply and Demand Comparison

Water Use	Water Use (AFY)					
	2015	2020	2025	2030	2035	2040
Supply Totals	8,400	14,100	15,600	17,300	19,000	21,000
Demand Totals	8,400	14,100	15,600	17,300	19,000	21,000
Difference	0	0	0	0	0	0

Table 7-4: Multiple Dry Year Supply and Demand Comparison

		Water Use (AFY)					
		2015	2020	2025	2030	2035	2040
Year 1	Supply totals	8,400	14,100	15,600	17,300	19,000	21,000
	Demand totals	8,400	14,100	15,600	17,300	19,000	21,000
	Difference	0	0	0	0	0	0
Year 2	Supply totals	8,400	14,100	15,600	17,300	19,000	21,000
	Demand totals	8,400	14,100	15,600	17,300	19,000	21,000
	Difference	0	0	0	0	0	0
Year 3	Supply totals	7,500	12,600	13,800	15,400	16,900	18,600
	Demand totals	7,500	12,600	13,800	15,400	16,900	18,600
	Difference	0	0	0	0	0	0

7.4 Water Quality Impact on Reliability

The City of Madera's water system currently meets state and federal guidelines for regulation of contaminants and monitoring requirements. A copy of the City's Consumer Confidence Report is included in **Appendix H**.

MWH Americas evaluated water quality regulations pertinent to the City and summarized the results in a letter report (refer to the 2014 WSCP for a copy of the letter report). Water quality tests for City wells did not reveal contaminant levels in excess of established primary MCLs, with the exception of Well No. 27. The report identifies the following issues with Well Nos. 21, 27, and 33:

- Well No. 27 requires treatment using GAC for ethylene dibromide (EDB) and dibromochloropropane (DBCP), and has not been used recently. The City plans to install a nitrate analyzer to Well No. 27 with the intent of running the well. Water will be flushed until nitrate levels drop below the MCL, then the well will run continuously. This will be done since GAC traps nitrate, which can sometimes be released from the GAC during short periods resulting in high nitrate concentrations in the water. Monitoring the nitrate levels will help to reduce nitrate accumulation and the potential for a release.Well No 21 and Well No. 33 have quantifiable amounts of DBCP, but do not exceed the MCL. Additionally, other wells in and around the City have measurable levels of nitrate, but do not exceed the MCL.

These groundwater quality issues do not currently pose a threat to the City's water reliability.

Other water quality issues are discussed in Section 6.2.2. Careful planning and placement of new wells can help to avoid water quality issues in the City. While it was preferred to continue constructing groundwater supply wells throughout the City, review of the groundwater conditions, completed by Kenneth D. Schmidt and Associates, combined with recent groundwater test holes, indicate high probabilities of poor water quality and low well yields in the east and northeast part of the City. As a result, future supply wells will be located in the western part of the City, and the CIP includes projects designed to facilitate transport of water from west to east to meet city-wide standards.

7.5 Regional Supply Reliability

Legal Requirements:

CWC 10620 (f)
An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

Table 7-5 shows the main water supply sources for the City, and factors that could impact overall reliability.

Table 7-5: Factors Resulting in Inconsistency of Supply

Water supply sources[1]	Specific source name, if any	Limitation quantification	Legal	Environmental	Water quality	Climatic
Groundwater	Madera – Sub-basin				X	X
MID Surface Water	Annual surface water purchases	X				X

Groundwater

Isolated groundwater quality issues may impact only a subset of the City's wells. In addition, increasing concentrations of total dissolved solids (TDS) over time may indicate TDS sources from human activities such as wastewater percolation, agricultural drainage, or the migration of poorer quality water toward pumping depressions to the northeast. Given that the City has the ability to influence some of the activities that cause water quality issues, as well as alter the pumping regimes, which then influence groundwater flow in the region, groundwater management practices should be adjusted to ensure a consistent groundwater supply.

Groundwater levels can also fluctuate based on climatic conditions, mostly as a result of increased dependence on groundwater in areas surrounding the City when surface supplies are limited in droughts. This can cause a reduction in groundwater levels.

MID Surface Water

The City has purchased small quantities of surface water from MID in the past. The quantity is typically limited and purchases are subject to approval by the MID Board of Directors. MID water supplies have been reduced due to the San Joaquin River Restoration Program, and it is expected that they will only sell water in wet years then they have surplus supplies.

8 Water Shortage Contingency Planning

Water supplies may be interrupted or reduced significantly in a number of ways, such as a drought, which limits supplies, an earthquake, which damages water delivery or storage facilities, a regional power outage, or a toxic spill that affects water quality. This chapter describes how the City plans to respond to such emergencies so that needs are met promptly and equitably. The City's Water Shortage Contingency Plan is described in this chapter.

The groundwater aquifer, which supplies the City, is large, covering much of the San Joaquin Valley, and is known to contain several million acre-feet of water, with an average annual replenishment of over two million acre-feet. While it is acknowledged that the aquifer is overdrafted and the groundwater level has declined over the past several decades (See Section 6, Water Supplies), the rate of decline in the City has been moderate and the groundwater surface has not been subject to sudden changes. As a result, the quantity of water available from this water source is considered to be very reliable and not subject to sudden failure due to natural causes.

Despite the reliable nature of the aquifer, other factors could create a water emergency for the City. As demonstrated by the actions of the State during 2015, an executive order from the Governor's office, or an act of the Legislature, can have a profound effect on the City's access to water. The 2015 executive order requiring a 28 percent reduction in overall water use created such an emergency for the City, despite the ongoing availability of groundwater for the City's use.

8.1 Stages of Action

Legal Requirements:

CWC 10632 (a)
(1) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions, which are applicable to each stage.

As part of the preparation of the City's 1995 UWMP, the City Council adopted Resolution Number 95-52, Adoption of a Water Shortage Contingency Plan (WSCP). The plan identifies four water shortage stages and accompanying supply conditions. The WSCP has since been modified, most recently by Ordinance C-4-2015 in 2015 in response to Governor Brown's Executive Order declaring a water emergency. The 2015 WSCP primarily addresses outdoor landscape watering. Both of these ordinances can be found in **Appendix I,** and are collectively called the Water Shortage Contingency Plan. Each WSCP includes different tiers with increasing water use restrictions. The 1995 WSCP includes Stages 1 through 4. The 2015 WSCP includes Levels A through E. Currently, the two WSCPs are jointly used, and the water use restrictions in both plans are combined. Note that the 2015 WSCP focuses on outdoor water use restrictions, while the 1995 WSCP contains more details on triggers for declaring water shortages, customer actions to reduce water use, and public ageny consumption reduction methods.

8.1.1 Triggers for Water Shortage Stages

1995 Water Shortage Contingency Plan - Water shortage stages are defined in the 1995 resolution 95-52, which adopted the Water Shortage Contingency Plan. The WCSP includes supply conditions that initiate each water shortage stage (**Table 8-1**).

Water shortage stages are declared by the City Administrator as advised by the Water Shortage Response Team, chaired by the Water Division Supervisor. In addition, it is recommended that the declaration of a water shortage stage be based on the following factors:

- Reduced average static ground water levels
- Local factors such as degradation of water
- Regional factors such as increased groundwater extraction by other users
- Regulatory factors including the Governor's order regarding water emergency
- Failure of equipment within the City's water system

Table 8-1 lists the initiating conditions for each stage, along with suggested groundwater level triggers based on historic groundwater data. The suggested groundwater level triggers for each shortage stage were calculated considering potential reduction in the area of well screen to groundwater interface, as a result of reduced groundwater levels. It was assumed that as groundwater levels fall, the reduction in available well screen area corresponds to a reduction in supply from the City's groundwater wells. The suggested triggers were based on the level at which the reduction in supply equates to the minimum demand reduction for that shortage stage. A drawdown of 50 feet was assumed based on the historical difference between static and pumping levels.

Table 8-1: Triggers for Water Shortage Stages

City of Madera Water Shortage Plan Stage Initiating Conditions	Suggested Associated Groundwater Level (1,2)
Stage 1: Continued decrease of water table due to weather conditions and overdraft pumping	-
Stage 2: Weather forecasts predict a continuing trend of drier than normal conditions with a further deterioration of groundwater levels	245 ft bgs
Stage 3: Ground water levels have decreased to the point that City wells are in jeopardy of breaking suction	260 ft bgs
Stage 4: Customer demands and system pressure criteria requirements cannot be met	330 ft bgs

1. Associated Groundwater Level is calculated as the capacity weighted average depth to groundwater level for all the City's wells
2. The suggested groundwater level is based on the assumption that the overall reduction of well screening area will result in a corresponding reduction in supply from groundwater wells, and is the level at which the percentage reduction of capacity weighted average screen range available equals the minimum demand reduction for the water shortage stage.

Ordinance C-4-2015 (Outdoor Watering Ordinance) – The Outdoor Watering Ordinance deals specifically with outdoor watering requirements, which were targeted by the City as the best and most effective way to respond to the State mandate that they reduce consumption by a State mandated 28 percent below 2013 levels. Any of these response levels can be triggered by Resolution of the City Council. The Ordinance does not contain any objective or automatic triggers. Ordinance response levels are different from and independent of the levels in the 1995 WCSP.

8.1.2 Summary of Response Levels

Conservation targets for each Response Level in the WCSP are summarized in Table 8-2. As a Response Level is declared, all water conservation measures for the previous Response Level are also enforced.

Table 8-2: Water Shortage Plan Response Levels

Response Levels	Restrictions	Conservation Target
Stage 1 – Existing Conditions	Voluntary	Limit water use increase to population increase
Stage 2 – Potential Moderate Shortage	Mandatory	5 - 10%
Stage 3 – Serious Shortage	Mandatory	10 - 35%
Stage 4 – Critical Emergency Shortage	Mandatory	35 - 50%

These can be supplemented with provisions in the 2015 WSCP (Levels A through E) focused on outdoor watering.

The City relies on the San Joaquin Valley aquifer for its water supplies. With an overall volume of several million acre-feet, the aquifer is not subject to sudden rises or shortages and contains sufficient water to serve the City and other water users, which have relied on it for decades, even in its overdrafted condition. If the overdraft continues unabated, and storage reserves are reduced substantially, then this assumption will be revised and the WSCP will be amended accordingly.

8.1.3 Procedures for Declaring Response Levels

Response levels for the Water Shortage Plan and the Outdoor Watering Levels are proposed by the City Administrator and approved by the City Council, following the guidance for conditions and groundwater levels set forth in **Table 8-2** above. The City Council always has discretion to delay or speed declaration of a given response level depending upon other conditions.

8.2 Prohibitions on End Users

Legal Requirement

CWC 10632 (a)
(4) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

Prohibitions on end users are shown in the Table below.

Table 8-3: Water Shortage Plan Prohibitions on End Users

Response Levels	Restrictions	Explanation	Penalty
Stage 1 – Existing Conditions	Voluntary	Outside irrigation limited to 3 days per week based on street address No hosing of paved surfaces No irrigation between 11 a.m. and 7 p.m No water is allowed to run into street or gutter Water leaks must be repaired within 5 days of citation Evaporative coolers must be equipped with water recirculation devices No washing down of buildings other than for painting or other maintenance No continuous flow for recreational purposes Require recirculation of water in new commercial car washes	Yes
Stage 2 – Potential Moderate Shortage (5% to 10%)	Mandatory	All Stage 1 prohibitions become mandatory Voluntary reduction of water consumption by stricter adherence to Water Use Regulations	Yes
Stage 3 – Serious Shortage (10% to 35%)	Mandatory	All Stage 1 and Stage 2 prohibitions Stricter adherence to Water Use Regulations Outside watering is limited to two days a week Water served to restaurant customers only upon request to promote conservation and public awareness of drought conditions Existing commercial carwashes required to install water recirculation equipment	Yes
Stage 4 – Critical Emergency Shortage (35% to 50%)	Mandatory	All Stage 1 through Stage 3 prohibitions Outside watering limited to one day per week Installing low-flow showerheads and toilet tank displacement devices	Yes

Stage 1 – Existing Conditions occurs when there is a continuous decrease of the water table due to weather conditions and overdraft pumping.

Stage 2 – Potential Moderate Shortage occurs when weather forecasts predict a long period of drought conditions accompanied by deteriorating groundwater conditions. The target reduction in water consumption for this stage is five to ten percent.

Stage 3 – Serious Shortage occurs when, in addition to continuing drought conditions, standing groundwater level has decreased to the point where City wells are in jeopardy of breaking suction. The target reduction in water consumption for this stage is 10 to 35 percent.

Stage 4 – Critical Emergency Storage occurs when customer demands and system pressure requirements cannot be met. The target reduction in water consumption for this stage is 35 to 50 percent.

For each of the requirements above that deal with outdoor watering restrictions, the requirements in the WSCP have been superseded by Ordinance C-4-2015. Outdoor watering requirements can now be set to any of five levels of restriction by the City Council, without change to the overall Water Shortage Plan response level that is in place. This allows the City to quickly respond to a need to reduce overall consumption, even in cases when the written triggers in the WSCP have not been met.

Prior to the 2015 water emergency, the City had been enforcing restrictions equivalent to Level B. With the adoption of this ordinance, the City Council chose to impose Level C outdoor watering restrictions, which remain in effect at the time of this report. The table below summarizes water use restrictions adopted in the 2015 ordinance.

Table 8-4: Outdoor Watering Ordinance Prohibitions on End Users

Response Level	Restriction
Level A, Limited Provisions:	Outdoor application of water for irrigation and recreation uses shall be restricted to the hours of 7:00 pm to 10:00 am.
Level B, Moderate Provisions:	Outdoor application of water for irrigation and recreation uses shall be restricted to the hours of 7:00 pm to 10:00 am and restricted to usage on Sunday and Thursday for even addressed parcels and Saturday and Wednesday for odd addressed parcels.
Level C, Significant Provisions:	Outdoor application of water for irrigation and recreation uses shall be restricted to the hours of 7:00 pm to 10:00 am and restricted to usage on Sunday for even addressed parcels and Saturday for odd addressed parcels.
Level D, Aggressive Provisions:	Outdoor application of water for irrigation of plants shall be limited to drip system designed to only irrigate trees and bushes to minimally maintain their viability. Irrigating of lawn/turf using any method of watering shall be prohibited.
Level E, Extreme Provisions:	All outdoor application of water for irrigation of plants other than edible crops for personal consumption shall be eliminated.

In addition to the five levels of outdoor watering restriction set forth in **Table 8-4** above, the ordinance contains a number of other use requirements and prohibitions, including the following:

- Food for personal consumption: Watering of plants by drip irrigation that is grown as food for personal consumption (not for medicinal use) shall always be allowed to be watered on any day of the week between the hours of 7:00 p.m. to 10:00 a.m.
- Household Gray Water: Up to 100 gallons per household per parcel per day of reused domestic water from showers, washing, etc. "Gray Water" may be reutilized for outdoor watering, subject to applicable health and safety regulations.
- Importation of Water: Except for Recycled or “Gray” water, no water which is obtained from a source other than the City's municipal water system may be used for outdoor watering.

8.3 Penalties, Charges, and Other Enforcement of Prohibitions

Legal Requirements:

CWC 10632 (a)
(6) Penalties or charges for excessive use, where applicable.

The Water Shortage Contingency Plan identifies penalties in addition to basic use violations, to be associated with each stage of action.

- Stage 1 Violations
  Penalties for violations were increased in 2015. They are currently as follows:
    - Violation 1 - $75 surcharge on next water bill
    - Violation 2 - $250 surcharge on next water bill
    - Violation 3 - $500 surcharge on next water bill
- Stage 2 Violations
    - Penalties will be the same as Level 1, but a follow up letter will be sent after the second violation and an education visit and warning will be issued after the third violation. Further violation concerns will be met with staff contact to resolve violations, with water service shutoff as a potential consequence. A reconnection fee will be issued in the event of a shutoff.
- Stage 3 Violations
    - Penalties will be the same as Level 2, but violation 2 will be accompanied by an additional surcharge and educational visit from City Staff. Violation 3 will be accompanied by a second additional surcharge, possible installation of a water meter (if not already metered), a flow restriction devise on connection or discontinuation of service of situation if not resolved.
- Stage 4 Violations
    - Penalties will be the same as Level 3, and City Council will consider increasing surcharges for violation of Water Use Regulations.

8.4 Consumption Reduction Methods by Agencies

Legal Requirements:

CWC 10632 (a)
(5) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

The City has established the following consumption reduction methods to help reduce water use. These are measures that the City (as opposed to customers) would implement.

Table 8-5: City Consumption Reduction Methods

Response Level	Consumption Reduction Methods by Water Supplier
1,2,3,4	Prepare and mail Annual Water Use Regulations to all customers
1	Two water patrol personnel enforcing regulations 80 hrs/week from Apr 1st to Oct 31st
1	Check groundwater levels quarterly
2	Check groundwater levels monthly
2,3,4	Public Works Department initiates its annual water conservation program
2,3,4	Third Water Patrol added
2,3,4	Increase public information campaign
2,3,4	Work with news media to publicize water savings
2,3,4	Disseminate water savings technical information to specific customer types.
2,3,4	Recruit and train volunteers for speaker's bureau.
2,3,4	Distribute water conservation kits to all customers
3,4	Check groundwater levels weekly
3,4	Pass City of Madera Resolution declaring Water Shortage Emergency
3,4	Revue water revenue, and adjust if necessary
3,4	Hire part-time employee to coordinate Water Conservation Program
3,4	Distribute landscape conservation, drought tolerant garden and efficient irrigation info.
3,4	Publicize Stage 4 reduction requirements if conditions worsen
3,4	Eliminate fire hydrant flushing, except when absolutely necessary
3,4	Discontinue irrigation of selected turf areas at parks and schools
3,4	Require low flow toilets and showerheads, and faucet aerators prior to property sale
3,4	Require hot water re-circulating systems or on demand water heaters in new construction
3,4	Initiate high visibility low flow toilet replacement program (elected officials, City Hall, etc.)
3,4	Lower bowls on city wells (if needed)
4	Implement the City of Madera Water Quality Emergency Notification Plan
4	Moratorium on new water services until shortage ends
4	Discontinue irrigation of park and school district athletic fields
4	Rate increases to finance improvements
4	Require all homes to install low flow showers/toilets and fix leaks. Hire compliance officer.

8.5 Tracking Water Use Reductions

Legal Requirements:

CWC 10632(a)
(9) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

As of 2015, the City is 90% metered, and expected to be fully metered by 2018. As a result, the City will soon have the tools to monitor specific consumption at all connections. Users with increasing or excessive consumption relative to their neighbors can be identified, and City staff can work with these customers to identify issues with leaks, equipment, or behavior that are driving above-average water consumption. The City's wells are fully metered, and the City will soon be able to compare well pumping to customer use, to help identify system losses.

With the upgrade of the Water Department's Supervisory Control and Data Acquisition (SCADA) equipment, precise and detailed reports can be easily generated for water production at any or all of the City's groundwater wells. Under all water supply conditions, production is measured by the SCADA system every 20 seconds and is recorded perpetually; first, at the control station hard drive; then, periodically at secondary electronic storage media. Regulation reports are printed monthly and kept on file.

Under normal Stage 1 conditions, the Water Department Operations Manager reviews the Daily Water Production Report before it goes to file.

In the event of a Stage 2 water shortage, the Operations Manager will review daily production figures every week and check them against a previous three years average to ensure compliance with the 5 to 10 percent Stage 2 reduction goal.

During a Level 3 water shortage, production figures are reviewed daily by the Water Division Operations Manager and the Public Works Director. The City Administrator and the City Council will be kept informed weekly of production levels, particularly of non-attainment of the 10 to 35 percent Stage 3 reduction goal.

When a Level 4 water shortage is declared, a production report will be provided to the Operations Manager twice daily, and daily to the Public Works Director. If the 35 to 50 percent reduction goal is not being met, the City Administrator and City Council will be immediately informed.

City residents can call the Public Works Department to get information on their water use. The City is currently upgrading its water monitoring software, with the goal of allowing individual customers to review their water use in near-real-time, over any internet connection. This will be a benefit to users enabling them to track water usage and exercise more control over the variable-cost component of their water bills. Additionally, it will allow the City to add accountability to customers who are using substantially more than the average household, by printing warnings on water bills, and adding quantity-based fines to the current ordinance restrictions. Involving customers in the responsibility to monitor and control consumption will be an important step toward accountable water use.

8.6 Revenue and Expenditure Impacts/Measures to Overcome Impacts

Legal Requirements:

CWC 10632 (a)
(7) An analysis of the impacts of each of the actions and conditions described in paragraphs (1) to (6), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

According to the UWMPA, the UWMP is required to include an urban water shortage contingency analysis that addresses the financial impacts from reduced water sales.

It is anticipated that water shortages would result in a reduction in revenue. Since the substantial completion of the metering project in 2015, the City has implemented metered pricing, based in part on a fixed service charge and in part on a variable use charge driven by actual water volume metered. To the extent water use is reduced, the variable component of the water bills will go down and City revenues will be reduced.

The City will need to determine the extent of any revenue and expenditure imbalance as well as proposed measures to overcome impacts to City revenues and expenditure imbalances at the time the water shortage has started.

The revenue impacts of a water shortage for metered accounts are expected to parallel but be less than the consumption reductions of 5 to 10 percent in Stage 2, 10 to 35 percent in Stage 3, and 35 to 50 percent in Stage 4. Revenue impacts are of lower magnitude than use reductions because the fixed service portion of the bill would remain unchanged.

Water Department expenditures will rise with declaration of higher water conservation stages. Level 2 expenditure impacts include hiring an additional Water Patrol officer, distribution of water conservation kits, and media and public education campaigns. Level 3 involves further public education, and Level 4 is accompanied by further noticing, enforcement, education, and hiring of another part time seasonal compliance officer.

The City has sufficient operating funds to supplement short term deficiencies in revenue caused from a brief (one year or less) water shortage, but would need to quickly consider and implement rate changes if the per-service volume of water delivered were to decline significantly.

The City recently performed a Rate Study (Raftelis, 2015) and implemented new rates in 2015 that address many of the issues discussed above. The City's new water rates can be found in **Appendix J**.

8.7 Resolution or Ordinance

The City adopted its Water Shortage Response Plan on April 5, 1995. Copies of the relevant ordinances are included in **Appendix I**. The complimentary Ordinance C-4-2015 was adopted May 20, 2015 and operates alongside the Water Shortage Response Plan.

Table 8-6: City Ordinances and Resolutions for Water Shortage Measures

Ordinance or Resolution Number	Date	Legislation
95-52	4/5/95	Adopts City's Water Shortage Contingency Plan
C-4-15	5/20/15	Urgency Ordinance Relating to Water Service Restrictions

8.8 Catastrophic Supply Interruption

Legal Requirements:

CWC 10632(a)(3)
Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

During declared shortages, or when a shortage declaration appears imminent, the City will activate water shortage response measures, including a Stage 4 – Critical Emergency Shortage.

Because the City is reliant entirely upon groundwater drawn from an extensive basin, and not reliant on surface water, supplies which may have dramatic annual fluctuations or become suddenly disrupted by failure of a major conveyance system, the possibilities for a catastrophic system interruption are much more limited. Because of the distributed nature of groundwater production, there is no single facility whose loss would cripple supply. Each well contributes only a small percentage of the overall total, so the loss of one or even two or three wells simultaneously would not be crippling. Loss of a major proportion of the wells concurrently could occur from a failure of the power grid, but even that damage would be mitigated by engine-powered backup generators at many of the well sites.

Other failure mechanisms would not occur suddenly but could more plausibly affect a large percentage of the wells. A major contamination plume affecting the aquifer could render water unusable for potable purposes if untreated. There is no known contaminant plume upgradient of the City, so this threat, while possible, is not viewed as realistic at this time.

Significant decline in the aquifer's water surface elevation could drop the water surface below the well bowls. The Water Shortage Plan acknowledges this threat by using water surface elevation as the trigger for water conservation target levels. Because of the large size of the aquifer beneath the City, changes in level tend to occur with low to moderate rapidity. In every historic case of water elevation decrease, there has been time for the City to respond by deepening pump set elevations and changing bowls and motors as required to maintain production. Depending upon the severity of the drop, certain wells may not be deep enough to accommodate the necessary pump set depth, but this is not expected to be a widespread issue. Shallow wells will have to be replaced by new, deeper wells to maintain overall system capacity.

It is anticipated that a major or long-term disaster such as described would deplete City reserves and that restoration of the water distribution system would depend upon outside emergency funding to construct needed treatment facilities and/or new and modified supply wells. Either of these jobs, if needed throughout the system, would over-tax the City's existing reserves and bonding capacity.

For a major emergency such as an earthquake, Pacific Gas and Electric (PG&E) has declared that in the event of an outage, power would be restored within a 24 hour period. For example, after the 1994 Northridge earthquake, Southern California Edison experienced extensive damage to several key power stations, yet was able to restore power within 19 hours.

8.9 Minimum Supply Next Three Years

Legal Requirements:

CWC 10632 (a) (2)
An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

Future demands include an assumed 2% annual growth in all water sectors (residential, commercial, industrial and large landscape).

The very large aquifer supplying the City acts much as a reservoir, able to provide substantially the same water supply in dry years and wet years. Accordingly, the City expects that the water supply available to its users over the next several years will be sufficient to meet demands without reduction. The values in **Table 8-7** show anticipated demands for the next five year (2016 to 2020), which the City would be able to meet, even during periods of minimal rainfall and runoff. The values in **Table 8-7** assume that the 2020 target of 196 gpcd is met each year. This is a reasonable assumption because 2015 usage (128 gpcd) was well below the 2020 Target.

Table 8-7: Water Shortage Contingency – Minimum Supply (2016-2020)

	2016	2017	2018	2019	2020
Available Water Supply (AF)	14,500	14,800	15,100	15,400	15,700

9 Demand Management Measures

In 1991, a Memorandum of Understanding (MOU) regarding urban water conservation in California formed the California Urban Water Conservation Council (CUWCC). Council members can submit their most recent Demand Management Measures (DMM) Report with their UWMP to address the urban water conservation issues in the UWMPA. The City is not currently a signatory of the MOU, and is therefore not a member of the CUWCC. However, the City realizes the importance of the DMMs to ensure a reliable future water supply, and the City strives to meet the DMM standards established by the CUWCC. In 2015, the City was implementing all the DMMs described in the CUWCC MOU and UWMP guidelines.

Legal Requirements:

CWC 10631 (f)

(A) …A narrative shall describe the water demand management measure that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

(B)The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:

(i) Water waste prevention ordinances.
(ii) Metering.
(iii) Conservation pricing.
(iv) Public education and outreach.
(v) Programs to assess and manage distribution system real loss.
(vi) Water conservation program coordination and staffing support.
(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

CWC 10631

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) (A) … a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years.

9.1 DMMs

9.1.1 Water Waste Prevention Ordinances

The City's Water Shortage Contingency Plan (see **Appendix I**) identifies penalties for water waste or violating current drought regulations. The water waste ordinances can also be found in the Madera Municipal Code, Title 5, Chapter 5. The penalties associated with each stage of a water shortage are provided below.

- Level 1 Violations
  Penalties for violations were increased in 2015. They are currently as follows:
    - Violation 1 - $75 surcharge on next water bill
    - Violation 2 - $250 surcharge on next water bill
    - Violation 3 - $500 surcharge on next water bill
- Level 2 Violations
    - Penalties will be the same as Level 1, but a follow up letter will be sent after the second violation and an education visit and warning will be issued after the third violation. Further violation concerns will be met with staff contact to resolve

violations, with water service shutoff as a potential consequence. A reconnection fee will be issued in the event of a shutoff.

- Level 3 Violations
    - Penalties will be the same as Level 2, but violation 2 will be accompanied by an additional surcharge and educational visit from City Staff. Violation 3 will be accompanied by a second additional surcharge, possible installation of a water meter, a flow restriction devise on connection or discontinuation of service of situation if not resolved.
- Level 4 Violations
    - Penalties will be the same as Level 3, and City Council will consider increasing surcharges for violation of Water Use Regulations.

Further details on prohibitions and penalties are explored in Chapter 8, the Water Shortage Contingency Planning.

9.1.2 Metering

In compliance with State law, the City has nearly completed the process of placing meters on all customer water connections. As of the end of 2015, about 90% of the customer connections are metered. The City is expecting to be fully metered by 2017 or 2018. The City adopted a new rate structure in 2015 that includes commodity rates for metered connections (see Section on Conservation Pricing below). The City's current rate structure is included in **Appendix J**.

9.1.3 Conservation Pricing

In 2015, the City of Madera prepared the *City of Madera Utility Rate Study Report* (Raftelis, 2015). The major objectives of the study included:

1. Develop financial plans for the water and wastewater enterprises to ensure financial sufficiency, meet operation and maintenance costs, ensure sufficient funding for capital replacement and refurbishment needs, and maintain a strong financial outlook for the enterprises;
2. Develop sound and sufficient reserve fund targets;
3. Review current rate structures for the water and wastewater enterprises;
4. Develop a cost-of-service analysis for the water and wastewater enterprises; and
5. Develop fair and equitable utility rates.

The rate structure recommended in the rate study was adopted in 2015 and can be found in **Appendix J**. Prior to the new rate structure, customers with meters were charged a monthly fixed rate based on the size of the customers meter, and a variable (volume) charge based on usage. The City also has accounts that are not currently metered and these accounts are charged a flat monthly fee. Once these accounts are metered, they would be charged the corresponding metered rates.

The new rate structure includes a tiered rate system to promote conservation. The new system is described below:

- Single-Family Residential (SFR) water rates were modified from a uniform rate to a 3-tiered inclining rate structure. The tiers closely reflect the water demands of residential customers for indoor needs (Tier 1), outdoor needs (Tier 2), and any additional usage above Tiers 1 and 2 (Tier 3).
- Multi-Family Residential (MFR) water rates were modified from a uniform rate to a 2-tiered rate structure. Multi-family homes typically have no or low outdoor water usage, so Tier 1 reflects typical indoor usage, and Tier 2 includes usage above Tier 1.
- Non-Residential (commercial, industrial, etc.) accounts will remain on a uniform rate.

9.1.4 Public Education and Outreach

The City utilizes mass mailings and the City internet site to distribute information to all water service customers. Walk in customers are also provided with information at City Hall and at the Public Works Department Water Division. When called upon to distribute time sensitive notices and information, local print media is also used.

Mass mailings with information on regulations and Consumer Confidence Reports are performed every March. The City also provides additional information on conservation measures at this time. Display cases and public bulletin boards are utilized in the Public Works facility to display information that is mailed out.

The City staffs information booths at the annual Madera District Fair in September. The booths provide pamphlets and flyers with promotional and educational materials as well as updates on regulations and ordinances.

The City monthly water bill distributed to all water service customers also contains information regarding previous year water usage, conservation measures, and other updates.

The City makes staff available for guidance and educational tours of water system facilities. They have also developed a plan to enhance existing school education wherein students tour facilities and receive formal presentations at their schools. The City encourages local educators to include demand management education in their curriculum where appropriate. The City also makes presentations to neighborhood agencies and service clubs.

Table 9-1 summarizes the public outreach and education in 2015.

Table 9-1: Public Outreach and Education in 2015

Description	No. of Events
Schools	11
Swap Meets	2
Fairs/Festivals	4
Used Oil Events	2
Other Events	4
Madera Tribune	2
Monthly Newsletters	7
Television	1

9.1.5 Programs to Assess and Manage Distribution System Real Loss

The City operates a detection and repair program of its entire water distribution system. In addition, the City's distribution system includes a SCADA system to accurately record production quantities. All of the City's wells are metered; however, as of 2015, 10% of the City's water connections were not metered, and thus, a complete system water audit is not possible without assuming unmetered water usage. System audits to determine losses will be performed once meters are fully installed, which is expected in 2017 or 2018. Currently, water main records are maintained in a GIS system. The City has convenient access to historical data on each water main.

Although losses were estimated to be 7% to remain consistent with previous planning and engineering documents, water losses were also calculated using AWWA Free Water Audit Software. The AWWA spreadsheet is discussed further in Section 4.2. The AWWA spreadsheet breaks losses into various categories using assumed default percentages. These categories include unauthorized use (theft), metering inconsistencies, etc. The complete AWWA software spreadsheets can be viewed in **Appendix E**.

9.1.6 Water Conservation Program Coordination and Staffing Support

The City's Water Divisions Operations Manager has also served as the City's Water Conservation Coordinator since 1986. Water Conservation Coordinator duties include interdepartmental coordination, monitoring the practice and application of DMMs, supervision of the Conservation Water Patrol, and planning of community water conservation education projects. As the City's water Conservation efforts have expanded, additional staff have been used to implement water conservation measures. The City is in the process of hiring one full time person to oversee all of the water conservation programs, and guide other staff that help with those efforts.

9.1.7 Other Demand Management Measures

The City implements several other DMMs, which are described below.

Rebate Programs

The City operates numerous rebate programs to help defer costs for customers and encourage water conservation. Residents should check with the City to determine program qualifications and follow directions listed on the City website. These programs are described below.

High Efficiency Clothes Washer Residential Replacement Rebate Program

City residents may apply to receive a $50 rebate following the purchase of a qualifying High Efficiency Clothes Washer (HECW). An HECW can save up to 22 gallons of water per load. HECWs also have a higher load capacity reducing the number of loads required per household. HECWs are more energy efficient than standard washing machines reducing power bills and requiring less heated water, which will save on gas or electric depending on the customers' water heater fuel source. Residents should check with the City to see which models qualify for the rebate. Only non-HECWs can be replaced using this program and the HECW must remain in the home for 36 months.

High Efficiency Dishwasher Replacement Rebate Program
City residents may apply to receive a credit of $35 to their utility service account for purchasing a high efficiency (HE) dishwasher. HE dishwashers can save 2 gallons of water per load of dishes. They can also help reduce energy bills (gas or electric) due to reduced requirements for heated water. HE dishwashers must be Energy Star rated.

Drip Irrigation Kit and Irrigation Timer Rebate
City residents may apply to receive a credit of $30 for drip irrigation kits or irrigation timers. Drip irrigation eliminates over-watering problems by applying water only where and when it is needed, with less runoff and less evaporation from leaves and soil. The uniform application of water from drip irrigation systems can achieve high water savings. The conversion can save up to 9 gallons of water annually for each square foot of irrigated area converted. Irrigation timers turn a hose faucet into a programmed system and automatic watering scheduling. They help conserve water by providing a consistent watering schedule and help to avoid over-watering.

Mulch Rebate Program
The City provides a mulch rebate program for its customers. According to SaveOurWater.com 20-30 gallons of water can be saved per 1,000 square feet of mulch. Good mulch conserves water by significantly reducing moisture evaporation from the soil. It also reduces weed populations, prevents soil compaction, and keeps soil temperatures more moderate. The mulch rebate allows for a maximum of $50 per City of Madera utility customer.

Smart Irrigation Controller Replacement Program
The City is offering a $100 rebate for the purchase of an EPA WaterSense certified smart irrigation controller. Smart irrigation controllers automatically adjust their watering schedule according to the weather conditions to provide optimal moisture for healthy plants and lawns. Smart irrigation controllers purchased must be capable to be set for the City of Madera’s scheduled water days. A pre-installation audit of your current irrigation system by City staff may be required.

High Efficiency Toilet Replacement Rebate Program
Residential customers may be eligible for a rebate when they replace their old high water use toilets with a new qualifying High Efficiency (HE) Toilet providing 1.28 gallons per flush (gpf) or less. Installing an HE toilet can save about 38 gallons of water per day for a family of four. All qualifying toilets must have a WaterSense label.

Turf Replacement Rebate Program
The City will pay customers $0.75 per square foot to remove up to 1,000 square feet of irrigated turf. Turf grass at homes and commercial landscapes consume large amounts of water. Water-efficient landscapes use 50% or less water than most turf. The amount saved depends on the amount of turf removed, type of plants installed, irrigation system, and soil type. A water-efficient landscape can use less water and may not require expensive maintenance.

Table 9-1 summarizes the City rebate program further. It also approximates the total number of gallons saved for each rebate program. By far, the most successful programs were the High Efficiency Toilet Replacement Program and the Turf Replacement Program saving an estimated 110,960 gallons/year and 205,079 gallons/year, respectively. These savings will continue for the life of the appliances. Assumptions for water savings from drip irrigation, timers, and smart timers were not available.

Table 9-2: Demand Management Measures - Rebate Program (2015)

Rebate Program	Rebate	Water Savings	Number of Rebates	Total Rebate	Annual Water Savings	Notes
High Efficiency Clothes Washers	$50	22 gallons per load	4	$200	32,120 gallons	Water savings estimated based on one load per home per day
High Efficiency Dishwashers	$35	2 gallons per load	5	$175	1,560 gallons	Water savings estimated based on 3 loads per home per week
Drip Irrigation Kits and Irrigation Timers	$30	NA	4	$120	-	-
Mulch	$50	30 gallons per 1,000 square feet	5 customers, 216 square feet of cover per home	$250	3,370 gallons	Assume 2 cubic yards per rebate, 3 inches deep and water 2x per week
Smart Irrigation Controllers	$100	NA	1	$100	-	-
High Efficiency Toilets	$50	38 gallons per day	8	$400	110,960 gallons	
Turf Replacement	$0.75 per ft^3	50% less outdoor water use	20 customers 16,872 total square feet replaced	$12,654	205,079 gallons	Assume an average of 0.75 inches of water per week[2].

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[2] University of California Davis, Lawn Watering Guide for California http://anrcatalog.ucanr.edu/pdf/8044.pdf

Water Survey Programs for Single-Family and Multi-Family Residential Customers

The City offers water audits to residential customers when requested. Audits include reviewing water usage history with the customer, identifying leaks inside and outside the home, and recommending improvements. As a part of the audit, the City will also provide a water-conservation kit, which typically includes educational materials, faucet and shower aerators, toilet tank volume displacer, and leak detection tablets as available. The City does not currently track the number of water audits performed or record budget information for water audits separately.

Residential Plumbing Retrofit

While new construction requires low-flow water fixtures, there is no requirement to retrofit existing plumbing fixtures with low-flow water fixtures. The City's plan does mandate appropriate retrofitting of low-flow fixtures during remodeling.

As a part of its public information program, the City distributes educational material describing the importance of plumbing retrofits as an integral part of water conservation. Several studies suggest that water use savings resulting from miscellaneous interior retrofit fixtures can range between 25 and 65 gpd per housing unit. The studies also suggest that installation of retrofit fixtures in older single-family homes tend to produce more savings, while newer multi-family homes tend to produce lesser savings per housing unit.

System Water Audits

The City operates a detection and repair program of its entire water distribution system. In addition, the City's distribution system includes a SCADA system to accurately record production quantities. However, as of 2015, 10% of the City's water meters were not metered, and thus, a complete system water audit is not possible without assuming unmetered water usage. System audits to determine losses will be performed once meters are fully installed, which is expected n 2017 or 2018.

Large Landscape Conservation Programs

Most of the City's large landscape accounts are metered, and all will be metered within the next few years. The City offers water audits to large landscape customers when requested. Audits include reviewing water usage history with the customer, identifying leaks in the customers system, and recommending improvements. In addition, the City can assist large landscape customer's with programming of irrigation timers to promote water efficiency through irrigation scheduling.

Conservation Programs for Commercial, Industrial, and Institutional (CII) Accounts

CII accounts that have large landscape usage can get landscape water audits from the City upon request. Audits include reviewing water usage history with the customer, identifying leaks in the customer's system, and recommending improvements.

Another program which the City makes available to commercial, industrial, and institutional accounts is the Conservation Water Patrol. This group has the responsibility to educate commercial and industrial users that overuse water for irrigation purposes. The patrol can provide a variety of resources to help a commercial or industrial consumer conserve, including staff expertise, written materials, and the City's demonstration water conservation garden.

Wholesale Agency Programs

This DMM applies to wholesale agencies and defines a wholesaler's role in terms of financial, technical, and programmatic assistance to its retail agencies about implementing DMMs. The City is not a wholesale agency, so this DMM does not apply.

9.2 Planned Implementation to Achieve Water Use Targets

Legal Requirements:

CWC 10631
(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:
(1) (A) …The narrative shall describe the water demand management measures that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

The DMMs currently implemented by the City have been effective in reducing water consumption. The City's historic per-capita and future projections are shown in **Figure 5-2** and **Table 4-3**. Conservation measures have substantially reduced water usage in the City over the past 20 years.

The water metering program, planned for completion in 2017-2018, will help to conserve water because metered accounts typically use 10-20% less water than unmetered accounts. The City has also adopted conservation pricing, implementing a partially volumetric, increasing tiered rate structure, which will further help to conserve water.

The City should prioritize its efforts towards expanding its large scale DMM programs to result in increased conservation gains. Continued support of residential retrofits is also essential because of the City's largely residential customer base. Although school and public education programs to not provide quantifiable water savings, they are considered an essential and effective part of creating a culture of water conservation in Madera and helping to meet the 2020 conservation target.

9.3 California Urban Water Conservation Council

Legal Requirements:

CWC 10631 (i) For purposes of this part, urban water suppliers that are members of the California Urban Water Conservation Council shall be deemed in compliance with the requirements of subdivision (f) by complying with all the provisions of the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated December 10, 2008, as it may be amended, and by submitting the annual reports required by Section 6.2 of that memorandum.

The City is not a member of the California Urban Water Conservation Council. However, where practical, the City attempts to meet the water conservation standards documented in the Council's *Memorandum of Understanding Regarding Urban Water Conservation in California.*

10 Completed UWMP Checklist

CWC Section	UWMP Requirement	Subject	Guidebook Location[1]	UWMP Location
10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1	2.3.2
10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.5.2	2.2
10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	Plan Preparation	Section 2.5.2	2.2, 2.3
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	3.1.1/3.1.2
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	3.1.3
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	System Description	Section 3.4	3.2
10631(a)	Describe other demographic factors affecting the supplier's water management planning.	System Description	Section 3.4	3.2
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4 and 5.4	3.2
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	4.1
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	System Water Use	Section 4.3	4.2
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.5	4.4
10608.20(b)	Retail suppliers shall adopt a 2020 water use target using one of four methods.	Baselines and Targets	Section 5.7 and App E	5.6
10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Chapter 5 and App E	Ch 5
10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5 year baseline. This does not apply if the suppliers	Baselines and Targets	Section 5.7.2	5.2.2/5.6.2

CWC Section	UWMP Requirement	Subject	Guidebook Location[1]	UWMP Location
	base GPCD is at or below 100.			
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Baselines and Targets	Section 5.8 and App E	5.6.3 / 5.6.4
10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.8.2	5.7.2
10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	Section 5.1	NA
10608.40	Retail suppliers shall report on their progress in meeting their water use targets. The data shall be reported using a standardized form.	Baselines and Targets	Section 5.8 and App E	5.7.1
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	System Supplies	Chapter 6	6.9
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	6.2
10631(b)(1)	Indicate whether a groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	6.2.3
10631(b)(2)	Describe the groundwater basin.	System Supplies	Section 6.2.1	6.2.1
10631(b)(2)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.2	6.2.4
10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	System Supplies	Section 6.2.3	6.2.4
10631(b)(3)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	Section 6.2.4	6.2.5
10631(b)(4)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Sections 6.2 and 6.9	6.9
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.7	6.7
10631(g)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years.	System Supplies	Section 6.8	6.8
10631(h)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6	6.6
10631(j)	Retail suppliers will include documentation that	System Supplies	Section	NA

CWC Section	UWMP Requirement	Subject	Guidebook Location[1]	UWMP Location
	they have provided their wholesale supplier(s) – if any - with water use projections from that source.		2.5.1	
10631(j)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	Section 2.5.1	NA
10633	For wastewater and recycled water, coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.1	6.5.1
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	System Supplies (Recycled Water)	Section 6.5.2	6.5.2
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.2.2	6.5.3
10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and 6.5.4	6.5.3
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.4	6.5.4
10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.5.4	6.5.4
10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.5.5	6.5.5
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5	6.5.5
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4	7.1
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Water Supply Reliability Assessment	Section 7.1	7.2
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Water Supply Reliability Assessment	Section 7.2	7.2
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that source.	Water Supply Reliability Assessment	Section 7.1	7.2
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Section 7.1	7.4
10635(a)	Assess the water supply reliability during	Water Supply	Section 7.3	7.2

CWC Section	UWMP Requirement	Subject	Guidebook Location[1]	UWMP Location
	normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Reliability Assessment		
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Water Shortage Contingency Planning	Section 8.1	8.1
10632(a)(2)	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency.	Water Shortage Contingency Planning	Section 8.9	8.9
10632(a)(3)	Identify actions to be undertaken by the urban water supplier in case of a catastrophic interruption of water supplies.	Water Shortage Contingency Planning	Section 8.8	8.8
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Water Shortage Contingency Planning	Section 8.2	8.2
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Water Shortage Contingency Planning	Section 8.4	8.4
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Water Shortage Contingency Planning	Section 8.3	8.3
10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Water Shortage Contingency Planning	Section 8.6	8.6
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Water Shortage Contingency Planning	Section 8.7	8.7
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Water Shortage Contingency Planning	Section 8.5	8.5
10631(f)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Sections 9.2 and 9.3	9.1
10631(f)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	Sections 9.1 and 9.3	NA
10631(i)	CUWCC members may submit their 2013-2014 CUWCC BMP annual reports in lieu of, or in addition to, describing the DMM implementation in their UWMPs. This option is only allowable if the supplier has been found to be in full compliance with the CUWCC MOU.	Demand Management Measures	Section 9.5	NA
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Plan Adoption, Submittal, and Implementation	Section 10.3	2.3
10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and	Plan Adoption, Submittal, and Implementation	Section 10.2.1	2.3.1

CWC Section	UWMP Requirement	Subject	Guidebook Location[1]	UWMP Location
	considering amendments or changes to the plan.			
10621(d)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.	Plan Adoption, Submittal, and Implementation	Sections 10.3.1 and 10.4	2.3.3
10635(b)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 60 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	NA
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan.	Plan Adoption, Submittal, and Implementation	Sections 10.2.2, 10.3, and 10.5	2.3.4
10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Sections 10.2.1	2.3
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.1	2.3.2
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4.3	2.3.3
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	NA
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Sections 10.4.1 and 10.4.22	2.3.3
10645	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	2.3.4

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CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX A – URBAN WATER MANAGEMENT PLANNING ACT

Appendix A

California Water Code
Urban Water Management Planning

California Water Code Division 6, Part 2.6.

Chapter 1. General Declaration and Policy

SECTION 10610-10610.4

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. (a) The Legislature finds and declares all of the following:

(1) The waters of the state are a limited and renewable resource subject to ever-increasing demands.

(2) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.

(3) A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate.

(4) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years.

(5) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.

(6) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.

(7) Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.

(8) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.

(9) The quality of source supplies can have a significant impact on water management strategies and supply reliability.

(b) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:

(a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.

(b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.

(c) Urban water suppliers shall be required to develop water management plans to actively pursue the efficient use of available supplies.

Chapter 2. Definitions

SECTION 10611-10617

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. “Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10616.5. "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

Chapter 3. Urban Water Management Plans

Article 1. General Provisions

SECTION 10620-10621

10620. (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d) (1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that

share a common source, water management agencies, and relevant public agencies, to the extent practicable.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

10621. (a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero, except as provided in subdivision (d).

(b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days before the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

(c) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

(d) Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.

Article 2. Contents of Plan

SECTION 10630-10634

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall be adopted in accordance with this chapter that shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For basins that a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) (1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(A) An average water year.

(B) A single-dry water year.

(C) Multiple-dry water years.

(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(J) Distribution system water loss.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(3) (A) For the 2015 urban water management plan update, the distribution system water loss shall be quantified for the most recent 12-month period available. For all subsequent updates, the distribution system water loss shall be quantified for each of the five years preceding the plan update.

(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

(4) (A) If available and applicable to an urban water supplier, water use projections may display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.

(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:

(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.

(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) (A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measures that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

(B) The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:

(i) Water waste prevention ordinances.

(ii) Metering.

(iii) Conservation pricing.

(iv) Public education and outreach.

(v) Programs to assess and manage distribution system real loss.

(vi) Water conservation program coordination and staffing support.

(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

(2) For an urban wholesale water supplier, as defined in Section 10608.12, a narrative description of the items in clauses (ii), (iv), (vi), and (vii) of subparagraph (B) of paragraph (1), and a narrative description of its distribution system asset management and wholesale supplier assistance programs.

(g) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use, as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(h) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

(i) For purposes of this part, urban water suppliers that are members of the California Urban Water Conservation Council shall be deemed in compliance with the requirements of subdivision (f) by complying with all the provisions of the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated December 10, 2008, as it may be amended, and by submitting the annual reports required by Section 6.2 of that memorandum.

(j) An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (c). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (c).

10631.1. (a) The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.

(b) It is the intent of the Legislature that the identification of projected water use for single-family and multifamily residential housing for lower income households will assist a supplier in complying with the requirement under Section 65589.7 of the Government Code to grant a priority for the provision of service to housing units affordable to lower income households.

10631.2. (a) In addition to the requirements of Section 10631, an urban water management plan may, but is not required to, include any of the following information:

(1) An estimate of the amount of energy used to extract or divert water supplies.

(2) An estimate of the amount of energy used to convey water supplies to the water treatment plants or distribution systems.

(3) An estimate of the amount of energy used to treat water supplies.

(4) An estimate of the amount of energy used to distribute water supplies through its distribution systems.

(5) An estimate of the amount of energy used for treated water supplies in comparison to the amount used for nontreated water supplies.

(6) An estimate of the amount of energy used to place water into or withdraw from storage.

(7) Any other energy-related information the urban water supplier deems appropriate.

(b) The department shall include in its guidance for the preparation of urban water management plans a methodology for the voluntary calculation or estimation of the energy intensity of urban water systems. The department may consider studies and calculations conducted by the Public Utilities Commission in developing the methodology.

10631.5. (a) (1) Beginning January 1, 2009, the terms of, and eligibility for, a water management grant or loan made to an urban water supplier and awarded or administered by the department, state board, or California Bay-Delta Authority or its successor agency shall be conditioned on the implementation of the water demand management measures described in Section 10631, as determined by the department pursuant to subdivision (b).

(2) For the purposes of this section, water management grants and loans include funding for programs and projects for surface water or groundwater storage, recycling, desalination, water conservation, water supply reliability, and water supply augmentation. This section does not apply to water management projects funded by the federal American Recovery and Reinvestment Act of 2009 (Public Law 111-5).

(3) Notwithstanding paragraph (1), the department shall determine that an urban water supplier is eligible for a water management grant or loan even though the supplier is not implementing all of the water demand management measures described in Section 10631, if the urban water supplier has

submitted to the department for approval a schedule, financing plan, and budget, to be included in the grant or loan agreement, for implementation of the water demand management measures. The supplier may request grant or loan funds to implement the water demand management measures to the extent the request is consistent with the eligibility requirements applicable to the water management funds.

(4) (A) Notwithstanding paragraph (1), the department shall determine that an urban water supplier is eligible for a water management grant or loan even though the supplier is not implementing all of the water demand management measures described in Section 10631, if an urban water supplier submits to the department for approval documentation demonstrating that a water demand management measure is not locally cost effective. If the department determines that the documentation submitted by the urban water supplier fails to demonstrate that a water demand management measure is not locally cost effective, the department shall notify the urban water supplier and the agency administering the grant or loan program within 120 days that the documentation does not satisfy the requirements for an exemption, and include in that notification a detailed statement to support the determination.

(B) For purposes of this paragraph, "not locally cost effective" means that the present value of the local benefits of implementing a water demand management measure is less than the present value of the local costs of implementing that measure.

(b) (1) The department, in consultation with the state board and the California Bay-Delta Authority or its successor agency, and after soliciting public comment regarding eligibility requirements, shall develop eligibility requirements to implement the requirement of paragraph (1) of subdivision (a). In establishing these eligibility requirements, the department shall do both of the following:

(A) Consider the conservation measures described in the Memorandum of Understanding Regarding Urban Water Conservation in California, and alternative conservation approaches that provide equal or greater water savings.

(B) Recognize the different legal, technical, fiscal, and practical roles and responsibilities of wholesale water suppliers and retail water suppliers.

(2) (A) For the purposes of this section, the department shall determine whether an urban water supplier is implementing all of the water demand management measures described in Section 10631 based on either, or a combination, of the following:

(i) Compliance on an individual basis.

(ii) Compliance on a regional basis. Regional compliance shall require participation in a regional conservation program consisting of two or more urban water suppliers that achieves the level of conservation or water efficiency savings equivalent to the amount of conservation or savings achieved if each of the participating urban water suppliers implemented the water demand management measures. The urban water supplier administering the regional program shall provide participating urban water suppliers and the department with data to demonstrate that the regional program is consistent with this clause. The department shall review the data to determine whether the urban water suppliers in the regional program are meeting the eligibility requirements.

(B) The department may require additional information for any determination pursuant to this section.

(3) The department shall not deny eligibility to an urban water supplier in compliance with the requirements of this section that is participating in a multiagency water project, or an integrated regional water management plan, developed pursuant to Section 75026 of the Public Resources Code, solely on the basis that one or more of the agencies participating in the project or plan is not implementing all of the water demand management measures described in Section 10631.

(c) In establishing guidelines pursuant to the specific funding authorization for any water management grant or loan program subject to this section, the agency administering the grant or loan program shall include in the guidelines the eligibility requirements developed by the department pursuant to subdivision (b).

(d) Upon receipt of a water management grant or loan application by an agency administering a grant and loan program subject to this section, the agency shall request an eligibility determination from the department with respect to the requirements of this section. The department shall respond to the request within 60 days of the request.

(e) The urban water supplier may submit to the department copies of its annual reports and other relevant documents to assist the department in determining whether the urban water supplier is implementing or scheduling the implementation of water demand management activities. In addition, for urban water suppliers that are signatories to the Memorandum of Understanding Regarding Urban Water Conservation in California and submit biennial reports to the California Urban Water Conservation Council in accordance with the memorandum, the department may use these reports to assist in tracking the implementation of water demand management measures.

(f) This section shall remain in effect only until July 1, 2016, and as of that date is repealed, unless a later enacted statute, that is enacted before July 1, 2016, deletes or extends that date.

10631.7. The department, in consultation with the California Urban Water Conservation Council, shall convene an independent technical panel to provide information and recommendations to the department and the Legislature on new demand management measures, technologies, and approaches. The panel shall consist of no more than seven members, who shall be selected by the department to reflect a balanced representation of experts. The panel shall have at least one, but no more than two, representatives from each of the following: retail water suppliers, environmental organizations, the business community, wholesale water suppliers, and academia. The panel shall be convened by January 1, 2009, and shall report to the Legislature no later than January 1, 2010, and every five years thereafter. The department shall review the panel report and include in the final report to the Legislature the department's recommendations and comments regarding the panel process and the panel's recommendations.

10632. (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

(1) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions that are applicable to each stage.

(2) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

(3) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

(4) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

(5) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are

appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

(6) Penalties or charges for excessive use, where applicable.

(7) An analysis of the impacts of each of the actions and conditions described in paragraphs (1) to (6), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

(8) A draft water shortage contingency resolution or ordinance.

(9) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

(b) Commencing with the urban water management plan update due July 1, 2016, for purposes of developing the water shortage contingency analysis pursuant to subdivision (a), the urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area, and shall include all of the following:

(a) A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

(b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

(c) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

(f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

(g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

Article 2.5. Water Service Reliability

SECTION 10635

10635. (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

(c) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.

(d) Nothing in this article is intended to change existing law concerning an urban water supplier's obligation to provide water service to its existing customers or to any potential future customers.

Article 3. Adoption and Implementation of Plans

SECTION 10640-10645

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630). The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water demand management methods and techniques.

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.

After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644. (a) (1) An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.

(2) The plan, or amendments to the plan, submitted to the department pursuant to paragraph (1) shall be submitted electronically and shall include any standardized forms, tables, or displays specified by the department.

(b) (1) Notwithstanding Section 10231.5 of the Government Code, the department shall prepare and submit to the Legislature, on or before December 31, in the years ending in six and one, a report summarizing the status of the plans adopted pursuant to this part.

The report prepared by the department shall identify the exemplary elements of the individual plans. The department shall provide a copy of the report to each urban water supplier that has submitted its plan to the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans submitted pursuant to this part.

(2) A report to be submitted pursuant to paragraph (1) shall be submitted in compliance with Section 9795 of the Government Code.

(c) (1) For the purpose of identifying the exemplary elements of the individual plans, the department shall identify in the report water demand management measures adopted and implemented by specific urban water suppliers, and identified pursuant to Section 10631, that achieve water savings significantly above the levels established by the department to meet the requirements of Section 10631.5.

(2) The department shall distribute to the panel convened pursuant to Section 10631.7 the results achieved by the implementation of those water demand management measures described in paragraph (1).

(3) The department shall make available to the public the standard the department will use to identify exemplary water demand management measures.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

Chapter 4. Miscellaneous Provisions

SECTION 10650-10656

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part.

(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of actions taken pursuant to Section 10632. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing Section 10632, or any project for expanded or additional water supplies.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board and the Public Utilities Commission, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board or the Public Utilities Commission requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

10654. An urban water supplier may recover in its rates the costs incurred in preparing its plan and implementing the reasonable water conservation measures included in the plan. Any best water management practice that is included in the plan that is identified in the "Memorandum of Understanding Regarding Urban Water Conservation in California" is deemed to be reasonable for the purposes of this section.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. An urban water supplier that does not prepare, adopt, and submit its urban water management plan to the department in accordance with this part, is ineligible to receive funding pursuant to Division 24 (commencing with Section 78500) or Division 26 (commencing with Section 79000), or receive drought assistance from the state until the urban water management plan is submitted pursuant to this article.

CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX B – STANDARD UWMP TABLES

Table 2-1 Retail Only: Public Water Systems

Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
20010002	Madera-City	13,695	9,314
	TOTAL	13,695	9,314

NOTES: Connections includes residential, commercial, industrial and landscape

Table 2-2: Plan Identification (Select One)		
☑	Individual UWMP	
☐	Regional UWMP (RUWMP) *(checking this triggers the next line to appear)*	
	Select One:	
	☐	RUWMP includes a Regional Alliance
	☐	RUWMP does not include a Regional Alliance
NOTES:		

Table 2-3: Agency Identification	
Type of Agency (select one or both)	
☐	Agency is a wholesaler
☑	Agency is a retailer
Fiscal or Calendar Year (select one)	
☑	UWMP Tables Are in Calendar Years
☐	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Day that the Fiscal Year Begins (dd/mm)	
Units of Measure Used in UWMP (select from Drop down)	
Unit	AF
NOTES:	

Table 3-1 Retail: Population - Current and Projected

Population Served	2015	2020	2025	2030	2035	2040*(opt)*
	64,810	71,555	79,003	87,226	96,304	106,328

NOTES: Assumes population growth rate of 2.0% per year

Table 4-1 Retail: Demands for Potable and Raw Water - Actual

Use Type *(Add additional rows as needed)*	2015 Actual		
Use Drop down list *May select each use multiple times* *These are the only Use Types that will be recognized by the WUEdata online submittal tool*	Additional Description *(as needed)*	Level of Treatment When Delivered *Drop down list*	Volume
Single Family		Drinking Water	5,295
Multi-Family		Drinking Water	1,596
Commercial	Includes Institutional	Drinking Water	1,503
Industrial		Drinking Water	44
Institutional/Governmental			
Landscape	Large Landscape Irrigation	Drinking Water	224
Losses		Drinking Water	652
Other			
Other			
Other			
Other			
		TOTAL	9,314

Table 4-2 Retail: Demands for Potable and Raw Water - Projected						
Use Type *(Add additional rows as needed)*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
Use Drop down list *May select each use multiple times* *These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2020	2025	2030	2035	2040-opt
Single Family		8,900	9,900	10,900	12,000	13,300
Multi-Family		2,700	3,000	3,300	3,600	4,000
Commercial	Includes Institutional	2,500	2,800	3,100	3,400	3,800
Industrial		100	100	100	100	100
Landscape	Large Landscape	400	400	500	500	600
Losses		1,100	1,200	1,300	1,500	1,600
Other						
Other						
Other						
Losses						
Other						
	TOTAL	15,700	17,400	19,200	21,100	23,400

NOTES:

Table 4-3 Retail: Total Water Demands

	2015	2020	2025	2030	2035	2040 *(opt)*
Potable and Raw Water *From Tables 4-1 and 4-2*	9,314	15,700	17,400	19,200	21,100	23,400
Recycled Water Demand *From Table 6-4*	0	0	0	0	0	0
TOTAL WATER DEMAND	9,314	15,700	17,400	19,200	21,100	23,400

NOTES:

Table 4-4 Retail: 12 Month Water Loss Audit Reporting

Reporting Period Start Date (mm/yyyy)	Volume of Water Loss
01/2015	652

NOTES: Loss is calculated assuming 7% total losses

Table 4-5 Retail Only: Inclusion in Water Use Projections

Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook) *Drop down list (y/n)*	No
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, etc… utilized in demand projections are found.	
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	Yes

Table 5-1 Baselines and Targets Summary

Retail Agency or Regional Alliance Only

Baseline Period	Start Year	End Year	Average Baseline GPCD*	2015 Interim Target *	Confirmed 2020 Target*
10-15 year	*1995*	*2004*	*245*	*220*	*196*
5 Year	*2003*	*2007*	*224*		

*All values are in Gallons per Capita per Day (GPCD)

NOTES: Values from SBX Tables

Table 5-2: 2015 Compliance

*Retail Agency or Regional Alliance Only**

Actual 2015 GPCD	2015 Interim Target GPCD	**Optional Adjustments to 2015 GPCD** Enter "0" for adjustments not used *From Methodology 8*					2015 GPCD *(Adjusted if applicable)*	Did Supplier Achieve Targeted Reduction for 2015? Y/N
		Extraordinary Events	Economic Adjustment	Weather Normalization	TOTAL Adjustments	Adjusted 2015 GPCD		
128	*220*	0	0	0	0	128	128	Yes

**All values are in Gallons per Capita per Day (GPCD)*

NOTES:

Table 6-1 Retail: Groundwater Volume Pumped

☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type ***Drop Down List*** *May use each category multiple times*	Location or Basin Name	2011	2012	2013	2014	2015
Add additional rows as needed						
Alluvial Basin	Madera Sub-basin	11,396	11,743	10,855	10,636	9,314
	TOTAL	11,396	11,743	10,855	10,636	9,314
NOTES:						

Table 6-2 Retail: Wastewater Collected Within Service Area in 2015

☐	There is no wastewater collection system. The supplier will not complete the table below.
100	Percentage of 2015 service area covered by wastewater collection system *(optional)*
100	Percentage of 2015 service area population covered by wastewater collection system *(optional)*

Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated? *Drop Down List*	Volume of Wastewater Collected in 2015	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area? *Drop Down List*	Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List*
Add additional rows as needed						
City of Madera	Metered	16,503	City of Madera	City of Madera Wastwater Treatment Facility	No	No
Total Wastewater Collected from Service Area in 2015:		16,503				
NOTES:						

Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2015

☐ No wastewater is treated or disposed of within the UWMP service area.
The supplier will not complete the table below.

Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal *Drop down list*	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level *Drop down list*	2015 volumes			
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
City of Madera Wastewater Treatment Facility	WWTF Percolation Ponds	280 acres at the WWTF		Percolation ponds	Yes	Secondary, Undisinfected	16,503	16,503	0	0
						Total	16,503	16,503	0	0

NOTES:

Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area

☑ Recycled water is not used and is not planned for use within the service area of the supplier.
The supplier will not complete the table below.

Name of Agency Producing (Treating) the Recycled Water:	
Name of Agency Operating the Recycled Water Distribution	
Supplemental Water Added in 2015	
Source of 2015 Supplemental Water	

Beneficial Use Type *These are the only Use Types that will be recognized by the DWR online submittal tool*		General Description of 2015 Uses	Level of Treatment *Drop down list*	2015	2020	2025	2030	2035	2040 (opt)
Agricultural irrigation									
Landscape irrigation (excludes golf courses)									
Golf course irrigation									
Commercial use									
Industrial use									
Geothermal and other energy production									
Seawater intrusion barrier									
Recreational impoundment									
Wetlands or wildlife habitat									
Groundwater recharge (IPR)									
Surface water augmentation (IPR)									
Direct potable reuse									
Other	Type of Use								
			Total:	0	0	0	0	0	0

IPR - Indirect Potable Reuse

NOTES:

Table 6-5 Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual

☑ Recycled water was not used in 2010 nor projected for use in 2015.
The supplier will not complete the table below.

Use Type *These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2010 Projection for 2015	2015 actual use
Agricultural irrigation			
Landscape irrigation (excludes golf courses)			
Golf course irrigation			
Commercial use			
Industrial use			
Geothermal and other energy production			
Seawater intrusion barrier			
Recreational impoundment			
Wetlands or wildlife habitat			
Groundwater recharge (IPR)			
Surface water augmentation (IPR)			
Direct potable reuse			
Other			
	Total	0	0

Table 6-6 Retail: Methods to Expand Future Recycled Water Use

☐	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
44	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Add additional rows as needed			
Support Customers	Assist commercial and industrial customers with developing recycled water on-site	On-going	Unknown
Seek Funding	Seek funding for capital costs if economics of recycled water improve	Unknown	3300
		Total	3,300
NOTES:			

Table 6-7 Retail: Expected Future Water Supply Projects or Programs						
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☑	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
45	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type *Drop Down List* *User may select more than one.*	Expected Increase in Water Supply to Agency *This may be a range*
	Drop Down List (y/n)	*If Yes, Agency Name*				
Add additional rows as needed						
NOTES:						

Table 6-8 Retail: Water Supplies — Actual

Water Supply	Additional Detail on Water Supply	2015		
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Actual Volume	Water Quality *Drop Down List*	Total Right or Safe Yield *(optional)*
Add additional rows as needed				
Groundwater	Recovered from local groundwater wells	9,314	Drinking Water	
Total		9,314		0

NOTES:

Table 6-9 Retail: Water Supplies — Projected

Water Supply	Additional Detail on Water Supply	**Projected Water Supply** *Report To the Extent Practicable*									
		2020		**2025**		**2030**		**2035**		**2040** *(opt)*	
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Add additional rows as needed											
Groundwater	Recovered from local groundwater wells	15,700		17,400		19,200		21,100		23,400	
Surface water											
Recycled Water											
Transfers											
Exchanges											
Exchanges											
	Total	15,700	0	17,400	0	19,200	0	21,100	0	23,400	0

NOTES:

Table 7-1 Retail: Basis of Water Year Data

Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year	1992	11 inches	100%
Single-Dry Year	2013	2.47 inches	22%
Multiple-Dry Years 1st Year	2013	2.47 inches	22%
Multiple-Dry Years 2nd Year	2014	5.42 inches	49%
Multiple-Dry Years 3rd Year	2015	3.85 inches	35%
Multiple-Dry Years 4th Year *Optional*			
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			

Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.

Volume available is local precipitation, which is a general indicator of water availability.

Table 7-2 Retail: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	15,700	17,400	19,200	21,100	23,400
Demand totals *(autofill from Table 4-3)*	15,700	17,400	19,200	21,100	23,400
Difference	0	0	0	0	0
NOTES:					

Table 7-2 Wholesale: Normal Year Supply and Demand Comparison

	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	0	0	0	0	0
Demand totals *(autofill fm Table 4-3)*	0	0	0	0	0
Difference	0	0	0	0	0

NOTES:

Table 7-3 Retail: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals	15,700	17,300	19,200	21,100	23,300
Demand totals	15,700	17,300	19,200	21,100	23,300
Difference	0	0	0	0	0
NOTES:					

Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison

	2020	2025	2030	2035	2040 (Opt)
Supply totals					
Demand totals					
Difference	0	0	0	0	0

NOTES:

Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison

		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	8,400	14,100	15,600	17,300	19,000
	Demand totals	8,400	14,100	15,600	17,300	19,000
	Difference	0	0	0	0	0
Second year	Supply totals	8,400	14,100	15,600	17,300	19,000
	Demand totals	8,400	14,100	15,600	17,300	19,000
	Difference	0	0	0	0	0
Third year	Supply totals	7,500	12,600	13,800	15,400	16,900
	Demand totals	7,500	12,600	13,800	15,400	16,900
	Difference	0	0	0	0	0
Fourth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Fifth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Sixth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0

NOTES: No restrictions on pumping (Supply = Demand)

Table 8-1 Retail
Stages of Water Shortage Contingency Plan

Stage	Complete Both	
	Percent Supply Reduction[1] *Numerical value as a percent*	Water Supply Condition (*Narrative description)*
Add additional rows as needed		
1	0%	Existing Conditions
2	5-10%	Potential Moderate Shortage
3	10-35%	Serious Shortage
4	35-50%	Critical Emergency Shortage

[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*

Table 8-2 Retail Only: Restrictions and Prohibitions on End Uses

Stage	Restrictions and Prohibitions on End Users *Drop down list* *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement? *Drop Down List*
Add additional rows as needed			
1,2,3,4 and A,B,C,D,E	Landscape - Limit landscape irrigation to specific days		Yes
1,2,3,4	Other - Prohibit use of potable water for washing hard surfaces		Yes
1,2,3,4 and A,B,C,D,E	Landscape - Limit landscape irrigation to specific times		Yes
1,2,3,4	Other	No water allowed to run into street or gutter	Yes
1,2,3,4	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Within 5 days	Yes
1,2,3,4	Other	Evaporative coolers must recirculate water	Yes
1,2,3,4	Other	No building washing except for painting and maintenance	Yes
1,2,3,4	Other water feature or swimming pool restriction	No continuous flow for recreational purposes	Yes
1,2,3,4	Other	New commercial car washes must recirculate water	Yes
2,3,4	Other	Stricter adherence to regulations	Yes
3,4	CII - Restaurants may only serve water upon request		Yes
3,4	Other	Existing carwashes to install recirulation system	Yes
4	Other	Install low flow showerheads and toilet tank displacement devices	Yes
NOTES:			

Table 8-3 Retail Only: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods

Stage	Consumption Reduction Methods by Water Supplier **Drop down list** *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*
Add additional rows as needed		
1,2,3,4	Expand Public Information Campaign	
1,2,3,4	Increase Water Waste Patrols	
1,2,3,4	Other	Increase groundwater monitoring frequency
2,3,4	Other	Initiate annual water conservation program
2,3,4	Other	Rectruit and train volunteers for speaker's bureau
2,3,4	Other	Distribute conservation kits to all customers
3,4	Other	Declare Water Shortage Emergency
3,4	Implement or Modify Drought Rate Structure or Surcharge	
3,4	Other	Hire additional water conservation staff
3,4	Other	Publicize Stage 4 reduction requirements if conditions worsen
3,4	Decrease Line Flushing	Eliminate fire hydrant flushing, except when absolutely necessary
3,4	Other	Discontinue irrigation of selected turf areas at parks and schools
3,4	Other	Require low flow toilets and showerheads, and faucet aerators prior to property sale
3,4	Other	Require hot water re-circulating systems or on demand water heaters in new construction
3,4	Other	Initiate high visibility low flow toilet replacement program (elected officials, City Hall, etc.)
3,4	Other	Lower bowls on city wells (if needed)
4	Other	Implement City Water Quality Emergency Notification Plan
4	Moratorium or Net Zero Demand Increase on New Connections	
4	Other	Discontinue irrigation of park and school athletic fields
4	Other	Require all homes to install low flow showers/toilets and fix leaks. Hire compliance officer.
NOTES:		

Table 8-4 Retail: Minimum Supply Next Three Years

	2016	2017	2018
Available Water Supply	14,500	14,800	15,100

NOTES: Assumes per capita demand meets 2020 goal in each year

Table 10-1 Retail: Notification to Cities and Counties

City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
	☐	☐
	☐	☐
	☐	☐
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Madera County	☑	☑
	☐	☐
	☐	☐
NOTES:		

SB X7-7 Table 0: Units of Measure Used in UWMP* *(select one from the drop down list)*
Acre Feet
**The unit of measure must be consistent with Table 2-3*
NOTES:

SB X7-7 Table-1: Baseline Period Ranges

Baseline	Parameter	Value	Units
10- to 15-year baseline period	2008 total water deliveries	13,901	Acre Feet
	2008 total volume of delivered recycled water	-	Acre Feet
	2008 recycled water as a percent of total deliveries	0.00%	Percent
	Number of years in baseline period[1, 2]	10	Years
	Year beginning baseline period range	1995	▨
	Year ending baseline period range[3]	2004	▨
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2003	▨
	Year ending baseline period range[4]	2007	▨

[1] *If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a continuous 10-year period. If the amount of recycled water delivered in 2008 is 10 percent or greater, the first baseline period is a continuous 10- to 15-year period.*

[2] *The Water Code requires that the baseline period is between 10 and 15 years. However, DWR recognizes that some water suppliers may not have the minimum 10 years of baseline data.*

[3] *The ending year must be between December 31, 2004 and December 31, 2010.*

[4] *The ending year must be between December 31, 2007 and December 31, 2010.*

NOTES:

SB X7-7 Table 2: Method for Population Estimates	
Method Used to Determine Population (may check more than one)	
☑	**1. Department of Finance** (DOF) DOF Table E-8 (1990 - 2000) and (2000-2010) and DOF Table E-5 (2011 - 2015) when available
☐	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review
NOTES:	

SB X7-7 Table 3: Service Area Population

Year		Population
10 to 15 Year Baseline Population		
Year 1	1995	36,557
Year 2	1996	37,753
Year 3	1997	39,276
Year 4	1998	40,518
Year 5	1999	41,424
Year 6	2000	43,089
Year 7	2001	44,565
Year 8	2002	46,066
Year 9	2003	47,939
Year 10	2004	49,691
Year 11		
Year 12		
Year 13		
Year 14		
Year 15		
5 Year Baseline Population		
Year 1	2003	47,939
Year 2	2004	49,691
Year 3	2005	51,735
Year 4	2006	53,928
Year 5	2007	57,181
2015 Compliance Year Population		
2015		64,810

NOTES:

SB X7-7 Table 4: Annual Gross Water Use *

Baseline Year *Fm SB X7-7 Table 3*		Volume Into Distribution System *This column will remain blank until SB X7-7 Table 4-A is completed.*	Deductions					Annual Gross Water Use
			Exported Water	Change in Dist. System Storage (+/-)	Indirect Recycled Water *This column will remain blank until SB X7-7 Table 4-B is completed.*	Water Delivered for Agricultural Use	Process Water *This column will remain blank until SB X7-7 Table 4-D is completed.*	
10 to 15 Year Baseline - Gross Water Use								
Year 1	1995	10,306			-		-	10,306
Year 2	1996	11,314			-		-	11,314
Year 3	1997	11,650			-		-	11,650
Year 4	1998	10,888			-		-	10,888
Year 5	1999	12,156			-		-	12,156
Year 6	2000	11,834			-		-	11,834
Year 7	2001	11,210			-		-	11,210
Year 8	2002	11,869			-		-	11,869
Year 9	2003	12,474			-		-	12,474
Year 10	2004	12,887			-		-	12,887
Year 11	0	-			-		-	-
Year 12	0	-			-		-	-
Year 13	0	-			-		-	-
Year 14	0	-			-		-	-
Year 15	0	-			-		-	-
10 - 15 year baseline average gross water use								**11,659**
5 Year Baseline - Gross Water Use								
Year 1	2003	12,474			-		-	12,474
Year 2	2004	12,887			-		-	12,887
Year 3	2005	12,819			-		-	12,819
Year 4	2006	13,166			-		-	13,166
Year 5	2007	14,050			-		-	14,050
5 year baseline average gross water use								**13,079**
2015 Compliance Year - Gross Water Use								
2015		9,314	-		-		-	**9,314**

* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3

NOTES: Exludes direct raw water deliveries to La Paloma Powerplant

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)

Complete one table for each source.

Name of Source		City Groundwater		
This water source is:				
☑	The supplier's own water source			
☐	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional (+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	1995	10,306		10,306
Year 2	1996	11,314		11,314
Year 3	1997	11,650		11,650
Year 4	1998	10,888		10,888
Year 5	1999	12,156		12,156
Year 6	2000	11,834		11,834
Year 7	2001	11,210		11,210
Year 8	2002	11,869		11,869
Year 9	2003	12,474		12,474
Year 10	2004	12,887		12,887
Year 11	0			-
Year 12	0			-
Year 13	0			-
Year 14	0			-
Year 15	0			-
5 Year Baseline - Water into Distribution System				
Year 1	2003	12,474		12,474
Year 2	2004	12,887		12,887
Year 3	2005	12,819		12,819
Year 4	2006	13,166		13,166
Year 5	2007	14,050		14,050
2015 Compliance Year - Water into Distribution System				
2015		9,314		9,314

** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)

Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Annual Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	1995	36,557	10,306	252
Year 2	1996	37,753	11,314	268
Year 3	1997	39,276	11,650	265
Year 4	1998	40,518	10,888	240
Year 5	1999	41,424	12,156	262
Year 6	2000	43,089	11,834	245
Year 7	2001	44,565	11,210	225
Year 8	2002	46,066	11,869	230
Year 9	2003	47,939	12,474	232
Year 10	2004	49,691	12,887	232
Year 11	0	-	-	
Year 12	0	-	-	
Year 13	0	-	-	
Year 14	0	-	-	
Year 15	0	-	-	
10-15 Year Average Baseline GPCD				**245**

5 Year Baseline GPCD

Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use
Year 1	2003	47,939	12,474	232
Year 2	2004	49,691	12,887	232
Year 3	2005	51,735	12,819	221
Year 4	2006	53,928	13,166	218
Year 5	2007	57,181	14,050	219
5 Year Average Baseline GPCD				**224**
2015 Compliance Year GPCD				
2015		64,810	9,314	**128**

NOTES:

SB X7-7 Table 6: Gallons per Capita per Day *Summary From Table SB X7-7 Table 5*	
10-15 Year Baseline GPCD	245
5 Year Baseline GPCD	224
2015 Compliance Year GPCD	128
NOTES:	

SB X7-7 Table 7: 2020 Target Method *Select Only One*		
Target Method		Supporting Documentation
☑	Method 1	SB X7-7 Table 7A
☐	Method 2	SB X7-7 Tables 7B, 7C, and 7D *Contact DWR for these tables*
☐	Method 3	SB X7-7 Table 7-E
☐	Method 4	Method 4 Calculator
NOTES:		

SB X7-7 Table 7-A: Target Method 1

20% Reduction

10-15 Year Baseline GPCD	**2020 Target GPCD**
245	**196**

NOTES:

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target			
5 Year Baseline GPCD *From SB X7-7 Table 5*	Maximum 2020 Target[1]	Calculated 2020 Target[2]	**Confirmed 2020 Target**
224	213	196	**196**

[1] Maximum 2020 Target is 95% of the 5 Year Baseline GPCD

[2] 2020 Target is calculated based on the selected Target Method, see SB X7-7 Table 7 and corresponding tables for agency's calculated target.

NOTES:

SB X7-7 Table 8: 2015 Interim Target GPCD		
Confirmed 2020 Target *Fm SB X7-7 Table 7-F*	10-15 year Baseline GPCD *Fm SB X7-7 Table 5*	**2015 Interim Target GPCD**
196	245	**220**

NOTES:

SB X7-7 Table 9: 2015 Compliance

Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)*					2015 GPCD *(Adjusted if applicable)*	**Did Supplier Achieve Targeted Reduction for 2015?**
		Enter "0" if Adjustment Not Used			TOTAL Adjustments	Adjusted 2015 GPCD		
		Extraordinary Events	Weather Normalization	Economic Adjustment				
128	220	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	-	128	128	**YES**

NOTES:

CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX C – ADOPTION RESOLUTION

RESOLUTION NO. 16-_

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MADERA, CALIFORNIA ADOPTING THE 2015 CITY OF MADERA URBAN WATER MANAGEMENT PLAN

WHEREAS, California Water Code Sections 10620 et seq. require the adoption of an Urban Water Management Plan (the "Plan"); and

WHEREAS, such legislation requires that once adopted that a copy of the Plan be filed with the California Department of Water Resources; and

WHEREAS, the City of Madera in compliance with such legislation has drafted a proposed Plan and circulated it for public review and held a duly noticed public hearing on such proposed plan; and

WHEREAS, public hearings on the PLAN were duly noticed and held on ____

NOW, THEREORE, THE COUNCIL OF THE CITY OF MADERA, hereby finds, orders, and determines as follows:

1. The Urban Water Management, a copy of which is on file in the office of the City Clerk and referred to for more particulars, is hereby adopted.
2. The Director of Public Works is hereby authorized and directed to file this Plan with the California Department of Water Resources
3. This Resolution is effective immediately upon adoption

****

PASSES AND ADOPTED by the City Council of the City of Madera this __ day of ______, 2016, by the following vote:

AYES:

NOES:

ABSENTIONS:

ABSENT:

CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX D – NOTICE OF PUBLIC HEARINGS & NOTIFICATION LETTERS

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

286 W. Cromwell Avenue
Fresno, CA 93711-6162
Tel: (559) 449-2700
Fax: (559) 449-2715
www.ppeng.com

April 10, 2016

Mr. Ahmad Al-Khayyat,
Acting Director of Public Works
Madera County
200 W. 4th Street
Madera, CA 93637

Re: City of Madera Urban Water Management Plan Update

Dear Mr. Al-Khayyat:

On behalf of the City of Madera, we wish to inform you that we are currently updating the City's Urban Water Management Plan (UWMP) to meet new State guidelines.

The City of Madera welcomes your input and participation in regards to the preparation of 2015 UWMP. We anticipate sending out the Draft UWMP to you for review within the next few months. Please feel free to contact Provost & Pritchard Consulting Group with any questions.

Respectfully,

Owen Kubit, PE
Senior Water Resources Engineer

Provost & Pritchard Consulting Group
UWMP Contact: Owen Kubit, PE
okubit@ppeng.com
(559) 326-1100

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An Employee Owned Company

286 W. Cromwell Avenue
Fresno, CA 93711-6162
Tel: (559) 449-2700
Fax: (559) 449-2715
www.ppeng.com

April 10, 2016

Mr. Thomas Greci
General Manager
Madera Irrigation District
12152 Road 28 1/4
Madera, CA 93637-9199

Re: City of Madera Urban Water Management Plan Update

Dear Tommy:

On behalf of the City of Madera, we wish to inform you that we are currently updating the City's Urban Water Management Plan (UWMP) to meet new State guidelines.

The City of Madera welcomes your input and participation in regards to the preparation of 2015 UWMP. We anticipate sending the Draft UWMP to you for review within the next few months. Please feel free to contact Provost & Pritchard Consulting Group with any questions.

Respectfully,

Owen Kubit, PE
Senior Water Resources Engineer

Provost & Pritchard Consulting Group

UWMP Contact: Owen Kubit, PE
okubit@ppeng.com
(559) 326-1100

CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX E – DISTRIBUTION SYSTEM WATER LOSSES

AWWA Free Water Audit Software v5.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits
for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person: Danny Martin
Email Address: dmartin@cityofmadera.com
Telephone | Ext.: 559-661-5465 |
Name of City / Utility: Madera-City Public Water System
City/Town/Municipality: Madera
State / Province: California (CA)
Country: United States
Year: 2015 | Calendar Year

Audit Preparation Date: 5/24/2016
Volume Reporting Units: Acre-feet
PWSID / Other ID: 2010002

The following guidance will help you complete the Audit

All audit data are entered on the ***Reporting Worksheet***

⬜	Value can be entered by user
🟨	Value calculated based on input data
🟪	These cells contain recommended default values

Use of Option (Radio) Buttons:

Pcnt:			Value:
0.25%	●	○	

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0
American Water Works Association.

? Click to access definition
\+ Click to add a comment

Water Audit Report for: Madera-City Public Water System (2010002)
Reporting Year: 2015 1/2015 - 12/2015

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED

		Grade	Value	Unit		Grade	Pcnt:		Value:	
Volume from own sources:	+ ?	9	9,314.000	acre-ft/yr	+ ?	7	0.00%	● ○		acre-ft/yr
Water imported:	+ ?	n/a		acre-ft/yr	+ ?			● ○		acre-ft/yr
Water exported:	+ ?	n/a		acre-ft/yr	+ ?			● ○		acre-ft/yr
WATER SUPPLIED:			**9,314.000**	acre-ft/yr						

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

		Grade	Value	Unit	Pcnt:		Value:	
Billed metered:	+ ?	7	7,081.000	acre-ft/yr				
Billed unmetered:	+ ?	7	1,581.000	acre-ft/yr				
Unbilled metered:	+ ?	n/a	0.000	acre-ft/yr				
Unbilled unmetered:	+ ?		116.425	acre-ft/yr	1.25%	● ○		acre-ft/yr

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

AUTHORIZED CONSUMPTION: ? **8,778.425** acre-ft/yr

Use buttons to select percentage of water supplied **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption)

535.575 acre-ft/yr

Apparent Losses

		Grade	Value	Unit	Pcnt:		Value:	
Unauthorized consumption:	+ ?		23.285	acre-ft/yr	0.25%	● ○		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

		Grade	Value	Unit	Pcnt		Value	
Customer metering inaccuracies:	+ ?	9	71.525	acre-ft/yr	1.00%	● ○		acre-ft/yr
Systematic data handling errors:	+ ?		17.703	acre-ft/yr	0.25%	● ○		acre-ft/yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? **112.513** acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? **423.062** acre-ft/yr

WATER LOSSES: **535.575** acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: ? **652.000** acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

		Grade	Value	Unit
Length of mains:	+ ?	7	200.0	miles
Number of active AND inactive service connections:	+ ?	9	13,802	
Service connection density:	?		69	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: + ? (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 7 41.0 psi

COST DATA

		Grade	Value	Unit
Total annual cost of operating water system:	+ ?	10	$6,128,228	$/Year
Customer retail unit cost (applied to Apparent Losses):	+ ?	6	$1.81	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	+ ?	10		$/acre-ft

☑ Use Customer Retail Unit Cost to value real losse

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 81 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources

2: Billed metered

3: Customer retail unit cost (applied to Apparent Losses)

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

WAS v5.0

Water Audit Report for: Madera-City Public Water System (2010002)
Reporting Year: 2015 | 1/2015 - 12/2015

***** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 81 out of 100 *****

System Attributes:

	Apparent Losses:	112.513	acre-ft/yr
+	Real Losses:	423.062	acre-ft/yr
=	**Water Losses:**	**535.575**	acre-ft/yr
?	Unavoidable Annual Real Losses (UARL):	144.77	acre-ft/yr
	Annual cost of Apparent Losses:	$88,709	
	Annual cost of Real Losses:		Valued at **Customer Retail Unit Cost**

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	7.0%	
	Non-revenue water as percent by cost of operating system:	8.4%	Real Losses valued at Customer Retail Unit Cost
Operational Efficiency:	Apparent Losses per service connection per day:	7.28	gallons/connection/day
	Real Losses per service connection per day:	27.36	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.67	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	423.06	acre-feet/year
	? Infrastructure Leakage Index (ILI) [CARL/UARL]:	2.92	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.

Water Audit Report for: Madera-City Public Water System (2010002)

Reporting Year: 2015 | 1/2015 - 12/2015

Data Validity Score: 81

Own Sources (Adjusted for known errors) *9,314.000*	Water Exported *0.000*			Billed Water Exported	
	Water Supplied *9,314.000*	Authorized Consumption *8,778.425*	Billed Authorized Consumption *8,662.000*	Billed Metered Consumption (water exported is removed) *7,081.000*	Revenue Water 8,662.000
				Billed Unmetered Consumption *1,581.000*	
			Unbilled Authorized Consumption *116.425*	Unbilled Metered Consumption *0.000*	Non-Revenue Water (NRW) 652.000
				Unbilled Unmetered Consumption *116.425*	
		Water Losses *535.575*	Apparent Losses *112.513*	Unauthorized Consumption *23.285*	
				Customer Metering Inaccuracies *71.525*	
				Systematic Data Handling Errors *17.703*	
Water Imported *0.000*			Real Losses *423.062*	Leakage on Transmission and/or Distribution Mains *Not broken down*	
				Leakage and Overflows at Utility's Storage Tanks *Not broken down*	
				Leakage on Service Connections *Not broken down*	

AWWA Free Water Audit Software:
Dashboard

WAS v5.0

American Water Works Association.

The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

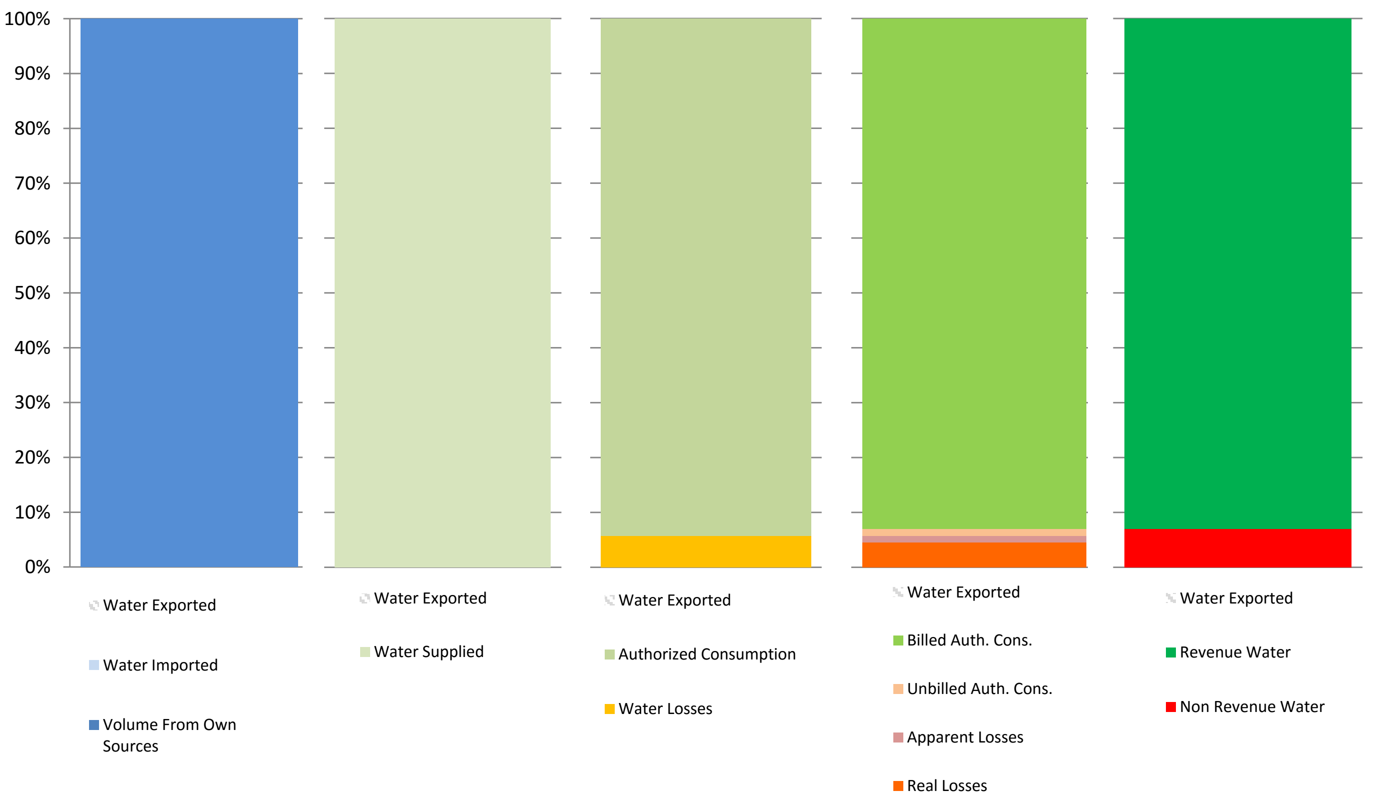
Water Audit Report for: Madera-City Public Water System (2010002)

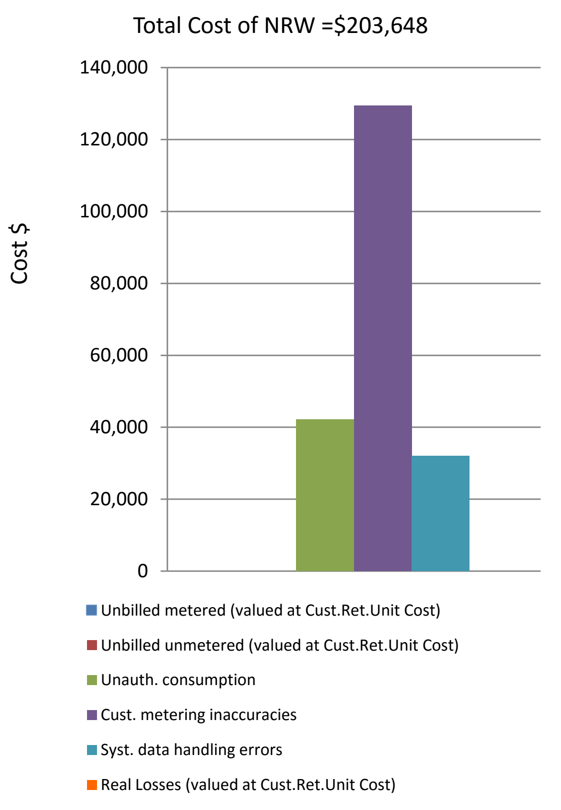
Reporting Year: 2015 1/2015 - 12/2015

Data Validity Score: 81

○ Show me the VOLUME of Non-Revenue Water

● Show me the COST of Non-Revenue Water





CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX F - GROUNDWATER BASIN INFORMATION

San Joaquin Valley Groundwater Basin
Madera Subbasin

- Groundwater Subbasin Number: 5-22.06
- County: Madera
- Surface Area: 394,000 acres (614 square miles)

Basin Boundaries and Hydrology

The San Joaquin Valley is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern Rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern Lakes.

The Madera subbasin consists of lands overlying the alluvium in Madera County. The subbasin is bounded on the south by the San Joaquin River, on the west by the eastern boundary of the Columbia Canal Service area, on the north by the south boundary of the Chowchilla Subbasin, and on the east by the crystalline bedrock of the Sierra Nevada foothills. Major streams in the area include the San Joaquin and Fresno Rivers. Average annual precipitation is 11 inches throughout the majority of the subbasin and 15 inches in the Sierran foothills

Hydrogeologic Information

The San Joaquin Valley represents the southern portion of the Great Central Valley of California. The San Joaquin Valley is a structural trough up to 200 miles long and 70 miles wide. It is filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains, respectively. Continental deposits shed from the surrounding mountains form an alluvial wedge that thickens from the valley margins toward the axis of the structural trough. This depositional axis is below to slightly west of the series of rivers, lakes, sloughs, and marshes, which mark the current and historic axis of surface drainage in the San Joaquin Valley.

Water Bearing Formations

Hydrogeologic units in the Madera Subbasin consist of unconsolidated deposits of Pleistocene and Holocene age. These deposits are divided into continental deposit of Tertiary and Quaternary age, and continental deposits of Quaternary age. Continental deposits of Quaternary age include older alluvium, lacustrine and marsh deposits and younger alluvium. The continental deposits of Quaternary age crop out over most of the area and yield probably more than 95 percent of the water pumped from wells.

Although younger alluvium and flood-basin deposits yield small quantities of water to wells, the most important aquifer in the area is the older alluvium. It consists mostly of intercalated lenses of clay, silt, sand, and some gravel.

The lacustrine and marsh deposits (which contain the E-clay) do not crop out in the area but occur within the older alluvium and underlie the western portion of the subbasin at depths ranging between 150 and 300 feet (DWR 1981). These deposits restrict the vertical movement of ground water and divide the water-bearing deposits into confined and unconfined aquifers. Continental deposits of Tertiary and Quaternary age include the Ione Formation which outcrops on the Subbasin's eastern margin. This unit may yield small quantities of water to wells but is not an important aquifer.

The estimated average specific yield of this groundwater subbasin is 10.4 percent (based on DWR San Joaquin District internal data and that of Davis 1959).

Restrictive Structures

Groundwater flow is generally southwestward in the eastern part of the subbasin and to the northwest in the southern portion, away from the recharge area along the San Joaquin River. During 1999, a groundwater mound occurred in the northwest portion of the subbasin with accompanying depressions to the north and south, and a large depression in the subbasin's southeast corner (DWR 2000). Based on current and historical groundwater elevation maps, groundwater barriers do not appear to exist in the subbasin.

Groundwater Level Trends

Changes in groundwater levels are based on annual water level measurements by DWR and cooperators. Water level changes were evaluated by quarter township and computed through a custom DWR computer program using geostatistics (kriging). On average, the subbasin water level has declined nearly 40 feet from 1970 through 2000. The period from 1970 through 1978 showed steep declines totaling about 30 feet. The nine-year period from 1978 to 1987 saw stabilization and rebound of about 25 feet, taking the water levels close to where they were in 1970. 1987 through 1996 again showed steep declines, bottoming out in 1996 at about 45 feet below 1970 levels. Water levels rose about 8 feet from 1996 to 2000. Water levels declines have been more severe in the eastern portion of the subbasin from 1980 to the present, but the western subbasin showed the strongest declines before this time period.

Groundwater Storage

Estimations of the total storage capacity of the subbasin and the amount of water in storage as of 1995 were calculated using an estimated specific yield of 10.4 percent and water levels collected by DWR and cooperators. According to these calculations, the total storage capacity of this subbasin is estimated to be 18,500,000 af to a depth of 300 feet and 40,900,000 af to the base of fresh groundwater. These same calculations give an estimate of 12,600,000 af of groundwater to a depth of 300 feet stored in this subbasin as of 1995 (DWR 1995). According to published literature, the amount of stored groundwater in this subbasin as of 1961 is 24,000,000 af to a depth of $\leq$ 1000 feet (Williamson 1989)

Groundwater Budget (Type B)

Although a detailed budget was not available for this subbasin, an estimate of groundwater demand was calculated based on the 1990 normalized year and data on land and water use. A subsequent analysis was done by a DWR water budget spreadsheet to estimate overall applied water demands, agricultural groundwater pumpage, urban pumping demand and other extraction data.

Natural recharge was estimated to be 21,000 af. Artificial recharge and subsurface inflow were not determined. Applied water recharge was calculated to be 404,000 af. Annual urban extraction and annual agricultural extraction were estimated as 15,000 af and 551,000 af, respectively. There were no other extractions, and subsurface outflow was not determined.

Groundwater Quality

Characterization. The majority of this subbasin is generally a calcium-sodium bicarbonate type, with sodium bicarbonate and sodium chloride at the western margin of the subbasin along the San Joaquin River (Mitten 1970). TDS values range from 100 to 6,400 mg/L, with a typical range of 200 to 400 mg/L. The Department of Health Services, which monitors Title 22 water quality standards, reports TDS values in 40 wells ranging from 100 to 400 mg/L, with an average value of 215 mg/L. EC values range from 180 to 600 µmhos/cm, with an average value of 251 µmhos/cm (based on 15 wells).

Impairments. There are localized areas of high hardness, iron, nitrate, and chloride. One well is currently undergoing GAC filtration for the removal of EDB/DBCP (Glos 2001).

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]
Inorganics – Primary	44	0
Radiological	44	0
Nitrates	43	1
Pesticides	46	3
VOCs and SVOCs	45	0
Inorganics – Secondary	44	7

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).

[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.

[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: 40 – 4,750	Average: 750 – 2,000
	Total depths (ft)	
Domestic		
Municipal/Irrigation	Range: 100 - 600	

Active Monitoring Data

Agency	**Parameter**	**Number of wells /measurement frequency**
DWR (incl. Cooperators)	Groundwater levels	378 Semi-annually
Department of Health Services (including cooperators)	Title 22 water quality	127 Varies

Basin Management

Groundwater management:	Discussions taking place between purveyors to create draft AB3030 Plan.
Water agencies	
Public	Gravelly Ford W.D., Madera I.D.; Root Creek W.D.
Private	None

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Mitten, HT, LeBlanc, RA, and Bertoldi, GL. 1970. *Geology, Hydrology, and Quality of Water in the Madera Area, San Joaquin Valley, California.* USGS. Open-File Report 6410-03.

Williamson, Alex K, Prudic, David E, and Swain, Lindsay A. 1989. *Groundwater flow in the Central Valley, California.* US Geological Survey Professional Paper 1401-D. 127 p.

Additional References

California Department of Water Resources (DWR). 1980. Bulletin 118-80, *Ground Water Basins in California*.

________. 1994. Bulletin 160-93. *California Water Plan Update, Vol. 1*.

Errata

Changes made to the basin description will be noted here.

CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX G – GROUNDWATER MANAGEMENT PLAN

(appendices not included due to their length)

MADERA REGIONAL GROUNDWATER MANAGEMENT PLAN

A partnership between:
City of Chowchilla
Chowchilla Water District
City of Madera
Madera County
Madera Irrigation District
South-East Madera County United

OWEN KUBIT
No. C6[illegible]552
Civil

Owen Kubit

Date Signed: 12-9-2014

DECEMBER 2014

PREPARED BY:

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

In cooperation with

WOOD RODGERS

KDSA
Est. 1972

NOTICE

Gravelly Ford Water District was initially part of the stakeholder group as a Groundwater Management Plan Participant, but withdrew in March 2014. This Groundwater Management Plan may still contain references to Gravelly Ford Water District.

EXECUTIVE SUMMARY

ES-1. Goals of the Groundwater Management Plan

The goal of this Plan is to provide the framework and technical data to allow for effective groundwater management which moves to restore, where possible, and maintain a high quality and dependable groundwater resource. This Plan documents the existing groundwater management efforts throughout the Groundwater Management Plan (GMP) area and planned efforts to improve groundwater management. The GMP Participants include Chowchilla Water District, City of Chowchilla, City of Madera, Madera County, Madera Irrigation District, and South-East Madera County United.

The goals of the Plan are supported by each of the participants, though not every agency will find it necessary or appropriate to implement every mitigation measure identified in this Plan. The Plan is written to address area-wide issues, but specific measures may only be feasible (technically or economically) in certain subareas. The Plan identifies the measures that may be feasible for each partner agency and leaves the final decisions on implementation to the individual boards of directors and city councils.

ES-2. Basin Management Objectives

The GMP Participants have adopted several overarching Basin Management Objectives which have guided preparation of the recommendations in this Plan. These consist of:

- Collaborative Governance
- Stabilization of Groundwater Levels
- Subsidence Mitigation
- Recovery of Groundwater Levels
- Public Awareness
- Economic Viability

ES-3. Groundwater Overdraft and Sustainability

Of the several Basin Management Objectives, the most critical and the one that drives all the others is the objective of achieving groundwater sustainability, which is defined as "*development and use of groundwater in a manner that can be maintained for an indefinite time without causing unacceptable environmental, economic, or social consequences*." (Alley et al. 1999) A large list of projects has been identified by the GMP Participants to initiate a program for implementation and work towards maintaining groundwater levels. These are listed in **Section 9.3**.

Determination of an available groundwater supply in a groundwater region (groundwater that can be pumped without causing overdraft) is a complex effort; an estimation was made using data including imported surface water, water used throughout the region by municipal and agricultural uses, water returned to the aquifer via natural and intentional recharge, and the calculated change in underground water storage as measured by the changes in groundwater elevation over the region to approximate an area-wide water balance.

In **Section 2.5,** the Plan discusses region-wide overdraft. The 2008 IRWMP calculated the cumulative overdraft in the Valley area to be 99,000 AF/year. The area covered by this Plan does not include the entire Valley area of the County, since it excludes several active districts that did not participate in the Plan. Overdraft was estimated to average 143,000 AF/year over the period from 1980-2011. Future overdraft (2014 and beyond) is estimated to be 259,000 AF/year. The increase in overdraft can be attributed primarily to increased cropping, maturation of existing tree crops, and impacts from the San Joaquin River Restoration.

ES-4. Land Subsidence

Within certain portions of the GMP area, land subsidence results from excessive groundwater pumping over time. Unabated, such pumping can cause unwanted land surface disruptions. In reviewing work performed by the Department of Water Resources (DWR) and the United States Bureau of Reclamation (USBR) related to the San Joaquin River Restoration Project, it appears that substantial land subsidence is occurring in the Red Top area of Madera County, and that the rate of subsidence has increased in recent years with increased groundwater pumping in the area. The Red Top area is located in the west-northwest portion of the GMP area near the axis of the valley where the majority of the historic land subsidence has been documented.

DWR and USBR are both very interested in the subsidence issues in the Red Top area as it relates to the San Joaquin River Restoration Project and to capacity of the existing flood control channels. Neighboring agencies are concerned as well with what is happening and what can be done to limit land subsidence. Subsidence in this area, and across the valley in general, is a subject at the center of discussions within the state and the State Legislature regarding potential legislation to address groundwater and possible State regulation. **Section 2.7** describes the historical background of this subject in more detail. The basin management objectives set forth in **Section 3** include a specific objective regarding subsidence limitation and mitigation.

In **Section 7**, the Plan discusses factors that affect groundwater sustainability and provides a list of over twenty strategies for mitigating groundwater overdraft, for consideration by the GMP Participants as may be appropriate for each.

ES-5. Groundwater Monitoring

Of all the factors affecting groundwater sustainability mentioned above, overdraft and calculated direction from changes in groundwater storage over time is the most direct method of determining the state of a groundwater basin. No matter the other factors, over a long time period, if the groundwater elevation is declining, the groundwater basin is in a state of overdraft. If the groundwater elevation is increasing, uses and natural groundwater discharge are less than supplies and the basin is recovering. It should be noted that the Madera and Chowchilla sub basins are used conjunctively, meaning that groundwater and surface water are used collectively for municipal and agricultural purposes and the groundwater basin is used as a storage reservoir. During wet years, less groundwater pumping is required and recharge is practiced so that excess surface water supplies can be added to water into below-ground storage. In dry years, less surface water is available, more groundwater is pumped to meet demands and groundwater levels decline. Because of this variable use, it is expected that water levels will rise and fall, but in a balanced groundwater basin those levels will be relatively stable over a longer time period.

Section 6 of the Plan describes current groundwater monitoring efforts, both as to groundwater surface elevation and groundwater quality, and describes recommended improvements to the program to help the partner agencies have a more thorough understanding of how the state of the aquifer is changing. The Plan finds that groundwater monitoring data is actually less comprehensive now than it was several years ago, since numerous wells that had been previously monitored are no longer being monitored. Intensification of a semi-annual monitoring program will give each of the GMP Participants strong data from which to make informed decisions regarding groundwater management, and will be the foundation of achieving the overall Basin Management Objectives.

Section 7 expands that recommendation and describes how the groundwater in the region must be protected from contamination due to transport of contaminants occurring as a result of over-pumping in areas of high-quality water. Several potential mitigation measures are included for consideration by each GMP Participant.

ES-6. On-Going Groundwater Operations and Management

An on-going groundwater overdraft as large as the one this region must manage means that significant and broad-based action will be required to bring the region to the point of groundwater sustainability. Review of the water use numbers shows that the issue is too large to be solved by any individual agency or economic sector. It is expected that solving the problem will need to be accomplished in a regional context across all economic sectors and industries in a manner consistent with the boundaries identified in the State's Bulletin 118 consistent with the Madera and Chowchilla sub basins.

Managing the region's groundwater resource to a sustainable level fairly and equitably will require ongoing cooperation among all the stakeholders in the region, as well as real sacrifices on a number of fronts. These upcoming policy and management decisions have led the GMP Participants to recommend formation of a region-wide groundwater management authority, in the form of a Joint Powers Authority (JPA) amongst the partner agencies. This JPA would be a powerful tool for the accomplishment of the goals set forth in this Plan, vested with the authority to make region-wide policy with respect to groundwater use, short of imposing groundwater use moratoria on properties or land uses within the region. The JPA could also be granted the power to levy and collect groundwater pumping charges and other fees meant to provide incentives to reduce groundwater use and increase overall water conservation.

Similar JPAs have been created in over a dozen areas of California. The details of the JPA agreements vary widely, and the GMP Participants will have a high degree of latitude in designing a JPA that will be best suited to the Madera region. These JPAs have proven to be effective tools in those regions for creating equitable and effective groundwater management without resorting to adjudication of the basins. In other words, the regions have maintained local control by their willingness to submit to the controls and policies necessary to reach sustainability.

Section 5 deals in more detail with how a JPA could be set up and what might be the extents and limitations of its authorities.

Readers are cautioned that it was beyond the scope of this project to perform a detailed water budget for each participant. While data exists to make water budget calculations at the sub-regional level, making them at the agency footprint level would require groundwater flow data that are not available without constructing an extensive network of monitor wells throughout the region. Interpolating the sub-regional calculations to the agency footprint level without that supplementary data would be an approximation beyond the prudent use of the available information. It is recommended that as the regional groundwater effort advances, a detailed water budget should be performed to the agency level. This will be helpful in identifying more-detailed information about each agency and the associated impacts that occur from actions by its neighbors. Trends may also become more visible.

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Appendices

List of Abbreviations

AB	Assembly Bill
AF	acre-feet
AFY	acre-feet/year
bgs	below ground surface
BMO	basin management objective
BNSF	Burlington Northern Santa Fe Railway
CASGEM	California State Groundwater Elevation Monitoring program
CCID	Central California Irrigation District
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CFU	colony forming unit
CGPS	continuous global positioning satellite
CSD	community services district
CVP	Central Valley Project
CWD	Chowchilla Water District
DBCP	dibromochloropropane
DOGGER	California Division of Oil, Gas and Geothermal Resources
DPH	Department of Public Health
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EC	electrical conductivity
EDB	ethylene dibromide
EPA	Environmental Protection Agency
GAC	Groundwater Advisory Committee
GAMA	Groundwater Ambient Monitoring and Assessment Program
GFWD	Gravelly Ford Water District
GMP	Groundwater Management Plan
GPS	global positioning system
HPC	heterotrophic plate count
HSA	Hydrologic Study Area
ID	Irrigation District
InSAR	Interferometric synthetic aperture radar
IRWMP	Integrated Regional Water Management Plan
JPA	Joint Powers Agreement / Joint Powers Authority
KDSA	Kenneth D. Schmidt and Associates
KDWCD	Kaweah Delta Water Conservation District
LLNL	Lawrence Livermore National Laboratory
mAF	million acre-feet
MCL	Maximum contaminant level
MD	Maintenance District
MG	million gallons
MGD	million gallons per day
MID	Madera Irrigation District
MOA	Memorandum of Agreement

MOU	Memorandum of Understanding
msl	mean sea level
mya	million years ago
NAVSTAR	Navigation Satellite Timing and Ranging
NGS	National Geodetic Survey
OBGMA	Ojai Basin Groundwater Management Agency
P&P	Provost & Pritchard Consulting Group
PBO	plate boundary observatory
RCD	Resource Conservation District
RCWD	Root Creek Water District
RWQCB	Regional Water Quality Control Board
SA	Service Area
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
SEMCU	South-East Madera County United
SGA	Sacramento Groundwater Authority
SJJRP	San Joaquin River Restoration Project
SLDMWA	San Luis & Delta-Mendota Water Authority
SMWA	Sacramento Metropolitan Water Authority
TAC	Technical Advisory Committee
TDS	total dissolved solids
TID	Tulare Irrigation District
UNAVCO	University NAVSTAR Consortium
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USGS	United States Geologic Survey
WCD	Water Conservation District
WHPA	wellhead protection area
WSJV	Western San Joaquin Valley
WWTP	wastewater treatment plant

1. INTRODUCTION

1.1. Overview

This Groundwater Management Plan (GMP or Plan) is a collaborative effort between the City of Chowchilla, City of Madera, Madera Irrigation District, Chowchilla Water District, Madera County and South-East Madera County United. These agencies will hereafter be called the Plan Participants or GMP participants. Other agencies or entities that may have an interest in the plan will be called Stakeholders. This GMP addresses regional groundwater management issues, as well as local groundwater management by each participating agency. Each participant maintains sovereign groundwater management over their respective service areas. Refer to Section 1.5 for more details on the groundwater management authority of the GMP Participants.

This Groundwater Management Plan satisfies the new requirements for GMPs created by the September 2002 California State Senate Bill No. 1938 and 2011 Senate Bill 359, which amended Sections 10753 and 10795 of the California Water Code. This Plan also addresses recommended components for a Groundwater Management Plan described in Appendix C of Department of Water Resources Bulletin 118 (2003 Update). Section 1.6 shows the required and recommended components for GMPs.

In September 2014, the State of California passed Senate Bill 1168, Assembly Bill 1739, and Senate Bill 1319, which are collectively known as the Sustainable Groundwater Management Act. These bills impose mandates for sustainable groundwater management on local agencies in high- and medium-priority groundwater basins, and require development of Groundwater Sustainability Plans, which will supplant Groundwater Management Plans such as this one. The State must develop detailed guidelines for what to include in the Groundwater Sustainability Plans. This GMP will not fully satisfy the requirements of this new legislation, but much of the information herein will be useful in developing a Groundwater Sustainability Plan in coming years.

The primary purpose for this plan is to demonstrate that local groundwater management efforts can be meaningful. Adjudication of the groundwater basin by the State may be likely in the near future if a coordinated, regional effort is not implemented to improve groundwater conditions, and to limit subsidence along the San Joaquin River in northwestern Madera County. Additional purposes for preparing this regional GMP include:

1. Satisfy new State requirements for GMPs.
2. Update and document the region’s goals and objectives for groundwater management.
3. Update information on local groundwater conditions so the GMP is a useful reference document.

4. Maintain the participant's eligibility for certain State grants, loans and special drought assistance that require an updated GMP.
5. Continue each of the participant's authority to responsibly manage local groundwater with the intent to sustainably meet local water needs.
6. Improve water management on a regional basis to avoid adjudication of the local groundwater basin by the State.

This plan outlines the framework for regional and local groundwater management efforts in the valley floor portion of Madera County and the portion of Merced County covered by Chowchilla Water District. Several of the GMP participants have previously prepared Groundwater Management Plans, but those plans do not satisfy all the current GMP requirements. The Participants have chosen to prepare a regional GMP so the plan can more effectively address topics that are regional in nature, such as groundwater overdraft and land subsidence, or are better addressed with a regional approach, such as data collection and public education. It is intended that each participant will implement the appropriate regional concepts in their local jurisdictions. **Table 1.1** shows the previous GMPs and when each was developed.

Table 1.1 – Previous Groundwater Management Plans

Participant	Date of Previous GMP
City of Chowchilla	1997
Chowchilla Water District	1997
Gravelly Ford Water District	1998
City of Madera	None
Madera County	2002
Madera Irrigation District	1999
South-East Madera County United	None

Hereafter in this report, the terms 'region' and 'regional' refer to the cumulative jurisdictional areas covered by these agencies.

The other public water agencies in the valley portion of Madera County were offered the opportunity to participate in this plan, but chose not to for a variety of reasons. These areas include Madera Water District, Root Creek Water District, Clayton Water District, Progressive Water District, Sierra Water District, New Stone Water District and Columbia Canal Company. Of these, Madera Water District, Columbia Canal Company, Aliso Water District and Root Creek Water District have Groundwater Management Plans that comply with recent State laws. The other districts are inactive or do not have a GMP, and are included in the County's tabulations.

1.2. Report Organization

This report is organized according to the required content for GMPs outlined in the California Water Code. General categories that are addressed include descriptions of the regional geology and hydrogeology, basin management objectives, stakeholder involvement, groundwater monitoring, groundwater resources protection, groundwater sustainability, groundwater operations, and groundwater planning and management. Within these categories, specific groundwater management elements are described including existing activities and planned actions to improve groundwater management.

Some of these topics are discussed in more than one section, which is a reflection of Water Code requirements. Specifically groundwater quality, land subsidence and groundwater overdraft are discussed in multiple sections, as shown in **Table 1.2**.

Table 1.2 – Groundwater Management Plan Topics Addressed in Multiple Sections

Topic	Related GMP Sections
Groundwater Quality	2.7 – Groundwater Quality
	5.2 – Groundwater Quality Monitoring
	6.3 – Saline Water Intrusion
	6.4 – Migration of Contaminated Groundwater
	6.5 – Groundwater Quality Protection
Land Subsidence	2.7 – Land Subsidence
	5.4 – Land Subsidence Monitoring
	7.5 – Land Subsidence Mitigation
Groundwater Overdraft	2.5 – Groundwater Overdraft and Available Groundwater Supplies
	2.6 – Geologic Potential for Groundwater Recharge
	7.2 – Overdraft Mitigation
	7.3 – Groundwater Replenishment
	7.4 – Conjunctive Use of Water Resources

1.3. Background Information

This section provides an overview of each of the GMP Participants as well as the region's geography, climate, hydrologic features, geology, land use, water demands, groundwater supplies and surface water supplies. Information is provided for each agency, and collectively the data is used in a regional analysis of groundwater conditions. Refer to Section 8.2 - Operation of Facilities for more details on water-related infrastructure in the region. A map showing the locations of each participating agency is shown as **Figure 1.1**.

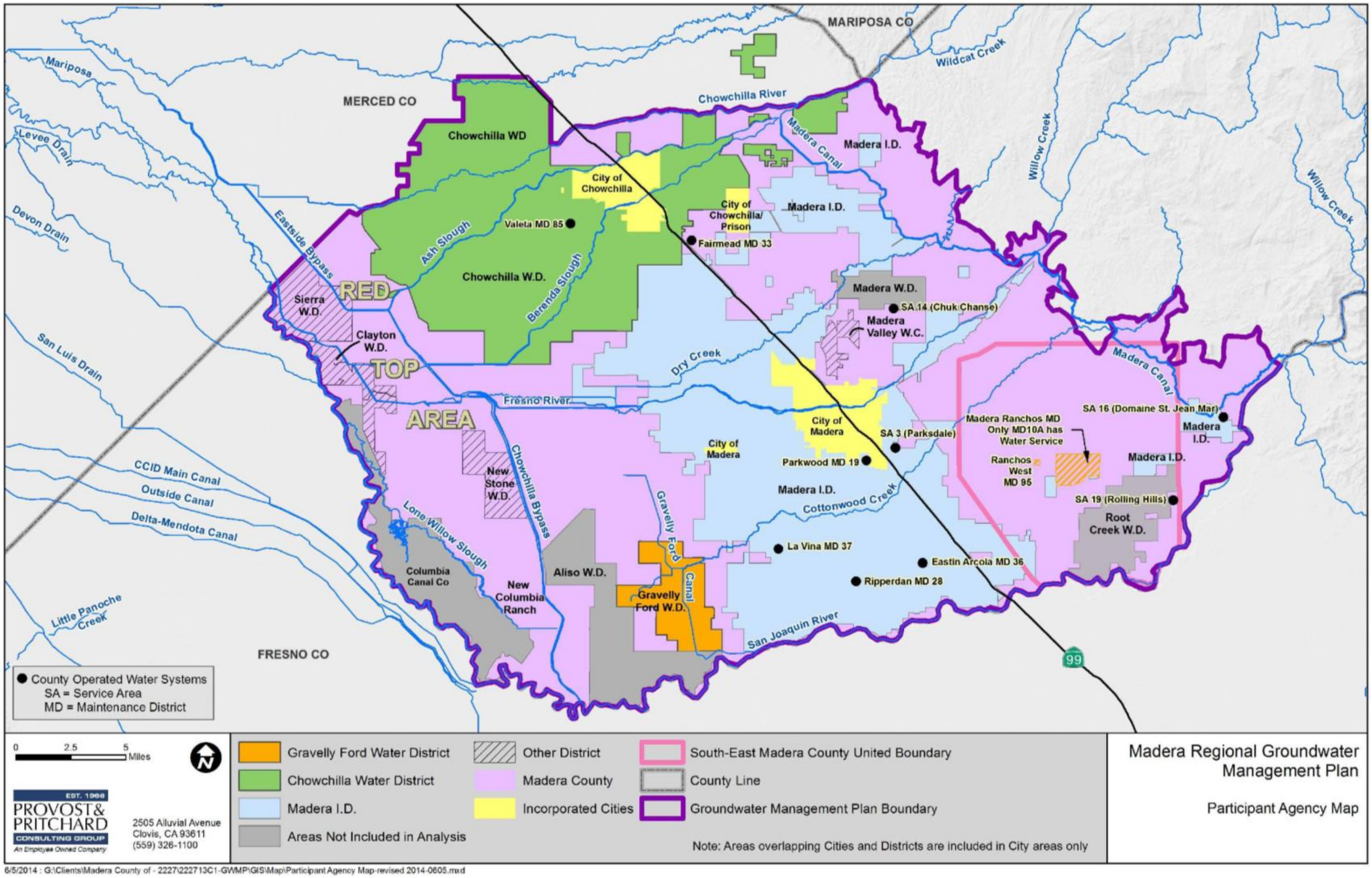


Figure 1.1 – Participating Agency Map

1.3.1 Participants Overview

City of Chowchilla

The City of Chowchilla, incorporated in 1923, covers approximately 11.72 square miles (7,500 acres) and has a population of 19,000 (US Census, 2013), including about 6,600 inmates at two local prisons. The two local prisons are surrounded by County of Madera lands, effectively creating a 1,323-acre city island east of the main city limits. The prisons together farm about 780 acres and provide their own water and sewage services.

The City of Chowchilla is governed by a five member City Council which sets policy for city government, city services, and economic development. The City Council has the authority to pass emergency ordinances for the immediate preservation or protection of public health, property or safety. Various commissions and committees, including the Airport Advisory Committee, Heritage Preservation Commission, Parks & Recreation Commission, and the Planning Commission, act in advisory capacities to the City Council.

Chowchilla Water District

Irrigation in the Chowchilla region began in the late 1800s using artesian wells, but by the 1940s diminished groundwater supplies threatened the area's continued economic viability. The Chowchilla Water District was formed in 1949 for the purpose of furnishing a supplemental water supply for agriculture within its boundaries. Until that time, the lands within the District boundaries had been part of the Madera Irrigation District. In the ensuing years, additional acreage was added to the District. In 1988, the LaBranza Water District and Chowchilla Water District consolidated into the current Chowchilla Water District.

In 1950, the District signed its original water service contract with the U.S. Bureau of Reclamation, for water delivery from the Friant Division of the Central Valley Project. In 1968, the District signed a second water service contract with the U.S. Bureau of Reclamation, for water delivery from the Buchanan Unit of the Central Valley Project.

Since its inception, the District has provided consistent and reliable surface water to its constituents, resulting in improvements to local groundwater conditions. The District currently consists of approximately 129.2 square miles (88,700 acres), which includes an overlap of 6,100 acres with the City of Chowchilla. The District includes lands in both Madera and Merced counties.

The mission of the Chowchilla Water District is to protect, enhance, and manage surface and groundwater resources of the District in order to meet present and future water demands within the District. The District is governed by a five-member Board of Directors.

City of Madera

The City of Madera is the largest city in Madera County and serves as the County seat. The City had an estimated 2013 population of 62,200. Laid out in 1876 at the end of a lumber flume and incorporated in 1907, it now occupies approximately 10,000 acres (15.8 square miles). Utilizing a Council and Manager form of government, six City Council members and a separately-elected Mayor address the legislative needs of the city. The City Manager is appointed by the City Council to administer the overall city organization. Madera is a full-service city, operating its own water and wastewater systems, and hosting a full range of community-based programs and services. Strategic planning in the City is driven by Vision Madera 2025, a community-based visioning program completed in 2006, and by the City's Comprehensive General Plan.

Madera County

Madera County was formed in 1893 and encompasses 2,174 square miles (1.4 million acres). The valley portion of the County is covered by this GMP, excluding Cities and Irrigation/Water Districts with adopted GMPs (see **Figure 1.1**). This area covers 432 square miles (277,000 acres) and has a population of about 27,000 with about 19,700 residing in eight Maintenance Districts and four Service Areas that are provided water by the County. Large areas of unincorporated lands are cropped or grazed and operate on private domestic and irrigation wells. A large portion of the eastern end of Madera County (within the valley) has high bedrock, limited alluvium and little groundwater supply, despite being in a DWR defined groundwater basin. Local wells in this area have limited groundwater yield, and groundwater is typically only pumped from small stockwater wells.

A five member Board of Supervisors (BOS) oversees the duties and functions of Madera County government. Supervisors work with the elected department heads and hire other department heads to run the various departments. The BOS may set County policy, but works within the constraints of State and Federal law. It is the duty of the BOS to submit a balanced budget to the State. The Board meets regularly on the first four Tuesdays of the month and any member of the public may bring matters before the Board if the item is placed on the meeting agenda. The BOS is the governing body for the following: Madera County Flood and Water Conservation Agency, Maintenance Districts and Service Areas, Public Finance Authority, and Redevelopment Agency.

Madera Irrigation District

Madera Irrigation District (MID) is a public agency, established by the State Legislature as a Special Act District. It is governed by a five-member Board of Directors who are elected at large but who must reside within the division they serve. A large segment of the City of Madera (City) is included within the District as well as portions of Madera Water District. Each registered voter who resides within the City has the opportunity to vote for the Director of his or her choice and may opt to run for the directorship. In addition to the services rendered to the lands within the District, the District also conveys agricultural water to the Gravelly Ford Water District. The District is also a partner in the Madera-Chowchilla Water and Power Authority.

The District was formed in 1920 to bring surface water to the Madera area. The District presently encompasses an area of about 129,000 acres, with about 9,400 acres overlapping with the City of Madera. About 10,800 acres within MID are known as “subordinate lands,” which have a lower priority to surface water than other lands in the District. Excluding the City of Madera overlap area, MID has a population of 11,900 according to the 2013 census.

The District has a Central Valley Project (CVP) repayment contract with United States Bureau of Reclamation (USBR) providing up to 85,000 acre-feet (AF) of Class 1 and 186,000 AF of Class 2 water per year from the Friant Division (Millerton Lake). CVP water is released from Millerton Lake through the Friant Dam, and then conveyed through the Madera Canal for delivery into the District’s service area. The District also entered into a CVP repayment contract with the USBR for the yield from the Hidden Unit (Hensley Lake). The average annual supply available to the District under the Hidden Unit contract is approximately 24,000 AF per year.

The District has Pre-1914 rights to divert water from Big Creek, known as the Big Creek Diversion, and the North Fork of Willow Creek, known as the Soquel Diversion. The Big Creek Diversion originates in Big Creek, a tributary of the Merced River. This Diversion is located just upstream of Fish Camp, CA, and redirects water to flow down Lewis Creek, a tributary of the upper Fresno River. The Soquel Diversion originates in North Fork Willow Creek, a tributary of the San Joaquin River. This Diversion is located approximately nine miles upstream of Bass Lake, where the Diversion can redirect water to flow through the Soquel Ditch to Nelder Creek, a tributary of the upper Fresno River. Alternatively, water can be left in North Fork Willow Creek, and allowed to flow to Bass Lake and eventually to the San Joaquin River, where it can be diverted in Friant Dam. MID also has a Pre-1914 water right on the Fresno River. MID expects surface water supplies to increase by 10,000 AF/year in the future as they sell less of their water, and some growers import some surface water.

South-East Madera County United

South-East Madera County United (SEMCU) is a non-profit mutual benefit organization dedicated to representing the interests of the residents, property owners, and businesses in the SEMCU Area. It is bounded to the north by Highway 145, on the south by the San Joaquin River, on the east by Highway 41, and on the west by the Burlington Northern Santa Fe Railway (“BNSF”) and by Avenue 32 1/2 north of its intersection with the BNSF Railway. It occupies an area of 97.6 square miles (~62,500 acres). There are two identified communities within the SEMCU area. The larger is the Madera Ranchos with about 12,000 people and around 3,500 homes. Most residential lots are either 2.5 or five acres in size, although there are some one-acre lots and a number of larger parcels. Rural residential development is common in the area. The smaller community is Rolling Hills, located on the west side of SR 41, between Avenue 10 and Avenue 11-1/2. It is comprised of 300 homes; virtually all lots are one acre in size. Both of these areas are unincorporated and represented by Madera County. The population within the SEMCU area was estimated to be 10,500 in 2013.

SEMCU is a participant in the GMP but does not own or operate groundwater extraction, recharge or conjunctive use facilities. It is a non-profit educational organization and has no land-use planning authority. However, SEMCU represents numerous public and private interests in its area and provides input and comments on water related land-use policies. In representing local interests, SEMCU studies issues facing its members, such as access to water, transportation, schools, and energy, and works with local governments and private entities to find working solutions to regional problems. Additionally, SEMCU strives to advocate for its members wherever and whenever the opportunity arises and to obtain grant funding to help address area needs. More information on SEMCU can be found on their website: http://semcu.com/about.php).

1.3.2 Geography

The Madera Regional GMP area is located in the geographic center of California in the San Joaquin Valley. The GMP area generally includes the valley portion of Madera County and a portion of Chowchilla Water District that is within Merced County. The borders of the GMP area are generally defined by the DWR Groundwater Basin boundaries to the east, the San Joaquin River on the south and west, and the Chowchilla River on the north. The GMP area considered under the jurisdiction of Madera County includes County lands that are not under the jurisdiction of a City, or active water district or irrigation district. Areas excluded from the GMP include Root Creek Water District, Madera Water District, Aliso Water District and Columbia Canal Company. The area of each GMP participant is shown in **Figure 1.1** and summarized in **Table 1.3.**

Table 1.3 – Groundwater Management Plan Participant Areas

Participant	Area		Notes
	Square Miles	Acres	
Chowchilla Water District	129	82,700	Excludes City areas, includes subordinate lands
City of Chowchilla	12	7,500	Includes prisons
City of Madera	16	10,100	
County of Madera	432	277,000	Includes unincorporated areas outside of Cities and districts
Madera Irrigation District	187	119,600	Excludes City areas; includes subordinate lands
South-East Madera County United	98	62,500	Overlaps with Cities, districts and county
Total (excluding SEMCU overlap)	776	496,900	

1.3.3 Climate

The climate of the GMP area is characterized by cool, mild winters and hot, dry summers. Temperatures in the summer often exceed 100 degrees Fahrenheit. Fog can be experienced for long periods in the winter, with low temperatures typically in the mid-30's and occasionally dropping into the 20's. Average annual precipitation is about 10 inches, with 80 percent of the rainfall occurring in the winter months. The frost-free growing season averages around 250 days per year.

Water supplies can vary substantially year to year due to wide variations in precipitation in the GMP area and its upper watersheds. The California Department of Water Resources created an index that provides a comparison of normal, single-dry and multiple-dry years in the San Joaquin Valley. The data is presented as the Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices (Index), and covers the period from 1901 to 2013. DWR has defined certain base years as average, single-dry and multiple-dry. These are presented in **Table 1.4** with the estimated unimpaired runoff each year.

Table 1.4 – Comparison of Unimpaired Runoff in Normal and Dry Years

Description	Base Year	Runoff (mAF)	Percentage of Average Year	Water Supply Index
Average Water Year	1921	5.90	100%	3.23
Single-Dry Water Year	1977	1.05	18%	0.84
Multiple-Dry Water Years	1929-1931	2.58[1]	44%	1.74[2]
Single-Dry Year	2012	2.76	47%	2.18
Single-Dry Year	2013	3.05	52%	1.76

Notes: [1] Average runoff for 3 year period.
[2] Average index over 3 year period

Table 1.4 shows that water supplies can be substantially lower than average in dry years, and less than half of normal for as long as three consecutive years. As well, to illustrate the most current condition in the region, water supplies in 2012 and 2013 have been about one-half of the average and it is likely that due to a lack of storage in the watershed, in terms of lack of soil moisture and minimal snow pack, that 2014 may be as dry a year as 1977.

1.3.4 Hydrologic Features

The major hydrologic features in the GMP area, including reservoirs, rivers, streams, flood bypass channels, and canals are shown in **Figure 1.2**. Major rivers include the San Joaquin River, Fresno River and Chowchilla River. The Eastside Bypass and Chowchilla Bypass are the backbone of the flood control conveyance facilities. MID and CWD have extensive irrigation canal systems.

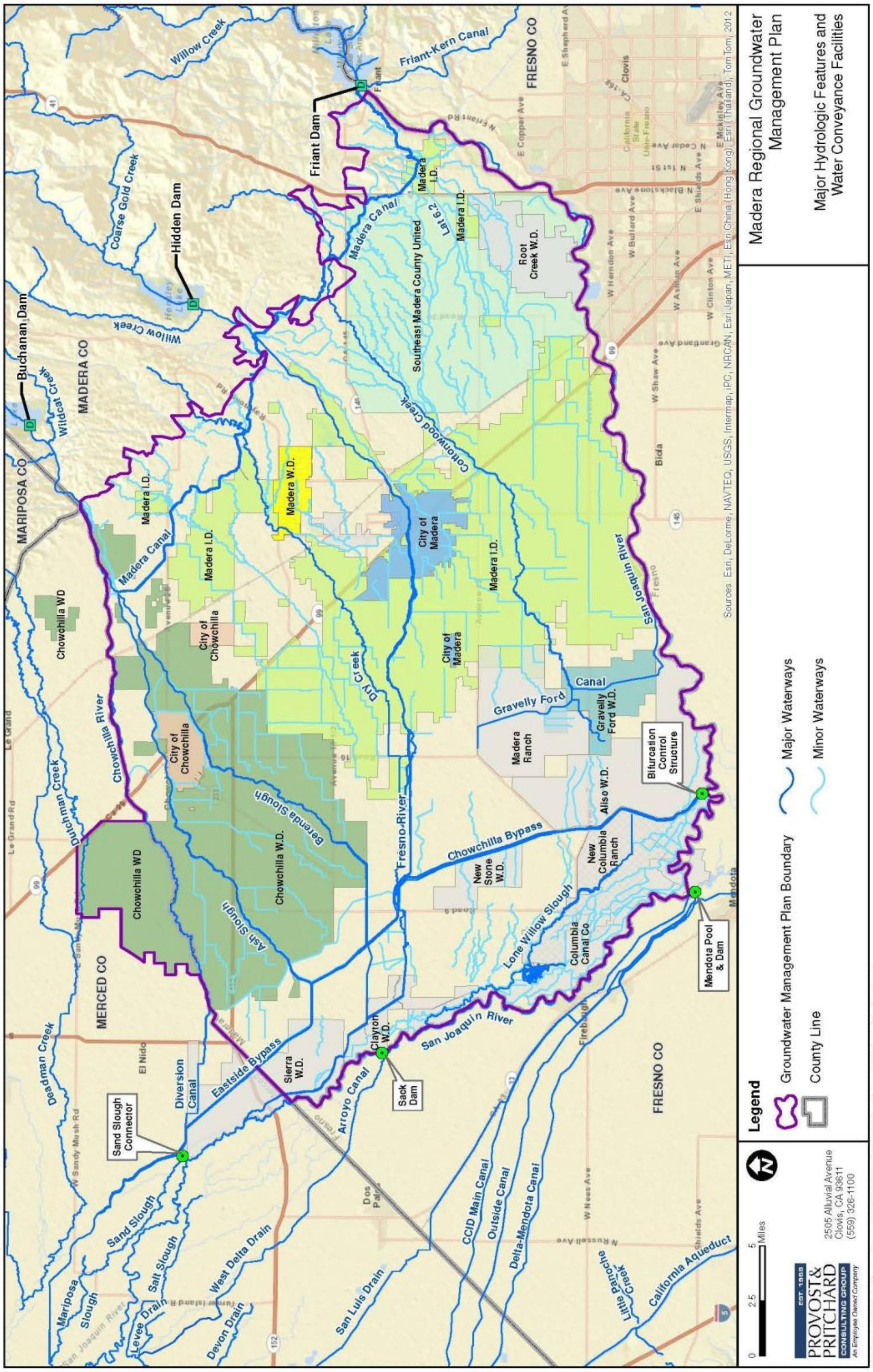


Figure 1.2 – Major Hydrologic Features and Water Conveyance Facilities

1.3.5 Geology

The GMP area encompasses the majority of the Madera Groundwater Sub-basin, and portions of the Chowchilla and Delta Mendota Groundwater Sub-basins (a map and discussion of the extent of these groundwater basins is provided in Section 2.1). These Sub-basins are defined by the California Department of Water Resources Bulletin 118-80. These Sub-basins are within the San Joaquin Valley Groundwater Basin and the San Joaquin Basin Hydrologic Study area.

The Madera and Chowchilla Sub-basins are considered to be ‘critically overdrafted’ by the California Department of Water Resources. Groundwater levels in the GMP area have gradually declined over time. The Corcoran Clay, a major confining bed in the San Joaquin Valley, is present in the western portion of the Plan area. See Section 2 for more details on the geology of the GMP area.

1.3.6 Domestic Water Demand

Domestic water demands are defined as water used for domestic (indoor and landscape) purposes in urban and rural areas. The Cities directly provide water to their residents, and the County provides water to residents of the 12 Maintenance Districts and Service Areas in the Plan area. Rural residents living in the irrigation districts, water districts and other unincorporated areas also pump domestic water from their private wells. **Table 1.5** summarizes domestic water demands in the GMP area based on the most recent statistics

Table 1.5 – Domestic Water Demands

Area	Per Capita Usage (gal/day)	Annual Demand (AF/year)
City of Chowchilla	311	3,500
City of Madera	195	12,700
County Maintenance Districts / Service Areas	168	3,700
Unincorporated County lands	168	1,400
Madera Irrigation District	168	2,200
Chowchilla Water District	168	600
Gravelly Ford Water District	168	20
	Total	24,100

The per capita water usage values were obtained from the City’s Urban Water Management Plans, 2008 Madera County IRWMP, and current water use and population statistics.

Urban growth was relatively high in the early and mid-2000's in Madera County but recently has been relatively flat. Evaluating future population growth is beyond the scope of this Plan. However, it is recommended that population growth be evaluated in a separate study to forecast the impacts it may have on future groundwater overdraft. Important factors that may impact population growth include available water supplies, local economic activity, and improvement in local schools.

1.3.7 Agricultural Water Demands

Cropping Data

Agricultural cropping data was collected to estimate agricultural water demands in the GMP area. Several sources of cropping data were found including:

1. California Department of Water Resources (DWR) - Land Use Data
2. California Department of Conservation – Farmland Mapping and Monitoring Data
3. Madera County Agricultural Commissioner's office
4. USDA CropScape
5. Local Irrigation and Water District cropping records

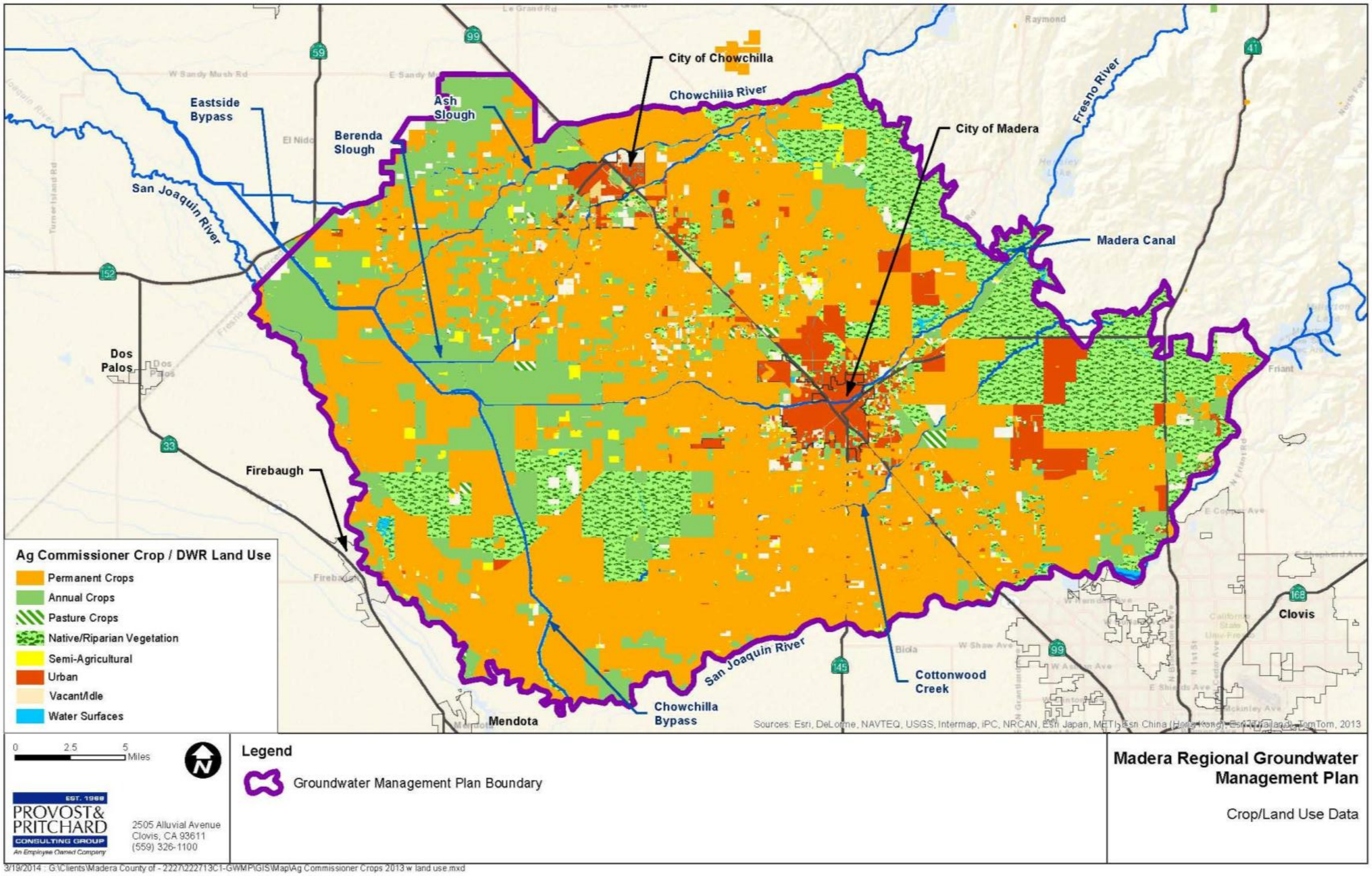
The DWR Land Use Data is generally considered the most accurate and reliable source because it is collected by trained staff who use a combination of aerial photographs and field verification. However, DWR surveys are only performed in each County about once every six years, and the most recent survey was performed in 2011. DWR data was also used in crop demand estimates in the 2008 IRWMP and it can provide a meaningful comparison to changes since 2007. As a result, the 2011 DWR data was projected to 2013 based on historical cropping changes since 2003.

The Madera County Agricultural Commissioner's Office had 2013 cropping data, which is based on pesticide permit applications. This data is not field verified, but is the most recent data available. The data does not include records for organic farms since they do not require pesticide permits, although these cover a relatively small part of the County. Nevertheless, the larger organic farms and dairies were identified, and cropping was assumed to be similar to the year before they converted to organic operations.

During the preparation of this report, the Irrigated Lands Regulatory Program was contacted as a potential source of cropping data. However, ILRP members were still in the process of organizing and collecting data and none was available for release.

Crop Water Demands in GMP Area

General land use in the GMP area is shown in **Figure 1.3.** The cropping data for **Figure 1.3** was acquired from the Madera County Agricultural Commissioner's Office and can be found in **Appendix A**. **Figure 1.3** shows that almost 54% of the land is planted in permanent crops, and 69% of the total land is cropped. There is potential for further agricultural development since 21% of the land has not been developed.



Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013

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Figure 1.3 – Crop / Land Use Data

Countywide cropping data is shown in **Table 1.6** for several years. DWR data from 2011 was projected to 2013 based on average annual historical changes between 2003 and 2011. The estimated water demands are within 0.5% of those estimated using the 2013 data from the Madera County Agricultural Commissioner's Office.

Table 1.6 – County-wide Cropping and Agricultural Water Demands

Year	Cropping Data Source	Acreage	Applied Water Demands (AF/year)
2003	DWR	314,800	1,010,000
2011	DWR	360,900	1,022,000
2013	DWR (projected)	372,600	1,050,000
2013	County Agricultural Commissioner's Office	357,700	1,044,000

The projected DWR data and County Agricultural Commissioner's Office have similar applied water demands, but the acreage varies by approximately 4%. A review of the data shows that 2013 included a reduction in low-water-use crops, such as grains, and an increase in medium- and high-water use crops, including corn and truck crops, thus explaining the discrepancy.

Agricultural plantings have increased substantially in recent years. Much of the plantings have been tree crops that cannot be fallowed in dry years. In addition, the demand for certain crops, such as almonds, is very strong and may encourage further development. An evaluation of future agricultural water demands is beyond the scope of this plan, but is needed to assess the impacts of future irrigation demands on groundwater overdraft.

Crop Water Demands in Participating Agencies

Table 1.7 shows cropped area and agricultural water demands for each agency. Refer to **Appendix A** for water demand calculations. Both Cities include small areas that are cropped and hence have some agricultural water demand.

Table 1.7 – Agency Cropping and Agricultural Water Demands (2013)

Area	Cropped Acreage	Annual Demand (AF/year)
City of Chowchilla	1,500	4,000
City of Madera	1,100	2,500
Unincorporated County Lands	141,000	418,000
Madera Irrigation District	104,000	286,000
Chowchilla Water District	68,500	215,000
Gravelly Ford Water District	7,600	20,400
Total	**323,700**	**945,900**

Note: The values for MID and CWD exclude areas that overlap with the Cities. This was done to avoid double-counting areas and water demands.

The total cropped area in **Table 1.7** differs from the acreage presented in **Table 1.6** because certain areas which have adopted Groundwater Management Plans (Root Creek Water District, Aliso Water District, Columbia Canal Company and Madera Water District) were excluded from the latter summary.

1.3.8 Groundwater Supplies

All of the GMP Participants use groundwater to meet at least a portion of their water demands. Groundwater serves an important reserve supply to supplement surface water deliveries. Below is a summary of groundwater usage in each agency, including groundwater used directly by the agency and groundwater pumped from private wells within the agency boundaries. Groundwater pumpage is directly measured by some municipal agencies, but is not measured on domestic or agricultural wells. Domestic groundwater pumping was based on population and typical per capita use rates (see **Table 1.5**). Groundwater pumping in agricultural areas was estimated as the difference between water demands and surface water deliveries.

Table 1.8 - Average Annual Groundwater Pumpage (2004-2013)

Agency	Agency Groundwater Pumpage (AF)	Private Groundwater Pumpage (AF)	Total Pumpage (AF)
Chowchilla Water District	0	118,600	118,600
City of Chowchilla	4,100	2,600	6,700
City of Madera	12,700	600	13,300
County of Madera	3,700	398,800	402,500
Gravelly Ford Water District	0	16,300	16,300
Madera Irrigation District	0	185,000	185,000
Total	20,500	721,900	742,400

Notes:

1. Values are total groundwater pumpage. Net pumpage is less due to deep percolation of irrigation and percolation of wastewaters.
2. These are historical values. Future pumping will likely increase due to reductions in surface water deliveries as a result of the San Joaquin River Restoration settlement.

1.3.9 Surface Water Supplies

Madera Irrigation District, Chowchilla Water District and Gravelly Ford Water District each meet significant portions of their water demands with surface water. The County of Madera provides a small amount of surface water to one of their Service Areas. In addition, an estimated 10,000 AF/year of riparian water is delivered to other private lands in unincorporated areas of Madera County.

The Cities of Madera and Chowchilla do not have surface water rights or contracts. However, within the limits of each City there are cropped lands that receive some surface water from local water or irrigation districts. Owners of those parcels pay assessments to the districts, and as a result partially fund the importation of surface water to the GMP area. The City of Madera also purchased 300 AF of floodwater in 2009 from MID as a pilot study on groundwater recharge. **Table 1.9** summarizes the historical surface water deliveries in the GMP area, followed by more detailed descriptions of those supplies.

SEMCU does not have the authority to hold water rights or water contracts.

Table 1.9 – Historical Surface Water Supplies in the Groundwater Management Plan Area

Agency	Average Annual Supplies (2004-2013)	Notes
Chowchilla Water District	135,000	Excludes CWD lands in City of Chowchilla
City of Chowchilla	1,400	CWD water delivered to cropped land in City
City of Madera	1,900	MID water delivered to cropped land in City
County of Madera	20,000	Sumner Hills Service Area, riparian agricultural water, some MID water
Gravelly Ford Water District	10,500	
Madera Irrigation District	188,000	Excludes MID lands in City of Madera
Total	**356,800**	

Note: Values include surface water that is delivered directly to growers and recharge basins, and lost as canal seepage.

These surface water supplies have been and will continue to be reduced to provide water for the San Joaquin River Restoration. Those impacts are described in Section 7.1 – Issues Impacting Groundwater Sustainability.

Chowchilla Water District

Irrigation in the Chowchilla region began in the late 1800s with artesian wells, but by the 1940s diminished groundwater supplies threatened the area's continued economic viability. The Chowchilla Water District was formed in 1949 for the purpose of furnishing a supplemental water supply for agriculture within its boundaries. Until that time, the District had been part of the Madera Irrigation District.

In the ensuing years additional acreage was added to the District. In 1988, the LaBranza Water District and Chowchilla Water District were consolidated into the current Chowchilla Water District. In 1950, the District signed its original water service contract with the U.S. Bureau of Reclamation (USBR) for water delivery from the Friant Division of the Central Valley Project (Friant CVP). In 1968, the District signed a second water service contract with USBR for water delivery from the Buchanan Unit of the Central Valley Project.

Since its inception, the District has provided consistent and reliable surface water to its constituents, resulting in improvements to groundwater conditions. The District services over 400 landowners on about 88,000 acres of land in southern Merced and northern Madera counties.

Chowchilla Water District (CWD) receives water from three main sources: the San Joaquin River, the Chowchilla River and Merced Irrigation District. Chowchilla Water District's current Friant CVP contract provides for an annual maximum of 55,000 AF of Class 1 water and an annual maximum of 160,000 AF of Class 2 water, all supplied via the Madera Canal. The District receives an annual average of 48,500 AF from its Buchanan Unit contract, and purchases surplus water from Merced Irrigation District in varying quantities when it is available.

Gravelly Ford Water District

Gravelly Ford Water District's contract with the USBR is for 14,000 AF of Class 2 water, delivered through the San Joaquin River. The District has also been able to take some water from Cottonwood Creek, and buy additional water from Madera Irrigation District and the USBR. The average annual surface water supply between 2004 and 2013 was 10,500 AF, and in some years no water has been available.

Madera Irrigation District

The Madera Irrigation District purchases and wheels or delivers water to growers within its boundaries. Madera Irrigation District has a Central Valley Project (CVP) repayment contract with United States Bureau of Reclamation (USBR) providing up to 85,000 acre feet (AF) of Class 1 and 186,000 AF of Class 2 water per year from the Friant Division (Millerton Lake). The CVP water is released from Millerton Lake through the Friant Dam, and then conveyed through the Madera Canal for delivery into the District's service area. The District also entered into a CVP repayment contract with the USBR for the yield from the Hidden Unit (Hensley Lake). Under the Hidden Unit contract, the average annual supply available to the District is approximately 24,000 AF per year.

The District has Pre-1914 rights to divert water from Big Creek via the Big Creek Diversion and from the North Fork of Willow Creek via the Soquel Diversion. The Big Creek Diversion originates in Big Creek, a tributary of the Merced River. This Diversion is located just upstream of Fish Camp, CA, and redirects water to flow down Lewis Creek, a tributary of the upper Fresno River. The Soquel Diversion originates in North Fork Willow Creek, a tributary of the San Joaquin River. This Diversion is located approximately nine miles upstream of Bass Lake, and can divert water to flow through the Soquel Ditch to Nelder Creek, a tributary of the upper Fresno River. Alternatively, water can be left in North Fork Willow Creek, allowed to flow to Bass Lake and eventually to the San Joaquin River, and diverted at Friant Dam into the Madera Canal. MID also has a Pre-1914 water right on the Fresno River.

County of Madera

The County of Madera manages Sumner Hills Service Area (SA-16) which is supplied with first-priority water released into the San Joaquin River from Millerton Lake by the USBR, under the terms of Holding Contract 7. Sumner Hills' average annual demands are 120 AF. In addition, an estimated 10,000 AF of other riparian water is delivered to unincorporated lands each year.

1.4. Goals and Objectives of Groundwater Management Plan

The purpose of this GMP is to develop a coordinated and comprehensive approach to the evaluation and management of groundwater resources in the area covered by the GMP. The goal of this Plan is to provide the framework and technical data to allow for effective groundwater management which moves to restore, where possible, and maintain a high quality and dependable groundwater resource. The goals and proposed actions in this plan will likely evolve as other concerns and issues arise.

This Plan documents the existing groundwater management efforts in the GMP area and planned efforts to improve groundwater management. The objective the GMP is to help the GMP Participants meet the following goals:

1. Develop a collaborative relationship with all the GMP participants to address groundwater management issues on a regional scale.
2. Identify policies, priorities and goals for a collaborative approach to regional management of the groundwater.
3. Develop new surface water sources and the necessary infrastructure to bring the groundwater within the GMP area to a balance.
4. Stabilize groundwater levels in order to minimize pumping costs and energy use, and to provide groundwater reserves for use in droughts.
5. Maximize the use of surface water, including available flood water, for beneficial use, and thus reduce stress on groundwater resources.
6. Prevent groundwater degradation by protecting groundwater quality, importing clean surface water, and preventing intrusion of poor quality groundwater.
7. Preserve, and, where feasible, enhance the existing quality of the area’s groundwater.
8. Address potential impacts to groundwater from changes in surface water supplies resulting from surface water losses in the region (i.e. San Joaquin River Restoration), urban and agricultural development, and drought.
9. Prevent surface water or groundwater exports that would reduce the long-term reliability of groundwater.
10. Coordinate groundwater management efforts between regional water users.
11. Responsibly manage the local groundwater resources so adjudication is unnecessary.
12. Maintain a groundwater-monitoring program to provide an early warning system to future problems.
13. Increase knowledge of the local geology and hydrogeology to better understand threats to groundwater quality and quantity.
14. Minimize land subsidence caused by groundwater pumping through in-lieu groundwater recharge, direct recharge, and wise and conservative use of pumped groundwater.

1.5. Groundwater Rights and Statutory Authority for Groundwater Management

Basic Groundwater Rights in California

The following discussion of current California Law regarding groundwater is excerpted from *Sustainability from the Ground Up, Groundwater Management in California – A Framework*, published by Association of California Water Agencies (ACWA) in 2011. In the Foreword of this document, the authors state "*the challenge of providing sustainable groundwater management must be met by local and regional agencies and not by centralized state regulation*." The authors continue "..*the job is far from done. While there are numerous case studies in successful management, efforts must be expanded in many parts of the state to achieve sustainable outcomes*." This document is included as **Appendix B**.

Under current California law, landowners are entitled to pump and use reasonable amounts of groundwater from a basin underlying their land. *Correlative rights* and *appropriative rights* are the two foundational principles of California law germane to groundwater use. Under the doctrine of "correlative rights," landowners overlying a common source of groundwater are limited to using a reasonable share of the resource. "Reasonable" groundwater use is relative to the amount of overlying land owned by the landowner and the physical condition of the groundwater basin. When there is insufficient water to meet the cumulative demands of the overlying landowners, those users are expected to reduce their demands *correlatively* to bring groundwater extractions within the safe yield of the basin and prevent overdraft.

Entities other than overlying users, such as cities, may be entitled to "*appropriative*" water from the basin for use as a municipal supply when water surplus to the needs of the overlying users is available. Unless otherwise permitted, appropriators must curtail their use when there is no surplus.

Summary of Groundwater and Surface Water Law

Under California law, water is characterized as either groundwater or surface water. Groundwater is divided into subterranean stream or percolating groundwater. Surface water and subterranean streams are subject to the permitting authority of the State Water Resources Control Board, while percolating groundwater is not. In areas where there is a hydrologic connection between surface water and groundwater, a number of early cases provide foundational legal doctrine. The following three points are excerpted from ACWA (2011) and the reader is referred to that document or the actual case law for more details.

- User of percolating groundwater may diminish flows in a surface stream only if the groundwater is put to reasonable use on lands overlying the groundwater basin.
- Overlying owners may extract groundwater for use on overlying lands, despite impacts on downstream riparians and down-gradient overlying pumpers.
- Riparian and overlying rights are treated as extracting water from a common source and so have joint rights to reasonable shares of the resource.

Key Definitions

The brief overview of the basic concepts of groundwater use under current California Law provided must be understood in the context of several terms which are defined below, including “safe yield,” “surplus” and “overdraft.” This GMP will use these terms, with the exception of “safe yield,” as defined by ACWA (2011) throughout the remainder of the Plan. Other terms regarding groundwater are included here and most are from the 2011 ACWA document with the appropriate reference cited. In place of “safe yield,” this GMP uses the term “Available Groundwater.”

- Adjudication – product of a judicial process involving parties in a groundwater basin to determine the nature and quantity of each producer’s share of the basin’s safe yield. ACWA 2011.

- Applied Water – the amount of water, from any source, needed to meet the demand for beneficial use by the user. (DWR California Water Plan Update, 2005)
- Available Groundwater – The volume of groundwater that can be presently pumped without causing groundwater overdraft.
- Conjunctive Use – the coordinated and planned use of both surface water and groundwater resources to maximize the availability and reliability of water supplies in a region to meet various management objectives. (ACWA, 2011)
- Consumptive Use – quantity of applied water that is not available for immediate or economical reuse. (DWR California Water Plan Update, 2005)
- Deep Percolation – water applied to crops and landscaped areas that exceeds evapotranspiration demands and percolates to the groundwater, sometimes referred to as Applied Water Recharge
- Groundwater Banking – a water management tool designed to increase water supply reliability. Makes use of dewatered aquifer space to store water during wet years, so that stored water can be pumped and used during dry years. (ACWA, 2011)
- Intentional Recharge – surface water purposely recharged into a groundwater aquifer
- Natural Groundwater Recharge – water from any natural source such as rainfall or seepage from rivers and streams that recharges groundwater resources
- Overdraft – “….*overdraft occurs when extractions exceed safe yield* Safe Yield – *Safe yield refers to “the maximum quantity of water which can be withdrawn annually from a groundwater supply under a given set of conditions without causing an undesirable result”. California Supreme Court, Los Angeles v. San Fernando case, 1975*. The phrase *“undesirable result” is understood to refer* to “*a gradual lowering of the groundwater levels resulting in depletion of the supply.”*

(This term is not used in this GMP because no groundwater supply is considered safe or sustainable in the long-term, and the groundwater yield is dynamic and constantly changing. Instead the term Available Groundwater (see above) is used).

- Subsidence – the gradual settling or sudden sinking of the Earth's surface due to changes that take place underground. (ACWA, 2011)
- Surplus – Surplus refers to "*the amount of water in a groundwater basin in excess of safe yield*." (San Fernando Court, City of Los Angeles v. City of San Fernando, 1975)
- Sustainability – "*development and use of groundwater in a manner that can be maintained for an indefinite time without causing unacceptable environmental, economic, or social consequences*." (Alley, W. M., Reilly, T.E., and Franke, O.L, 1999)

Legislation Authorizing Groundwater Management Plans

California Assembly Bill No. 3030 (AB 3030), which became law on January 1, 1993, authorized local agencies that are within groundwater basins as defined in California Department of Water Resources (DWR) Bulletin 118-80, and that meet certain other criteria, to prepare and adopt Groundwater Management Plans. Each of the Plan Participants (with the exception of SEMCU, which is a private not-for-profit organization) qualifies under the law.

The law created by AB 3030, now codified in California Water Code Section 10753, et. Seq., was amended by 2002 California Senate Bill 1938 (SB 1938), which also identified new requirements for GMPs. In 2011, Senate Bill 359 added additional requirements, mostly related to public outreach. This GMP meets the requirements of AB 3030, SB 1938 and SB 359.

Local Sovereignty

This GMP serves as both a regional planning document and a local GMP for each of the GMP Participants. Each agency maintains sovereign control over groundwater in its service area, and no agency, including Madera County, is granted rights or permission to manage groundwater in another jurisdiction. This reservation of sovereignty is supported by California Water Code Section 10750.8 (a) which states "*A local agency may not manage groundwater pursuant to this part within the service area of another local agency without the agreement of that other entity*."

Powers Granted to Adopting Agencies

The powers granted to each agency adopting a GMP are codified in the California Water Code and existing state legislation. These powers include:

1. The agency may take any actions needed to replenish the groundwater within the GMP area, including buying and selling water, delivering water in lieu of

groundwater pumping, and spreading water for recharge.

2. The agency may take actions needed to protect or prevent interference with water, water quality, or water rights within the agency.

3. Using water quality goals, the agency may take any action needed to preserve the water within the agency for beneficial uses. These actions include preventing contaminants from entering agency groundwater supplies, removing contaminants, locating and characterizing contaminants within the agency's groundwater supply, identifying parties responsible for contamination of groundwater, and performing studies relative to the listed water quality goals.

4. The agency may enter into agreements with other local agencies or private parties to manage mutual groundwater supplies, including those existing in overlapping areas.

5. The agency may levy and collect general groundwater replenishment assessments, as well as water extraction fees based on the amount of groundwater extracted from the aquifer. However, these fees must be ratified by a majority vote in an election, according to the election rules applicable to the agency.

6. The agency may sue to recover the amount of agency expenditures for protection of groundwater quality from parties responsible for contamination.

7. The agency is granted additional powers of a Replenishment Agency, which allows it to:
    a) Acquire and operate facilities, waters and rights needed to replenish the groundwater supplies;
    b) Store water in groundwater basins, acquire water rights, import water into the Agency, and conserve water;
    c) Participate in legal proceedings as required to defend water rights, and water supplies, and to prevent unlawful exportation of water from the agency;
    d) Under certain conditions, to exercise the right of eminent domain;
    e) Act jointly with other entities in order to economically perform required activities;
    f) Carry out investigations required to implement programs;
    g) Fix rates for water for replenishment purposes;
    h) Recapture and reclaim water as provided for in Water Code Section 60221; and
    i) Fix the terms and conditions of contracts for use of surface water

in-lieu of groundwater.

1.6. Groundwater Management Plan Components

This GMP includes the required and voluntary components for a GMP as identified in California Water Code Section 10753, et. seq. This Plan is also consistent with the recommended elements for a GMP as identified in DWR Bulletin 118 (2003), Appendix C. **Table 1.10** identifies the appropriate section of the GMP where each component is addressed.

Table 1.10 – Location of Groundwater Management Plan Components

Description		Plan Section(s)
California Water Code Mandatory Requirements (10750 et seq.)		
1.	Documentation of public involvement	1.5, **Appendix C**
2.	Groundwater basin management objectives	1.2, 3
3.	Monitoring and management of groundwater elevations, groundwater quality, land subsidence, and surface water	5.1 – 5.4
4.	Plan to involve other agencies located in the groundwater basin	4.3
5.	Monitoring protocols	5.3
6.	Map of groundwater basin and agencies overlying the basin	**Figure 2.1**
California Water Code Voluntary Components (10750 et seq.)		
7.	Control of saline water intrusion	6.3
8.	Identification and management of wellhead protection areas and recharge areas	6.2, 7.2, 7.3
9.	Regulation of the migration of contaminated groundwater	6.3, 6.4
10.	Administration of well abandonment and well destruction program	6.1
11.	Mitigation of overdraft conditions	7.2, 7.3
12.	Replenishment of groundwater extracted by water users	7.3
13.	Monitoring of groundwater levels and storage	5.1, 9.2
14.	Facilitating conjunctive use operations	7.4
15.	Identification of well construction policies	8.1
16.	Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects	8.2
17.	Development of relationships with state and federal regulatory agencies	4.2, 4.3
18.	Review of land use plans and coordination with land use planning agencies	9.1
Additional Components Recommended by DWR (App. C of Bulletin 118)		
19.	Advisory committee of stakeholders	4.1
20.	Description of the area to be managed under the Plan	1.1, 2
21.	Descriptions of actions to meet management objectives and how they will improve water reliability	4 – 9
22.	Periodic groundwater reports	9.2
23.	Periodic re-evaluation of Groundwater Management Plan	9.4

1.7. Adoption of Plan

Refer to **Appendix C** for documentation on the adoption of the GMP and the public process that was followed.

Groundwater Advisory Committee

The Regional Groundwater Advisory Committee (GAC or Committee) is comprised of representatives from the six entities that sponsored the GMP and who worked collaboratively to prepare this GMP. Each Plan Participant also has its own governing body to address local groundwater issues within their service area. GAC meetings were held regularly during the preparation of the GMP.

Plan adoption

As required by California Water Code Section 10753.2(a), the Plan Participants published a series of public notices, held public meetings, and adopted resolutions required for preparing and adopting this GMP. Public notices were published in local newspapers. The public was provided a 30-day period to review the draft GMP. No comments were received from the public. These public outreach efforts are summarized in **Table 1.11** below.

Table 1.11 – Public Participation in Groundwater Management Plan Update

Phase of Public Noticing	Description	Date
Intent to update GMP	Notice of hearing published	September 2013
	Hearing held. Resolution adopted.	September 24, 2013
Public Review	Notice of hearing published	November 8, 15, 2014
	Hearing held.	December 9, 2014
GMP Adoption	Final GMP adopted by GMP Participants[1]	Varies

1 – The GMP was adopted by the Plan Participants at six separate Board and council meetings. The respective resolutions can be found in **Appendix C**.

2. GEOLOGY AND HYDROGEOLOGY

This section discusses the geology and hydrogeology of GMP area and immediate surrounding areas. The purpose of this section is to provide general background information on the local hydrogeology that will aid in selecting and implementing groundwater management programs.

The following sections include technical discussions on the region's groundwater. These are intended to provide geologists, engineers, and water managers a greater understanding of the area's stratigraphy, groundwater conditions, and hydrogeologic parameters. The content of this chapter requires a basic understanding of some geologic principles and terminology. Less technical discussions on groundwater management programs can be found in Sections 3-9.

2.1. Groundwater Basins and Subbasins Description

The GMP area is underlain by the San Joaquin Valley Groundwater Basin. The San Joaquin Valley Groundwater Basin covers a vast area and encompasses the alluvial deposits under the valley floor from the Sierra Nevada Mountains to the east, the Coast Range mountains to the west, the Sacramento Valley and Delta to the north, and the San Emigidio and Tehachapi mountains to the south. The San Joaquin Valley Groundwater Basin lies within the San Joaquin River and Tulare Lake Hydrologic Regions and covers approximately 13,900 square miles and has been divided into 16 subbasins. The GMP area is within the San Joaquin River Hydrologic Region and is underlain by three groundwater subbasins (**Figure 2.1**) as defined by the California Department of Water Resources (DWR) in "*California's Groundwater, Bulletin 118 – Update 2003*". These subbasins are the Chowchilla, Madera, and Delta-Mendota subbasins. A subbasin is defined as follows:

> "A groundwater basin is defined as an alluvial aquifer or a stacked series of alluvial aquifers with reasonably well-defined […] features that significantly impede groundwater flow such as rock or sediments with very low permeability or a geologic structure such as a fault. […]
>
> "A subbasin is created by dividing a groundwater basin into smaller units using geologic and hydrologic barriers or, more commonly, institutional boundaries […]. These subbasins are created for the purpose of collecting and analyzing data, managing water resources, and managing adjudicated basins."

DWR was directed by legislation to define critical overdraft in 1978 and report which subbasins were in critical overdraft. The *California Water Plan Update* of 2009 restates that the eastern San Joaquin (County), Chowchilla, and Madera subbasins as being in critical condition of overdraft. A comprehensive assessment of overdraft in California's subbasins has not been completed since 1980.

Bulletin 118-80 defined critical overdraft as:

> *"A basin is subject to critical conditions of overdraft when the present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts."*

Chowchilla Subbasin

The Chowchilla subbasin is shown in **Figure 2.1**, and is identified as Basin 5-22.05 by DWR. As defined in DWR Bulletin 118, the subbasin covers an area of 248 square miles and is located in Madera County and a small portion of Merced County. The subbasin is bound by the Columbia Canal Company Service Area on the east and the San Joaquin River on the west. To the north, the subbasin is bound by the southern portion of the Merced subbasin. The southern boundary consists of an irregular pattern and borders the northern portion of the Madera subbasin. This basin has been characterized as being critically overdraft since 1980 by DWR. Groundwater recharge is primarily from deep percolation of applied irrigation water (DWR, 1995).

Madera Subbasin

The Madera subbasin is shown in **Figure 2.1** and is identified as Basin 5-22.06 by DWR. As defined in DWR Bulletin 118, the subbasin covers an area of 614 square miles and is located entirely within Madera County. It is bound on the south by the San Joaquin River, on the west by the eastern boundary of the Columbia Canal Service Area, on the north by the south boundary of the Chowchilla subbasin, and on the east by the crystalline basement bedrock of the Sierra Nevada foothills. DWR Bulletin 118 characterizes this basin as being in critical overdraft since 1980 by DWR.

Delta-Mendota Subbasin

The Delta-Mendota Subbasin is shown in **Figure 2.1** and is identified as Basin 5-22.07 by DWR. As defined in DWR Bulletin 118, the subbasin covers an area of 1,170 square miles and encompasses a small portion of western Madera County and is largely in Fresno County and portions of Stanislaus and Merced counties. It is bound on the west by the Coast Ranges, on the north by the Stanislaus/San Joaquin county line, and on the east generally by the San Joaquin River. The southern boundary is irregular and consists of portions of the western Kings subbasin and the Westside subbasin. DWR Bulletin 118 states that groundwater levels within the Delta-Mendota subbasin have been relatively stable and this subbasin is not considered to be in overdraft.

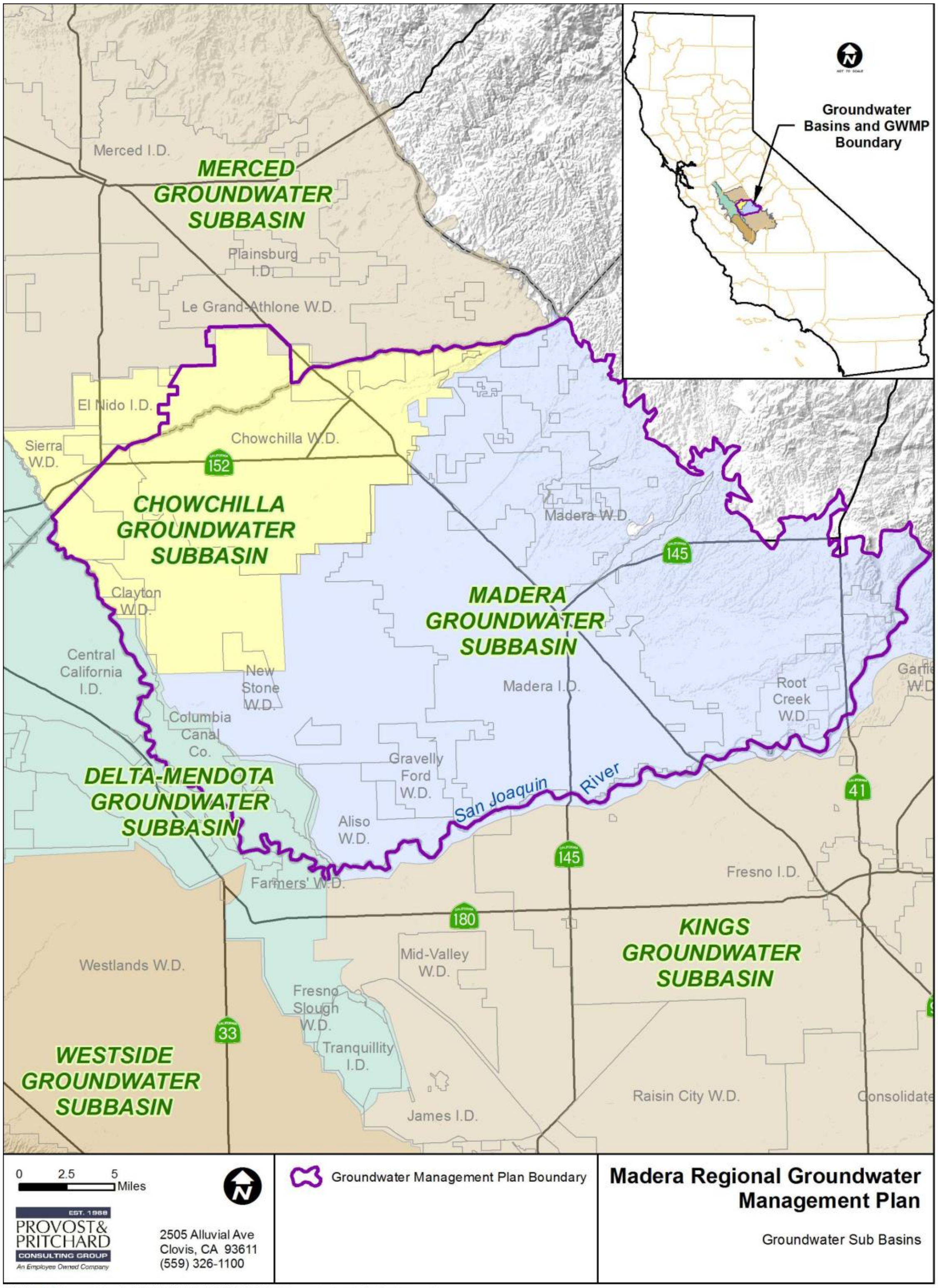

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Figure 2.1 – Groundwater Sub-basins

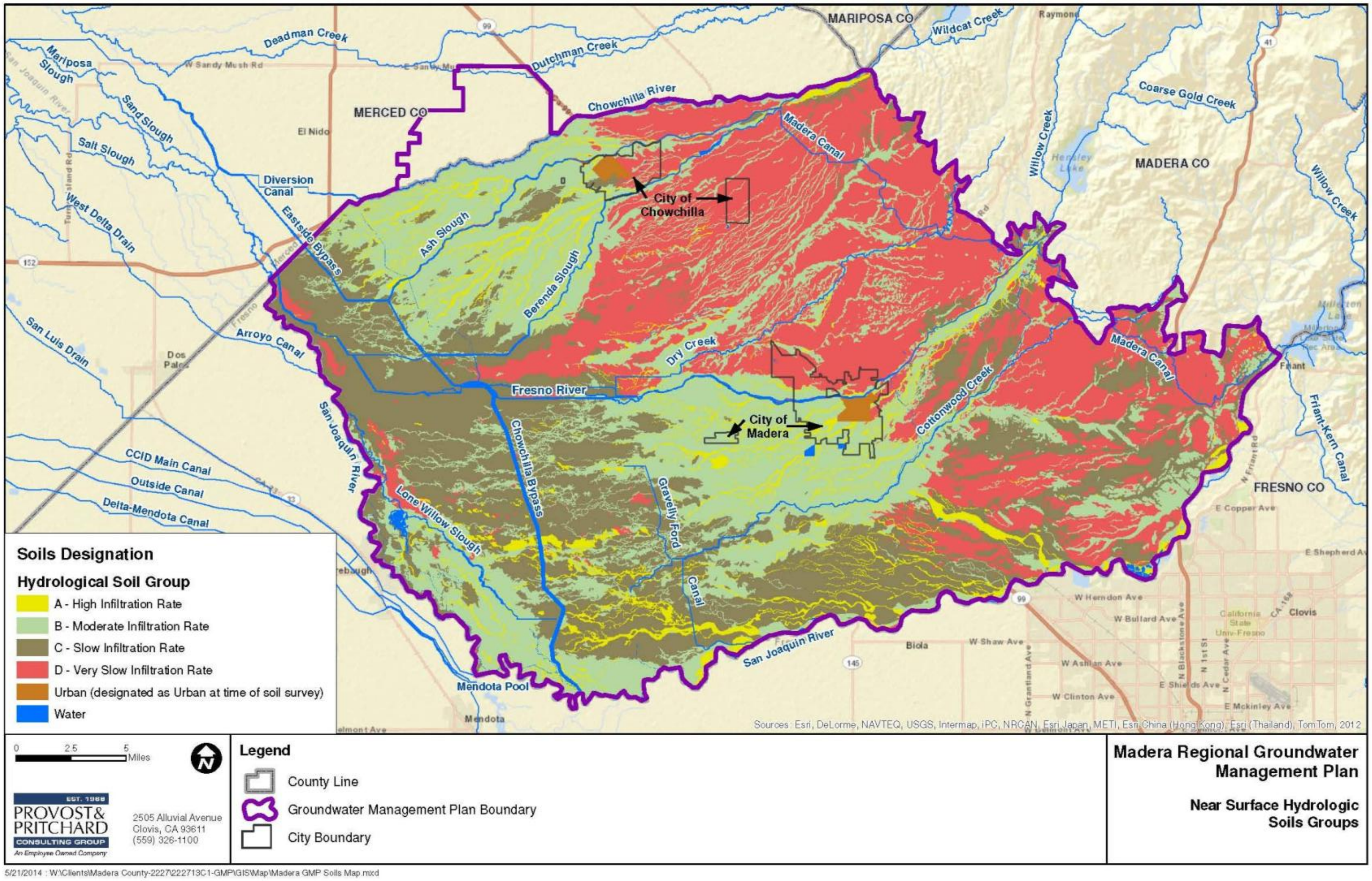
2.2. Geomorphology and Soils

The GMP area consists of generally flat agricultural land, sloping to the west, with the Sierra Nevada Mountains rising to the east. Fluvial and alluvial processes have formed the landforms within the San Joaquin Valley portion of GMP plan area. Precipitation in the Sierra Nevada Mountains adjacent to the GMP area has drained westward and deposited sediments into the San Joaquin Valley, creating the dominant geomorphic features in the valley. Three major drainages developed east of the Madera area, the Chowchilla, Fresno, and San Joaquin Rivers. Each stream transported sediment out and onto the valley floor developing overlapping alluvial fans. The alluvial fan size appears to increase to the south. In cross section, alluvial fans are wedge-shaped or lens-shaped. Sediments in alluvial fans decrease in grain size with increasing distance from the source.

The Chowchilla River flows west along the northern portion of Madera County and spills into the Berenda and Ash Sloughs. The Fresno River flows west through the central portion of the county where it joins the San Joaquin River in the west. The San Joaquin River flows west along the southern portion of Madera County before turning north in the axial portion of the valley, creating the western boundary of Madera County. Each river deposited sediments on the valley floor. There tends to be a larger amount of coarse-grained sediments near the valley margin and more fine-grained sediments downstream. As flood events occurred, the streams would overbank their channels and deposit fine-grained sediments to the north and south of each river channel. Alluvial fans form multiple stream channels over the cycle of formation and often overlap with other alluvial fans.

The flood plain deposits of each of the major alluvial fans increase in size from north to south. The flood plain of the Chowchilla River is half a mile wide and less than five (5) miles long (Bertoldi, 1970). The flood plain of the Fresno River is near one-mile wide and 10 miles long (Bertoldi, 1970). The flood plain of the San Joaquin River is the largest and has a maximum width of about two miles and extends 25 miles below Friant Dam (Bertoldi, 1970).

Soils that have developed on top of the alluvial fans have varying degrees of infiltration characteristics. The development and extent of soils are dependent on the degree of weathering of the source material. **Figure 2.2** depicts the soils in the Madera area based on infiltration rates. A prominent soil designation throughout the eastern valley in the GMP plan area is Hydrologic Group Soil D, indicated by the red color as shown in **Figure 2.2**. This type of soil is primarily located in-between the major drainages of the county and has the lowest infiltration rate. It is apparent that soil with the greatest infiltration rate, Hydrologic Soil A, are within the main channels of the major stream systems. The soils become less permeable further from the alluvial fan deposits.



Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012

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Figure 2.2 – Near Surface Hydrologic Soils Groups

2.3. Geology and Hydrogeology

The Great Valley of California is an asymmetrical structural trough filled with Mesozoic (deposited 248 million years ago [mya] to 99 mya) and Cenozoic (65 mya to present) sediments that reach a thickness of approximately 30,000 feet. The Great Valley consists of the Sacramento Valley in the north and the larger San Joaquin Valley in the south. The San Joaquin Valley represents the lower two-thirds of the Great Valley of California and is approximately 200 miles long and up to 70 miles wide, bound on the north by the Sacramento-San Joaquin Delta, the Sierra Nevada mountains on the east, the Coast Range Mountains on the west, and the Tehachapi and San Emigdio Mountains to the south.

The freshwater aquifer systems underlying the GMP area consist of the younger alluvium and older alluvium and are contained in the Late Tertiary and Quaternary continental deposits (Page, 1986). These deposits increase with thickness from north to south and are up to 3,000 feet thick in the GMP area (USGS, 2012). Sediments generally are coarser at the proximal sides of the fans, closest to the Sierra Nevada Mountains, and become finer towards the center of the valley. Below is a discussion on the regional geologic formations identified in the subsurface in the GMP area as well as their water bearing capacities.

Stratigraphy

Mitten, LeBlanc, and Bertoldi (1970) characterized the subsurface geology underlying the GMP area. The geologic units, from deep to shallow (oldest to youngest), consist of crystalline basement rock, marine sediments, marine and undifferentiated continental sediments, consolidated continental sediments (including the Ione Formation and Mehrten Formation), and unconsolidated sediments. The stratigraphic succession of deposits in the valley include, from oldest to youngest: crystalline basement rock, marine and continental sedimentary rocks, Ione Formation, Mehrten Formation, continental deposits of tertiary and quaternary age, and continental deposits of quaternary age. The youngest formation is further divided into the Older Alluvium and the Younger Alluvium.

Crystalline Basement Rock

The basement complex of pre-Tertiary age consists of mostly granitic and metamorphic rocks (Bateman *et. al.,* 1963). As shown on **Figure 2.3**, the basement complex outcrops east of the older alluvium. The crystalline basement rock underlies the entire GMP plan area at depth. The crystalline basement rock is comprised of the Sierra Nevada batholith (map symbol grMz) and partly the western metamorphic belts, consisting of meta-volcanic and meta-sedimentary (map symbol J) strata (Bateman *et. al*., 1963). This formation likely contains groundwater in fractures, but does not provide significant groundwater to the GMP area.

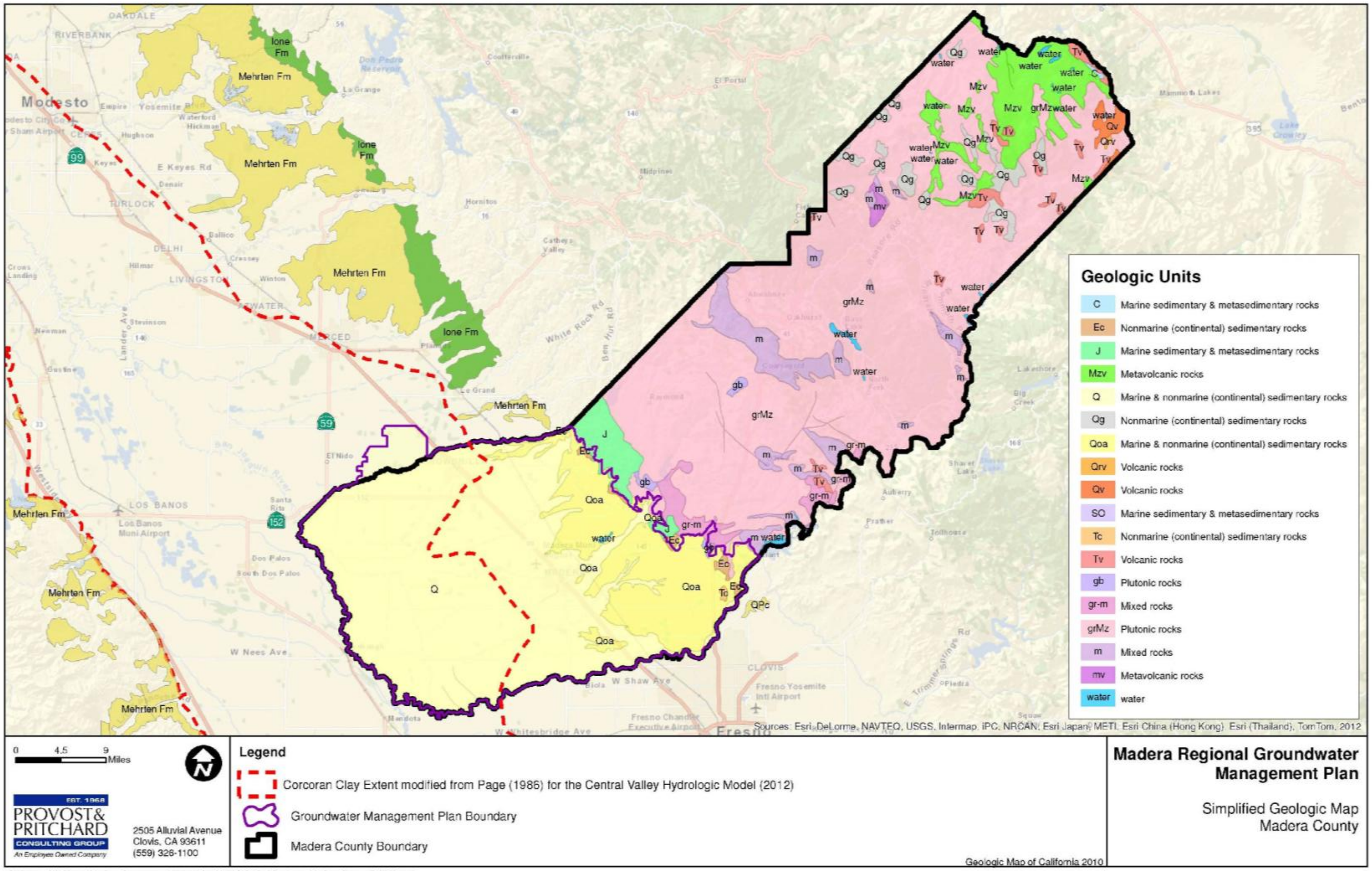

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Figure 2.3 – Simplified Geologic Map – Madera County

Marine and Continental Sedimentary Rocks

The marine and continental rocks of pre-Tertiary and Tertiary age overlie the basement complex and underlie the western part of the Madera area. The formations do not outcrop in the area, but can be tracked in the subsurface (Mitten *et. al*. 1970). These rocks consist mostly of sandstone, claystone, siltsone, and shale. The marine sedimentary rocks most likely contain connate saline water and do not provide useable groundwater to the GMP area.

Ione Formation

The Ione Formation outcrops in the eastern portion of the valley and caps many of the hills northwest of Friant Dam (Mitten et. al. 1970). The Ione Formation is a sedimentary formation and was deposited in both a marine and non-marine environment. The Eocene Ione Formation outcrops discontinuously along the western margin of the Central Valley and consists of sandstone and conglomerates. During the late Cenozoic, a period of erosion eroded the Ione Formation in the Chowchilla River area (Helley, 1978). The Ione Formation does not provide groundwater to the GMP area. This is significant because the absence of the Ione Formation reduces the recharge potential of the groundwater basin in the GMP area.

Mehrten Formation

The Mehrten Formation is a significant geologic formation within the San Joaquin Valley. The Mehrten Formation is Mio-Pliocene in age and consists of a sequence of volcaniclastic and volcanic rocks. The Mehrten Formation unconformably overlies the Ione Formation. The Mehrten Formation is comprised of two distinct geologic units. The first consists of sediments deposited under alluvial and fluvial conditions and are comprised of gravel, sand, silt, and clay size sediments. The second unit consists of dense volcanic flows of tuff breccia with some interbedded conglomerates and sandstones. As shown in **Figure 2.3**, the Mehrten Formation outcrops north of the GMP plan area but is not present in Madera County. Sierra Nevada uplift and a period of erosion thought to occur at a higher rate in the south, and glaciation and the associated alluvial fans are thought to have eroded the Mehrten Formation (Helley, 1978). Exposures of the Mehrten Formation have not been identified in the area of the alluvial fan created by the Chowchilla River (Helley, 1978) or in the Madera area. The Mehrten is an important aquifer that stretches from Merced County north to Sutter County. The fact that it is not present in the eastern portion of the GMP area is a significant reason that groundwater recharge does not occur at a rate as it does in the subbasins north of the GMP area. Three miles southeast of Chowchilla, a recent test hole drilled to a depth of 1,000 feet encountered black sand that could be the Mehrten Formation; however, the geophysical surveys indicated that the water in this formation was not fresh as the formation above and could be slightly brackish (personal communication Larry Ernst). The depth to brackish water was reported at approximately 710 feet below ground surface at this location, or an elevation of approximately -510 feet MSL. The base to fresh water map (Page, 1977) predicts the depth between -600 to -800 feet MSL, slightly deeper than was observed in this test hole.

Continental Deposits of Tertiary and Quaternary age

The continental deposits of Tertiary and Quaternary age underlie most of Madera County, but do not crop out at the surface. The formation dips gently southwest and overlies the marine and continental rocks (Mitten *et. al*., 1970). The deposit consists of interbedded, poorly sorted sand, silt, clay and conglomerate, with layers of hardpan. The deposits becomes finer grained with depth and distance from the foothills. The lower part of the deposits contains blue and green clays and the upper portion contains red, yellow, and brown clays, which are interpreted to have been deposited under reducing and oxidizing conditions, respectively. In the past, few water wells penetrated the continental deposits. The water bearing capacity of this formation is unclear at this time; however, many new agricultural wells are drilling deeper into this formation to produce additional groundwater. As these wells are put into production over the next several years, additional information with regard to well yields, water quality, and aquifer recharge will become available.

Continental Deposits of Quaternary Age (Older Alluvium)

The older alluvium of Pleistocene and Holocene age underlies most of the GMP area (Mitten *et. al*., 1970). As shown in **Figure 2.4**, the older alluvium (map symbol Qoa) outcrops south of the San Joaquin River and north of the Chowchilla River. Janda (1965) correlated the formation near Little Table Mountain with the Turlock Lake, Riverbank, and Modesto Formations of Davis and Hall (1959). The older alluvium dips gently southwest and ranges in thickness from zero to about 1,000 feet (Mitten *et. al*. 1970). It overlies the continental deposits of Tertiary and Quaternary age and overlaps the Ione Formation (where present) and the basement complex. The older alluvium consists mostly of interbedded lenses of clay, silt, sand, and some gravel. Cemented hardpan occurs throughout the area near the ground surface. The source of the older alluvium is from the Sierra Nevada (Mitten *et. al*. 1970). The older alluvium decreases in grain size with depth and grades into the underlying fine-grained continental deposits of Tertiary and Quaternary age (Mitten *et. al*. 1970). The base of the older alluvium is defined where the resistivity on electric logs reflect a change from relatively coarse to fine grained sediment (Mitten *et. al*. 1970).

Mitten *et. al.* (1970) summarized aquifer characteristics based on aquifer tests made by the USGS in the late 1960's and reported aquifer transmissivity values ranging from 18,000 to 99,000 gallons per day per foot (gpd/ft) of drawdown in the Madera area. Based on multiple well tests throughout the Madera area, transmissivities of deposits above a depth of 500 feet (with significant coarse-grained deposits) range in transmissivities from 50,000 to 250,000 gpd/ft of drawdown. The underlying continental deposits normally range in transmissivities from about 10,000 to 30,000 gpd/ft of drawdown (Boyle, 2008).

Continental Deposits of Quaternary Age (Younger Alluvium)

The younger alluvium is a well-sorted sedimentary formation and overlies the older alluvium. It does not contain cemented hard pan, which differentiates it from the older alluvium. As shown in **Figure 2.4**, the younger alluvium (map symbol Q) overlies the older alluvium and covers a significant portion of the GMP plan area. The younger alluvium is indistinguishable from the older alluvium in the subsurface. The estimated thickness ranges from zero to 50 feet and is unsaturated, except when saturated near streams and channels (Mitten *et.al* 1970).

Corcoran Clay (E Clay)

To better depict the aquitards in the southern San Joaquin Valley, Croft (1972) identified several extensive clay layers in the subsurface that he designated, youngest to oldest, by letters A through F. The A and E clays are the most significant clay layers in the vicinity of the GMP area, but only the E clay is present in the GMP area based on Crofts mapping. The E clay is the thickest and most laterally extensive of the clay layers identified and mapped by Croft. The A clay has been mapped locally at shallow depths southwest of the GMP area at depths of 10 to 60 feet and is generally less than 60 feet thick (Croft, 1972). Elevated groundwater salinity has been identified west of the GMP area, and north of the mapped A clay in the subsurface. This potentially indicates that the A clay extends further north than previously mapped. This correlation will require additional studies.

The E Clay, which includes the Corcoran Clay Member of the Tulare Formation, is a regional confining layer and underlies approximately 3,500 square miles in the San Joaquin Valley (Croft, 1972). Within the upper portion of the Older Alluvium, the Corcoran Clay divides the San Joaquin Valley freshwater aquifer system into an unconfined to semi-confined upper system and a largely confined lower system (USGS, 2012). The Corcoran Clay has been identified in the subsurface in the western portion of the GMP area, as shown in **Figure 2.5**. The Corcoran Clay ranges in depth between 80 and 350 feet, however, it does not outcrop in the GMP area (Croft, 1972). The E clay dips gently from a depth of 80 feet below ground surface near Chowchilla to a depth of 400 feet below ground surface towards the southwestern portion of the GMP area. It consists mostly of clay, silty clay, or silt and divides the Older Alluvium into confined and unconfined aquifers. In contrast to other clays in the subsurface, the Corcoran Clay appears gray, greenish gray, or bluish gray (Mitten *et. al*. 1970). Water well drillers commonly referred to this clay as the “blue clay”. Portions of the Corcoran Clay consist of a matrix of diatomaceous clays, which are compressible when the pore pressure is reduced by dewatering. The compression of the diatom rich matrix is thought to be the main reason for the extreme inelastic compression and the associated land subsidence overlying the Corcoran Clay.

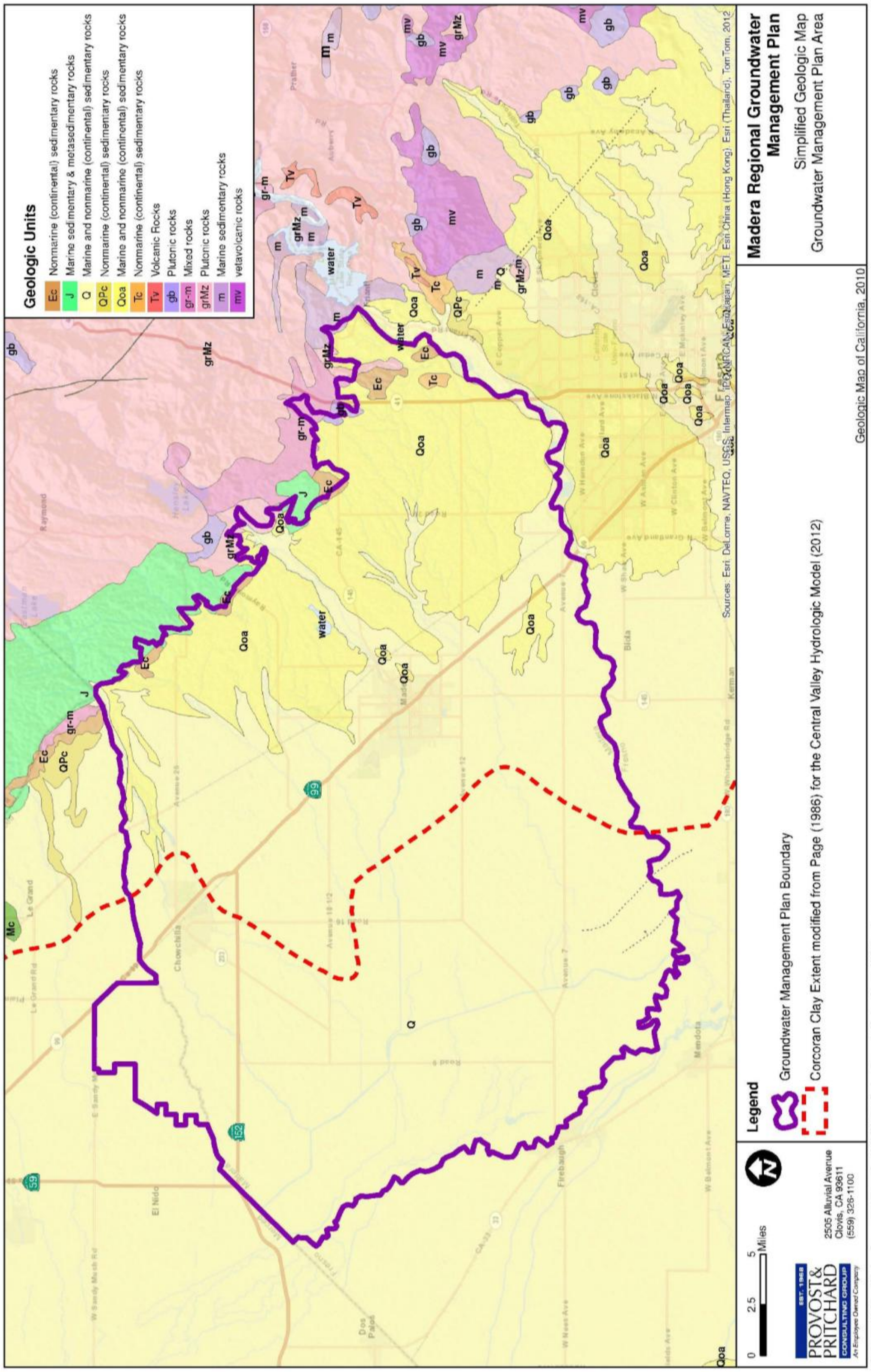

Figure 2.4 – Simplified Geologic Map – Groundwater Management Plan Area

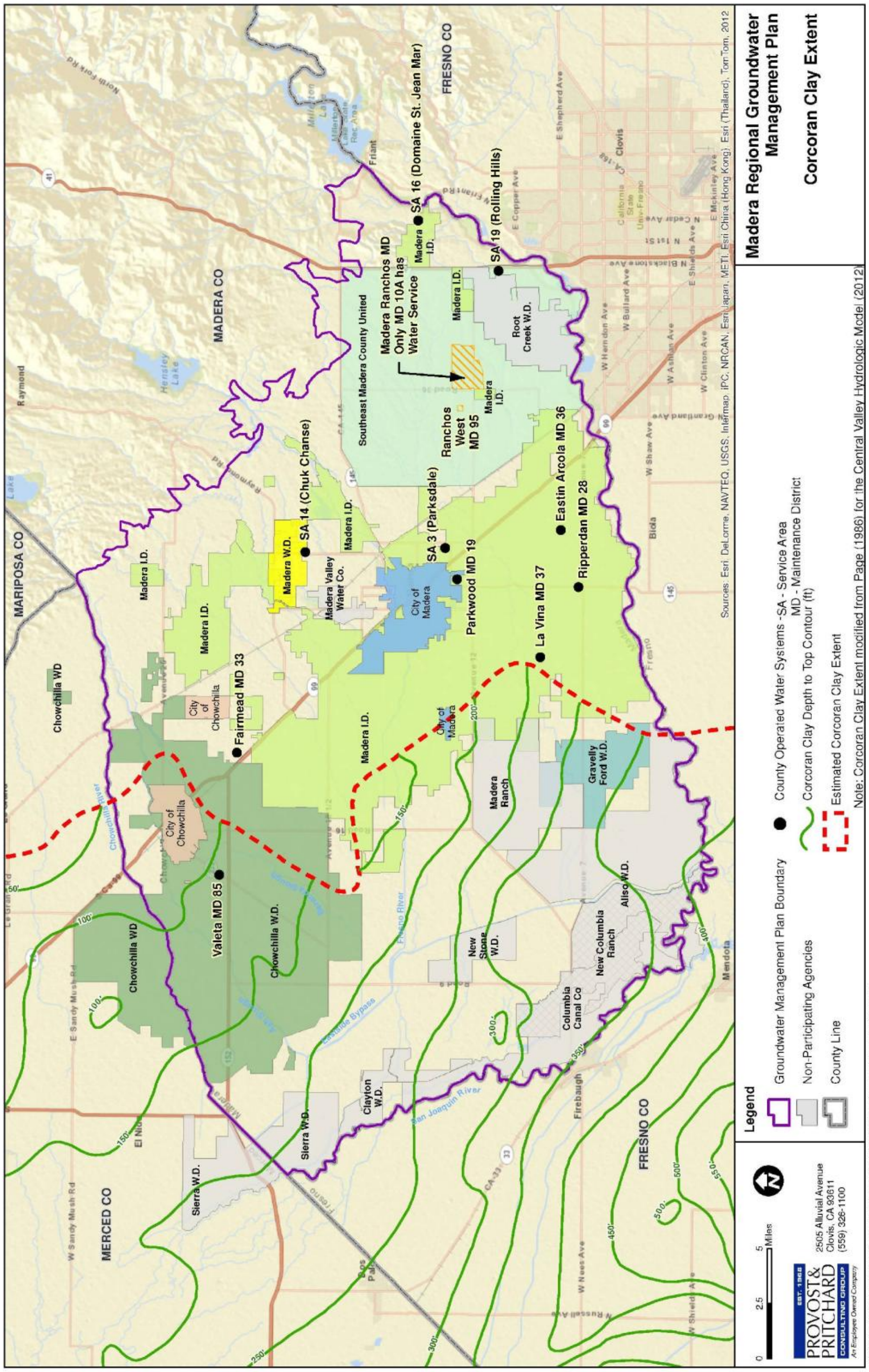

Figure 2.5 – Corcoran Clay Extent

2.4. Groundwater Elevations and Flow Direction

This section discusses the available groundwater level data, recent groundwater elevation contours, groundwater flow direction and existing cones of depression. Existing groundwater level data is limited and recommendations are given for improving monitoring.

Groundwater Levels

Recent and readily available groundwater level data was obtained from several GMP Participants for the fall 2013 season. Although not a GMP Participant, fall 2013 water level data was also obtained for Root Creek Water District. Fall 2013 data was used because it: 1) provides the most recent data, and; 2) illustrates the condition of the aquifer after a summer of groundwater withdrawals. Groundwater elevation contours were estimated based on the data provided (**Figure 2.6**). The following should be noted concerning the data sources used for the groundwater level information:

- Chowchilla Water District monitors 142 wells, of which 79 have fall 2013 water level data.
- Madera Irrigation District monitors 161 wells, of which 85 have fall 2013 water level data.
- Root Creek Water District – water level data available for 22 wells.
- Madera County supplied information from eight wells in valley-floor Maintenance Districts and Service Areas.
- The City of Madera and City of Chowchilla monitor groundwater levels, but the data was not readily available for the analysis.
- No fall 2013 groundwater level data was collected for the Western Madera County Subsidence Study. The participants in the study only measure groundwater levels in the spring.
- The California Department of Water Resources no longer measures wells in Madera County (personal communication with DWR staff, March 2014).
- The USBR reports their water level data to the DWR, and only eight of those wells are available on CASGEM.
- No readily available data in the un-districted areas of the county, except for data from Madera County.

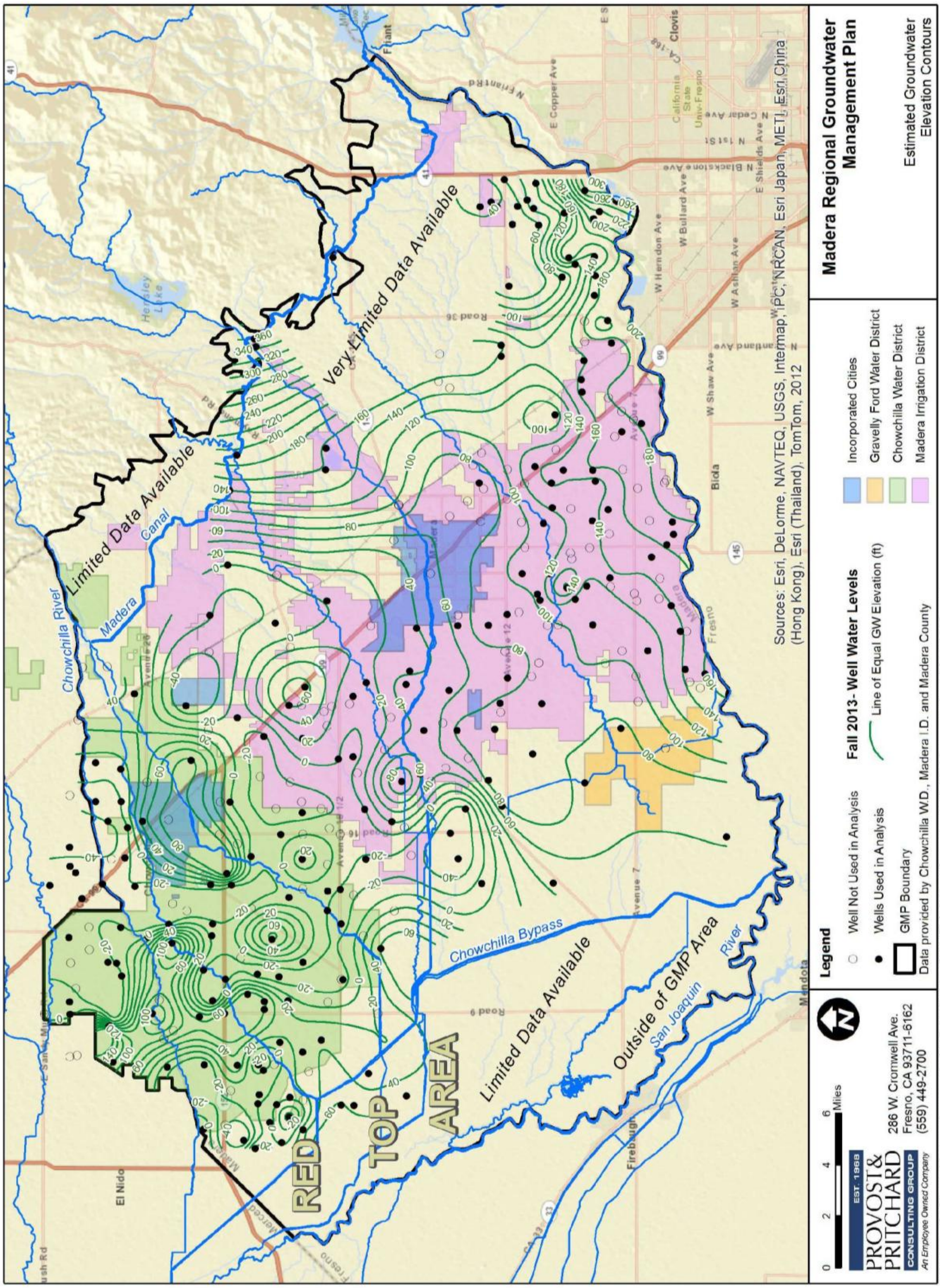

Figure 2.6 – Estimated Groundwater Elevation Contours

Groundwater Monitoring

The majority of the water level data available falls within MID and CWD. Outside of the districted areas readily available water level data is sparse. Water level monitoring programs in the un-districted areas, or areas that receive little or no surface water, are as a whole deficient. Much fewer water level measurements are available in the east part of the valley floor, where the greatest water level declines are occurring. As well, as shown on **Figure 2.6** very little water-level data was available in the cities. The City of Madera does monitor groundwater levels annually, but the data was not readily available or organized/formatted in a manner that would allow it to be used in the evaluation. The relative paucity of data outside of the Districted areas, coupled with a general lack of knowledge concerning well construction details, stresses the importance of implementing a robust regional groundwater level monitoring program as described in **Section 5.1 – Groundwater Level Monitoring Program**. The following items should be considered when reviewing the estimated groundwater contours and will need to be considered when developing a regional groundwater monitoring network:

- Well construction details are lacking for most of the wells, and determining the perforated interval and aquifer being measured will require a separate detailed study; therefore groundwater contours were developed without knowledge of specific aquifers monitored by a given well.
- The supplied water level data sheets do not indicate the aquifer(s) monitored by a given well.
- Only the eight CASGEM wells, supplied by the County of Madera, and the Root Creek WD wells have measuring point elevation data, therefore the depth to water information from the MID and CWD wells were estimated from a GIS elevation model.
- KDSA indicates that confined groundwater, caused by local confining clay layers, is found east of the Corcoran Clay.
- KDSA also indicates that below depths of several hundred feet, usually below 200 feet, groundwater is confined regardless of whether or not the Corcoran Clay is present.

Derivation of Groundwater Elevation Contours

Groundwater elevation contours were estimated from available water level data. As **Figure 2.6** shows, wells in relatively close proximity to one another can have significantly different water elevations. This is likely caused by several factors 1) groundwater elevations in wells across the study area appear to be affected to varying degrees by confining conditions, 2) water level measurements are taken with different types of measuring devices 3) water levels taken within a season may be several months apart and 4) groundwater level data taken when a well is running or to soon after the well was shutoff will affect the data. This emphasizes the importance of developing standard protocols to be used throughout the GMP area to measure groundwater levels.

Groundwater Flow and Cones of Depression

The most consistent and reliable groundwater elevation contours are found along the San Joaquin River from the Root Creek area to about 5 miles west of Highway 145. Through this area groundwater flows northwest into the region due to recharge from the San Joaquin River. Generally flow is west to southwest across the study area with numerous groundwater mounds and depressions indicating that groundwater can locally flow in any direction-either towards a depression or away from a mound. This is readily apparent in areas west of Highway 99, where confining conditions are more prevalent. However, it should be noted that groundwater elevation contours based on fall readings often show more groundwater depressions due to prolonged pumping during the growing season. These seasonal affects to groundwater are partly ameliorated when analyzing spring water level data.

Past groundwater contour maps indicate that one of the largest groundwater depressions in the area is south of Highway 145 northeast of the Santa Fe railroad. This depression coincides with a large area with limited surface water. This groundwater depression is not evident on **Figure 2.6** due to a lack of recent data in this area. In the area east of Fairmead another groundwater depression is evident which also coincides with an area with limited groundwater supplies (MID annexed lands and Chowchilla Correctional Facilities). This groundwater depression is evident on **Figure 2.6**. Historically several additional groundwater depressions were present in the un-districted areas west of MID and CWD. These depressions are not evident on **Figure 2.6** due to lack of recent data for this area, but are evident on historic DWR groundwater elevation contour maps (not included).

Subsidence Area Groundwater-level Monitoring

KDSA contoured equal groundwater elevations for the upper and lower aquifers underlying the west side of the County for January-February of 2013. This work was performed as part of an expanded monitoring program in areas experiencing subsidence. This program does not measure water levels in the fall. As shown in **Figure 2.7**, the direction of groundwater flow in the upper aquifer in this part of the County is towards the northeast, away from the San Joaquin River. Groundwater in the lower aquifer was moving from the south, southwest and southeast toward a pumping depression in the area of Highway 152 and the Merced/Madera County line, as shown in **Figure 2.8**. Groundwater elevation contour maps for the lower aquifer exist only for the western portion of the Madera area, due to lack of measurements in deep wells on the eastern side. Of note on the groundwater elevation maps, **Figures 2.7 and 2.8** is similar groundwater elevations in both the upper and lower aquifers in the area north of the confluence of Ash Slough and the Eastside Bypass. South of this area, near the T10S R14E and T11S R14E line, water elevations in the upper aquifer are much as 50 feet higher than in the lower aquifer. This, coupled with the steep northeasterly groundwater gradient in the upper aquifer, indicates that water elevations in the upper aquifer have declined in the area north of the Ash Slough and the Eastside Bypass confluence. Based on this information, upper aquifer groundwater elevations in this area have been reduced significantly over historic conditions.

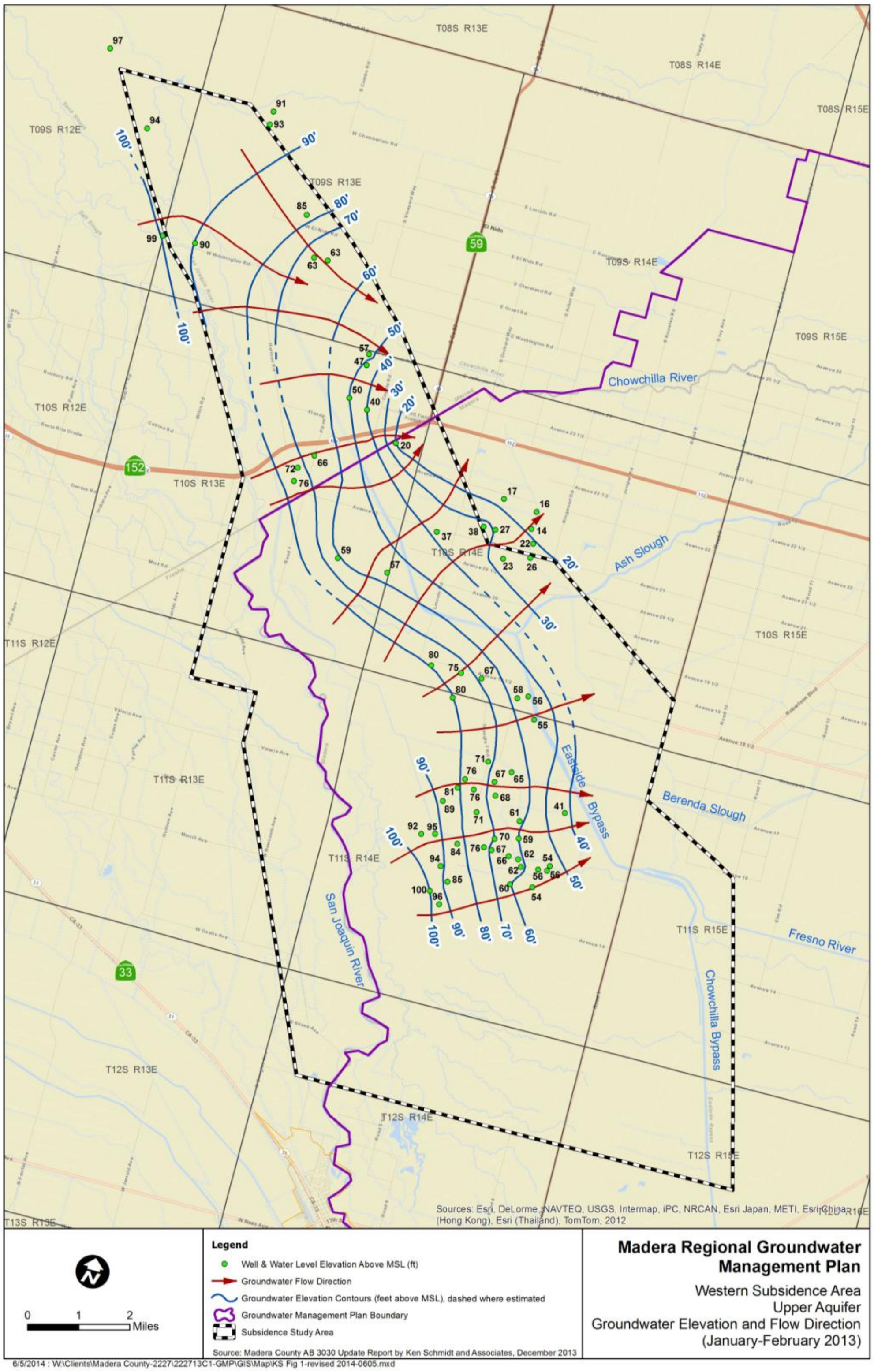

Figure 2.7 – Western Subsidence Area – Upper Aquifer – Groundwater Elevation and Flow Direction (Jan-Feb 2013)

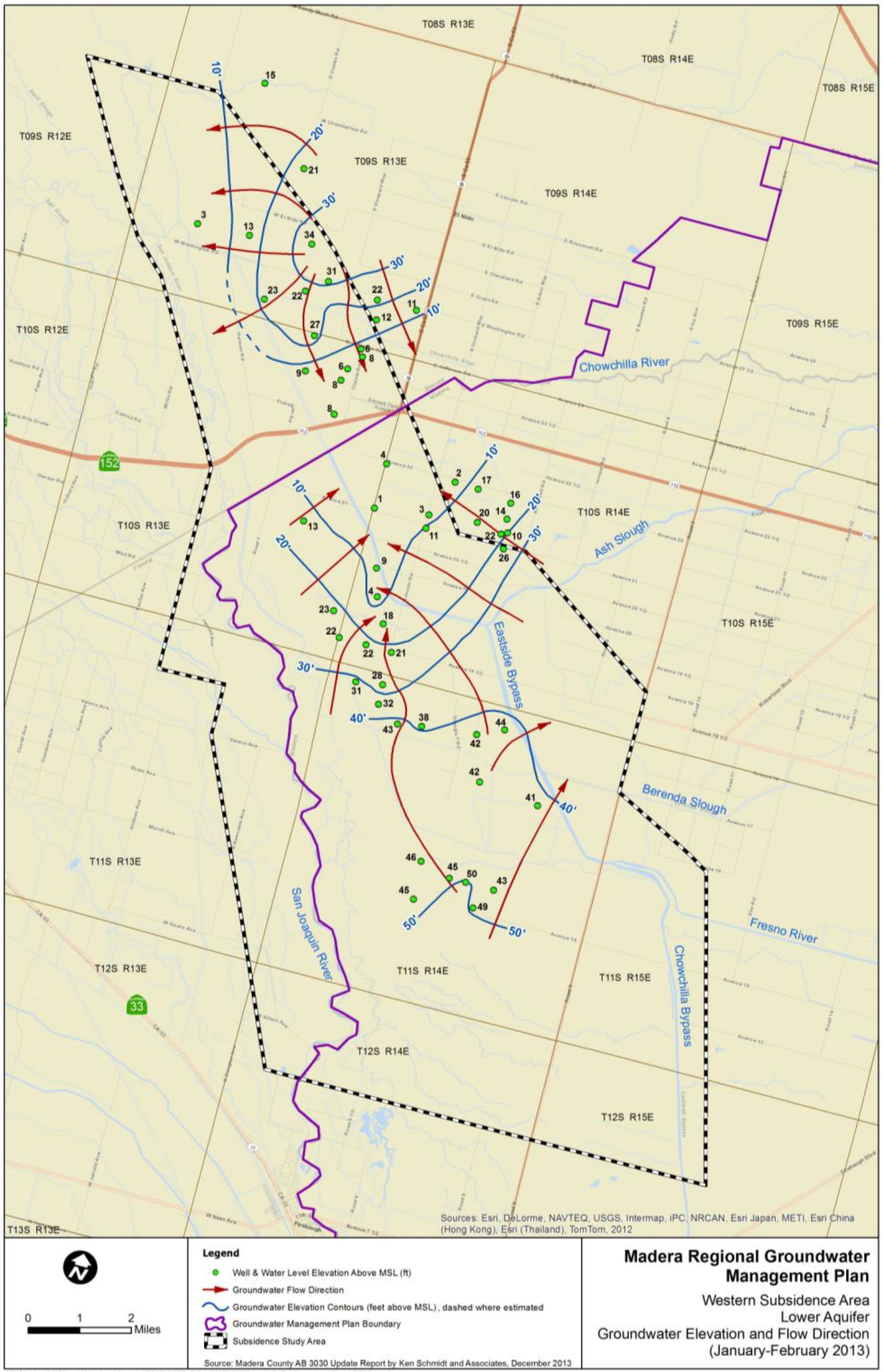

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Figure 2.8 – Western Madera Subsidence Area – Lower Aquifer - Groundwater Elevation Contour and Flow Direction (Jan-Feb 2013)

2.5. Groundwater Overdraft and Available Groundwater Supplies

Overview

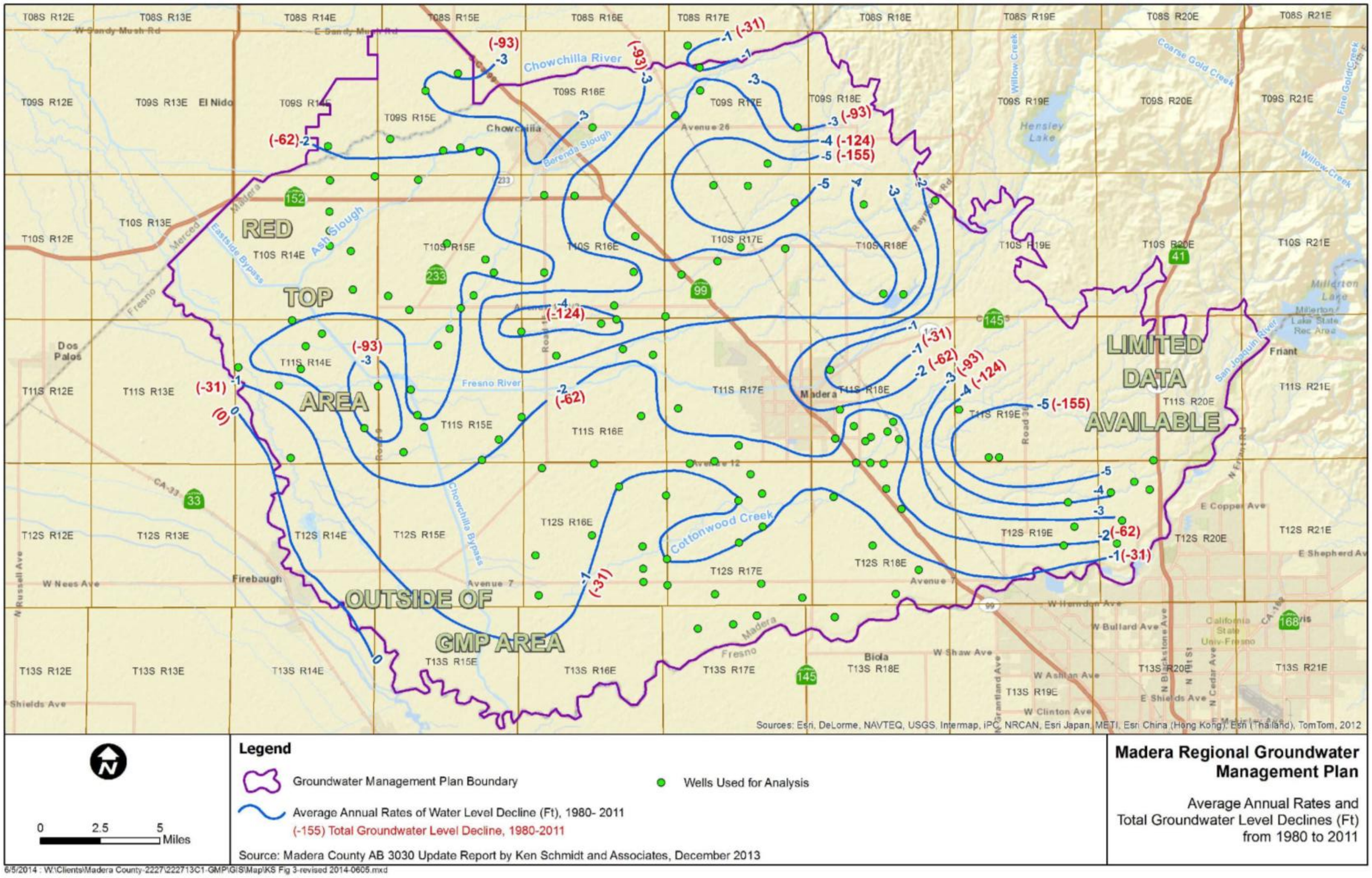
This section discusses current groundwater level trends, historical and projected future overdraft, and estimates of available groundwater. Groundwater overdraft was estimated for the entire GMP area. Available groundwater, defined as the amount of groundwater that can be withdrawn without causing overdraft, was also estimated for the GMP area. The estimates are preliminary and should be refined with more detailed agency-specific water balance studies including monitoring of groundwater flow between agency service areas.

Groundwater overdraft can be estimated based on an evaluation of long-term groundwater levels. Calculation of the available groundwater supply is more complex. In addition to changes in groundwater levels, this calculation must also consider water demands, surface water supplies, natural and artificial recharge, and groundwater flows in and out of the area being considered. The calculation therefore includes some inherent uncertainty. Available groundwater may change over time as natural recharge, groundwater inflows/outflows and practices in neighboring areas change. Overdraft is recommended as a more reliable parameter because it is derived from water level changes that reflect groundwater inflows, outflows and unknown stressors to the resource, and should be the quantitative measurement for making ongoing groundwater management and planning decisions.

Readers are cautioned that it was beyond the scope of this GMP to perform a detailed water budget for each participant. While data exists to make water budget calculations at the sub-regional level, making them at the agency footprint level would require groundwater flow data that are not available without constructing an extensive network of monitor wells throughout the region. Interpolating the sub-regional calculations to the agency footprint level without that supplementary data would be an approximation beyond the prudent use of the available information.

Average Annual Groundwater Level Decline

Over the past 30 years, groundwater levels in the GMP area have experienced significant declines due to overdraft. **Figure 2.9** shows the average annual rate of groundwater level decline in feet from 1980 to 2011 in the GMP area. These declines were determined by using trend lines for the decline of the shallowest levels each year and another set of lines for the deepest levels each year. The average of these two lines for each hydrograph was used to represent the average water-level declines.



Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012

Source: Madera County AB 3030 Update Report by Ken Schmidt and Associates, December 2013

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Figure 2.9 – Average Annual Rates and Total Groundwater Level Declines (ft) from 1980 to 2011

Long-term hydrographs with reliable trends were not available in certain areas, and the map represents the best available data in the GMP area. These data were used to establish historical overdraft and available groundwater through 2011. More recent data (up to 2013) were available for only a subset of the important hydrographs that show reliable long-term trends, so a comprehensive map through 2013 cannot be made. However, the estimates were projected to 2013 based on current conditions, which are discussed in the following section.

In general, average annual declines are greater on the eastern side of the GMP area, at up to five (5) feet or even more in the southeast and northeast. Increased agricultural demands, particularly the conversion of native grasslands to permanent crops, has increased the rate of decline in the eastern portion of the GMP area.

There have been virtually no water-level declines during the past three decades near the San Joaquin River downstream of Mendota Pool. There is insufficient long-term data to make the same conclusion upstream of Mendota Pool along the San Joaquin River. Rates of water-level decline generally increase with distance from the Chowchilla River, Fresno River and San Joaquin River, confirming the importance of recharge from river seepage. For example, near the Fresno River east of the City of Madera, the average water-level decline has been less than one foot per year.

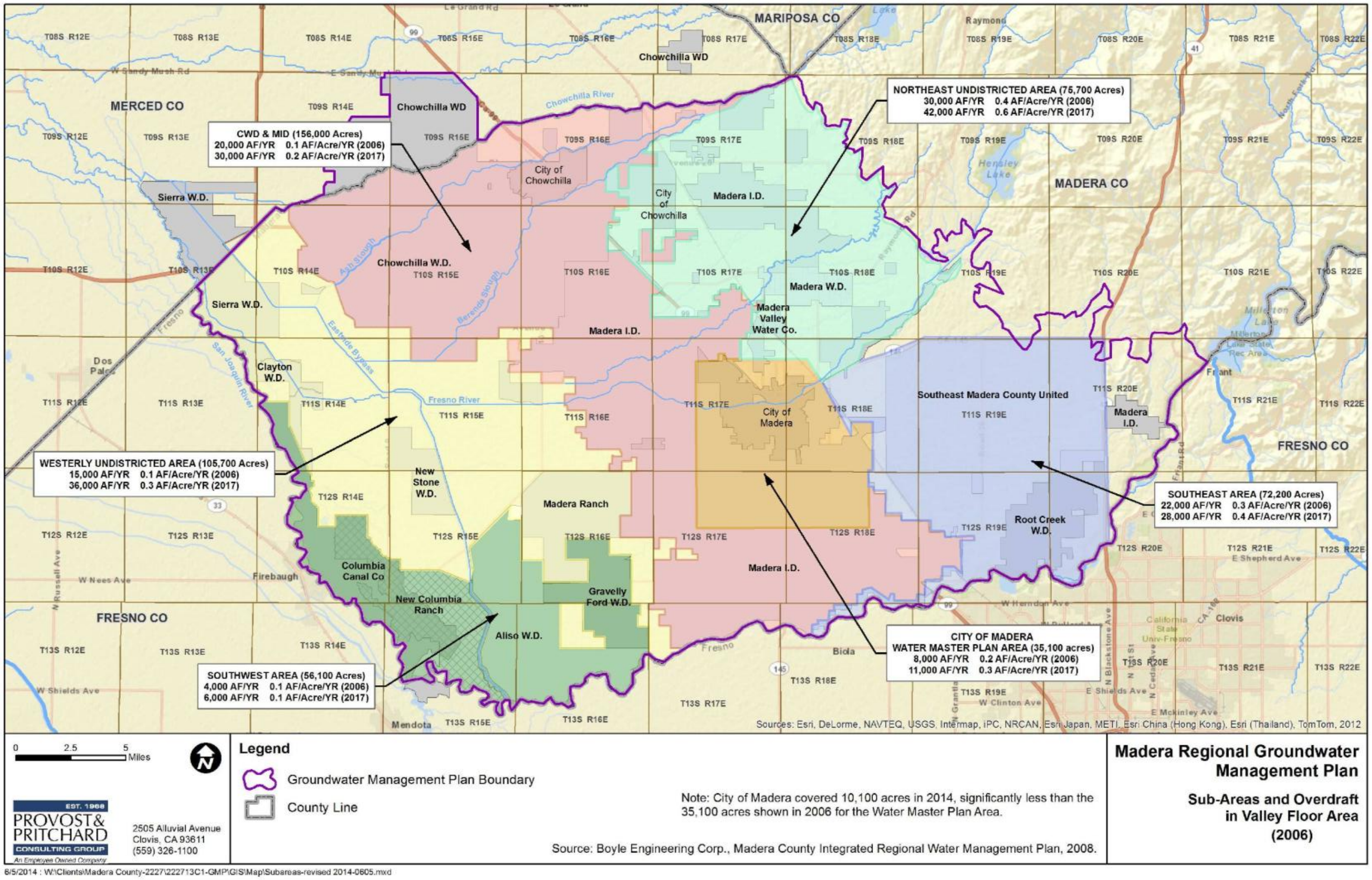
It is clear that increased and intensified agricultural development has made a major impact on groundwater levels. Since 2003, about 80,000 acres of new orchards have been developed. A substantial percentage of these new plantings occurred along the western edge of the Valley floor. Some orchards replaced existing annual crops, but many were planted on previously fallow land. While the trees have a lower irrigation demand than annual crops when they are immature, water use from those orchards will continue to increase over the next few years as the trees grow to maturity. That means that even absent additional plantings in coming years, agricultural water demands in those areas of new plantings will increase from the present rate and are estimated to peak around the year 2017.

The contours in **Figure 2.9** are intended to pertain primarily to the unconfined aquifer, or the upper aquifer. However, many of the wells are composite, and tap the unconfined and confined aquifer. Information on which wells tap which aquifer is not readily available without an extensive investigation. Experience indicates that water levels in composite wells are usually closer to water levels in the lower aquifer than those in the upper aquifer (Kenneth D. Schmidt Associates, **Appendix F**). As a result, the estimated changes in groundwater levels, and the overdraft values presented below, may be overestimated.

Previous Overdraft Estimates

In the 2008 Madera County IRWMP (Boyle, 2008), groundwater overdraft was estimated in six specific areas in the Valley portion of Madera County. The six subareas are shown in **Figure 2.10**. These subareas were identified in the 2008

IRWMP for Madera County (Boyle, 2008) and generally cover the valley portion of Madera County. The exact basis for the boundaries was not documented, but they do represent areas with different hydrologic conditions and separate political governance. Some small areas in the eastern portion of the GMP area were not included when the subareas were delineated in 2008 because they generally have little to no groundwater supply from wells completed in valley alluvium; the majority of wells are completed in hardrock and have very little water supply. It should also be noted that some of the lands in the Northeast and Westerly Undistricted areas are within water districts, portions of irrigation districts or water companies (**Figure 2.10**). The subareas also do not include the Merced County portion of Chowchilla Water District, which was evaluated in this GMP. As part of the 2008 IRWMP, overdraft was estimated for the subareas for 2006. The 2006 overdraft is shown in **Figure 2.10** and summarized in **Table 2.1.**



NORTHEAST UNDISTRICTED AREA (75,700 Acres)
30,000 AF/YR 0.4 AF/Acre/YR (2006)
42,000 AF/YR 0.6 AF/Acre/YR (2017)

CWD & MID (156,000 Acres)
20,000 AF/YR 0.1 AF/Acre/YR (2006)
30,000 AF/YR 0.2 AF/Acre/YR (2017)

WESTERLY UNDISTRICTED AREA (105,700 Acres)
15,000 AF/YR 0.1 AF/Acre/YR (2006)
36,000 AF/YR 0.3 AF/Acre/YR (2017)

SOUTHEAST AREA (72,200 Acres)
22,000 AF/YR 0.3 AF/Acre/YR (2006)
28,000 AF/YR 0.4 AF/Acre/YR (2017)

CITY OF MADERA
WATER MASTER PLAN AREA (35,100 acres)
8,000 AF/YR 0.2 AF/Acre/YR (2006)
11,000 AF/YR 0.3 AF/Acre/YR (2017)

SOUTHWEST AREA (56,100 Acres)
4,000 AF/YR 0.1 AF/Acre/YR (2006)
6,000 AF/YR 0.1 AF/Acre/YR (2017)

Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012

Note: City of Madera covered 10,100 acres in 2014, significantly less than the 35,100 acres shown in 2006 for the Water Master Plan Area.

Source: Boyle Engineering Corp., Madera County Integrated Regional Water Management Plan, 2008.

Figure 2.10 – Sub-Areas and Overdraft in Valley Floor Area (2006)

Table 2.1 – Groundwater Overdraft in Subareas (2006)

Subarea	Acreage	2006 Overdraft (AF/year)[1]
Chowchilla Water District and Madera Irrigation District	156,000	20,000
Westerly Undistricted Area	105,700	15,000
Southwest Area	56,100	4,000
City of Madera Water Master Plan Area[2]	35,100	8,000
Southeast Area	72,200	22,000
Northeast Undistricted Area	75,700	30,000
Total	**508,000**	**99,000**

1 – Value from 2008 Madera Integrated Regional Water Management Plan

2 – This area is considerably larger than the current City limits which cover 10,100 acres, and even includes lands outside of the City's sphere of influence and planning area. It is reported here as it was shown in the 2008 IRWMP.

Other previous overdraft estimates included 74,000 AF/year from 1970-1991 (Swanson, 1998) and 68,000 AF/year from 1990-1998 (Todd Engineers, 2002).

Below are discussions on an overdraft estimate for the entire GMP area. The footprints evaluated for the subareas in **Table 2.1**, and for the total area evaluated in this GMP, differ. The subareas generally includes the valley portion of Madera County, minus some areas in the east that are not considered to have groundwater supplies. The area evaluated in this GMP encompasses all of the GMP Participants, including the Merced County portion of CWD. The area evaluated in this GMP excludes the areas covered by Root Creek Water District, Madera Water District, Aliso Water District and Columbia Canal Company.

Historical Overdraft

Historical overdraft was estimated using groundwater hydrographs that had continuous or near continuous data from 1980-2011. Overdraft was based on the following formula:

Estimated Overdraft = Avg. Annual Water Level Decline x Avg. Specific Yield x Acreage

= 2.4 feet/year (from **Figure 2.9**) x 0.13 x 458,900 acres = 143,000 AF/year

The specific yield value is an average determined from previous reports by Kenneth D. Schmidt and Associates, values used in previous MID studies, values used in the San Joaquin River Restoration litigation, and experience with test holes, wells and groundwater evaluations in Madera County.

The area with a groundwater supply (451,900 acres) is slightly less than the total area of the GMP (496,900 acres). A portion of the eastern end of Madera County lands is considered to have no alluvial groundwater supply despite being within a DWR-defined groundwater basin. This area is estimated at 45,000 acres. This area has shallow soils, high bedrock, no groundwater elevation data, and lack of irrigated agriculture. The area only supports small domestic and livestock wells with limited capacity. In the 2008 IRWMP, a similar area of limited groundwater supply was recognized and considered in overdraft calculations.

Projected Overdraft and Available Groundwater Supplies by Agency

Future groundwater overdraft and Available Groundwater were estimated for the GMP area. ‘Available Groundwater’ is defined as the amount of groundwater that can be pumped without causing groundwater overdraft. As discussed above, historical overdraft was determined for the period of 1980-2011 based on long-term groundwater level declines. Future overdraft was estimated based on these values and consideration of the following:

1. Recent changes in cropping patterns and acreages
2. Maturation of all existing orchards by 2017
3. Surface water reductions from the San Joaquin River Restoration
4. Additional seepage due to San Joaquin River Restoration flows
5. The difference in hydrology between the historical period 1980-2011 (considered about 10% wetter than normal) and an average hydrologic period.

Available groundwater was determined based on a preliminary water budget analysis, and how much groundwater can be pumped without causing overdraft. Available groundwater cannot be precisely determined for a variety of reasons, including uncertainty in data, and limited groundwater level records, but estimates are provided.

Table 2.2 shows the estimated overdraft, available groundwater and several other parameters for the overall GMP area.

Table 2.2 – Summary of Regional Hydrologic Parameters

Description	Units	Value
Total Area	acres	496,900
Area with Groundwater Supply	acres	451,900
Irrigable Area	acres	315,100
Surface Water	AF/year	314,300
Water Demands (urban and ag.)	AF/year	970,000
Future Overdraft	AF/year	259,000
Available Groundwater	AF/year	438,400

Note: This table lists some of the primary hydrologic parameters in the region. It does not provide all the components of a water budget.

The future overdraft predictions assume no significant increase in agricultural or urban water demands, and no further reductions in surface water supplies beyond those predicted for the San Joaquin River Restoration Project (see Section 7.1). Further studies are needed to validate these assumptions or estimate future changes in supplies and demands. The analysis also does not consider potential impacts on water supplies from climate change, which should also be addressed in separate studies.

Recharged groundwater does not recognize political boundaries and agencies that import surface water often see their groundwater flow to other areas. Thus groundwater supplies can change over time as neighboring areas change their practices, so the available groundwater and overdraft needs to be periodically re-evaluated.

Overdraft and available groundwater can both be used to manage groundwater, but overdraft is recommended for several reasons. For example, groundwater management in Arizona has been focused on progressively reducing groundwater overdraft for more than three decades, without specifically evaluating the available groundwater. Groundwater overdraft is much simpler to determine, as it can be calculated by examining water-level trends and specific yields. To the contrary, ‘available groundwater’ by its nature depends on items such as river seepage, groundwater flows, well pumping, and deep percolation of applied waters that cannot be directly measured with any precision from agency to agency, and can only be estimated. Data is even lacking for accurate estimates for some of these variables. Presently, there are not adequate water-level maps or values for aquifer transmissivity at the right locations (i.e. at the boundaries between entities) to do this. Because groundwater overdraft estimates already take these other items into consideration (i.e. as reflected by water-level trends), overdraft estimates are highly useful in groundwater management.

There are many inadequacies in the data needed to perform a water budget, which emphasizes the need for improved monitoring to provide better overdraft and available groundwater estimates. This evaluation should be viewed as the first in a series of water resources evaluations needed to manage the region’s groundwater.

2.6. Geologic Potential for Groundwater Recharge

Groundwater recharge is the process by which groundwater is replenished. The geologic formations that comprise the aquifer system underlying the GMP area extend well beyond the local agencies' jurisdictional boundaries. Several processes are responsible for natural recharge of the groundwater basin. On a regional scale, surface water flowing over the surface expression of the geologic formations (surface outcrops) allows for direct infiltration into the hydrogeologic system. Locally, groundwater recharge occurs where surface water flows over permeable sediment (gravels and sand) in the river channels, allowing for direct infiltration of surface water (see **Figure 2.11**). Deep percolation of applied irrigation water also recharges the groundwater basin in areas where impermeable formations do not exist.

The amount of groundwater that can be recharged is dependent on the available storage space within the aquifer(s). Depending on the separation of the bottom of the river or stream and that of the groundwater, streams can either "lose" water into the underlying aquifer(s) or "gain" water. Where groundwater levels are at or above the elevation of the surface water, groundwater will flow into the stream (gaining stream). Where there is separation between the groundwater and surface water, water flowing downstream will recharge into the groundwater basin (losing stream). Conversely, if groundwater levels are at the land surface, there will be refusal of any "new" water in the subsurface. Throughout the GMP area, there is significant available storage due to low groundwater levels.

DWR groundwater contour maps, as shown in **Figure 2.6,** above, indicate that the groundwater basins underlying the GMP area received recharge through under seepage from the San Joaquin and Fresno Rivers. As shown in **Figure 2.6**, above, water recharge occurs beneath the San Joaquin River. Local agricultural interests are increasingly implementing localized groundwater recharge programs using both percolation basins and in-lieu recharge. Due to the hardpan and low infiltration rates in the eastern portion of the County within the GMP area, the majority of surface runoff during storm events flows overland and most water does not percolate into the subsurface. Section 2.2 – Geomorphology and Soils, provides some discussion on the surficial soils and potential for recharge.

Those areas conducive to recharge, i.e. underlain by soils with moderate to high infiltration rates, are mainly found west to southwest of the Cities of Madera and Chowchilla. Other areas with soils of high infiltration rates are intermittently found as stream or river deposits radiating from the San Joaquin River and to a lesser extent the Chowchilla River. Along the major rivers and streams areas with the potential for recharge exists as relatively narrow outcrops of soils with moderate infiltration rates that extend easterly to the edge of the groundwater basin. From a regional groundwater recharge perspective these area are very important areas to focus recharge programs. These areas are primarily up gradient from the majority of the valley floor area, thus water recharge in the eastern portions of the major stream and rivers will eventually flow down gradient and recharge the area's aquifer to the west. Seepage from streams is the primary source of groundwater recharge for the Madera area, but as climatic conditions change, available recharge opportunities are reduced. Several possibilities exist to promote groundwater recharge.

- Percolation basins, or storm water retention basins, in conjunction with dry wells, can enable storm water to infiltrate into the subsurface. Dry wells are shallow wells, completed up to 100 feet or more below the land surface, which are constructed in the unsaturated zone and can provide for direct recharge into the underlying hydrogeologic system. Where the impermeable hardpan is located, as along the eastern portion of the GMP area, the base of any retention basins needs to be below the elevation of the hard pan. The location of percolation basins should be considered near dry riverbeds, where the soils and geology will allow higher rates of infiltration.
- Direct aquifer storage by constructing wells to inject water into specific aquifers
- Uncontrolled flood releases and year-round flows in the San Joaquin, Chowchilla and Fresno Rivers would enhance recharge of the underlying groundwater basin.

Currently, limited site-specific information on recharge potential is available, or the information has not been gathered and summarized. Some limited recharge studies have been performed, including some for the proposed Madera Water Bank, but overall much of the GMP area has not been studied in detail for recharge potential. Additional investigations are needed to develop large scale recharge projects. These studies would have merit for each GMP Participant. The studies could investigate soils, geology, proximity to conveyance facilities, and include soil testing, exploratory drilling and cone penetration testing. This information would assist in identifying and prioritizing the best locations for recharge. These studies are recommended to identify the most efficient sites and address the critical rate of overdraft in the GMP area.

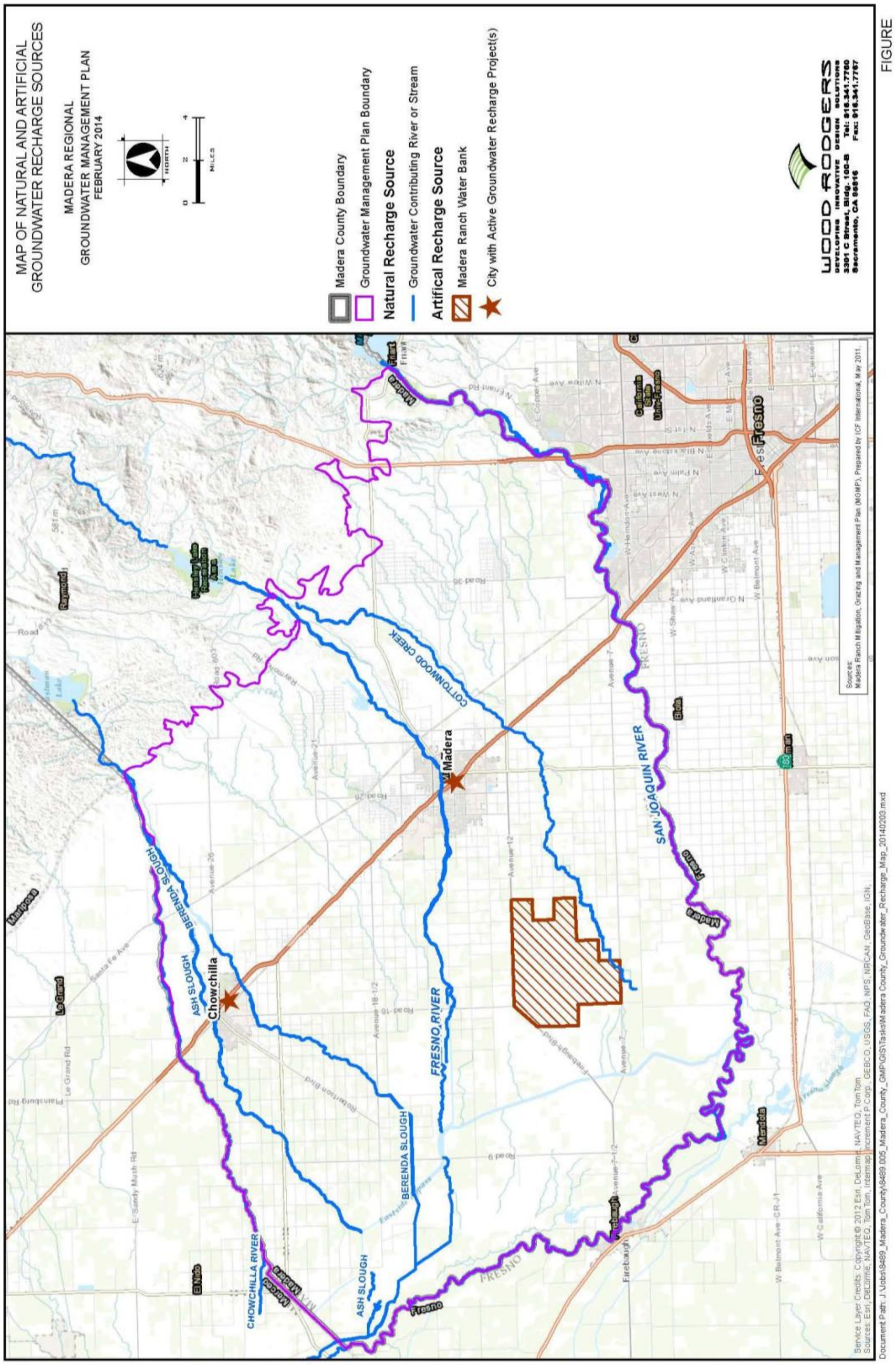


Figure 2.11 – Natural and Artificial Groundwater Recharge Sources

2.7. Groundwater Quality

Groundwater quality within the GMP area is generally good for both domestic supply and agricultural use. However, variations in groundwater quality can make it unacceptable without treatment. Groundwater contamination can be a result of naturally occurring, point source contamination, and/or regional contamination. Some common elements of concern include dissolved salts (as measured by the specific conductance or electrical conductance [EC]), boron, manganese, arsenic, iron, hexavalent chromium, bacteria, uranium, and methane. In many cases, these are naturally occurring, but could also be related to regional or point sources of contamination. Typical sources of anthropogenic contamination originate from gas stations, dry cleaners, high-density animal enclosures, applied fertilizers, leaky sewer lines, wastewater treatment plants, and septic systems.

Water quality data collected by the California Department of Water Resources (DWR), California Department of Public Health (CDPH) database (up to 2013), and local City and County water agencies for wells located within the County were analyzed to characterize spatial and depth-dependent water quality trends within the GMP sub-areas used in the 2008 IRWMP (see **Figure 2.10**). The sub-area boundaries are based on a combination of political and hydrologic boundaries, and are considered appropriate for reporting water quality data.

In 2001, the State of California passed the Groundwater Quality Monitoring Act of 2001 to assess and monitor the quality of groundwater in California (State of California, 2001b, Sections 10780– 10782.3 of the California Water Code, Assembly Bill 599). AB 599 required that the California State Water Resources Control Board (SWRCB) work in coordination with various State of California public agencies and a Public Advisory Committee to integrate existing monitoring programs and design and establish a comprehensive statewide groundwater quality monitoring program (USGS, 2013). In order to assess groundwater quality and establish baseline groundwater quality conditions in aquifers within the State, the SWRCB, in collaboration with the U.S. Geological Survey (USGS) and Lawrence Livermore National Laboratory (LLNL), implemented the Groundwater Ambient Monitoring and Assessment (GAMA) Program (California State Water Resources Control Board, 2010, website at http://www.swrcb.ca.gov/gama/). Currently, the GAMA program consists of four projects:

1. GAMA Priority Basin Project, conducted by the USGS (website at http://ca.water.usgs.gov/gama/)
2. GAMA Domestic Well Project, conducted by the SWRCB
3. GAMA Special Studies, conducted by LLNL
4. GeoTracker GAMA online database, conducted by the SWRCB (USGS, 2013).

Groundwater quality in the Madera, Chowchilla, and Delta-Mendota Subbasins were investigated as part of the GAMA Priority Basin Project Program. The primary objective of the Priority Basin Project within the Madera-Chowchilla and the Western San Joaquin Valley (WSJV) study units, which included the Delta-Mendota and Westside subbasin, was to provide an assessment of water quality in the primary aquifer system. The assessments conducted in the Madera-Chowchilla and WSJV study relied on water-quality and ancillary data collected by the USGS from 35 wells during April–May 2008 for the Madera-Chowchilla study unit, 58 wells during March to July 2010 for the WSJV study unit, and water-quality data reported in the California Department of Public Health (CDPH) database (USGS, 2013). Analysis of the water quality data from these wells was used to characterize both spatial and depth dependent water quality trends within the GMP sub-areas.

Below is a general description of the water quality parameters selected for the characterization of the groundwater basins underlying the GMP area. The data was separated by total well depth into three categories: less than 400 feet deep, 400 to 600 feet deep and greater than 600 feet deep, as delineated on the water quality maps in **Appendix D**. The selected depth intervals are based on the variations observed in the stratigraphic units within the GMP area.

The selected constituents include arsenic, boron, specific conductance, manganese, and nitrate (as NO_3). The spatial and vertical trends in each GMP sub-area are discussed with regard to suitability for agriculture and domestic use.

Arsenic

Arsenic is a naturally occurring element commonly found in groundwater. Its presence in groundwater is a result of the dissolution of the element in sediments containing minerals containing arsenic. Exposure to arsenic above the CDPH maximum contaminant level (MCL) can cause both short and long-term health effects. Long-term exposure to arsenic has been linked to cancer, while short-term exposure to high doses of arsenic can cause other adverse health effects. The CDPH has established a primary MCL of 10 micrograms per liter (µg/L) for arsenic, which was reduced from 50 µg/L in 2008.

Boron

Boron is a necessary element for agriculture, but may become toxic to very sensitive crops above 500 µg/L. For public drinking water systems, the CDPH has established a notification level of 1,000 µg/L for boron.

Specific Conductance

Specific conductance is a property of groundwater that is relatively simple to measure and collect in the field at the wellhead and can help identify and characterize the condition of the freshwater bearing aquifer system. Specific conductance is a measure of how effectively water will conduct electricity in units of both micromhos per centimeter (µmhos/cm) and microsiemens (µS/cm) per centimeter (which are analogous), and provides for the indirect measurement of the amount of dissolved salts in groundwater. Lower specific conductance values indicate less salt, while higher specific conductance values indicate more salt.

Applied irrigation water with fertilizers as well as water softeners can add salts to the hydrogeologic system, which can increase the specific conductance of the groundwater.

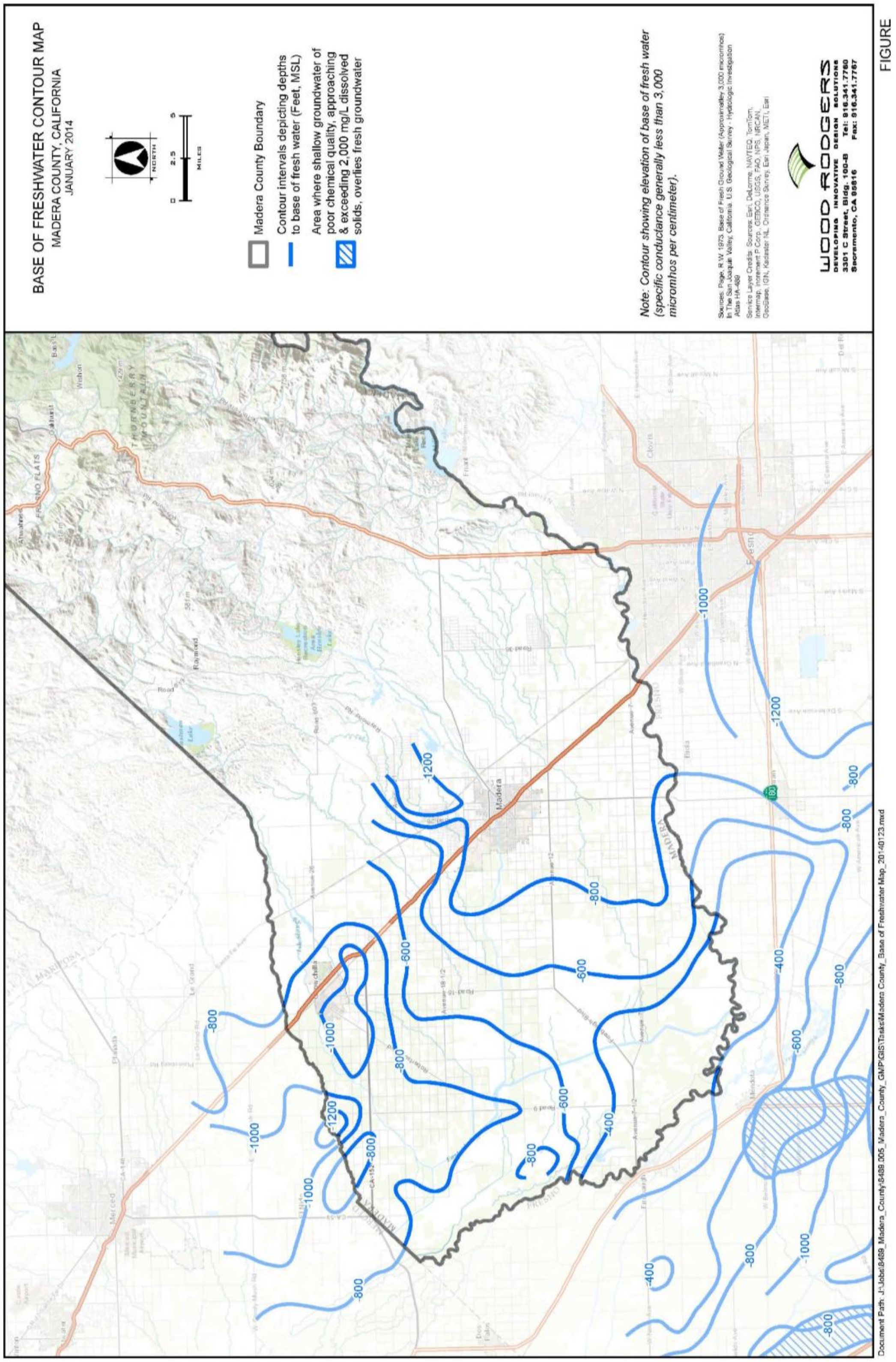
Elevated specific conductance values can also be attributed to naturally occurring brackish or saline water, such as geologic formations which are, or have been in the past, directly connected to a salt water body or where geologic formations were deposited under marine (salt water) conditions which have inherently high dissolved salt concentrations. **Figure 2.12** shows the elevation of the base of fresh water, which is discussed in more detail in Section 6.3 – Saline Water Intrusion. The data comes from Page (1973) and is the most recent published study to evaluate the base of fresh water in Madera County. Data is only available in some of the GMP area.

Manganese

Manganese is a naturally occurring element found in rocks and minerals. Its presence in groundwater is a result of the dissolution of the naturally occurring element. In lower concentrations (below the secondary CDPH MCL of 50 µg/L), manganese may cause aesthetic problems (odor or staining) for domestic and municipal uses, but generally would not pose a health risk.

Nitrate (as NO_3)

Nitrate (as NO_3) is a contaminant which does not naturally occur in the subsurface. Elevated concentrations of nitrate are widespread in the San Joaquin Valley. The CDPH has established a primary MCL of 45 milligrams per liter (mg/L) for nitrate as NO_3. Where elevated concentrations of nitrates are present, it is likely a result of overlying land uses, such as applied fertilizer, septic systems, leaky sewer systems (including transmission lines, storage, and wastewater treatment plants), and high-density animal enclosures, such as dairies.



Note: Contour showing elevation of base of fresh water (specific conductance generally less than 3,000 micromhos per centimeter).

Sources: Page, R.W. 1973. Base of Fresh Ground Water (Approximately 3,000 micromhos) In The San Joaquin Valley, California. U.S. Geological Survey - Hydrologic Investigation Atlas HA-489

Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri

Document Path: J:\Jobs\8489_Madera_County\8489.005_Madera_County_GMP\GIS\Tasks\Madera County_Base of Freshwater Map_20140123.mxd

Figure 2.12 – Base of Freshwater Contour Map

Chowchilla Water District and Madera Irrigation District Sub-Area

The Chowchilla Water District (CWD) and Madera Irrigation District (MID) sub-area consists of the central portion of the GMP area (**Figure 2.10**). As illustrated in **Appendix D**, available water quality data indicate that:

- **Arsenic –** concentrations do not exceed the MCL of 10 µg/L.
- **Boron –** concentrations are generally acceptable, with the exception for one data point southwest of Road 16 and Avenue 18½, where boron concentrations ranged from 1,000 to 2,000 µg/L (well construction information for this well is unknown).
- **Specific Conductance –** in a few areas located to the west and southwest of Chowchilla, elevated values for specific conductance near to and/or exceeding the recommended MCL[1] for domestic use are observed in the shallow and intermediate aquifers. A closer examination into the potential source for the elevated specific conductance concentrations revealed that high-density animal enclosures and/or fertilizer plants were in close proximity. Elevated concentrations of specific conductance could be problematic for agricultural and domestic use.
- **Manganese –** concentrations are generally acceptable in this sub-area, with the exception of the area south of the City of Madera in the aquifers less than 400 feet. Concentrations were reported in the remainder of the area between the secondary MCL of 50 µg/L and 150 µg/L.
- **Nitrate (as NO_3) –** wells located west and south of the City of Chowchilla have reported nitrate concentrations that exceed the MCL of 45 mg/L in the shallow aquifer. The occurrence of elevated concentrations observed within these shallow wells can be directly correlated to their close proximity to high-density animal enclosures and fertilizer plants.

Northeast Undistricted Sub-Area

The Northeast Undistricted sub-area generally includes the portions of the GMP area east of Highway 99 and north of the City of Madera (**Figure 2.10**). As illustrated in **Appendix D**, available water quality data indicates that:

- **Arsenic –** concentrations are elevated and exceed the MCL of 10 µg/L in several wells, completed in both the shallow and deep aquifers.
- **Boron –** concentrations are generally acceptable in this sub-area, with values primarily below 500 µg/L.
- **Specific conductance –** concentrations are generally acceptable in this sub-area, with average values ranging between 600 and 900 µmhos/cm.
- **Manganese –** concentrations are generally below the secondary MCL of 50 µg/L

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[1] Recommended CDPH MCL for Specific Conductance is 900 µS/cm; upper limit is 1,600 µS/cm; short term is 2,200 µS/cm

throughout the sub-area, with the exception of one well exceeding the secondary MCL (well construction information was unavailable for this data point)

- **Nitrate (as NO_3) –** concentrations are acceptable in this sub-area, with reported concentrations below the MCL of 45 mg/L.

Southeast Undistricted Sub-Area

The Southeast Undistricted sub-area generally includes the portions of the GMP area east of Santa Fe Avenue and south of the Fresno River (**Figure 2.10**). As illustrated in **Appendix D**, available water quality data indicate that:

- **Arsenic –** concentrations are generally acceptable with regard to the MCL of 10 µg/L in the shallower aquifers. Elevated concentrations over 10 µg/L appear to be concentrated in the aquifers below 600 feet.
- **Boron –** concentrations are acceptable for the sub-area, with values ranging from less than 500 to 1,000 µg/L.
- **Specific conductance –** concentrations are acceptable (less than 900 µmhos/cm) with the exception of one data point northwest of the Madera Ranchos (unknown well depth).
- **Manganese –** concentrations appear to be acceptable in the underlying aquifers. One data point in the shallow aquifer indicates elevated manganese concentrations, but is most likely a result of a turbid sample (which results in anomalously high results).
- **Nitrate (as NO_3) –** Elevated concentrations near to or above the MCL of 45 mg/L is of concern for this sub-area and have been documented in the shallow aquifers. This is of concern primarily for domestic wells, which are usually constructed in the shallow aquifers. The primary reason for the elevated concentrations of nitrates in this sub-area is likely the high density of septic systems in the Madera Ranchos.

City of Madera Water Master Plan Sub-Area

The City of Madera Water Master Plan sub-area includes the City of Madera and significant amounts of primarily agricultural lands that surround the City mainly to the south (**Figure 2.10**). This was the area identified in the 2008 IRWMP. According to the City of Madera, it extends beyond their current sphere of influence and planning area. As illustrated in **Appendix D**, available water quality data indicate that:

- **Arsenic –** concentrations are acceptable and below the MCL of 10 µg/L in the sub-area.
- **Boron –** concentrations are below 500 µg/L in the entire sub-area.
- **Specific conductance** – concentrations are generally acceptable within the sub-area, with the exception of several wells in the western portion with elevated concentrations over 1,600 µmhos/cm. These wells do not have construction

information associated with them, but the wells are located to the southwest of the City and are located in an industrial area. Elevated specific conductance concentrations could be problematic for agricultural and domestic use.

- **Manganese** – concentrations appear to be acceptable and below the secondary MCL of 50 µg/L in the sub-area.
- **Nitrate (as NO_3)** – concentrations appears to be under the MCL of 45 mg/L, with the exception of the area southwest of the City where land use potentially affects the shallow aquifer water quality. A closer examination into the potential source for the elevated nitrate concentrations revealed that at these locations, high-density animal enclosures and/or fertilizer plants were in close proximity. Elevated nitrate concentrations can be harmful for domestic use.

Southwest Area Sub-Area

The Southwest Area sub-area encompasses the southwest portion of the GMP area (**Figure 2.10**). As illustrated in **Appendix D**, available water quality data indicate that:

- **Arsenic** – water quality data is inconclusive for the underlying aquifers. West of the sub-area in Firebaugh, the data indicate elevated concentrations of arsenic above the MCL of 10 µg/L, but the depth is unknown for the sampled well.
- **Boron** – appears to be acceptable, with concentrations less than 500 µg/L throughout the sub-area; however, well depths are not known.
- **Specific conductance** – is elevated in the northeastern portion of the sub-area in the shallow aquifer and appears to increase towards the west.
- **Manganese** – water quality data is inconclusive for the underlying aquifers.
- **Nitrate (as NO_3) –** concentrations appear to be at or near the MCL of 45 mg/L in the eastern portion of the sub-area, and decrease in concentration to the west.

Westerly Undistricted Area Sub-Area

The Westerly Undistricted Area sub-area encompasses the portions of the GMP area north of the Southwest Area sub-area and west of the CWD and MID sub-area (**Figure 2.10**). Water quality data is sparse, with the exception for specific conductance and nitrate (as NO_3). As illustrated in **Appendix D**, available water quality data indicate that:

- **Arsenic –** water quality data is inconclusive for the underlying aquifers; however, from the available data points, arsenic appears to be acceptable.
- **Boron** – water quality data is inconclusive for the underlying aquifers; however, from the available data points, boron appears to be acceptable.
- **Specific conductance –** concentrations have been documented to be above 1,600 µmhos/cm in the central portion of the sub-area in the intermediate aquifer and generally increase in concentration towards the southwest portion of the sub-area.

- **Manganese –** water quality data is inconclusive for the underlying aquifers; however, the available data points suggest manganese is acceptable.
- **Nitrate (as NO_3) –** concentrations appear to be above the MCL of 45 mg/L near the central portion of the sub-area in the shallow aquifer. The northwestern portion of the sub-area has elevated concentrations of nitrate (as NO_3) between 30 and 45 mg/L, near to or at the MCL. For the rest of the sub-area, concentrations are below the MCL.

2.8. Land Subsidence

Land subsidence occurs when groundwater levels in confined aquifers decline due to excessive withdrawals of water. This results in compaction of fine-grained sediments (clays) above and within the aquifer system as water is removed from pores between the grains of the sediments. Over time, as more water is removed from the area, the ground level sinks. Land subsidence can lead to reduced conveyance capacity in canals, and damage to structures such as canals, levees, buildings and wells. Subsidence can also cause flooding by creating low spots or reducing gradients in natural channels.

This section discusses the causes of land subsidence and impacts from recent land subsidence. Land subsidence monitoring is discussed in Section 5.4, and land subsidence mitigation measures are discussed in Section 7.5.

Cause of Local Land Subsidence

Land subsidence in the GMP area is caused by pumping groundwater from the deeper confined aquifer that is separated from the shallower unconfined aquifer by the Corcoran Clay. The Corcoran Clay is the regional aquitard throughout the San Joaquin Valley, and is prevalent throughout the western half of the GMP area (see **Figure 2.14**). The area of greatest land subsidence in the GMP area coincides with the area underlain by the Corcoran Clay. The greatest land subsidence has also occurred in western Madera County, particularly in areas along the Eastside Bypass.

History of Land Subsidence in Area

Land subsidence in the GMP area is of historic and ongoing significance. Between 1926 and 1972, subsidence resulted in between -1 and -4 feet of ground surface elevation change (drop) within the western half of the GMP area. The area of greatest subsidence occurred roughly along the path of the East Side Bypass flood control structure of the San Joaquin River (Bull, 1975). The majority of the subsidence has occurred since 1940, when large turbine pumps came into widespread use for extracting water from the deeper confined aquifer which underlies the western half of the GMP area (KDSA, 2013). Surface water from the Delta Mendota Canal (early 1950s) and the California Aqueduct (early 1970s) resulted in decreased groundwater demand, stabilization of groundwater levels and a reduced rate of compaction. Drought conditions during 1976-1977 and 1987-1992 resulted in increased demand for groundwater supply and also an increase in subsidence rates. Drought and regulatory reductions in surface water deliveries from 2007 through 2013 have forced unprecedented withdrawals of water from the lower aquifer to meet local water demand.

Loss of Storage due to Subsidence

The primary cause of land subsidence in the Sacramento and the San Joaquin Valleys has been the compaction of fine-grained sediments (predominantly clay) in the aquifer system following severe, long-term withdrawal of ground water in excess of recharge (USGS, 1995). Subsidence due to compaction of fine-grained sediments began in the San Joaquin Valley in the 1920's. As water levels declined severely during the 1960's, fine-grained sediments lost water from pore spaces and became compacted. When withdrawal rates decreased and water levels were allowed to recover, compaction rates slowed significantly (USGS 1995). Increased withdrawals during the 1976-77 drought caused additional subsidence, some of which was the result of compaction of coarse-grained sediments. When water levels recovered, the fine-grained sediments remained compacted; however, the land surface rebounded in 1978 because the compacted coarse-grained sediments regained some of their original volume when the former or near former pore pressure was attained (USGS, 1995). During the 1976-77 drought, compaction occurred only in the sand and gravel and was relatively insignificant and, to a degree, reversible (USGS, 1995).

Overall loss of storage space in the GMP area’s aquifer can be directly correlated to the amount of subsidence seen at the land surface. However, as is indicated above, subsidence due to aquifer compaction is a result of compaction of the fine grained sediments of the aquifer. The fine grained portions of the aquifer are not typically considered water producing portions. As noted above, the coarser grained sediments, i.e., the sands and gravels, may compact but this compaction is elastic, and is largely reversed with increased water levels. This indicates that while overall the aquifer has compacted and lost storage space, the majority of the loss is in the fine grained layers which do not contribute appreciable water to wells nor are the clay layers usable for the storage of recharged water. The minimal amount of storage loss in the coarser grained sediments, the usable part of the aquifer, is for the most part recoverable and is not considered an appreciable loss of storage space in the usable parts of the aquifer.

Recent Land Subsidence Impacts

Groundwater pumping that results in renewed compaction and land subsidence in the Valley could cause serious operational, maintenance, and construction-design problems for the California Aqueduct, the San Luis & Delta-Mendota canals, and other water-delivery and flood-control canals in the San Joaquin Valley. Subsidence has reduced the flow capacity of several canals that deliver irrigation water to farmers and transport floodwater out of the valley. Several canals managed by the San Luis & Delta-Mendota Water Authority (SLDMWA) and the Central California Irrigation District (CCID) have had reduced freeboard and structural damages that have already required millions of dollars worth of repairs, and more repairs are expected in the future (Sneed, et al. 2013). These instances of land subsidence are not in the GMP area but are adjacent to the westerly portions of the area in the vicinity of the San Joaquin River, and indicate that subsidence is occurring in broad area of the central part of the San Joaquin Valley. Within the GMP area, subsidence in the vicinity of the San Joaquin River and its flood control structures may cause flooding of Hwy. 152, and a local grade school, threaten valuable farmland and dairies, and jeopardize the San Joaquin River Restoration Program (Provost & Pritchard, 2013).

Recent work by the USGS, USBR, DWR and Kenneth D. Schmidt and Associates (KDSA) indicates that the greatest amount of subsidence in the GMP area is in the area of the East Side Bypass. This is also referred to as the Red-Top Area, which is located in the west-northwest portion of the GMP area near the axis of the valley where the majority of the historic land subsidence has been documented. The land surface elevation transect along Highway 152, **Figure 2.1** shows subsidence along this section since 1972. The maximum subsidence near the Eastside Bypass has amounted to approximately -7 feet. Most of the subsidence west of Highway 33 has occurred since 1988, while subsidence along the eastern portion of the transect occurred before 1988. (KDSA, 2013) **Figure 2.14** shows contours of equal subsidence between 2008 and 2010. It should be noted that during this two-year period the ground surface dropped between -0.1 and -1.7 feet, with the greatest declines in elevation occurring along the East Side Bypass.

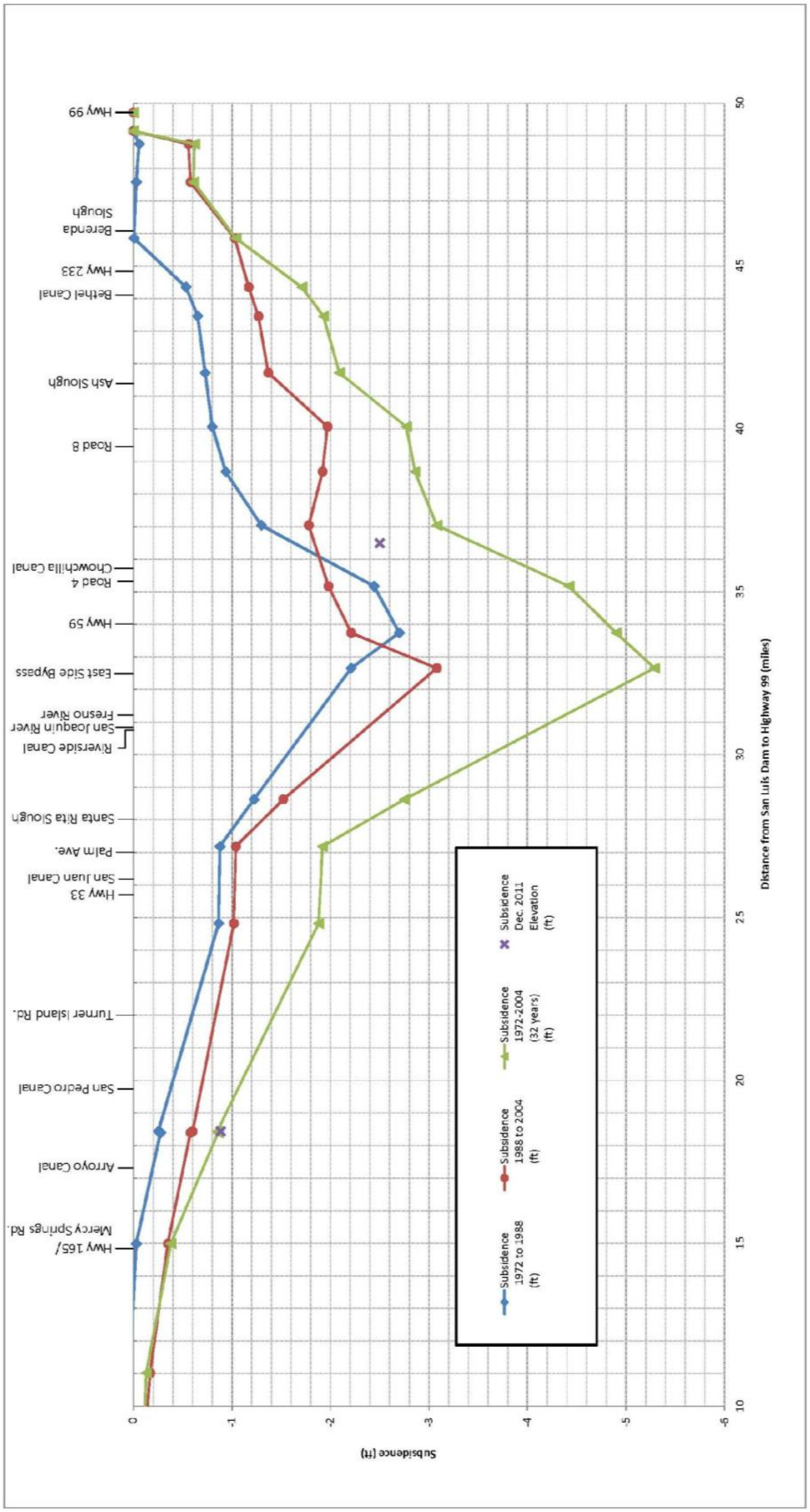

Figure 2.13 – Historical Land Surface Elevations along Highway 152 Transect

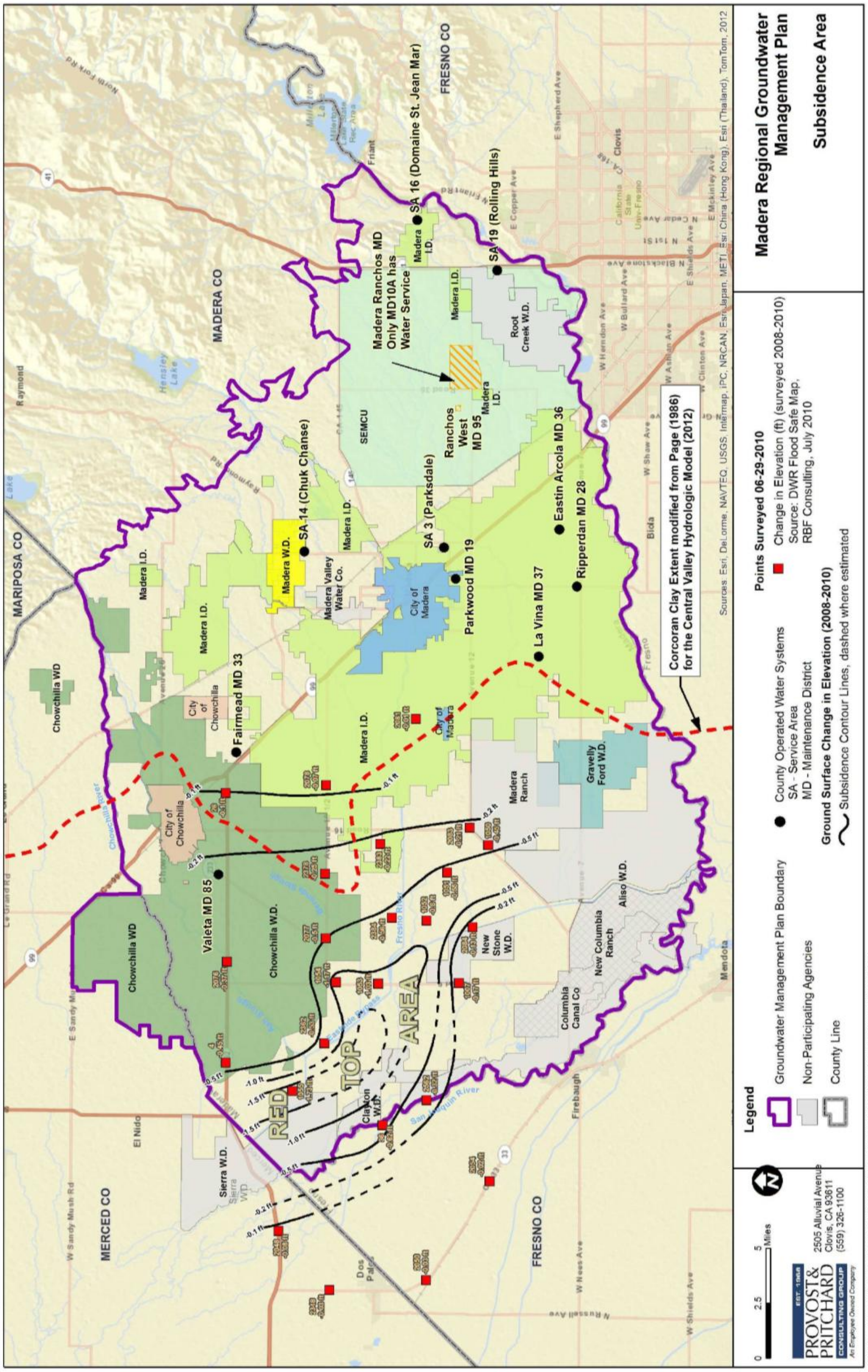

Figure 2.14 – Subsidence Area

Recent information on continued subsidence in this area, as draft maps produced by the USBR, indicates that subsidence in this area has continued through 2013. These maps are not included here because they are draft and have not been reviewed by the Western Madera County Subsidence Project. Over the period from December 2011 to 2012 as much as 0.6 feet of subsidence occurred in the area and from December 2011 to December 2013, subsidence in the area of the Eastside Bypass has been as much as 0.75 feet. However, a draft map of the same area for the period December 2012 to December 2013 indicates that as much as 1.05 feet of subsidence occurred in this area. It is unclear why there is a discrepancy in the draft maps but it is clear that land subsidence has continued in the area.

Department of Water Resources Subsidence Study

In November 2013, DWR generated a detailed study entitled "*Evaluation of the Effects of Subsidence on Flow Capacity in the Chowchilla and Eastside Bypasses.*" The bypasses are major flood control structures that parallel the San Joaquin River along the western edge of the GMP area. The DWR study focuses on changes in levee freeboard (the height of the top of the levee above the water level) and changes in flow capacity in the bypasses that have occurred between 2008 and 2011, and makes projections of potential changes in freeboard and capacity due to continuing subsidence through 2016. The goal of the study was to provide a planning tool for use by the San Joaquin River Restoration Program (SJRRP) in identifying potential impacts on the design and implementation of the projects to achieve the goals of that program.

Subsidence issues impacting the SJRRP are addressed by USBR in "*Subsidence Design Criteria for the San Joaquin River Restoration Program (DRAFT)*." That study used and compared subsidence data from the USGS, US Army Corps of Engineers (USACE), USBR, RBF Consulting and DWR. The agencies used InSAR (USGS), LiDAR (USACE), spirit leveling and GPS instrumentation (DWR/Reclamation/RBF). Topographic data collected by USGS using Interferrogram (InSAR) data between 2008 and 2010 show similar trends as the RBF Consulting data. Bi-annual survey data collected by Reclamation between 2011 and 2012 show similar trends, but subsidence rates vary along the bypass depending on season, year type, and land use. However, general subsidence trends indicated by USBR data are similar to the latest trends indicated by RFB Consulting and USGS data. Differences in subsidence data were attributed to placement of material on top of the levees after the USGS surveys, time frames that the data were taken (RBF 2008-2010, USGS 2008-2010, USBR 2011-2012, and DWR 2008-2012), the accuracy and geographical coverage of the data and the number of control points used in the ground surveys.

The study used the USACE Hydraulic Engineering Center's River Analysis System (HEC-RAS) software to model the bypasses with 2008 topography and 2010 bathymetry where available. Using the annual estimated subsidence rates determined by DWR, two versions of the model were developed, to reflect 2011 and 2016 conditions. The model results indicate the following:

> "*Water surface elevations declined between 2008 and 2011, and are predicted to continue to decline in 2016. Because the changes in topography represent the only variable between the model runs, changes in water surface elevation are caused by the lowering of the ground which, in turn, is the result of subsidence. The results show that freeboard in 2008 and 2011 is generally above 3 to 5 feet along most of the bypass except between Sand Slough and West Washington Road, which is an area of recurring sediment deposition. From 2011 to 2016, it is expected that the continuing subsidence will reduce the freeboard in this area by about 0.5 feet. In the peak subsidence area between Road 4 and Avenue 21, ongoing subsidence is estimated to decrease the freeboard from 2011 to 2016 an additional 1.5 feet. For Highway 152, the projected decrease in freeboard is about 0.7 feet. The opposite is true within the proximity of Avenue 18-1/2, where freeboard is expected to increase from 2011 to 2016 by about 0.7 feet due to the increase of the channel slope, resulting in higher channel capacity, as the result of the subsidence*."

DWR also modeled flow capacity of the bypasses in the study. In that analysis, flow capacity above Ash Slough will still handle published flood design flows. However, in the Eastside Bypass below Ash Slough, flow capacity is less than the assumed flood design flow. Continuing subsidence will further reduce the Eastside Bypass' ability to convey flood flows. The flow capacity in the Eastside Bypass from Ash Slough to Sand Slough was 5,000 cfs less in 2008 than published design flows and 500 cfs less than design from Sand Slough to the Mariposa Bypass. For 2011 and 2016 conditions, subsidence further reduces the flow capacity in these segments of the Bypass.

Due to backwater conditions caused by flood flows from the Kings River, maximum flow capacity in the Ash Slough to Sand Slough section of the Eastside Bypass is reduced to 7,500 cfs and 6,000 cfs in 2011 and 2016, respectively. This is a significant reduction from the flood design flow of 17,500 cfs in this segment of the Bypass. Likely causes include historical subsidence and sediment deposition in this reach, as illustrated from the already-reduced 2008 flood capacity of 9,500 cfs. Along the Eastside Bypass from Sand Slough to the Mariposa Bypass, the 2008 17,000 cfs flow capacity at 4 feet of freeboard was reduced by about 2,500 cfs to 14,500 cfs in 2011, and by another 1,500 cfs to 13,000 cfs in 2016.

Subsidence is reducing the amount of available freeboard in the two bypasses, which affects their abilities to convey flows. Flow capacity in the bypasses has been reduced by up to 2,500 cfs as a result of subsidence since 2008. If subsidence continues, it is estimated that there will be an additional loss in flow capacity from 2011 to 2016, up to 1,500 cfs depending on the segment of Bypass. If future subsidence occurs as expected, additional negative impacts on future flood operations would result.

3. BASIN MANAGEMENT OBJECTIVES

Basin Management Objectives (BMOs) are broad goals for improving the management of a local groundwater basin. BMOs were developed through a collaborative process with the GMP Participants. This process included several general meetings on the GMP, and three focused workshops specifically on BMOs, potential projects and future goals. The BMOs fall into the five main categories shown in **Figure 3.1** with Stabilization of Groundwater Levels by 2024 as the central or overarching Basin Management Objective.

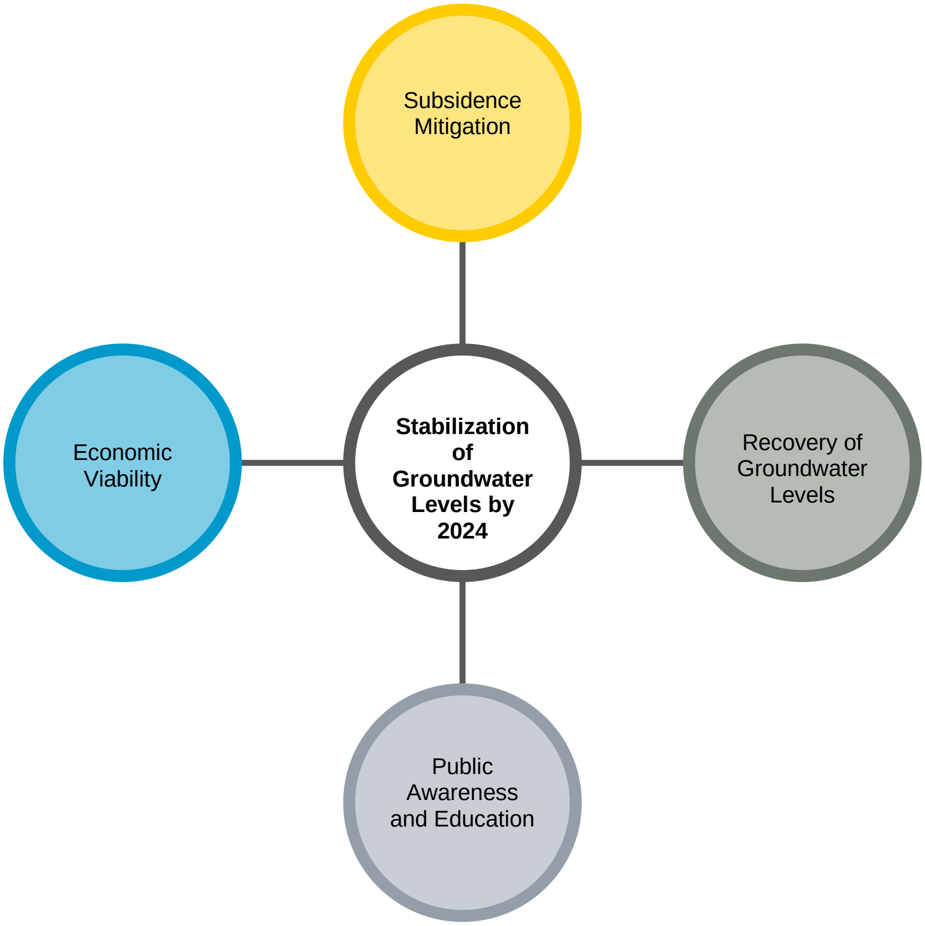

Figure 3.1 – Basin Management Objectives

Following is a description of each BMO.

Stabilization of Groundwater Levels (by 2024)

The overarching and highest-priority goal of the Participant Agencies is to stabilize the groundwater levels by 2024, by approximately 250,000 AF/year. This amount of overdraft reduction by 2024 is based on the estimated projected future overdraft of 259,000 AFY as discussed in Section 2.5. This includes 150,000 AFY reduction in overdraft by reducing groundwater demands, and an additional 100,000 AFY reduction in overdraft through recharge and acquisition of new surface water supplies.

Short Term Goals (1-5 years)

- Implement demand reduction measures to reduce 150,000 AFY of groundwater overdraft
- Identify, develop and construct storm water capture facilities to perform recharge with a minimum yield of 50,000 AFY

Long Term Goals (5-10 years)

- Perform additional recharge, identify and acquire new surface water supplies (50,000 AFY), such as Temperance Flat, watershed management, and storm water capture.
- Prevent degradation of potable water supplies and improve ground water quality where feasible.

Subsidence Mitigation

Continued unabated subsidence may potentially cause un-recoverable damages to groundwater storage capacity, existing infrastructure such as existing flood conveyance and irrigation conveyance facilities, future infrastructure such as future wells, restoration flows and High Speed Rail. Subsidence mitigation is critical in stemming the continued impacts to the western region of Madera County.

Short term Goal (1-5 years):

- Implement demand reduction measures in subsidence areas to reduce the rate of subsidence by half.
- Develop well construction and destruction policies in subsidence areas
- Develop recharge and flood irrigation projects

Long Term Goals (5-10 years):

- Significantly reduce rate of subsidence (near zero)

Recovery of Groundwater Levels after 2024

The goal is the recovery of groundwater levels to sustain a 5 year drought. The recovery of groundwater levels will inherently have multiple benefits such as improved groundwater quality, and reduced pumping cost. The storage needed to accommodate a 5-year drought will vary by area and drought severity, but could be 15 to 20 feet of groundwater.

Public Awareness and Education

The goal is to provide public education and awareness of groundwater conditions, preparation for the next drought, better understanding of water resources, and causes and impacts of subsidence. A major focus of the educational program will be on K-12 education. Another benefit to this goal is it will enable the timely transfer of accurate and up to date information to public officials so they can make better informed decisions about water and groundwater resources in the Madera region.

Economic Viability

One of the primary goals is to maintain and improve the economic viability of the Madera region. Continued unabated groundwater extractions and continued overdraft is unsustainable and will ultimately lead to depletion of groundwater and a declining water table. Significant demand reductions will be needed during drought years when surface water supplies are significantly reduced and groundwater supplies are not reliable. Demand reduction may lead to some agricultural properties having to fallow lands, municipalities curtailing outdoor water usage, loss of well production in public and private wells, loss of property values, increased unemployment and poverty, and loss of property tax revenues as a result of lower property values.

Properties that have a reliable groundwater supply will generally have increased property values and will be in higher demand. A reliable water supply will allow property owners and investors to make informed investment decisions.

Collaborative Governance

While not considered a standalone objective, the Partners understand that collaborative and regional solutions and management of the groundwater basin is essential to successfully addressing the groundwater resource issues within the basin. Formation of an agency to manage groundwater and promote collaboration among all the stakeholders within the groundwater basin is a key component to that collaboration.

The Partners have determined that formation of a Joint Powers Authority (JPA) may be the most direct and effective way to create such a collaborative governance structure. A JPA is an entity permitted under California Constitution (Section 6502 of the Government Code), whereby two or more entities (local governments, utilities or special districts), may jointly exercise any power common to all of them. JPAs may be used where:

- An activity naturally transcends the boundaries of existing public authorities, such as groundwater management authorities given to local agencies by the state following the agencies' adoption of AB 3030- and SB 1938-compliant groundwater management plans.

- The authority will receive existing powers from the creating governments.
- By combining their efforts, public authorities can achieve economies of scale, generally achieve consensus, improved effectiveness, and improve efficiencies.

A Joint Powers Authority would be distinct from the member authorities; it would have an independent board of directors and its own staff. The JPA Board can be given any of the powers inherent in all of the participating agencies. The authorizing agreement would state the powers the new authority would be allowed to exercise. The term, membership, and standing orders of the Board of the authority must also be specified. The JPA may employ staff and establish policies independently of the constituent authorities. The JPA could also provide a one-stop repository for data collection and sharing of groundwater and water resources data. Through a collaborative effort in collecting and monitoring groundwater data, the region would benefit from scale of economy and efficiencies.

A regional groundwater management authority and definitive mitigation measures would help prevent a state mandated adjudication of the groundwater basin.

Short Term Goals (1-5 years)

- Formation of a collaborative governance/JPA within one year of adoption of the GMP.
- Identify and secure short term funding for operation of JPA

Long Term Goals

- Identify long term funding for operation of JPA

The Basin Management Objectives are reflected in the strategies listed in **Section 7.2 – Overdraft Mitigation** and a list of projects provided in **Section 9.3 – Plan Implementation**.

4. STAKEHOLDER INVOLVEMENT

4.1. Groundwater Advisory Committee / Groundwater Management Agency

This section discusses the existing Groundwater Advisory Committees that oversaw development of this GMP, and potential Groundwater Management Agencies that could be formed to implement the GMP. A Groundwater Advisory Committee is a required component of Groundwater Management Plans and serves to guide and inform decision makers on groundwater related projects and policies.

4.1.1 Regional Groundwater Advisory Committee

The GMP Participants serve as the regional Groundwater Advisory Committee (GAC or Committee) for the Madera Regional Groundwater Management Plan. The GAC is composed of members from Madera County, Madera Irrigation District, Chowchilla Water District, City of Chowchilla, City of Madera, and South-East Madera County United. These participants serve as the GAC on regional groundwater issues.

The main role of the GAC is to provide regional oversight of groundwater concerns and address these concerns through preparation and implementation of this GMP. GAC meetings were held regularly during the preparation of the GMP and will be held as needed to discuss progress towards meeting the goals contained in this GMP.

The GAC will discuss the progress in implementing the Groundwater Management Plan in each regularly scheduled meeting and will have the following responsibilities:

- Review trends in groundwater levels and available information on groundwater quality;
- Evaluate the effectiveness of current groundwater management policies and facilities;
- Discuss the need for new groundwater supply/enhancement facilities;
- Educate landowners on groundwater management issues;
- Assess the overall progress in implementing the programs outlined in the GMP;
- Recommend updates or amendments to the GMP;
- Identify regional and multi-party groundwater projects;
- Review and comment on the Annual Groundwater Report (see Section 9.2); and
- If needed, form special committees or task forces to undertake special groundwater management tasks.

4.1.2 Local Groundwater Advisory Committees

Each participating agency also has their own individual GAC, which is comprised of their respective Boards of Directors/Supervisors or City Councils that serve to inform the respective GMP Participants on groundwater issues. Madera County also has a separate Water Advisory Commission that advises the Madera County Board of Supervisors on water and groundwater issues in the County’s service area. Each member agency currently maintains its own sovereignty for groundwater issues within its boundaries.

4.1.3 Development of Regional Groundwater Management Agency

The first step in developing a regional program should include educating the general public, growers, politicians and other water agencies in Madera County on the need for a regional management entity. As discussed in Section 3, the GMP Participants are planning to create a Joint Powers Authority to provide regional groundwater management within the Plan area. This JPA would provide greater powers in funding and implementing regional solutions to groundwater problems. Such an agency would also supplant the exiting GAC.

If a JPA is formed, each Participating Agency could still maintain local control of their groundwater depending upon the powers and authorities ceded to the JPA. This is a decision the Partner Agencies will need to make during the formation of the JPA.

While the Partner Agencies have already expressed interest in forming a JPA, there are other legal organizations available to manage groundwater. They vary from voluntary agreements to improve cooperation to formation of a new special district. Several examples are provided below:

- **Cooperative Agreements and Memoranda of Agreements**. Cooperative Agreements and Memoranda of Agreement (MOA) are documents written between parties to cooperate on an agreed-upon project or meet an agreed objective. The purpose of an MOA is to have a written understanding of the agreement between parties.

- **Water Conservation Districts.** Water Conservation Districts (WCD) are entities formed under the California Water Conservation District Law of 1931 which superseded the Water Conservation District Law of 1927. According to the law the purposes of water conservation districts are to:

  "*Conserve and store water by dams, reservoirs, ditches, spreading basins, sinking wells, sinking basins, etc.; appropriate, acquire and conserve water and water rights for any useful purpose; obtain water from wells; sell, deliver, distribute or otherwise dispose of water; make surveys; provide recreational facilities; provide flood protection. May reclaim sewage and storm waters. The whole or a part or parts of one or more watersheds of any stream of water or unnavigable river or rivers, or territory adjacent thereto or deriving a water supply therefrom; may be entirely within unincorporated territory or partly within incorporated territory; may be within one or more counties; need not be contiguous*." (DWR, 1977)

  Revenues can come from water sales, sales and leases of property, and charges for use of recreational facilities. Additionally, a WCD can issue general obligation bonds and levy an ad valorem tax on lands and/or property within the district.

- **Other Special Districts.** The formation of other special districts requires the enactment of a new law by the California Legislature. There is precedent for this in that the Legislature has created a number of groundwater management districts to meet the special needs in particular areas of the state. (Correspondence between Kronick, Moskovitz, Tiedemann & Gerard and Eastern Kern County Resource Conservation District; Indian Wells Valley Cooperative Groundwater Management Group, June 11, 1991)

The following are examples of existing legal entities or agreements used for groundwater management in other areas of California.

Indian Wells Valley Cooperative Groundwater Management Group

The Indian Wells Valley Cooperative Groundwater Management Group is a public water data-sharing group consisting of most of the major water producers, other government agencies, and concerned citizens in the Indian Wells Valley in Kern County, CA. In the past, efforts by the individuals or agencies involved were often duplicated. This group was formed to coordinate efforts, share data, and avoid the redundancy of effort. Signatories to the agreement include: U.S. Bureau of Land Management, City of Ridgecrest, County of Kern, Eastern Kern County Resources Conservation District, Indian Wells Valley Airport District, Indian Wells Valley Water District, Inyokern Community Services District, Kern County Water Agency, China Lake Naval Air Weapons Station, and Searles Valley Minerals.

A Technical Advisory Committee (TAC) continually reviews and monitors on-going efforts to better understand the local water resources. This group is also responsible for an extensive well monitoring program and a water recharge study. Numerous studies have been conducted to better understand the groundwater resource in the Valley. Rain and stream gages have been placed in strategic locations in the basin, and over 100 wells are monitored. More information can be found at their website: (http://iwvgroundwater.org/).

Sacramento Groundwater Authority

The Sacramento Groundwater Authority (SGA) is a joint powers authority (JPA) created to manage the Sacramento region’s North Area Groundwater Basin (North Area Basin). The SGA’s formation in 1998 resulted from a coordinated effort by the Sacramento Metropolitan Water Authority (SMWA) and the Sacramento Area Water Forum (Water Forum) to establish an appropriate management entity for the basin. The SGA is recognized as an essential element to implement a comprehensive solution for preserving the lower American River and ensuring a reliable water supply through the year 2030.

The SGA draws its authority from a joint powers agreement signed by the cities of Citrus Heights, Folsom, and Sacramento and the County of Sacramento to exercise their common police powers to manage the underlying groundwater basin. In turn, these agencies chose to manage the basin in a cooperative fashion by allowing representatives of the 14 local water purveyors and representatives for agricultural and self-supplied pumpers to serve as the SGA Board of Directors. At the core of the SGA's management responsibility is a commitment to not exceed the average annual sustainable yield of the basin, which was estimated to be 131,000 acre-feet.

To date the SGA has engaged in groundwater studies, monitoring, grant applications, education, and project promotion. They have enacted limited restrictions or controls on groundwater extractions in specific areas where overdraft is occurring. The SGA has also developed policies for groundwater banking, exchanges in the form of credits, a monitoring program and processes to report groundwater extractions on a monthly basis. More information on the SGA can be found on their website: (www.sgah2o.org).

Kaweah Delta Water Conservation District

The Kaweah Delta Water Conservation District (KDWCD) was formed in 1927, under the provisions of California state law known as the Water Conservation Act of 1927, for the purpose of conserving and storing waters of the Kaweah River and for conserving and protecting the underground waters of the Kaweah Delta. Later the Water Conservation Act, as well as the purpose of the District, was expanded to include power generation and distribution.

The District is located in the south central portion of the San Joaquin Valley and lies in portions of both Tulare and Kings Counties. The total area of the District is about 340,000 acres.

The District and the Kaweah River groundwater basin have experienced long-term groundwater overdraft estimated in 2007 to be as much as 40,000 AF/year. The District has performed several groundwater overdraft studies. There are currently over 40 recharge basins within the District covering approximately 5,000 acres. KDWCD owns and operates many of these groundwater recharge basins. The District also performs education, water resources studies and facilitates project development in their area. More information can be found on their website at: (http://kdwcd.com/).

Ojai Basin Groundwater Management Agency

The mission of the Ojai Basin Groundwater Management Agency (OBGMA) is derived from its enabling legislation, the Ojai Basin Groundwater Management Agency Act, which became law in 1991. The act was approved as a response to the needs and concerns of local water agencies, water users, and well owners of the Ojai Basin, located in Ventura County, CA. The Agency was established in the fifth year of a drought, amidst concerns for potential basin overdraft. More information on the agency can be found at their website: http://www.obgma.com/.

The OBGMA has enacted ordinances that specify the requirements for new well permitting, notification of intent to construct, registration of extraction facilities, metering, reporting of groundwater extractions, and the recordation of wells within the boundaries of the Agency. To date it has not initiated mandated restrictions on groundwater pumping, but it does charge an extraction fee of $17.75 per AF of water.

San Luis Obispo County

On August 27, 2013, the San Luis Obispo County Board of Supervisors adopted County Ordinance No. 3246, which is an "*Urgency Ordinance establishing a moratorium on new or expanded irrigated crop production, conversion of dry farm or grazing land to new or expanded crop production and new development dependent upon a new well in the Paso Robles Groundwater Basin unless such uses offset their total projected water use, including certain exemptions*." On October 8, 2013, The Board of Supervisors continued the Urgency Ordinance for two years (San Luis Obispo County Ordinance No. 3246; 2013).

The Ordinance requires large land uses to offset new water use at a 2:1 ratio, prohibit the creation of new parcels in the basin, and requires changes to the County General Plan to be water-neutral. The Ordinance will not affect the cities of Paso Robles and Atascadero or the towns of Templeton, San Miguel or Shandon, the drilling of wells, or the building of single family homes. Additionally, water from the Nacimiento or State Water Projects shall not be used for development in the rural area of the Paso Robles Groundwater Basin.

Net offsets for agricultural uses can be accomplished by showing that existing water use has been upgraded to achieve water savings equal to the future proposed water use. It can also be accomplished by removing irrigated agricultural land from production. For residential or other development, this can be done by showing that enough fixtures in other residences have been replaced to achieve water savings equal to the proposed future water use. This can also include offsetting of proposed outdoor water use. More information can be found at the following website:
(http://www.slocounty.ca.gov/planning/commguidelines/PRgroundwater.htm)

Existing Activities

- Continue groundwater management through local groundwater advisory committees

Planned Actions

- Develop a regional groundwater management authority, agency or organization
- Develop a framework to equitably manage groundwater resources to achieve the Basin Management Objectives
- Develop mechanisms to fund a regional groundwater management authority, staff and program activities to sustainably manage groundwater resources
- Avoid state adjudication of the Madera regional groundwater basin by demonstrating the effectiveness of local and regional efforts

4.2. Relationships with Other Agencies

The development of relationships between water agencies is important as the GMP Participants implement a regional approach to groundwater management with this GMP. The GMP plan area is located in three separate groundwater sub-basins (see **Figure 2.1**) which extend beyond many political boundaries and includes numerous municipalities, irrigation districts, water districts, private water companies, and private water users (see **Figure 1.1**). This network of interests emphasizes the importance of inter-agency cooperation, and the GMP Participants have historically made efforts to work conjunctively with many other water management agencies. Below is a list of some groups and organizations that they have worked with in managing the local groundwater**:**

- Madera Regional Water Management Group
- Madera-Chowchilla Basin Regional Groundwater Monitoring Group
- Chowchilla Red-Top-City Joint Powers Authority
- South-East Madera County United

A description of each organization and its role in managing groundwater in the GMP area is provided below.

Madera Regional Water Management Group

The Madera Regional Water Management Group (RWMG) was formally organized under a Memorandum of Understanding (MOU) in 2010. There are currently 15 MOU signatories, and all of the GMP Participants are MOU signatories. The RWMG has developed an Integrated Regional Water Management Plan, successfully secured funding for water resources projects, and meets monthly to discuss water related issues and share ideas. The goals of the RWMG overlap strongly with this plan as they both seek benefits from regional cooperation in addressing groundwater issues. More information on the RWMG can be found on their website (http://madera-id.org/index.php/rwmg).

Madera-Chowchilla Basin Regional Groundwater Monitoring Group

The Madera-Chowchilla Basin Regional Groundwater Monitoring Group (Monitoring Group) was formed in 2010 to monitor groundwater levels in the Madera Groundwater sub-basin and Chowchilla Groundwater sub-basin in compliance with California Statewide Groundwater Elevation Monitoring (CASGEM) program, which is described in Section 5.1. The group consists of Madera Irrigation District, Chowchilla Water District, Madera County, Madera Water District, Root Creek Water District, and Gravelly Ford Water District. The monitoring area covers 789 square miles. The group has worked cooperatively to establish a regional groundwater-level monitoring network.

Chowchilla Red-Top-City Joint Powers Authority

The Chowchilla Red-Top-City Joint Powers Authority (JPA) includes the Chowchilla Water District, City of Chowchilla and Chowchilla Red-Topy Resource Conservation District. The JPA was formed in 1997 to develop and implement a groundwater management plan. This is a sub-regional effort to address groundwater issues in the area covered by the three agencies.

South-East Madera County United

South-East Madera County United (SEMCU) is not a water agency, but educates and advocates for responsible and sustainable water management in southeast Madera County. SEMCU is interested in pursuing groundwater recharge projects, particularly in the southeast area of the county where their groundwater subbasin would directly benefit. SEMCU members have been working on a variety of specific projects in collaboration with Madera County Engineering and with some of the development interests in the area. SEMCU is working to collaborate with all agencies and organizations to enhance that aspect of future grant applications. SEMCU leadership is currently working to get a statement from Madera County that the two agencies are working together on groundwater issues, which could help in their efforts to secure additional planning and construction grants, especially where the collaboration will lead to multi-faceted, multi-disciplinary projects with a range of measurable benefits.

Proposed efforts to involve other public agencies and develop new relationships are discussed in Section 4.3.

Existing Activities

- Continue existing relationships with local, state and federal agencies

Planned Actions

- Madera County is a participant of the US Bureau of Reclamation's Sacramento-San Joaquin Basin wide Study and Update

4.3. Plan to Involve the Public and Other Agencies

The GMP Participants are already involved with many neighboring and regional agencies on groundwater management projects. Existing relationships that pertain to groundwater management are described in Section 4.2. Nevertheless, they are always interested in building new relationships with other agencies that share the same groundwater basin. They will also strive to involve the public in groundwater management decisions. Additional cooperative relationships can be achieved through data sharing, inter-agency committees, inter-agency meetings, memorandums of understandings, formal agreements, and collaborations on groundwater projects.

Several water management agencies in the valley portion of Madera County are not involved with this GMP. The GMP Participants will seek to gain support for regional groundwater management from these agencies.

Specific goals for involving the public and other agencies include:

1. Contact neighboring counties to discuss the impacts they are having on the area's groundwater levels
2. Recruit other water agencies to participate in future regional efforts, such as Joint Powers Authorities, or formation of a county-wide groundwater management district.
3. Engage in dialogue with the public and other agencies within, adjacent to or near Madera County, such as:
    a. Madera Water District
    b. Sierra Water District
    c. Aliso Water District
    d. Columbia Canal Company
    e. Progressive Water District
    f. Clayton Water District
    g. New Stone Water District
    h. Madera Oversight Coalition
    i. Madera County Farm Bureau
    j. Lower San Joaquin Levee District
    k. Revive the San Joaquin
    l. Chowchilla Red-Top Resource Conservation District
    m. Madera Valley Water Company
    n. Conservation Districts
    o. Merced County
    p. Fresno County
    q. Central California Irrigation District (CCID)
    r. San Joaquin River Exchange Contractors
    s. City of Fresno
    t. Friant Water Authority
    u. Mendota Pool Group

4. Involve Other State and Federal Agencies. The GMP Participants plan to engage other state and federal agencies, such as:
    a. California Department of Water Resources
    b. The US Bureau of Reclamation (through their 2013 Basin Wide Update)
    c. US Geological Survey (through subsidence elevation monitoring data)
    d. California Department of Public Health (through well construction and destruction)
    e. US Fish and Wildlife
    f. California Fish and Wildlife
    g. Regional Water Quality Control Board
    h. Natural Resource Conservation Service

Existing Activities

None

Planned Actions

- Provide copies of an annual groundwater reports (see Section 9.2) to the public and interested public agencies at their request.
- Recruit other water agencies to participate on regional groundwater management efforts.
- Work with and involve agencies in Madera County on groundwater management such as Root Creek Water District, Madera Water District, Aliso Water District, New Stone Water District, Columbia Canal Company, Clayton Water District, Sierra Water District, Chowchilla Red-Top Resource Conservation District, Madera Valley Water Company, Madera Oversight Coalition, and Lower San Joaquin Levee District.
- Work with adjacent counties and agencies (County of Merced, County of Fresno, City of Fresno, and Friant Water Authority) on groundwater management along county borders to reduce impacts from surrounding regions.
- Work with adjacent water districts and irrigation districts on groundwater management along county borders to reduce offsite impacts, such as CCID, and the Exchange Contractors.
- Continue to work with DWR, Bureau of Reclamation, USGS, California Department of Fish and Wildlife, US Department of Fish and Wildlife, and CDPH.

5. MONITORING PROGRAM

This section discusses monitoring of groundwater levels, groundwater quality, and land surface subsidence. Monitoring is considered critical to future management decisions, and the region's monitoring programs are intended to:

1. Provide warning of potential future problems;
2. Use data gathered to generate information for water resources evaluations;
3. Develop meaningful long-term trends in groundwater characteristics; and
4. Provide data comparable from place to place in the GMP area.

5.1. Groundwater Level Monitoring

Following is a discussion of groundwater level monitoring efforts in the areas served by the GMP participants, and a discussion of a regional groundwater-level monitoring program.

City of Chowchilla

The City of Chowchilla does not regularly measure groundwater levels, but does measure them when they perform maintenance on wells, which is frequent.

City of Madera

The City of Madera measures groundwater levels annually in 19 wells.

Chowchilla Water District

Chowchilla Water District measures groundwater levels in about 140 wells each spring and fall.

Gravelly Ford Water District

Gravelly Ford Water District does not perform groundwater level monitoring, but is a member of local CASGEM group and other agencies measures groundwater levels in their service area.

Madera Irrigation District

The Madera Irrigation District monitors groundwater levels each spring and fall in about 230 wells.

Madera County

Madera County monitors groundwater levels at 14 special districts operated by the county. Twenty five wells are monitored annually and one well has a data logger to provide continuous measurements. No monitoring is performed in other unincorporated areas of the County. There is especially a dearth of data in undistracted areas.

South-East Madera County United

SEMCU does not perform groundwater-level monitoring, but some agencies within the SEMCU area do monitor groundwater levels.

California State Groundwater Elevation Monitoring Program

The California State Groundwater Elevation Monitoring Program (CASGEM) was created by SBx7 6, Groundwater Monitoring, a part of the 2009 Comprehensive Water Package. By passing the bill, the Legislature established for the first time a statewide program to collect groundwater elevations, facilitate collaboration between local monitoring entities and the DWR, and report this information to the public.

In 2010, DWR approved the Madera-Chowchilla Basin Groundwater Monitoring Group (CASGEM Group) as the local monitoring entity. The Group includes Madera Irrigation District, Chowchilla Water District, Gravelly Ford Water District, and Madera County. The group also includes Root Creek Water District and Madera Water District, who are not part of this regional GMP. The total monitoring area covers 789 square miles and includes all of the Madera sub-basin and most of the Chowchilla sub-basin. The Group submits groundwater level data each spring and fall to the DWR.

In 2011, the CASGEM Group submitted a Groundwater Monitoring Plan to DWR. This plan describes:

- Well Network Design
    - Shallow versus deep aquifer wells
    - Minimum well density
    - Spatial distribution of the wells
    - Water level history for wells
    - Inclusion of wells in DWR Water Data Library
    - Use of dedicated monitoring wells
- Well selection criteria
- Addition of future wells to network
- Monitoring frequency
- Field methods for data gathering and reporting of data

Proposed Groundwater Monitoring Program for Madera County

In 2008, Kenneth D. Schmidt and Associates prepared a *Proposed Groundwater Monitoring Program for Madera County*. It included recommendations for monitoring groundwater levels and groundwater quality. Although it was prepared for the County of Madera, the recommendations envision a county-wide monitoring plan including the

GMP Participant service areas, not just the County districts and unincorporated areas outside of special districts. A copy of the plan can be found in **Appendix E**.

The plan states that DWR monitors groundwater levels in about 60 wells in the Valley floor, primarily in undistracted areas. However, these efforts have been scaled back in the anticipation that they will be replaced by CASGEM. DWR staff stated that they no longer measure groundwater levels in Madera County (personal communication with Chris Guevara, DWR, March 2014).

Schmidt cited several challenges with monitoring groundwater levels in the area:

1. Depth and/or perforated interval are not available for many wells being monitored, which complicates interpretation of the water-level records
2. Groundwater level data is not extensive enough in the non-Districted areas, especially the southeast part of the valley floor
3. Some wells tap multiple aquifers (i.e. composite wells) and have water levels intermediate between those in the different aquifers

Schmidt recommended the following:

- Develop two separate water level monitoring networks; one for relatively shallow wells (i.e., about 250 to 330 feet deep or shallower) and the other for deeper wells (commonly about 500 to 900 feet deep, and including only those wells without shallow perforations).
- Install data loggers to provide continuous measurements on at least one dozen wells in the county.
- Add new wells to the monitoring network. Sources of information can include private residential, private agricultural, landfills, wastewater treatment facilities, dairies, gasoline leak sites, and newly constructed dedicated monitoring wells.
- Prepare spring and fall water-level elevation maps for both the shallow and deep groundwater on an annual basis, with an evaluation of groundwater overdraft at least every three years.

In addition, a large number of deep wells have been drilled in the last decade to tap the confined aquifer. Long-term and even recent water-level changes from most of this deep groundwater are unknown in most of the area. Water levels in the deep aquifer are only well known in the Red-Top area (see **Figure 2.7 and 2.8**), which has implemented a detailed groundwater monitoring program and identified the perforated interval for the monitored wells.

Recommendations

The recommendations in Schmidt's report have not been implemented, but would substantially improve the groundwater monitoring network in the GMP area. It is recommended that the GMP Participants develop a regional groundwater level monitoring program similar to Schmidt's recommendations. The program would be more comprehensive than the CASGEM group, include a greater density of wells, and include all the GMP Participants. This could be accomplished through an expansion of the CASGEM program or a new separate program. The program would require participation from numerous agencies including the GMP Participants, and possibly other water agencies in the Madera area. The program would include collection of groundwater level data each spring and fall, and development of groundwater contour and groundwater level maps for the GMP area.

Figure 2.10 shows the network of wells with long-term hydrographs in the DWR database. There is a dearth of data in several areas, especially those outside of special districts. As a result, additional wells should be added to the network. These could be private wells that grant permission to be monitored, or preferably dedicated monitoring wells with data loggers.

Existing Activities

- Measure groundwater levels according to existing monitoring plans in each agency.

Planned Actions

- Require, as a condition of obtaining a well permit, that all new wells will be added to the monitoring grid.
- Add private domestic wells to the monitoring network since they are almost always known to be in the unconfined aquifer.
- Create County-wide groundwater contour maps (elevation and depth) each spring and fall for both the shallow unconfined aquifer and the deep confined aquifer.
- Generate a representative set of long-term hydrographs showing groundwater surface elevation and depth for both the shallow unconfined aquifer and the deep confined aquifer.
- Annually estimate the change in groundwater storage from groundwater contour maps, and compare it to reductions in groundwater pumping and the volume of surface water imported.
- Periodically review the monitoring network to determine if it provides sufficient areal coverage to evaluate groundwater levels.
- Maintain at least the same number of wells in the monitoring network by constructing monitoring wells, or adding new private wells to the network when existing wells are taken out of the monitoring network.
- Protect wells in monitoring program from being abandoned or destroyed.
- Encourage landowners and developers to convert unused wells to monitoring wells. Inform them through existing educational outreach programs that their abandoned well(s) could be useful to monitoring programs.

- Seek grant funds to install dedicated monitoring wells with data loggers.
- Prepare enhanced groundwater level maps after improved groundwater level data is available for the confined and unconfined aquifers
- Conduct aquifer tests along agency boundaries to determine aquifer transmissivity and storativity.
- Request as part of the well replacement/abandonment process that existing wells not be abandoned and utilized as monitoring wells.
- Madera County to consider development of a groundwater monitoring fee associated with the well permits, to partially subsidize groundwater monitoring program.
- Madera County shall develop policy as part of well permits that all new wells have meters installed to allow for possible future data gathering.

5.2. Groundwater Quality Monitoring

Groundwater quality monitoring is an important aspect of groundwater management in the GMP area. Monitoring groundwater quality serves the following purposes:

1. Spatially characterize water quality according to soil types, soil salinity, geology, surface water quality, and land use;
2. Establish a baseline for future monitoring;
3. Compare constituent levels at a specific well over time (i.e. years and decades);
4. Determine the extent of groundwater quality problems in specific areas;
5. Identify groundwater quality protection and enhancement needs;
6. Determine water treatment needs;
7. Identify impacts of recharge and surface water use on water quality;
8. Identify suitable crop types that are compatible with the water characteristics; and
9. Monitor the migration of contaminant plumes.

Groundwater quality in the GMP area is discussed in Section 2.7 – Groundwater Quality. Following are descriptions of monitoring programs in the GMP area.

Irrigation and Water Districts

MID, CWD and GFWD do not perform groundwater quality testing on a regular or periodic basis because they do not provide drinking water. Testing is sometimes performed for project specific purposes, such as when new groundwater banking facilities are being studied. Testing is also performed in the City of Chowchilla, which is within CWD, and the City of Madera, which is partially within the MID service area.

Urban Water

The City of Madera operates 19 wells, and the City of Chowchilla operates 7 wells. The County of Madera operates 12 small public water systems in the GMP area, each of which operates from one to four wells. These public water systems are all operated as either Maintenance Districts (MD) or Service Areas (SA). Eleven of the districts rely entirely on groundwater with a total of 22 wells. One system, Sumner Hills (SA 16) uses surface water from Friant Dam releases to the San Joaquin River. The County analyzes the water quality from each water supply well in Madera Ranchos (MD 10A), Parkwood (MD 19), Ripperdan (MD 28), Fairmead (MD 33), Eastin Arcola (MD 36), La Vina (MD 37), Valeta (MD 85), Parksdale (SA 3), Chuck Chanse (SA 14), Rolling Hills (SA 19) and Ranchos West (MD 95).

The Cities and County test water quality on a routine basis for state- and federally-regulated inorganic and organic constituents, as well as coliform bacteria, as required by the California Department of Public Health (CDPH). The period of sampling varies from quarterly (bacteria) to annually (nitrate), bi-annually (nitrite) to greater than bi-annually for those constituents that meet drinking water standards and do not show changes in concentrations. The two cities and each County district prepare annual Consumer Confidence Reports to inform the public of water quality issues, as required by the State of California.

Water Quality Coalition

The East San Joaquin Water Quality Coalition (Coalition) is a group of agricultural interests and growers formed to represent all “dischargers” who own or operate irrigated lands east of the San Joaquin River within Madera, Merced, Stanislaus, Tuolumne and Mariposa Counties and portions of Calaveras County. In the past monitoring efforts focused on surface water, but are being expanded to groundwater. The goals of the coalition include:

1. File required reports with the Central Valley Regional Water Quality Control Board (Regional Board) to provide conditional waiver coverage for members of the coalition
2. Develop and implement an economical and scientifically valid water monitoring program for area rivers and agricultural drains (as required by the waiver)
3. Spread costs equitably among farm land owners/operators who are coalition members;
4. Communicate to landowners where water monitoring indicates problems and work to solve those problems.

Mendota Pool Group

The Mendota Pool Group is a collection of interests who work together to manage surface water, groundwater, and water quality, and resolve water conflicts in the Mendota Pool area. Mendota Pool is located at the southwestern tip of Madera County, actually in the County of Fresno. As part of their efforts, an extensive groundwater quality monitoring program has been undertaken by the Pool Group, including a number of wells in the southwest part of the valley floor area and in adjoining areas in Fresno County. Annual monitoring reports are available for this program that provide and interpret this information. The Mendota Pool is an important hydrologic feature in central California because it is hydrologically connected to the San Joaquin River, Kings River, and numerous irrigation canal systems. It is feasible that future flood water, above the capacity of the Madera Canal, can be stored in Mendota Pool and later delivered downstream of Mendota Pool via the San Joaquin River to lands in the western part of Madera County near the San Joaquin River.

Landowner Monitoring

Many landowners test the water quality of their domestic and irrigation wells. Some landowners may provide the test results to the GMP Participants, however, the results are proprietary, and the landowners may ask that the data is used for informational purposes only, and not be released to the general public.

Other Agency Monitoring

Numerous other agencies play important roles in the monitoring and mitigation of groundwater quality. These agencies include the Regional Water Quality Control Board, Environmental Protection Agency, Department of Toxic Substances Control, USGS, and State Water Resources Control Board. The GMP participants make efforts to collect and review pertinent water quality data published by these agencies.

Proposed Improvements

Schmidt (2008) evaluated the current groundwater quality monitoring in the GMP area. Monitoring is performed in urban areas, but otherwise there is no routine mapping of groundwater quality issues, nor plotting of time trends for changes in concentrations of specific constituents. Schmidt recommends collecting data from private wells and regularly developing maps of groundwater quality issues, including high TDS, nitrate, DBCP, alpha activity, manganese, arsenic and high heterotrophic plate counts. In addition, information on vertical trends in groundwater quality (i.e. water quality changes with depth) should be gathered from cities, communities and schools.

Existing Activities

- Perform required groundwater quality testing for potable water systems.
- Regularly collect new water quality information from other agencies and review it to identify any impending groundwater quality problems.

Planned Actions

- Protect wells in monitoring program from being abandoned.
- Develop a central data repository for all available groundwater quality data in the GMP area.

5.3. Groundwater Monitoring Protocols

Monitoring protocols are necessary to ensure consistency in monitoring efforts and are required for monitoring evaluations to be valid. Consistency should be reflected in factors such as location of sample points, sampling procedures, testing procedures, and the time of year when the samples were taken. Without such common ground, comparisons between reports must be carefully considered. Consequently, uniform data gathering procedures are important. The monitoring protocols used are not attached to this GMP due to their length, but they can be found at the website links provided below.

Groundwater Level Monitoring Protocols

Members of the CASGEM Group (CWD, MID, GFWD and Madera County) follow DWR protocols for monitoring groundwater levels. The other GMP participants, City of Chowchilla and City of Madera, do not follow specific protocols, but do follow standard procedures similar to those documented by DWR.

In 2011, the CASGEM Group submitted a Groundwater Monitoring Plan to the DWR. In that plan, the Group's monitoring protocols "*will follow those described in Groundwater Elevation Monitoring Guidelines"* prepared by the DWR in December 2010. Those protocols can be found on the CASEGEM website:
(http://www.water.ca.gov/groundwater/casgem/)

The CASGEM protocols include requirements for:

- Well location data
- Establishing wellhead elevation (reference point)
- Water level measurement devices
- Calibration and maintenance of water level measurement devices
- Field data sheets for water level measurements

Groundwater Quality Monitoring Protocols

Protocols for obtaining groundwater quality samples can vary depending on the type of monitoring program. Routine sampling of constituents for municipal wells will differ from dedicated monitoring wells, private wells and agricultural wells in the sampling interval and types of constituents analyzed as well as the reporting agency overseeing the program (if any). Operators of municipal wells are required to report to and follow protocols set by the California Department of Public Health (http://www.cdph.ca.gov/Pages/default.aspx).

Any set of protocols for sampling should "*require that ground-water monitoring programs include measurement, sampling, and analytical methods that accurately assess ground-water quality, and that provide early detection of hazardous constituents released to groundwater. Measurement, sampling and analytical methods that are part* *of the ground-water quality program should be documented in the operating record and should include quality assurance and quality control procedures*." (U.S. Environmental Protection Agency, 1992)

Two other sources for groundwater quality monitoring protocols include:

1. Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program: Collection and Documentation of Water-Quality Samples and Related Data Open-File Report 95-399; United States Geological Survey, 1995, http://pubs.usgs.gov/of/1995/ofr-95-399/

2. RCRA Ground-water Monitoring: Draft Technical Guidance; U.S. Environmental Protection Agency, 1992.
   http://www.epa.gov/region9/qa/fieldsamp.html

The following list is compiled from both documents and should be included in the protocols for all groundwater quality monitoring programs:

- Equipment setup
- Well purging, grab samples and field measurements
- Assessment of chemical stability
- Sample collection and processing
- Sample preservation
- Decontamination of field equipment
- Preparation of blank samples
- Chain-of-Custody and records management
- Sample labels
- Sample handling and shipping

Existing Activities
- Continue using standard monitoring protocols developed by DWR, USGS and EPA.

Planned Actions
- Review the adequacy of the water quality monitoring protocols annually and revise them when necessary.
- Develop a standard set of water quality monitoring protocols for all GMP participants.
- Protect wells in monitoring program from being abandoned.
- Develop a standard set of water level monitoring protocols for all GMP participants to follow, especially a common time of year to measure water levels.
- Develop a central data repository for all available groundwater quality and groundwater level data.
- Survey all wells used for water level measurements in subsidence areas for change in ground surface elevation every two years.

5.4. Land Surface Subsidence Monitoring

High groundwater pumping can contribute to land subsidence across a broad area, resulting in aquifer compaction, loss of storage capacity, and adverse effects to surface features such as canals, flood control systems, and water supply pipelines which rely on gravity flow. Land subsidence in the western half of the GMP area is an historic and significant on-going problem. The USGS, California DWR and Kenneth D. Schmidt and Associates have each generated numerous studies documenting the subsidence problems in this area. Land surface elevation surveys which can be used for subsidence studies date back to the 1920s. According to KDSA, studies have centered on the periods 1926 through 1972, and 1992 to the present. Measurement and monitoring for subsidence is performed by a variety of agencies including USGS, DWR, USBR, USACE, San Luis & Delta-Mendota Water Authority (SLDMWA), Central California Irrigation District (CCID), California Department of Transportation (Caltrans), National Geodetic Survey (NGS), University NAVSTAR (Navigation Satellite Timing and Ranging) Consortium (UNAVCO), and various private contractors**.**

Geologic aspects of land subsidence and the results of land subsidence monitoring efforts are presented in Section 2.7 – Land Subsidence. Potential mitigation measures are discussed in Section 7.5 - Land Subsidence Mitigation. Below are discussions on existing and potential land subsidence monitoring techniques.

Current Subsidence Monitoring Programs

Currently, USBR in conjunction with DWR, USGS and USACE obtain subsidence data twice yearly in December and June, and publish maps of the results in January and July as part of the San Joaquin River Restoration Project (SJRRP). SJRRP is developing a technical memorandum entitled "*Subsidence Design Criteria for the San Joaquin River Restoration Program (DRAFT)*."

To address subsidence issues in the Red-Top area of Madera County, the Western Madera County Subsidence Solution Project was formed. It includes Central California Irrigation District, San Luis Canal Company, Washington Area Growers, Red Top Area Growers, Merced County and Madera County. This group gathers and reviews subsidence data collected by other agencies (see **Figure 2.14**). They are also performing technical studies and evaluating subsidence mitigation projects.

Existing subsidence areas may expand, and areas that currently lack subsidence may soon experience subsidence. It is recommended that all agencies in the GMP area that are not actively monitoring subsidence develop a monitoring plan that includes surveying several local benchmarks annually.

Subsidence Monitoring Methods and Technology

Surveying. In the past, subsidence measurement relied upon optical (spirit level) surveying devices and later laser and global positioning satellite (GPS) survey equipment. This type of measurement is still done today, usually along established highways and water conveyance facilities such as levees and canals.

Extensometers. In the 1950s and 1960s, the USGS, DWR and other agencies installed a number of borehole extensometers which allow for continuous measurement of subsidence. Extensometers are costly to install and require frequent maintenance and calibration. There are presently no extensometers within the GMP area; the closest is a few miles south of the southwest corner of the study area.

Continuous Global Positioning Satellites. Subsidence can also be measured using continuous global positioning satellite (CGPS) data. Various USGS studies obtain CGPS data from the UNAVCO Plate Boundary Observatory (PBO) network of continuously-operating GPS stations. The PBO is the geodetic component of UNAVCO, a consortium of research institutions whose focus is measuring vertical and horizontal plate boundary deformation across the western United States using high-precision measurement techniques.

InSAR. During the last decade the USGS and other groups have been using data from radar emitting satellites in a technique called InSAR (interferometric synthetic aperture radar). This form of remote sensing compares radar images from each pass of an InSAR satellite over a study area to determine changes in the elevation of the land surface (USGS, 2013).

LiDAR. DWR and USBR utilize LiDAR coupled with land elevation surveys to monitor subsidence. LiDAR utilizes a laser device that is flown from an airplane.

Existing Activities

- The US Bureau of Reclamation in conjunction with DWR, and USGS, beginning in 2010 have been measuring subsidence twice yearly in the western half of the GMP area.
- Periodically look for visual signs of land subsidence, such as loss of freeboard in canals and levees, collapsed wellheads, and other damaged infrastructure.
- Development of the Western Madera County Subsidence Solution Project, which includes Central California Irrigation District, San Luis Canal Company, Washington Area Growers, Red Top Area Growers, Merced County and Madera County.
- Continue to acquire subsidence information from various agencies.

Planned Actions

- Participate in any regional efforts to monitor and evaluate land subsidence.
- Educate local growers on the potential for land subsidence and visual indicators of possible subsidence.
- Review newly published land subsidence reports and information prepared by the USGS, DWR, USBR, Caltrans and other organizations.

- Coordinate with cooperative efforts by government agencies, water districts and water users to establish subsidence mitigation measures.
- Develop a cooperative management group to deal with subsidence issues on a regional basis.
- Develop a central repository for all available data and documents concerning subsidence in the region.
- In areas that are not actively monitoring subsidence, identify and monitor several benchmarks for subsidence annually.

6. GROUNDWATER RESOURCES PROTECTION

6.1. Well Abandonment

Existing State law and Madera County ordinance require that owners or lessees properly destroy their abandoned wells. Proper destruction of abandoned wells is necessary to protect groundwater resources since abandoned or improperly destroyed wells can result in contaminated surface water entering the well, and water of different chemical qualities from different strata mixing. In both cases, groundwater can be degraded. The administration and enforcement of the well ordinance is the responsibility of Madera County.

Madera County currently oversees all aspects of water well abandonment in the GMP area, including private wells in unincorporated areas, cities, irrigation districts and water districts. The County requires that wells be abandoned according to State standards documented in Water Well Standards, State of California (DWR, 1981).

Before a property owner can construct a new well, the County requires that abandoned or out of service wells be properly destroyed. Alternatively, they can be converted to dedicated monitoring wells if they are found suitable based on their condition, total depth, perforated interval, location and other criteria.

The City of Madera requires that existing wells be destroyed in conformance with the County’s Environmental Health Department standards before a property can connect to the City’s municipal water system.

Existing Activities

- Encourage landowners to abandon wells according to State and County standards.

Planned Actions

- Educate landowners through public outreach programs about well abandonment standards, and possible conversion of abandoned wells to monitoring wells.
- Perform inventory of retired wells that have not been properly abandoned to help in enforcing proper abandonment, and identifying potential wells to add to a monitoring network.
- When possible, convert unusable production wells to monitoring wells.

6.2. Wellhead Protection

A Wellhead Protection Area (WHPA) is defined by the Safe Drinking Water Act Amendment of 1986 as "*the surface and subsurface area surrounding a water well or wellfield supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield*." The WHPA may also be the recharge area that provides the water to a well or wellfield. Unlike surface watersheds that can be easily determined from topography, WHPAs can vary in size and shape depending on subsurface geologic conditions, the direction of groundwater flow, pumping rates and aquifer characteristics. There are several different methods typically used to delineate the lateral boundaries of a WHPA.

The Federal Wellhead Protection Program was established by Section 1428 of the Safe Drinking Water Act Amendments of 1986. The purpose of the program is to protect groundwater sources of public drinking water supplies from contamination, thereby eliminating the need for costly treatment to meet drinking water standards. The program is based on the concept that the development and application of land use controls, usually applied at the local level in California, and other preventative measures, can protect groundwater.

Under the Act, States are required to develop an EPA-approved Wellhead Protection Program. To date, California has no state-mandated program, but instead relies on local agencies to plan and implement programs. This is one of the factors that prompted the State Legislature to enact AB 3030. Wellhead Protection Programs are not regulatory in nature, nor do they address specific sources. They are designed to focus on the management of the resource rather than control a limited set of activities or contaminant sources.

Wellhead protection is performed primarily during design and can include requiring annular seals at the well surface, providing adequate drainage around wells, constructing wells at high locations, and avoiding well locations that may be subject to nearby contaminated flows. Wellhead protection is required for potable water supplies and is not generally required, but is still recommended, for agricultural wells.

Neither the County of Madera water well ordinance nor the City of Chowchilla water well ordinances have sections pertaining directly to wellhead protection areas for public drinking water wells. Both ordinances contain sections pertaining to placement of annular seals to prevent groundwater migration between aquifers. The City of Madera relies on the County’s standards.

Existing Activities

- Design new wells with appropriate wellhead protection features.

Planned Actions

- Manage potential sources of contamination to minimize their threat to drinking water sources.
- Develop a contingency plan to prepare for an emergency well closing and to plan for future water supply needs.
- Encourage the establishment of wellhead protection areas for non-municipal wells.

- Develop more detailed wellhead protection standards for Madera County, the City of Chowchilla and the City of Madera.

6.3. Saline Water Intrusion

Saline (or brackish) water intrusion is the induced migration of poor quality water into a freshwater aquifer system. Saline water intrusion is typically observed in coastal aquifers where over pumping of the freshwater aquifer causes salt water from the ocean to encroach inland, contaminating the fresh water aquifer. The proximity of the GMP area to the Pacific Ocean would negate the possibility of saltwater intrusion from the ocean into the underlying freshwater aquifers. However, groundwater with naturally occurring elevated concentrations of salts exist in the aquifers underlying the GMP area.

The base of freshwater, or the depth at which elevated specific conductance is encountered, has been characterized as the boundary where the concentration of specific conductance is over 3,000 µS/cm (Page, 1973). **Figure 2.12** depicts the base of freshwater in the subsurface. Figure 2.12 shows data from the most recent published study to evaluate the base of the freshwater. Figure 2.12 indicates that the base of freshwater becomes shallower towards the southwest boundary of the GMP area and deeper beneath the San Joaquin River on the south and the Chowchilla River to the north. In the deeper portions of the groundwater basins within the GMP area, specific conductance concentrations in excess of 3,000 µS/cm are present. The base to freshwater map also indicates areas southwest of the GMP area where brackish shallow water overlies freshwater. As discussed in Section 2.3, a shallow aquitard (the A clay) is likely associated with the perched water table.

The depth to saline, or brackish water, varies with depth throughout the GMP area (see **Figure 2.12**). The base of freshwater is commonly referred to when discussing the depth of brackish water. Brackish water is also present in the western portion of the GMP area as discrete pockets at shallower depths. Groundwater wells constructed in multiple aquifers can provide a conduit for the upward (or downward) migration of brackish water into freshwater aquifers. Oil and gas wells, which are required to have cemented annular seals throughout the freshwater bearing aquifers, but could also provide a conduit for saline water to migrate upward into the freshwater aquifers if improperly constructed or destroyed.

Preventing the intrusion of brackish water into the freshwater bearing aquifers is critical to protecting the groundwater resources in the GMP area. It is critical to identify and characterize the aquifers with brackish, or saline, waters when constructing new wells. Utilizing exploratory test holes with geophysical surveys or depth specific water quality sampling (monitoring wells) can identify zones of poor quality water. This information can be used to identify the depths of brackish water and to properly design wells to help ensure that aquifers with brackish water are not connected to freshwater aquifers.

Existing Activities
None

Planned Actions

- Update the County's well standards to add additional levels of protection to ensure that the design of new wells prohibits the migration of saline/brackish water into the freshwater bearing aquifers by requiring approved sealing methods to properly seal test holes, which were drilled below the known base to freshwater.
- Amend the County's well standards to require exploratory test holes, or borings, to be abandoned with approved sealing materials from the total depth to ground surface.
- Require, through the well permitting process, the use of geophysical surveys in all new boreholes that have the potential to encounter saline water to enhance groundwater protection by identifying the aquifer zone(s) with elevated concentrations of specific conductance, as well as the depths of confining layers, to design adequate sanitary/annular seals. With this data, future wells can be designed to be isolated from poor water quality and provide aquifer protection.

6.4. Migration of Contaminated Groundwater

Groundwater contamination can be the result of naturally occurring contaminants, point sources contaminants, or regional contaminants.

Improperly constructed groundwater wells (domestic, agricultural, or industrial) and oil and gas wells can become conduits resulting in the migration of poor quality groundwater into aquifers containing good quality water. Groundwater wells constructed with insufficient sanitary/annular seals can result in the downward migration of shallow/near surface contamination through the annulus (the area between the borehole wall and the well casing). Proper sealing methods include cement annular seals strategically placed to prevent the vertical migration of poor quality groundwater in the annulus. Additionally, groundwater wells that connect multiple aquifers of differing water quality and static water levels (head) can cause the vertical migration of contamination between aquifers. Migration of contaminated groundwater can also occur in unsecured abandoned wells or improperly destroyed wells. Unsecured wells are also susceptible to the illegal disposal of hazardous materials. Improperly destroyed wells have the potential to allow contaminants to flow between aquifers.

Several State of California maintained online databases provide information and data on known groundwater contamination, planned and current corrective actions, investigations into groundwater contamination, and groundwater quality from select water supply wells and environmental monitoring wells. These databases are discussed below:

California Water Resources Control Board

The State of California Water Resources Control Board (SWRCB) maintains an online database that identifies known contamination cleanup sites, known leaky underground storage tanks, and permitted underground storage tanks. The online database contains records of investigation and action related to site cleanup activities and groundwater contamination and can be accessed at http://geotracker.waterboards.ca.gov.

The Department of Toxic Substance Control

The State of California Department of Toxic Substance Control (DTSC) provides an online database with access to detailed information on hazardous waste permitted sites, corrective action facilities, as well as existing site cleanup information. Information available through the online database includes investigation, cleanup, permitting, and/or corrective actions that are planned, being conducted or have been completed under DTSCs oversight. The online database can be accessed at http://www.envirostor.dtsc.ca.gov.

Groundwater Ambient Monitoring and Assessment Program

The State Water Resources Control Board GAMA (Groundwater Ambient Monitoring and Assessment) program, as mentioned in Section 2.7, collects data by testing untreated raw water for naturally occurring and man-made chemicals and compiles all of the data into a publicly accessible online database. The online database can be accessed at http://geotracker.waterboards.ca.gov/gama/.

Existing Activities

- As Part of the permitting process for new well construction, require sanitary seal and annular seal depths to avoid creating a conduit for downward migration of shallow contaminated groundwater or co-mingling of aquifers of different water quality (current County regulation).
- As part of process to connect to a municipal water system, require existing wells to be properly abandoned prior to connection to municipal water system to prevent inter-aquifer contamination (current County regulation).

Planned Actions

- Review online databases for existing contaminant plumes, or investigations into groundwater contamination. Ensure that existing well operations and new well operations do not induce downward migration of contaminants.
- As part of the permitting process for new well construction, require sanitary seal and annular seal depths to avoid creating a conduit for downward migration of shallow groundwater contamination or the co-mingling of aquifers of different water quality.
- Design a well abandonment program to identify abandoned wells and develop a plan to properly destroy wells.

6.5. Groundwater Quality Protection

The intent of protecting the quality of groundwater is to minimize activities that could potentially reduce the long-term availability of high-quality groundwater in the GMP area. A brief discussion on the potential impacts of oil and gas development on the GMP area's groundwater resources is also included, as California is in the process of reviewing existing regulations regarding development of these resources.

Updating the County's well standards to add additional levels of protection will help prohibit the downward migration of surface/shallow contaminants or cross connection of aquifers. The County has adopted standards set forth in Chapter II of the State Department of Water Resources Bulletin 74-81, and as supplemented by Bulletin 74-90, entitled "Water Well Standards: State of California", except as otherwise provided in Chapter 13.52 "Well Standards" of the Madera County Municipal Code. Some amendments that could be made to the existing well standards are: (1) require the use of geophysical surveys for all new well projects, (2) increase the required minimum sanitary seal depths (currently 50 feet for municipal supply and 20 feet for agricultural wells), and (3) update the well destruction requirements.

Groundwater Quality Impacts of Oil and Gas Field Development

Hydraulic Fracturing. Hydraulic fracturing, also called fracking, includes stimulating a geologic formation to increase oil production. Hydraulic fracturing has been practiced in California for many years, but has become much more common in recent years. Most oil wells are now fracked. The process of fracking involves pumping water, sand and small concentrations of chemicals (some of which are toxic) underground at high pressure to break up oil-bearing rock formations, allowing the oil to flow more freely. There is some concern that this process can impact the quality of water in usable aquifers above the oil producing formations. Fracking is typically performed at considerable depths, well below usable aquifers. Currently, there are fairly stringent state guidelines that must be met before a well can be stimulated. Among other things, baseline water quality and water quality benchmarks in the usable aquifer must be established before a fracking operation can be permitted. Groundwater quality monitoring wells must be constructed and monitored before, during and after the fracking operation. The oil well must be sealed through and below the bottom of the usable aquifer. In addition to the regulations currently in place, California lawmakers are considering additional regulations and safeguards regarding future fracking in California. Oil companies are also working towards developing safer, bio-degradable chemicals to use in the process.

Disposal of Oilfield Brine and Hydraulic Fracturing Chemicals (wastewater). Oil well development can also impact water quality through disposal of brine wastewater. When oil wells are pumped, large quantities of water are also produced. The water derived from oil field operations can have very high salinity (~50,000 to 100,000 ppm total dissolved solids) and chemicals post hydraulic fracturing, and there is little demand for treating and recycling the water due to the high costs. Most of this water is disposed in deep injection wells built for this purpose.

Oil and Gas Fields in the GMP Area. There are currently six gas fields in the western portion of the GMP area: Any Field, Ash Slough Gas Field, Gill Ranch Gas Field, Merril Avenue Gas Field, Merril Avenue Southeast Gas Field; and Moffat Ranch Gas Field. To date, 296 gas wells have been drilled and completed. Of this total, 31 wells are actively producing gas, 6 are new with no production data, 3 are idle with the potential for production and 252 have been plugged and abandoned.

All oil, gas and geothermal resource exploration, development, stimulation and production are overseen by the California Division of Oil, Gas and Geothermal Resources (DOGGR). Additionally, all oil/gas field brine disposal is overseen by DOGGR. Information for each well can be obtained through the DOGGR interactive website: http://www.conservation.ca.gov/dog/Pages/Index.aspx.

Existing Activities

- Implement DWR Bulletin 74-84 and 74-91 Water well standards for the construction of new wells.

Planned Actions

- Educate growers on the proper use of pesticides, herbicides and fertilizers.
- Seek funding to improve security at participant facilities and reduce the potential for contamination from acts of vandalism or terrorism.
- Follow State and County well construction standards for wellhead protection to protect groundwater quality.
- Construct, abandon and destroy wells according to State and County standards.
- Assess and identify the availability of high-quality surface water supplies to augment groundwater use, to recharge the groundwater basin, and to create a conjunctive use program.
- Update the County’s well standards to reduce the risk of cross contamination or degradation of good quality water, refer to Section 8.1 for more details.

7. GROUNDWATER SUSTAINABILITY

7.1. Issues Impacting Groundwater Sustainability

A number of activities, both natural and man-made can impact groundwater sustainability. Long-term availability of the GMP area's groundwater resource will ensure that present and future demands are met. Establishing responsible groundwater use will help protect groundwater rights and maintain local control. Basin adjudication of the groundwater basin is possible if long-term groundwater sustainability cannot be achieved. Several issues that can impact the long-term groundwater sustainability are discussed below.

Groundwater Overdraft

Groundwater overdraft results in a net loss of the available groundwater resource. The overdraft in the GMP area is projected to be about 259,000 AF per year by 2017 when exiting orchards are mature as discussed in Section 2.5 and calculated in **Table 2.3**. This estimate assumes that no further increases in demands due to cropping or population growth. (It is beyond the scope of this document to forecast future growth but should be performed in a separate study). As overdraft continues, groundwater users are required to pump water from deeper depths and groundwater quality may decline in some areas as deeper water is extracted.

Regional Groundwater Recharge

Large portions of the Madera area geology and climatology is not conducive to groundwater recharge in quantities sufficient to offset the current rate of groundwater use. Large portions of the GMP area, especially in the east, have soils with very slow infiltration rates (**Figure 2.2**). The limited areas with groundwater recharge potential are described in Sections 2.2 and 2.6. Artificial groundwater recharge programs to capture storm water runoff and river flows that would otherwise be lost in flood releases to the sea will be an important tool to help reduce the current rate of depletion of the groundwater basin.

Agricultural/Urban Development

Agriculture is important to the economic viability of the GMP area. Changes in cropping patterns, such as converting dry pasture to permanent crops, have increased overall water demands in recent years. In addition, permanent crops cannot be fallowed in dry years, leading to a hardening of demand regardless of the type of water year. Where groundwater is the sole source for irrigation needs for water-intensive crops, pumping depressions have formed and will enlarge. Pumping depressions result in a reduction of the available resource as well as increased electrical costs to pump the water to the surface.

Every acre of previously-fallow land that is developed, whether for agricultural or urban uses, potentially places a greater demand upon the groundwater aquifer. Currently there are no restrictions on conversion of fallow land to new agricultural uses, and landowners are entitled to drill water supply wells on their own properties to support such plantings. Urban uses, on the other hand, are regulated not only by each local agency's land use authority but by State Water Code and CEQA. Madera County, for instance, has used these requirements in combination to help assure that proposed new residential developments, particularly in the southeast unincorporated areas of the County, demonstrate groundwater balance plans before project entitlements are granted.

Land Subsidence

Land subsidence is the gradual decline or sudden lowering of the land surface elevations due to inelastic compaction of the underlying sediments. Although there are several causes of inelastic land subsidence, the compression of clay as a result of groundwater extraction is most likely the cause of subsidence documented in the San Joaquin Valley.

Once water is removed (mined) from the compressible clay, the clay compresses, resulting in the lowering of the overlying land surface. The compressed clay can no longer store water, thus there is no opportunity to reverse the subsidence in these areas. Compressible Clays, such as the Corcoran Clay Member of the Tulare Formation, has been mapped over much of the western side of the San Joaquin Valley. The subsidence documented extends over a very large area, with ground surface declines of over 30 feet recorded in some areas. Recent investigations have indicated that subsidence is accelerating in parts of the San Joaquin Valley. Refer to Section 2.7 for more details on land subsidence in the GMP area.

Water Quality Degradation

Conserving the quality of the groundwater resource is a main goal of the GMP participants to ensure enough water of high quality is available for both urban and agricultural uses. A major concern is that the confined fresh water aquifer overlies a second confined aquifer containing extremely saline water with TDS in some areas measured in excess of 10,000 ppm. Water quality degradation could occur if wells are drilled deeper into these marine sediments, thereby tapping the underlying saline waters beneath the fresh water aquifers.

Below the saline water there are deposits of methane gas stored in natural rock formations. Wells completed deep enough could potentially cause upflow of saline water and in some areas methane gas might begin to migrate upward into the fresh water aquifer. Wells that are perforated across multiple aquifer zones can allow water of poor quality to migrate into aquifers with good water quality. As well, direct recharge of surface water in certain areas can cause migration of plumes of contamination. One of the main goals of the GMP Participants is to maintain the high quality groundwater to continue to meet drinking and agricultural standards.

Reductions in Surface and Imported Water

The San Joaquin River Restoration project will continue to reduce available surface water to the County of Madera, Chowchilla Water District, Gravelly Ford Water District and Madera Irrigation District. Declines in surface water allotments will likely result in additional groundwater extraction to meet water demands.

Reduction in imported surface water deliveries can cause a shift to increasing reliance on groundwater supplies to provide for total water demand. Reductions related to year-to-year climatic changes (drought years and wet years) and environmental issues could reduce the amount of water delivered each year. As surface water imports decline, increased groundwater pumping can cause groundwater levels to decline at an increased rate, as well as increase the incidence of land subsidence.

The San Joaquin River Settlement will reduce water deliveries to water contract holders and leave more water in the river for environmental flows. This will directly impact Friant Division CVP water supplies available to Madera Irrigation, Chowchilla Water District, and Gravelly Ford Water District. Madera County has a Friant contract for 200 AF/year but the water is used in the foothills outside of the GMP area.

Several forms of mitigation were promised to the water contractors, both in terms of water and monies. However, the water contractors have seen limited mitigation so far and the reliability and consistency of future mitigation is questionable. **Table 7.1** shows the anticipated impacts to the districts with and without mitigation.

Table 7.1 – Estimated Losses to Friant Water Contracts from San Joaquin River Settlement (units in AF/year)

District	Total Losses	Losses after all mitigation waters are received
Gravelly Ford WD	1,700	500
Madera ID	27,500	7,500
Chowchilla WD	22,600	6,200
Total	**51,800**	**14,200**

Source: Provost & Pritchard, San Joaquin River Restoration Water Supply Impact Tool, 2007. Losses were estimated using a spreadsheet model based on the anticipated settlement. Impacts to CVP Class I, Class II, and Section 215 water supplies were estimated for each Friant CVP contractor. Mitigation waters were estimated for ‘$10 water’ (additional water provided to contractors for $10/AF), re-circulated San Joaquin River water, and assumed $50 million for recharge projects

The Gravelly Ford Water District has historically been able to purchase about 2,000 AF/year of additional water, beyond their water contract, from USBR. This is water which, in the past, would have flowed past GFWD to a dry portion of the San Joaquin River. The water was sold to GFWD since it did not appear to have habitat benefits to a dry reach of the river. With the advent of the River Restoration program, these water sales have ceased. Since this water was not part of regular CVP supplies, the impact of its loss is not shown in **Table 7.1.** However, the cessation has had a real impact on the regional groundwater overdraft, and a very significant impact on GFWD.

Groundwater Management Funding

Any new property tax assessments will be subject to a Proposition 218 election requiring 2/3 voter approval in order to be imposed. Therefore raising revenues to fund groundwater management, replacement, and monitoring activities would require 2/3 voter approval. In addition, an engineering study would need to be provided identifying the benefits received by each parcel, and the amount of the proposed assessments for each parcel. These requirements add additional cost and make it very difficult to levy any assessments. Other funding alternatives are discussed in Section 9.6 – Program Funding and Fees.

7.2. Overdraft Mitigation

This section provides a list of strategies to mitigate groundwater overdraft, identifies the high priority strategies for each GMP Participant, and describes several of the strategies.

Groundwater overdraft can be mitigated both by reducing demands and increasing surface water supplies. MID, CWD and GFWD all make substantial impacts on groundwater overdraft by importing, on average, a cumulative of about 320,000 AF of surface water each year between 2004 and 2013. Surface water delivered to the City of Madera, City of Chowchilla and Madera County averaged 23,400 AF/year between 2004 and 2013. This water comes from MID, CWD and San Joaquin River riparian rights.

7.2.1 Summary of Overdraft Mitigation Strategies

Numerous alternatives are available to mitigate groundwater overdraft. Identifying strategies to address overdraft is one of the main goals of the Madera Regional Groundwater Management Plan. **Table 7.2** lists over 20 strategies with some potential to help alleviate overdraft. These strategies fall into seven groups, including conjunctive use, surface water, land management, groundwater use restrictions, water conservation, funding and public education. **Table 7.2** also provides the section of the GMP in which the individual strategies are discussed, and the estimated length of time to implement each of the various strategies.

Table 7.2 – Strategies for Addressing Groundwater Overdraft

No.	Category	Description	GMP Section	Estimated Time to Potential Implementation (years)		
1	Conjunctive Use	Groundwater Recharge	7.3, 7.4		1 - 5	
2		Groundwater Banking	7.4		1 - 5	
3		Intentional Irrigation Field Flooding	7.3		1 - 5	
4	Surface Water	Flood and Storm Water Capture (recharge or direct use)	7.3		1 - 5	
5		Identify and Import New Surface Water Supplies	7.2		1 - 5	
6		Increase Surface Water Storage	7.2			>5
7		Increase Conveyance Capacity	7.2		1-5	
8		Surface Water Treatment	7.2			>5
9	Land Management	Agricultural Land Conversion / Reserve Open Space	9.1		1 - 5	
10		Expand Districts/Form New Districts	9.1			>5
11		Crop Conversion (salt tolerant or low water use)	7.6	0 - 1		
12		Land Use Planning Regulations	9.1	0 - 1		
13		Disclaimer for Property Purchases	9.1	0 - 1		
14		Work with Adjacent Entities	4.2, 4.3	0 - 1		
15	Groundwater Use Restrictions	Prohibit Groundwater Exports	7.2	0 - 1		
16		Groundwater Pumping Restrictions	8.1	0 - 1		
17		Restrictions on Well Permits	8.1	0 - 1		
18	Water Conservation	Water Use Restrictions in Droughts	7.6	0 - 1		
19		Agricultural Water Conservation	7.6	0 - 1		
20		Urban Water Conservation	7.6	0 - 1		
21		Water Recycling	7.7			>5
22	Funding	New Fees to Fund Recharge Projects	9.6		1 - 5	
23		Groundwater Pumping Fees	9.6	0 - 1		
24	Education	Public Education	7.6	0 - 1		

These strategies are addressed at a planning level throughout this GMP. They are discussed in various sections because many of them relate to other required sections of GMPs, as dictated by the California Water Code. Those strategies that are not part of a GMP Section are discussed below. When implemented, each of these strategies will provide a certain amount of overdraft mitigation, but it is certain that numerous strategies will be needed to arrest the total current and projected overdraft.

7.2.2 Proposed Overdraft Mitigation Strategies for GMP Participants

Each strategy listed in **Table 7.2** has geographic and legal limitations. Some are not applicable to certain types of agencies or in certain geographic areas covered in this plan. In addition, some geographic areas have higher rates of overdraft than others and will need to use a larger portfolio of mitigation measures. **Table 7.3** lists the 'high-priority' strategies that apply to each GMP Participant. Some strategies are not listed under a GMP Participant, but they are still considered viable alternatives and may be considered in the future. The GMP Participants determined the high priority strategies in **Table 7.3** through a series of interactive workshops. The Participants considered economic feasibility, practicality of a given strategy, past experience and local knowledge during deliberations.

Table 7.3 – High Priority Strategies for Addressing Groundwater Overdraft

Description	Madera Co.	MID	CWD	City of Chowchilla	City of Madera	SEMCU
Groundwater Recharge	x	x	x		x	x
Groundwater Banking		x				
Intentional Irrigation Field Flooding	x	x	x			
Flood and Storm Water Capture (recharge or direct use)	x	x	x		x	x
Identify and Import New Surface Water Supplies	x	x	x		x	
Increase Surface Water Storage	x	x	x		x	x
Increase Conveyance Capacity	x	x	x		x	
Surface Water Treatment	x	x			x	
Agricultural Land Conversion / Reserve Open Space	x	x	x		x	
Land Use Planning Regulations	x					
Disclaimer for Property Purchases	x					
Work with Adjacent Entities	x	x	x		x	
Prohibit Groundwater Exports	x	x				
Water Use Restrictions in Droughts				x	x	
Agricultural Water Conservation	x	x	x			
Urban Water Conservation	x			x	x	
Water Recycling	x					x
New Fees to Fund Recharge Projects	x	x	x		x	
Public Education				x		x

7.2.3 Description of Overdraft Mitigation Strategies

Following are discussions on several overdraft mitigation strategies that are not covered in other State mandated Sections of the GMP. However, the GMP Participants recognize that the following overdraft mitigation strategies will be important components of addressing overdraft. Refer to **Table 7.2** for the locations within this Plan where the other strategies are addressed.

Increase Surface Water Storage

Increasing surface water storage can have a large positive impact on total annual water supplies. In the region, the three main reservoirs with Sierra Nevada watersheds are Millerton Lake, Hensley Lake, and Eastman Lake. In addition, Madera Lake is a medium-sized reservoir used for storage and regulation for MID. Building new dams on the local rivers could substantially increase water storage.

The proposed Temperance Flat project, which includes a new dam located upstream of Friant Dam on the San Joaquin River, would conserve about 175,000 AF/year. The GMP area would not receive or be entitled to all of this water. Other interests including the Friant Water Users Authority, San Joaquin River Restoration Project and the San Joaquin River Exchange Contractors would be also be recipients of portions of the water. However, new dams are certainly long-term projects and face significant funding and regulatory hurdles. Raising existing dams may be a more realistic option, but would still be a long-term option and require a minimum of five to ten years to implement.

Dam raising projects are relatively-large endeavors that entail detailed planning, environmental and engineering studies. However, as evidenced by the recent raising of Terminus Dam on the Kaweah River, these projects can be viable. Raising the Terminus Dam spillway by 21 feet increased the available storage in Lake Kaweah by 42,000 AF, from 143,000 AF to 185,000 AF. No recent dam-raising studies for the local reservoirs are available. MID has considered raising Madera Lake Dam, but has not performed any studies to date. Raising Friant Dam, if technically feasible, would not be practically feasible if the Temperance Flat project is constructed since the two facilities would then overlap.

Increase Conveyance Capacity

Increasing conveyance capacity can help increase water deliveries for intentional recharge, and allow delivery of water to lands that rely solely on groundwater. If large-scale recharge and banking projects are developed, existing conveyance facilities may be a limiting factor. For example, Kings River and San Joaquin River floodwaters are available approximately once every three years for about 120 days at a time. If the recharge target is an average of 100,000 AF/year, then facilities capable of accepting 300,000 AF within 120 days would be required. This would require a conveyance capacity of 1,250 cfs for the 120 days. This exceeds the capacity of portions of even the Madera Canal, which is the largest canal in the area, and its capacity ranges from 1,275 cfs down to 625 cfs. Three separate siphons on the Canal are limited to 1,500 cfs each. Estimating the cost of expanding the Madera Canal, or providing alternative reliable conveyance to recharge facilities, would require a detailed feasibility study that evaluates existing demands on the canal, anticipated future demands with San Joaquin River Restoration impacts, choke points, hydraulic grades and right of way issues.

Expand Area Served by Surface Water

Some land areas do not have facilities to receive surface water. Developing infrastructure to allow surface water delivery to these lands would not create new water supplies, but would allow districts to take greater advantage of surplus waters in wet years. The GMP area evaluated for this study includes about 223,000 acres of land that have surface water contracts (CWD, MID and GFWD) and about 295,000 acres of land that have little to no surface water (unincorporated County, City of Madera, City of Chowchilla).

Chowchilla Water District In-lieu Recharge Study. Fugro (2006) evaluated the benefits of new infrastructure that could deliver surface water to certain areas in CWD that currently lack the ability to use surface water. The Fugro study demonstrated that supplemental deliveries of surface water in-lieu of groundwater pumping would provide significant benefits to the groundwater resources. The study showed that increases in water levels and groundwater storage achieved during wet years do not completely diminish during dry years. Groundwater level increases of 5 to 10 feet were predicted over large portions of CWD even after four dry years.

The Fugro report also included the annual theoretical amount of CVP supplies available to but not purchased by CWD over the base period of 1993 to 2004. This amount ranged from 0 AF in dry years to as much as 40,000 AF in 1995 when Class 1, Class 2, and floodwaters were available. Over the base period, an estimated 127,220 AF, or about 10,600 AF/year, of available surface water went unused. This water was not purchased or used by the District mainly because of insufficient interests by local farmers to purchase the water. District staff noted to Fugro that many farmers believe CVP water was either too expensive or too inconvenient to physically receive into their irrigation systems. Several model scenarios were evaluated, showing water supply benefits ranging from 3,000 AF to 28,000 AF/year. These quantities of unused water supplies, and the benefits of new delivery infrastructure, will likely decrease with the impacts from the San Joaquin River Restoration.

Prohibit Groundwater Exports

Madera County and Madera Irrigation District (MID) both have regulations governing the exportation of groundwater from their service areas (see **Appendix G**). The potential impacts from exporting groundwater are summarized in the Madera County ordinance as follows:

> "*The direct or indirect transfer of groundwater from Madera County may have significant environmental impacts on Madera County including, but not limited to, increased groundwater overdraft; land subsidence; uncontrolled movement of contaminated groundwater, uncontrolled movement of poor quality groundwater; the lowering of groundwater levels; increased groundwater or soil degradation; and loss of aquifer capacity due to land subsidence*" (Article V of Title 13, Madera County Code).

These regulations provide Madera County and MID with regulatory controls over the exportation of groundwater, but also address regulation of groundwater banking. Generally groundwater cannot be exported from the County unless an equivalent amount of other water supplies are imported.

The regulations do not give the County jurisdiction over lands within the boundary of a local water agency or incorporated city. Rather, within these areas, regulatory powers reside with the local water agencies or incorporated cities which are governed by various statutes and regulations, including CEQA, that ensure that groundwater exports address potential environmental impacts. Therefore, all of the GMP Participants have, under existing Codes and Statutes, the regulatory authority to limit groundwater exports. Nevertheless, it is recommended that the other GMP Participants adopt a specific ordinance or regulation, similar to those adopted by Madera County and MID, to restrict groundwater exports.

Identify and Import New Surface Water Supplies

Most of the surface water supplies naturally flowing into the GMP area are fully allocated. The only available unallocated supplies are flood flows, which could potentially be used for groundwater recharge or banking. However, new water supplies could be imported to the GMP area from other parts of the Valley and the State. These may require complex exchanges and would likely have high costs compared to current local water prices.

One example is the long-term water purchase by Root Creek Water District (RCWD), located in southeastern Madera County. RCWD has agreed to purchase up to 7,000 AF/year from the Westside Mutual Water Company, located in Kern County, with prices starting at $600/AF and escalating over time. The water will be delivered to RCWD through a series of exchanges. This is an example of a recent water purchase in Madera County, and illustrates that large water transfers into the area are feasible. The agreement in RCWD will ultimately be absorbed by urban developments. Such costs are probably not realistic for irrigation water.

Potential water purchases are not identified here, but would require personal discussions with other water agencies. There may be some potential in purchasing additional water (above what is currently purchased by CWD) from Merced Irrigation District or the members of the San Joaquin River Exchange Contractors Water Authority.

Regional Surface Water Treatment Plant

A regional surface water treatment plant could be constructed at the base of Madera Lake and send water to the Cities of Madera and Chowchilla, as well as the Madera Ranchos area. The treatment plant would likely use MID and/or CWD surface water supplies. Such a surface water treatment plant could help reduce groundwater pumping in the two Cities and have some positive impact on groundwater levels in CWD and MID. A regional surface water treatment plant has been discussed but no formal studies have been performed. One obstacle is the lack of year-round surface water; this could be addressed by increasing storage space in a local reservoir. MID and CWD currently have contracts for agricultural water, but do not have authority to deliver municipal and industrial water. Amending the contracts may be difficult and face public opposition from local growers. Estimating the cost of a treatment plant would require a detailed study, but it could be on the order of $50 million to $100 million.

Existing Activities

- Restrict groundwater exports from the GMP area

Planned Actions

- CWD, MID and GFWD will pursue the transfer of surface water supplies into the County
- CWD, MID, and Madera County will increase the number of surface water users
- SEMCU will continue to assist with the demonstration project at Liberty High School
- Madera County and SEMCU will continue efforts for a surface water treatment plant for the Madera Ranchos
- Madera County will continue to pursue removal of vegetation from conveyance facility channels to reduce evapotranspiration to make that water available for delivery and groundwater recharge
- MID to perform analysis of increasing capacity of Madera Canal to convey floodwaters when available

7.3. Groundwater Replenishment

Replenishment of groundwater is an important technique in management of a groundwater supply to mitigate a condition of overdraft. Replenishment of groundwater underlying the Madera region occurs both naturally and through intentional means including deep percolation of crop and landscape irrigation, wastewater effluent percolation, intentional recharge and river seepage. The total recharge in the GMP area is estimated to be about 500,000 AF/year based on data from 2003-2014. Much of the recharge comes from imported surface waters (deep percolation of irrigation and intentional recharge).

Intentional Irrigation Field Flooding, and Flood and Storm Water Capture are identified in **Table 7.2** as strategies to increase groundwater replenishment and are discussed below.

Intentional Irrigation Field Flooding

Intentional irrigation field flooding (field flooding) for groundwater recharge occurs when agricultural fields are flooded with water in excess of the crop water demand. This is not widely practiced in the GMP area, but has some potential to increase the total area of lands that could be utilized for recharge in wet years. Field flooding is normally done on agricultural lands planted to annual crops, especially when the land is fallow. Field flooding would generally be performed on a voluntary basis by growers who wish to contribute to overdraft reduction; as a result some education and promotion may be necessary. They may also be interested if the flooding can provide pre-irrigation and salt leaching benefits. Generally growers would not flood their fields unless the water is free. It should be noted that intentional field flooding will only benefit groundwater resources if the source of water used to flood fields is not locally pumped groundwater.

The viability of field flooding in the GMP area is further limited by the complex soil profile common throughout the Valley area. Numerous subsurface clay lenses are present, and these impermeable layers restrict the effective percolation of applied surface water to the aquifer.

Field flooding is less viable on lands planted with permanent crops; mainly orchards. Several concerns that would need to be considered are the propensity for root rot, timing of pruning/shredding, and application of insecticide/herbicides. Another main concern, especially for shallow-rooted trees like almonds, is that when the field is saturated, even moderate winds can cause trees to blow over. As well, on lands that have been converted from annual crops to permanent crops, the infrastructure may no longer be in place to facilitate field flooding. Consequently, field flooding probably has limited potential in the GMP area.

Flood and Storm Water Capture

The local cities and districts currently have the facilities to capture significant amounts of flood and storm water. These could be expanded with additional recharge facilities. The following strategies could be used to capture more water for recharge:

- Construct additional stormwater detention and groundwater recharge basins
- Hold stormwater in basins as long as feasible to promote recharge
- Districts could provide water to Cities to recharge in their stormwater basins
- Expand districts so more land is accessible for the capture, storage and recharge of surplus waters
- Develop a maintenance program for existing streams, canals, and recharge basins to maintain and/or improve recharge rates
- Implement LID (Low Impact Development) and green infrastructure to maximize opportunities to infiltrate storm water within urbanized areas
- Coordinate with municipal agencies to encourage coordination of municipal storm water planning with the goals of this GMP

The three main water sources include San Joaquin River, Fresno River and Chowchilla River flows.

1. San Joaquin River. Historical flood releases from the San Joaquin River, and the adjacent Kings River, have typically flowed about once every third year, for about 120 days at a time. This is a good general estimate of available flood water on the San Joaquin River. A proprietary analysis that considers river

restoration impacts estimates that San Joaquin River flood flows will average about 55,000 AF/year in the future.

2. Chowchilla River. Fugro (2006) estimates that flood releases from Buchanan Dam on the Chowchilla River averaged 23,000 AF/year between 1993 and 2004. According to the San Joaquin Valley Water Year Hydrologic Classification Index (http://cdec.water.ca.gov/cgi-progs/iodir/wsihist), this period is hydrologically similar to the period from 1993 to 2013 (indexes of 3.48 versus 3.55). Therefore, 23,000 AF/year is considered a reasonable long-term estimate of available floodwater.

3. Hidden Dam. No studies are readily available on spills from Hidden Dam. Estimating the available water would require a detailed study including a hydrologic simulation of a minimum of 10 years of data and associated water demands. Lacking such a study, the flood flows from Hidden Dam are preliminarily estimated to average about 15-20,000 AF/year, based on basic information on the river, dam and watershed.

Developing accurate estimates of available flood flows would require a detailed study that investigates dam releases over a minimum 10-year period, contract water demands, demands for the flood waters from other agencies, minimum environmental flows, diversion capacities, and the timing of the releases. Such a study can provide a more accurate assessment of available water and recharge potential in the Madera Area.

Estimated Costs to Recharge Water

The cost to develop recharge basins varies, but conceptual costs for general discussion can be estimated using the basic assumptions in **Table 7.4**.

Table 7.4 – General Groundwater Recharge Assumptions (2014 dollars)

Description	Value	Notes
Recharge Basin Cost (Land and facilities)	$25,000/acre	Blend of average cost of several rural recharge projects in Fresno County ($20,000 for land and facilities), and land costs in the City of Madera ($66,000/acre)
Operation and Maintenance Cost	$100/acre/year	
Water Purchase Cost	$50/AF	Typical cost for surplus & flood water in Madera area
Water Availability	120 days every third year	Typical availability of Kings River and San Joaquin River floodwater
Infiltration Rate	0.25 ft/day	Assumed average

The infiltration rate of 0.25 ft/day used in this analysis is a conservative estimate of the long-term infiltration rate. This assumed infiltration rate is estimated based on local experience, the general lack of good recharge sites in the county, and the fact that lands with high infiltration rates may not be available for acquisition, and there has been no county-wide study of infiltration rates. The actual costs per AF to recharge water will need to be determined on a site by site basis during the feasibility phase prior to acquiring property for the purpose of groundwater recharge. In addition, several recent local recharge facilities were not sited based on the infiltration rate of site soils, but rather on the availability of that land for purchase. This clarifies the importance of identifying areas with high potential for recharge as these areas will provide more effective and cost efficient recharge.

Using the data as presented in **Table 7.4**, a one acre basin could recharge on average 10 AF per year or 300 AF over a 30-year life expectancy. This calculation is based on the assumption that water would be available for recharge on average for 120 days per year, and flood waters available for recharge occur on average once every 3 years (120 days/365 days per year X 1 year/3 years) X 0.25 ft/day infiltration rate = ~10 AF per year. The operation, maintenance and water purchase costs would be $10,500/acre over a 30-year period. This results in a unit cost of ($25,000 (land and facilities) + $15,000 (water cost) +3,000 (O&M cost)/300 AF = $143/AF or approximately $145/AF. This does not include the cost to convey water. The cost to develop recharge basins varies geographically and by project, so this number should be considered approximate, but can be useful for general planning purposes. The City of Madera has estimated that the cost to purchase land in the City is $66,000 per acre, however the majority of recharge basins developed in the Plan Area will be on lower value agricultural land; therefore the costs per acre provided above is a blended estimate.

Approximately 5,000 acres of recharge basins will be needed to mitigate an overdraft of 50,000 AF/year, pursuant to the short term goal of recharging 50,000 AF/year. This short term goal is meant to be achievable in the 1 to 5 year time frame and is a significant step towards the overarching BMO of Stabilization of Groundwater Levels by 2024. The annual cost to mitigate 50,000 AF/year of overdraft would be $7,250,000. Over a 30 year period (the life expectancy of the recharge basins) the total cost would be $218 million.

The estimated cost to mitigate the total overdraft of 259,000 AF/year (at $145/AF) through recharge would be $36.5 million/year, if sufficient surplus waters were available. However, as stated above, the anticipated surplus waters from the Fresno, Chowchilla and San Joaquin Rivers will be on the order of only 100,000 AF/year, and there will be other demands for this water and the timing of the flows will restrict how much can be captured. The GMP Participants have therefore set a goal of increasing recharge by 50,000 AF/year. A detailed study is needed to refine this number. Recharging more water may require importing water from other areas or constructing/raising dams. It is clear that recharge can make a significant contribution to mitigating overdraft, but it must be combined with other alternatives if overdraft is to be arrested.

Existing Activities

- Continue existing recharge programs

Planned Actions

- City of Madera will pursue recharge in the Schmidt Creek Flood Control and Groundwater Recharge Project
- GFWD will analyze expansion of Franklin Secara Basin
- GFWD will expand recharge opportunities in the Gravely Ford Canal-recharge basin
- Madera County and MID will pursue the viability of a dam on the Fresno River
- Madera County and the City of Madera will pursue recharge at Ellis Basin
- Madera County will pursue recharge at the SWC Road 29 and Avenue 29 Basin
- Madera County, MID, and City of Madera will continue to pursue recharge opportunities at the Air Port Basin and Avenue 12 Basin
- Madera County, MID, CWD, and GFWD will make efforts to implement an Irrigation Field Flooding program
- MID, CWD, and City of Madera will pursue recharge opportunities at golf course basins
- Perform detailed study to estimate the ability to capture and recharge floodwaters from the Fresno, Chowchilla and San Joaquin Rivers.

- Perform feasibility studies on existing streams, rivers, and recharge basins to develop strategies to increase recharge rates.
- Plan Participants, except the City of Chowchilla, will pursue future storm water collection/recharge projects

7.4. Conjunctive Use of Water Resources

Conjunctive use or management refers to the coordinated and planned use of both surface water and groundwater resources to maximize the availability and reliability of water supplies in a region to meet various management objectives (ACWA, 2011). Currently, surface water is limited in Madera County. The County of Madera, Chowchilla Water District, Gravelly Ford Water District, and Madera Irrigation District have and utilize surface water supplies to various extents. As GMP Participants secure additional surface water supplies, conjunctive use can be an effective management practice to ensure a long-term groundwater supply. For example, in years of reduced surface water availability, more groundwater could be used and groundwater levels might decline. Conversely, in years of full surface water availability, groundwater use could be curtailed and groundwater levels allowed to recover. Whenever possible, surface water should be used to the fullest extent practical, with groundwater serving as secondary supply. This practice will help maximize the available water supply because unused surface water generally flows downstream and is lost, but unused groundwater remains in the ground and would be available for later use.

Several steps can be taken to help ensure that surface water is fully utilized including: 1) construction of recharge basins; 2) selling or delivering surplus surface water to other agencies in the GMP area; 3) pricing surface water so it is competitive with groundwater pumping costs; and 4) expanding surface water delivery systems so more land can be served.

Implementing the use of recycled water to help offset groundwater withdrawals will reduce demand on the groundwater system. Regional wastewater treatment plants can provide recycled water for irrigation needs to agricultural customers or for landscaping. Recycled water can also be utilized to provide a “new” source of water to aid in incidental groundwater recharge.

Some existing conjunctive use programs in the GMP area are described below:

Madera Irrigation District

The MID Water Supply Enhancement Project (Project) as proposed involves water-banking facilities to recharge groundwater for water supply enhancement. The Project is located on Madera Ranch and consists of approximately 13,646 acres, located in southwestern Madera County south of the Fresno River, approximately five miles southwest of the City of Madera (**Figure 2.12**). The water bank will ultimately have capacity to store up to 250,000 AF/year. The water will recharge the groundwater basin through natural swales (ancient creek beds) and with 323 acres of recharge basins.

The Project aims to bank available surplus surface water in wet years for use in dry years. Currently, the Project is in the planning phase. MID also percolates surface water in the unlined portions of their canal systems and in various basins throughout MID and the City of Madera.

Chowchilla Water District
The CWD percolates water in their unlined canals, local sloughs, recharge basins and City of Chowchilla stormwater basins.

City of Madera
The City of Madera Waste Water Treatment Facility provides primary and secondary treatment with a capacity of 10.1 million gallons per day. The plant has 320 acres of land for effluent incidental recharge and evaporation. The City of Madera storm water system also drains flows to rivers and creeks and detention and retention basins.

City of Chowchilla
The City of Chowchilla provides for incidental recharge and evaporation of secondary effluent from its wastewater treatment facility.

Existing Activities

- Surface water recharged in existing City storm water basins
- Surface water recharged in existing MID basins and canals
- Surface water recharged in CWD canals and sloughs

Planned Activities

- MID's Water Supply Enhancement Project
- CWD will attempt to develop additional surface water storage
- MID and Madera County will evaluate feasibility of increasing storage in Lake Madera
- Identify and preserve lands with the potential for recharge
- Seek funding to develop additional regional recharge capacity
- Annex lands near existing water districts to provide surface water deliveries to meet demands

7.5. Land Subsidence Mitigation

Land subsidence in the GMP area is caused by pumping groundwater from the deeper confined aquifer that is separated from the shallower unconfined aquifer by the Corcoran Clay, the regional aquitard throughout the San Joaquin Valley. Subsidence is a process that can be slowed or stopped, but the inelastic subsidence that occurs in fine-grained layers such as those present in the western part of Madera County cannot be reversed. Any effort to mitigate land subsidence must substantially reduce or eliminate reliance on deep aquifers (those beneath the Corcoran clay) as a water source.

A coordinated effort in northwestern Madera County, specifically the Red-Top area (see **Figure 1.1** for the location of the Red-Top area), has been implementing methods to mitigate land subsidence. This effort is funded by the local growers, Madera County and Central California Irrigation District. As part of these efforts, the following activities were implemented in 2013 to reduce pumping from the deep aquifer:

- Convert pumping from primarily deep wells to primarily shallow wells on Triangle T Ranch.
- Substitution of two deep wells on Vlot Property for two shallow wells on Triangle T Ranch.
- Fallow late-year forage crops and purchase feed from an outside source.
- Secure and distribute a supplemental water supply from an outside source.

These activities resulted in a 6,000 AF/year reduction in deep well pumping (estimated by CCID District Manager pursuant to observations and conversations with local growers, 2013). These efforts represent a good model of regional cooperation among local agencies to address land subsidence.

Telescoping compression sections can also be used in new wells to reduce the impacts to well casings and well foundations. These do not mitigate the rate of subsidence but reduce collateral damage and impacts. They are typically only affordable on large capacity wells.

Additional long term solutions to achieve a reduction in deep well pumping have been suggested by the Land Subsidence Solution Program, USGS, DWR, Reclamation and other stakeholders. These include:

- Existing wells:
    - Convert to more efficient irrigation practices
    - Convert to crops with a lower water demand
- New Wells
    - Allow only shallow wells to be drilled in subsidence areas
- Development of a groundwater bank in the shallow aquifer (above Corcoran Clay) for overlying farming utilizing all available flood flows from local sources
- Secure a supplemental water supply from an outside source
- Develop a water distribution system to areas not served by surface water

Ultimately, reducing land subsidence comes down to reducing groundwater overdraft. Numerous overdraft mitigation alternatives, including those listed above, are discussed in more detail in Section 7.2 – Overdraft Mitigation.

Existing Activities

- Interagency monitoring and study of subsidence: USGS, USBR, DWR, USACE, and various stakeholders.
- Formation of Western Madera County Subsidence Project, which includes Central California Irrigation District, San Luis Canal Company, Washington Area Growers, Red Top Area Growers, Merced County and Madera County.
- Monthly subsidence coordination meetings between agencies and stakeholders.

Planned Actions

These planned actions primarily apply to CWD and unincorporated areas of Madera County where subsidence is occurring, however, they would apply to other areas if subsidence is observed in the near future:

- Develop a shallow groundwater banking program.
- Develop recharge basins to make use of available flood waters.
- Develop a water well replacement strategy.
- Explore potential to inject flood waters into the deeper aquifer.
- Construct internal conveyance infrastructure improvements to provide surface water to more areas.
- Implement other overdraft mitigation strategies identified in Section 7.2.
- Re-activate existing water districts, or annex into existing nearby water districts to import surface water supplies where feasible.
- Develop an enhanced conjunctive use program to perform intentional recharge in the lower aquifer.
- Madera County plans to develop policies for new well permits in the proximity of the subsidence area, to require wells to be constructed so they extract from the upper aquifer only, and limit the deep well extractions.

7.6. Water Conservation and Education

Water conservation can help reduce water demands and stress on groundwater resources. Below are discussions on agricultural and urban water conservation potential in the GMP area.

Agricultural Water Conservation

Agricultural water conservation through conversion to high efficiency drip and micro-sprinkler systems has limited potential in the GMP area. According to the California Department of Water Resources Land Use Data, Water Conservation and Land and Water Use Section, 66% of the crops in the GMP area already have high efficiency irrigation systems. This reflects the large percentage of the total area planted with permanent crops. Moreover, local irrigators and water managers have found that these systems do not conserve total water consumed over time, because they result in less deep percolation, and their precise water application paradoxically increases yields and thereby increases evapotranspiration demands. These systems have also allowed sloped land that is unsuitable for flood or furrow irrigation to be developed, thus increasing water demands. In summary, these systems have helped to increase agricultural output, but have not likely reduced water consumption.

Growers of annual crops may be able to change to crops or varieties that are more salt tolerant, drought tolerant or require less water. This can result in significant water savings if performed over a wide area, but may require conversion to less-valuable crops, which could have negative economic impacts. In California, such changes have typically only been made when there are severe water shortages or the high local cost of water has merited such conversions.

The districts already perform a wide variety of other water conservation programs. These include education, volumetric pricing, and numerous other methods. These are already summarized in their Agricultural Water Management Plans submitted to the United States Bureau of Reclamation.

Urban Water Conservation

Both the cities of Chowchilla and Madera currently have urban water conservation plans, as components of state-mandated Urban Water Management Plans.

City of Chowchilla. The City of Chowchilla’s water conservation programs are described in their Urban Water Management Plan (Boyle, 2008). They include year-round water scheduling restrictions, enforcement of plumbing efficiency standards, leak detection, public education, water metering, and a drought preparedness plan. The City will also be installing time-of-use smart meters that can assist in detecting leaks, water waste, and watering violations. Lastly, the City plans to increase efforts to enforce their existing regulations through a Conservation Water Patrol. The City’s per capita demand is estimated to be about 310 gallons/capita/day, which is high for a metered system in the Valley. A reduction of 20% through conservation is considered reasonable, and matches the goal set by the State of California through the 20 x 2020 Water Conservation Plan. This would reduce City water demands (excluding the prison population) by 700 AF/year.

City of Madera. The City of Madera’s water conservation program is described in their Urban Water Management Plan (Carollo Engineers, 2011). They use a variety of methods to encourage conservation, including a water shortage contingency plan, residential water surveys, water system audits, metering, large landscape conservation programs, high-efficiency washing machine and low-water-use toilet rebates, public education, and water waste prohibitions. The City also has a 4-stage water conservation program that requires up to 50% reduction in water use during severe droughts. The City installed water meters 10 to 15 years ahead of State requirements. Conservation efforts have helped reduce per capita water demands by over 20% since 1996, and per capita water demands are currently less than 200 gallons/capita/day. The City is also examining a modification to their rate structure to encourage conservation. Additional conservation is possible, but anticipated improvements would be smaller than for the City of Chowchilla.

Unincorporated Areas. Unincorporated areas were estimated to have a per capita consumption of 168 gallons/day in the 2008 IRWMP. These estimates are difficult to perform and confirm since most of this water is pumped from private unmetered wells. There are no more recent studies to provide additional data. This is a relatively low per-capita consumption, and conservation potential in these areas is probably still limited.

Various urban water conservation measures are available (metering, low-flow appliances, public education, etc.) to help reduce urban water demands. Requiring the use of native California plants that are drought tolerant and use very little water in new developments could help to reduce water demands. In addition, new buildings are required to have higher water efficiency standards and may have less per capita water demand than older buildings. According to Southwest Hydrology (2009), conservation methods range in cost from about $75/AF to $1,200/AF, with several options around $400/AF. Assuming an average cost of $400/AF, the cost to conserve every 1,000 AF would be $400/AF x 1,000 AF = $400,000. Some of the measures, such as plumbing rertrofits, would have life expectancies of 10 to 15 years. Other measures, such as ordinances and education, would be longer term.

Water Use Restrictions in Droughts

The irrigation and water districts are allocated lower water supplies in dry years and as a result must reduce deliveries to growers. Unit water prices usually increase in dry years since there are some fixed overhead costs that must be paid, regardless of the water allocation. The cities of Madera and Chowchilla both have water shortage contingency plans documented in their Urban Water Management Plans. Madera County is currently developing demand management measures for their water-serving Maintenance Districts and County Service Areas to implement in dry and multiple-dry years.

Public Education

An effective means to conserve water is through educating the public on water conservation methods, elevating awareness of the critical overdraft and land subsidence issues, and increasing awareness of severe water shortages.

Urban Areas. The cities provide information on water conservation programs to their customers though mass mailings (often in the form of utility bill inserts), their websites, and occasionally in the printed media. In addition, the cities also support water conservation programs for public schools. Educating young people has been shown to be an effective means of making the general public aware of certain issues. Students also tend to bring the water conservation message home to their family. The GMP

Participants could work with the local school districts to develop an educational program that specifically addresses groundwater overdraft and the importance of water conservation.

Agricultural Areas. Public awareness and educational programs should also be offered to the local farming and industrial communities. These should include awareness of overdraft and land subsidence issues and their consequences, as well as focused education on increasing irrigation efficiency, conversion to drought tolerant crops, conservation easements, and other methods to reduce crop water demand.

South-East Madera County United. SEMCU has recognized the need for much greater public awareness and knowledge of an entire spectrum of water-related issues, and has begun acting to address that need. SEMCU has published a series of articles in the Ranchos Independent, authored by SEMCU leadership, addressing groundwater decline, overdraft, future water quality issues and more.

As well, SEMCU is planning a “demonstration project” in collaboration with the Golden Valley School District, the California Water Institute at California State University Fresno, Provost & Pritchard Consulting Group and Valley Teen Ranch. The project, which is not yet fully defined, will be designed to provide education to students at Liberty High School about the school’s wastewater treatment plant, the benefits of using recycled water, and water-efficient irrigation practices. The project will also be used to educate the general public, although the format for that program has not been determined. An MOU has been signed by the parties and the group is currently working to develop a final scope and curriculum for the project.

Existing Activities

- Various urban and agricultural water conservation efforts performed by the GMP participants

Planned Actions

- City of Chowchilla will implement a conservation voucher/rebate program for low flow plumbing fixtures, smart irrigation controllers, turf removal and replacement with drought tolerant vegetation
- City of Madera and Madera County will develop commercial metering and water rates
- Develop a demonstration project at Liberty High School on wastewater effluent recycling
- Perform studies to evaluate the potential for further water conservation, and estimate the impact of population growth on urban water demands.
- Educate general public on groundwater overdraft and land subsidence issues.
- Focused education on growers to help increase irrigation efficiency and reduce water demands

- Madera County and City of Chowchilla will increase water wasting enforcement programs
- Madera County and City of Madera will implement a residential metering and water rates program, and water conservation outreach programs
- Cities of Chowchilla and Madera will encourage water conservation in landscaping in both existing and new developments

7.7. Water Recycling

Urban wastewater effluent can be reused in several ways. The water can be percolated and returned to the aquifer. If the water receives tertiary level treatment, it can be directly recycled for unrestricted landscaping, agriculture or industrial use. Sprayfields, often irrigating grass or natural open spaces that would not otherwise be irrigated, have been preferred in the past by the Regional Water Quality Control Board for effluent disposal at certain locations in Madera County, but due to higher evaporation losses they have fewer incidental recharge benefits than percolation ponds and are much less effective than direct recycling of water in replacement of pumped groundwater irrigation. The Central Valley Regional Water Quality Control Board encourages reclamation wherever feasible, and in some locales, where irrigated agriculture is not in proximity and there is limited land available for percolation ponds, sprayfields are a preferred method of effluent disposal.

Water returned to the aquifer through incidental effluent recharge of septic systems, or incidental infiltration of treated effluent, is generally about 35% of the demand. Thus there is large potential for capturing this water and directly using it in areas of need. Following is a discussion of water recycling practices and future goals in the City of Madera, City of Chowchilla, Madera County Special Districts, and other unincorporated communities.

City of Madera

The City of Madera currently discharges all treated wastewater to percolation ponds. The incidental recharge helps to recharge the local groundwater west of the City. The City has installed a well intended to recover percolated effluent and deliver it to MID Canals for direct irrigation use. Although this water would not be considered “recycled” in accordance with definitions in California Code, it would be a relatively effective method of water reuse by the City. In order to meet water quality standards set by MID, the groundwater pumped from underneath the percolation ponds would need to be blended with MID’s surface-sourced canal water. This project is partially developed, but it has encountered some water quality issues with the Regional Water Quality Control Board, and has not been implemented at this time.

The City of Madera also performed a recycled water feasibility study (Montgomery Watson Harza, 2013). Recycling wastewater was found to be technically feasible and the study found there would be demand for the recycled water. However, all alternatives were considered to be cost-prohibitive at this time; the cost to treat and distribute the water would be far more than potential water fees collected at the rates the City believes could be charged. The report instead recommended that City Well 27, which has required treatment before potable use, be used to provide non-potable water to certain customers, thus conserving the City's supply of potable well water.

City of Chowchilla

The City of Chowchilla currently discharges its secondary wastewater effluent to percolation ponds that incidentally returns to groundwater. The volume discharged is estimated to be about 365 MG/year (1,120 AF/year) with evaporation losses estimated at 10%. The City owns land southwest of the main City Limits intended for a new WWTP. If and when funding becomes available, the City plans to build a tertiary treatment plant and recycle the effluent to park landscaping or farmland.

County Service Areas

Madera County Service Areas and Maintenance Districts operate 16 small sewer systems. Seven of these are located in the Valley floor and the remaining nine are in the Foothills and Mountains subarea. Effluent disposal methods for the Valley districts within the Plan area are by either percolation ponds or sprayfields. No effluent from these districts is directly applied to agricultural crops. None of the WWTPs produce the tertiary-level effluent necessary for application to public landscape areas. The communities served by these districts range from 31 to 259 residential lots each.

Madera Ranchos

SEMCU plans to perform a privately-funded feasibility study to show the severity of the local groundwater quality problems in the Madera Ranchos area, where there is already some community interest in construction of a wastewater treatment system. Should the study demonstrate that a collection and treatment system is technically and financially feasible, the next step would be to apply for funding, either through the Clean Water State Revolving Fund or IRWMP Implementation funds, to design and construct the project. The Regional Water Quality Control Board will likely require recycling of treated waste water to the extent possible for any new waste water treatment facility.

Other Unincorporated Areas

Other unincorporated areas in the GMP area generally use septic systems. All of the wastewater is returned to the underground, and there is no practical way to recycle the water unless sewer systems are installed. In these areas it is assumed that 35% of water is used indoors and returned to groundwater through septic system percolation, with the remaining 65% used for outdoor irrigation and not effectively reused.

Existing Activities

- Percolate wastewater effluent to recharge the groundwater supplies.

Planned Actions

- Develop relationships between urban and agricultural water agencies to use more wastewater effluent for crop irrigation.
- Potentially use recycled water for city landscaping, golf courses, and parks
- Perform feasibility study to evaluate the severity of local groundwater quality problems in Madera Ranchos.
- Madera County and SEMCU will continue efforts to develop a waste water treatment plant for Madera Ranchos

8. GROUNDWATER OPERATIONS

8.1. Well Construction Policies

The GMP Participants follow State standards for well construction as documented in DWR Bulletins 74-81 and 73-90. Madera County and the City of Chowchilla supplement those standards with additional requirements (see **Appendix H**). The City of Madera defers to the County's well standards. Well construction policies fall into three general areas: 1) Policies to protect groundwater quality; 2) Policies to conserve groundwater and prevent land subsidence, and 3) Policies to promote and improve groundwater monitoring and data collection.

8.1.1 Groundwater Quality Protection

Improperly constructed wells can result in contaminated groundwater by creating pathways for pollutants to enter a well through drainage and percolation from the surface, by allowing mixing between aquifers of varying water quality, and through the unauthorized disposal of waste into a well.

The City of Chowchilla municipal water code section 8.20.050, Special Groundwater Protection, states that the City may designate areas where groundwater quality problems are known to exist, and where wells will likely penetrate more than one aquifer. In those locations, the City may require that wells include seals to prevent mixing of water from different aquifers. See **Appendix H** for a copy of the relevant sections of the City code.

Madera County has enacted and is responsible for enforcing a County Well Ordinance that regulates well construction within the unincorporated areas of the County and the City of Madera. Chapter 13.52, Title 13 of the Madera County Code and Chapter 8.2, Title 8 regulate the location, construction, maintenance, abandonment, and destruction of wells that may affect the quality of water within each jurisdiction. The well standards include regulations regarding: 1) drilling test holes; 2) restrictions on well construction in service areas as designated by the Public Utilities Commission; 3) restrictions on wells within 500 feet of existing public water systems; 4) requirement that private parcels have adequate area to site wells and on-site sewage disposal systems; and 5) safeguards against impacts of new wells on neighboring wells. The Madera County well standards are also found in **Appendix H**.

It is recommended that all new domestic and municipal wells require an annular seal of at least 100 feet, in accordance with current CDPH requirements, to avoid near-surface contamination from runoff, surface spills, agricultural amendments, septic systems, and wastewater effluent percolation. In some areas deeper seals may be appropriate due to local conditions. For example, a municipal well being constructed in 2014 by Madera County MD10A in Madera Ranchos will have an annular seal of 350 feet to protect the new well from known nitrate contamination in the area.

Urban and agricultural interests often compete for groundwater near city boundaries, but they have different water quality requirements. It is recommended that the geologic layers with good water quality near urban boundaries be characterized. It is also recommended that the GMP participants consider a policy that requires new agricultural wells on urban boundaries to seal layers with the best water quality for urban uses, so the water is reserved for the urban community.

8.1.2 Groundwater Conservation/Land Subsidence

Groundwater extraction is currently unrestricted in the GMP area and this has exacerbated overdraft and land subsidence. Locally-implemented (as opposed to State-mandated) well construction policies could be adopted to help conserve groundwater. They could range from voluntary programs to restrictions on pumping and well construction. Restrictions could be applied to certain high-priority areas or throughout the entire GMP area. For instance, in areas experiencing land subsidence, a possible permit requirement could be to perforate the casing only in the aquifer above the Corcoran Clay. Other well construction policies could be implemented in these areas as outlined below.

Mandatory restrictions on groundwater consumption are considered measures of last resort, but could be one of the most effective mitigation methods considering the gravity and magnitude of the overdraft situation in the GMP area. Following are possible alternatives for conserving groundwater through well construction policies; these could help to prevent or delay a court-ordered adjudication of the groundwater basin.

- Voluntary agreements to reduce pumping in severely impacted areas (e.g., agreements among an organized group to limit deep wells in the Red-Top area, which is experiencing high levels of subsidence)
- Mandatory restrictions on well drilling or pumping in severely overdrafted areas
- Mandatory restrictions on well drilling or pumping in areas experiencing land subsidence
- Levy additional fees on all new wells to fund overdraft mitigation projects
- Require that retired deep wells in subsidence areas be replaced with shallow wells
- Require parties applying for a new well to read and sign an educational document on aquifer overdraft and land subsidence

8.1.3 Groundwater Monitoring/Data Collection

Groundwater wells that are being abandoned could instead be converted to monitoring wells. During the well abandonment permitting process, wells that are properly constructed to allow for on-going monitoring and data collection could be identified and possibly included in a monitoring network. In addition, the County could adopt a policy requiring that new wells be added to a monitoring network and require regular water level monitoring as a condition of issuing a well permit. This policy could be constrained geographically to areas where there is currently a lack of monitored wells, or to areas with substantial groundwater level declines.

8.1.4 Private Well Construction

The cities of Madera and Chowchilla do not allow construction of new wells within their City limits, except under very limited circumstances. Typically new private wells are only allowed when an existing private well serving a particular property is failing and an extension of the municipal water systems to the site is not feasible. New private wells are not allowed in support of new development. The purpose of these regulations is to keep the water system under central control by the Cities' water departments.

The County has similar restrictions on construction of new private wells in areas proximate to County water systems, limiting new well construction to replacement of existing private wells where extension of the public system is cost-prohibitive. In undistricted areas, private wells are allowed as a matter of course. New private wells require a County well permit, which are commonly approved as long as well standards are followed. The County requires construction of a public water system to serve new developments in the Valley area with lots smaller than three acres.

Existing Activities

- Continue to enforce existing State, County and City well standards

Planned Actions

- Educate landowners on the existing City, County and State Well Standards
- Increase the minimum depth requirement of sanitary seals to at least 100 feet for all wells

8.2. Operation of Facilities

Following is a description of the water resources facilities in the GMP area and how they are operated.

City of Chowchilla

Drinking Water System

The City of Chowchilla's 2013 population was approximately 19,000, including the inmates of the Central California Women's Facility and Valley State Prison for Women, and is the second largest city in the County. The City relies solely on groundwater to supply its domestic water, but some cropped lands within the City limits do receive surface water from Chowchilla Water District.

The City's water system is comprised of 37 miles of main distribution pipelines, and about 3,770 connections. There are currently seven active groundwater wells (Wells 1, 3, 4, 6, 8, 10 and 11) in service, in addition to two off-line wells and one abandoned well. The total pumping capacity of the wells is 6,000 gpm. Each well site is equipped with a chlorine pump, metering chlorine dosage to the distribution system. The two prisons each have their own separate water systems. (Data primarily from Integrated Regional Water Management Plan, Madera County; Boyle, 2008)

Wastewater Treatment Facility

The City of Chowchilla collects wastewater from its customers via approximately 26 miles of sanitary sewers. There are seven sewage pump stations in Chowchilla. The collected wastewater is treated at a 1.8-MGD wastewater plant. Currently, the treated effluent is discharged to percolation ponds at the wastewater treatment plant. Discharges currently average about 1.0 MGD. (Data primarily from Integrated Regional Water Management Plan, Madera County; Boyle, 2008)

City of Madera

Drinking Water System

The City of Madera's 2013 population was approximately 62,200, and it is the largest urban area in the County. The City covers approximately 15.8 square miles of incorporated area. The City relies solely on groundwater to serve its domestic customers, but some cropped land within the City limits does receive surface water from Madera Irrigation District.

The City's existing water system facilities include 19 groundwater wells, 150 miles of water distribution system pipelines ranging in size from 4 to 14 inches in diameter, about 13,500 connections, and a 1.0-MG elevated water storage tank. The wells are located throughout the City and have completion depths ranging from approximately 300 to 700 feet. The total pumping capacity of the current water system is about 27,000 gpm.

The City also has numerous stormwater basins; some are connected to MID facilities and can receive surface water for recharge. The basins are being operated to maximize the volume of stormwater that is captured and recharged locally. (Data primarily from Integrated Regional Water Management Plan, Madera County; Boyle, 2008)

Wastewater Treatment Facility

Wastewater is collected throughout the City of Madera via a network of sanitary sewer collection pipelines ranging from 8 to 48 inches in diameter. With the aid of five sewer lift stations, the influent is gravity-fed to the WWTP, located approximately seven miles west of the City limits. There are approximately 12,500 residential connections, each typically with a 4-inch sewer service connecting to the main. Commercial and industrial customers number just over 1,000 and are connected with service lines appropriate to handle their particular wastewater load. The average daily wastewater volume for 2013 was estimated to be approximately 5.19 MGD. The City of Madera has no facilities for extensive storage of the wastewater before treatment. Septic haulers from outside the City service area bring in an additional volume of wastewater. The most recent data show that outside septic waste collection contributes about 7,500 gallons (less than 1 percent of total) per day to the treatment totals, though the biological loading is disproportionately higher due to the higher strength of the septage versus domestic wastewater.

The effluent from the City of Madera's WWTP is disposed to fourteen 20-acre percolation/evaporation ponds. The WWTP Expansion Predesign Report by Boyle (July 2004) proposed a system of recovery wells that would pump groundwater from under the percolation ponds to an MID canal for agricultural irrigation. This pumping of percolated effluent is intended to reduce groundwater mounding under the WWTP and to control elevated concentrations of nitrate or other contaminants in the underlying groundwater. A recovery well has been installed, but the implementation of the project has encountered regulatory hurdles.

Chowchilla Water District

Surface Water Facilities

The Chowchilla Water District receives water from three sources; San Joaquin River (Madera Canal), Chowchilla River (Buchanan Dam) and Merced Irrigation District. The District utilizes portions of the Chowchilla River, Ash Slough and Berenda Slough to convey irrigation water to the District's irrigation water distribution system, which consists of 150 miles of unlined canals and 49 miles of pipeline. There are over 950 turnouts in the system where irrigation water is delivered to water users.

The District utilizes various water management techniques and facilities to deliver water efficiently and accurately to its water users. These facilities include: measurement weirs, water meters, rated canal gates, regulating reservoirs and ponds, long-crested weirs, flap gates and the District's SCADA system. All water released to the District, delivered to water users and leaving the District is measured and recorded in the District's database. (Data primarily from Chowchilla Water District Website; http://cwdwater.com/index.php/about-cwd-2/district-system)

Groundwater Facilities

The District does not own or operate groundwater extraction facilities.

Conjunctive/Recharge Use Facilities

The District purchases water for recharge when available, but is not able to secure an additional water supply solely for recharge. Of all the water that flows through the District's conveyance system, it is estimated that as much as 30 percent of it is lost to seepage. An average of 38,000 AF of water was recharged through the District's conveyance system between 2004 and 2013. Irrigation seepage is estimated to be approximately 84,000 AF annually. In addition, natural and intentional recharge is accomplished in nearby stream channels (Chowchilla River, Dutchman Creek, Ash Slough), two surface water retention reservoirs (Berenda Reservoir and Minturn Dam), and eight recharge basins located throughout the district (Dairyland Pond, Haynes Pond, Townsend Pond, Rutherford Pond, Askew Pond, Vera Pond, Gregory Pond, and Berenda Pond). (Data primarily from Groundwater Management Plan; Chowchilla Red-Top-City Joint Powers Authority, 1997)

Madera County

Surface Water Facilities

Madera County has a 200 AF/year Class 1 CVP Friant Division contract supply from the San Joaquin River, delivered behind Friant Dam. The County also manages the Sumner Hills Service Area (SA-16), which diverts water released into the San Joaquin River by the USBR for their diversion pursuant to Holding Contract No. 7. (Integrated Regional Water Management Plan, Madera County; Boyle, 2008)

Groundwater Facilities

The County of Madera oversees the water services in eight Maintenance Districts and four Service Areas in the GMP area. These districts/areas are solely dependent on groundwater except for Service Area 16. County water service facilities include 22 water wells and service mains, and the surface water treatment facility for CSA 16.

The larger systems, with a combined capacity of about 2,000 gpm, serve Parkwood, Parksdale, and Madera Ranchos. The remaining systems have capacities ranging from 15 to 900 gpm. (Data primarily from Integrated Regional Water Management Plan, Madera County; Boyle, 2008)

Wastewater Treatment Facilities

Madera County Service Areas and Maintenance Districts operate seven small sewer systems within the GMP area. The smaller wastewater systems most commonly have sanitary sewer systems with asbestos cement, clay, or plastic pipe collection systems; one raw sewage pumping station; an extended aeration treatment process; chlorine disinfection; and treated water pumping. Effluent disposal is handled by percolation ponds and/or sprayfields.

Many of these wastewater systems are in poor condition and need repair. The largest County-operated wastewater system within the GMP area, with more than 500 connections, serves the community of Parksdale. (Data primarily from Integrated Regional Water Management Plan, Madera County; Boyle, 2008)

Unincorporated Areas

Large areas in the County are not served by a County District and rely on private wells for domestic and irrigation water. These areas dispose of wastewater through septic systems.

Madera Irrigation District

Surface Water Facilities

The District's water and distribution system is a combination of open flow primary and secondary laterals, enclosed conduit and natural streams. There are approximately 315 miles of open flow canals and laterals, 115 miles of pipeline and 102 miles of natural streams used for District conveyance and distribution. The open flow canals are comprised of approximately 90 miles of unlined canals and 225 miles of USBR built lined canals.

The District receives water via the Madera Canal from Friant Dam through natural streams and open flow primary laterals. Fresno River water is available from both controlled release and uncontrolled flows from Hidden Dam. Water from the Madera Canal may also be released into the Fresno River. Water is diverted from the Fresno River at the District's Franchi Diversion Weir on the east side of the District.

Groundwater Facilities

The District does not own or operate groundwater extraction facilities, but there are privately owned wells in the District.

Conjunctive/Recharge Use Facilities

The District maintains a number of stormwater and flood retention basins that are used for groundwater recharge. These basins range in retention capacity between 2 and 160 AF each. There are 45 recharge basins within MID, and the City of Madera has facilities which are capable of taking irrigation and floodwater for recharge purposes. Several City stormwater basins are connected to MID irrigation distribution facilities, allowing collected storm water to be beneficially reused. Portions of the City of Madera are within MID and are assessed a monthly charge that is related to the recharge stormwater conveyance benefits created by the District.

South-East Madera County United

South-East Madera County United (SEMCU) is a participant in the GMP but does not own or operate groundwater extraction, recharge or conjunctive use facilities. It is a non-profit education and advocacy organization and has no land-use planning authority. However, SEMCU represents numerous public and private interests in its area and provides input and comments on water related projects.

Existing Activities

None

Planned Actions

- Develop strategic operation of facilities to increase groundwater recharge in canals, recharge basins and storm water basins.
- MID and CWD will automate facility operation

- Madera County, MID, and CWD will implement vegetation removal on creeks and rivers, and increase the capacity of road crossings

9. GROUNDWATER PLANNING AND MANAGEMENT

9.1. Land Use Planning

This section describes the land-use planning authority for each GMP Participant and presents alternative land use planning policies that could improve groundwater management.

Madera County

Land use planning activities in unincorporated areas of Madera County are performed by the County of Madera's Planning Department, and are overseen by the Madera County Planning Commission.

City of Madera

The City of Madera Community Development Department was established in 2006 to facilitate a coordinated approach to planning and development within the City. All phases of the planning and development process are administered through the Community Development Department. Operations managers in the Planning, Building, Engineering, and Public Works Departments all report to the Director of Community Development. The Planning Department is responsible for long range planning within the City and for processing and approving site-specific development proposals. Planning staff members also serve as staff to the Madera Planning Commission.

The City of Madera requires a conditional use permit for new agricultural land uses on land that is designated for urban development. This requirement does not apply to the limited amount of land within the City limits already planned for agriculture uses (such as around the airport).

City of Chowchilla

The Community and Economic Development Department guides and facilitates projects and development activities within the City of Chowchilla. The department is responsible for planning and building activity within the City and for implementation of economic development plans and programs which strengthen and diversify the economic base of Chowchilla.

South-East Madera County United

SEMCU is a non-profit education and advocacy organization and has no land-use planning authority. However, SEMCU represents numerous public and private interests in its area and provides input and comments on water related land-use policies. SEMCU advocates for requiring sustainable water supplies for new urban developments, and supports development of a regional group, JPA or special district to manage the groundwater.

Irrigation and Water Districts

Madera Irrigation District and Chowchilla Water District have no land-use planning authority, therefore regional and local land use planning activities will remain with the appropriate agencies. However, when appropriate, they comment on proposed land use plans that may impact the local groundwater quantity or quality.

The Plan Participants all share some common land-use planning goals including:

1. Preserving areas with high groundwater recharge potential for recharge activities;
2. Protecting areas sensitive to groundwater contamination;
3. Requiring appropriate mitigation for any adverse impacts that land use changes may have on groundwater resources.
4. Requiring hydrogeologic investigations, water supply master plans, and sustainable water supplies for new developments. Current State Water Code requires that urban developments of 500 units or more must demonstrate a sustainable water supply in normal, dry and multiple dry years over a planning horizon of 20 years. The GMP Participants support requirements for a longer-term or permanent water source.

Disclaimer for Property Purchases

Land management agencies are authorized to require that buyers read and sign a disclaimer regarding groundwater supplies. Such a disclaimer could provide educational material on groundwater overdraft and subsidence. In addition, it could state that groundwater supplies are finite, and limit the liability of public agencies if groundwater levels decline or private wells run dry.

Agricultural Land Conversion

Agricultural land could be converted to other uses to reduce water demands. Land conversion falls into three main areas:

1. Agricultural Land Retirement. The County or other special districts could buy and retire agricultural land to reduce water demand. This would be performed on a voluntary basis with landowners willing to sell their property. This method has been highly effective at reducing water demands in Westlands Water District in Fresno and Kings Counties, but it could significantly impact economic output, employment, and tax revenue. Other similar programs have allowed small water usage on the retired land so other uses, such as grazing, are still feasible. As well, agricultural land retirement could preferentially focus on lands that currently have drainage problems, shallow saline groundwater, are no longer suitable for agriculture or have no surface water supply.

2. Conservation Easements. Some state and federal agencies will pay landowners to convert land to conservation easements, which are reserved for habitat

protection or soil conservation. These programs also help to reduce water demands. Some examples include the California Department of Fish and Wildlife Permanent Wetland Easement Program, and the United Stated Department of Agriculture Conservation Reserve Program. Westlands Water District (Fresno and Kings Counties) and Buena Vista Water Storage District (Kern County) have had significant success reducing water demands with conservation easements. In some cases the land is purchased from the landowner, in others the landowner still maintains title to the land but is restricted in the land uses and must still pay property taxes. Some other programs are similar to a lease and the land can be returned to farming after a certain period, such as five or ten years. Education and promotion of existing programs may be needed to get significant participation from local farmers.

3. Conversion to Low-Water-Demand Uses. Irrigated farming land could be converted to other uses that have low water demands, such as grazing, dry land agriculture reliant solely on precipitation, or solar energy development. These lands uses can still contribute to economic output.

Expand Districts/Form New Districts

New or expanded districts can help increase surface water supplies and increase the authority of certain areas to engage in surface water and groundwater management. There are several types of special districts that can be formed under California law, including water districts, irrigation districts, groundwater replenishment districts, community service districts, improvement districts, and maintenance districts. These types of entities are typically local in nature. Regional districts and legal organizations such as conservation districts and Joint Power Authorities are discussed in Section 4.1.

MID, CWD and GFWD have contracts with the USBR for surface water. This reduces the demand on the underlying groundwater resources. A strategy identified in **Table 7.2** to reduce groundwater overdraft is to expand the boundaries of existing districts or form new districts. New districts or annexed lands might have lower priority for water supplies than existing district landowners. The annexed lands or new district areas would primarily be eligible to receive flood water or surplus waters in certain years, similar to the rights associated with subordinate lands in Madera Irrigation District and Chowchilla Water District. The new districts might be able to apply to make floodwater diversions, but would still be junior to the existing districts. Within Madera County, about 277,000 acres is located outside of the two cities and the active districts.

Several benefits can be achieved from expanding districts or creating new districts:

- The legal right to deliver surface water to these areas, if the correct water conveyance facilities are in place.
- Facilities on the new lands could benefit from grants or low interest loans from the state or federal government. These funds could be used for large capital

improvement projects that could convey, store or recharge water supplies.

- More lands that could be potentially developed for intentional recharge.
- Improved ability of the districts to utilize flood waters that currently leave the region when the existing flood storage capacity is exceeded.
- The ability of existing districts to expand groundwater monitoring networks.
- More land becomes eligible for assessments.

The Chowchilla Water District has recently added 10,000 acres of subordinate lands. MID also has about 11,000 acres of subordinate lands. These lands have lower priority to water supplies, and generally can only take surface water after demands are met on other lands. These subordinate lands increase the potential area that surface water can be delivered to.

SEMCU is advocating for creating a self-governed utility provider in their area. MD10A, with about 1,000 connections, is by law governed by the Madera County Board of Supervisors and is staffed by the Madera County Engineering Department. Costs for these services are charged back to the District by the County.

As is typical of the Madera County special districts, the County maintains an Advisory Committee within MD10A. This committee, formed of area residents, provides advisory input to County Staff and the District Supervisor with respect to District operational issues. Communication from the County to the Committee is an important means of communicating to the local residents. However, as an advisory committee, there are real limits to the ability of the committee to effect policy or operational changes. Objective citizen input is limited to voting in Proposition 218 elections which result from proposed County changes in capital improvement strategy.

SEMCU has suggested, and has discussed with other area groups, the possibility of forming a Community Services District (CSD) in the area. Such a new district could take over MD10A's responsibilities for water in the Madera Ranchos, but could also be responsible to pursue development and operation of a wastewater collection, treatment and reuse/disposal system to serve the Madera Ranchos, and develop lands surrounding that community. Since a CSD would be directed by a board of directors elected by voters living within the district, local control would be increased along with the range of services. Taking such an action would require work to establish the feasibility of the CSD, technically and financially, and adequate management expertise would be needed.

Existing Activities

- When appropriate, comment on environmental documents and land-use plans that have the potential to impact groundwater.

Planned Actions

- Promote conservation easements and other land uses that have economic output but lower water demands.
- Where practical expand existing water districts and form new water districts so surface water can be delivered to additional lands.
- MID, Madera County and CWD will pursue increasing the number of surface water users
- At a planning and land-use level, MID, Madera County, CWD, GFWD and the City of Madera will continue to pursue future recharge basin sites
- Explore the establishment of a water agency in the SEMCU area to manage water and wastewater and perform groundwater recharge

9.2. Groundwater Reports

The California DWR included “Periodic Groundwater Reports’ in their list of additional components recommended for GMPs (Appendix C of Bulletin 118 – California’s Groundwater). The GMP Participants have therefore set a goal to prepare periodic regional groundwater reports to document groundwater conditions. Currently, none of the GMP participants prepare formal groundwater reports, but many collect and evaluate groundwater data on an annual basis, and therefore it is feasible that an annual report may be prepared.

The information in the groundwater report would primarily be used to evaluate the impact from overdraft mitigation measures, forecast future problems, plan future groundwater projects, and develop new groundwater policies. An important step in preparing the report is to develop a regional, coordinated groundwater monitoring program (see recommendations in Section 5.1 – Groundwater Level Monitoring).

The content of the groundwater report may vary based on the needs, available data, and recent accomplishments of the local agencies.

Existing Activities

None

Planned Actions

- Prepare a periodic regional groundwater report, as described above.

9.3. Plan Implementation

Table 9.1 includes an implementation plan for the GMP Participants. The Table lists the major projects they have identified for possible implementation. A legend at the bottom of the table describes the general strategies that the projects belong to. Implementation of each project will be contingent on local approval, favorable economics, and the availability of funding and staff to oversee implementation. Implementation of these projects is expected to result in significant amounts of new knowledge and a substantial reduction in groundwater overdraft in the GMP area.

Table 9.1 – Implementation Plan

Project	**Madera Co.**	**MID**	**CWD**	**GFWD**	**City of Chowchilla**	**City of Madera**	**SEMCU**
Airport Basin	10	10				10	
Assist with surface water transfers into Madera County		4, 6	4, 6	4,6			
Automation of facilities		8, 2	8, 2	8, 2			
Ave. 12 Basin	10	10					
Commercial Metering/Rates	2					2	
Conservation voucher/rebate program (low flow plumbing fixtures, smart irrigation controllers, turf removal / replacement, etc)					2		
Ellis Basin	10					10	
Expanding Franklin Secara Basin				10, 8			
Flood Irrigation on Fields	10, 8	10, 8	10, 8	10, 8			
Fresno River Dam in City of Madera	1, 8, 10	1, 8, 10				1, 8, 10	
Future Basin Sites	10	10	10	10		10	
Future stormwater collection/recharge projects	8, 10	8, 10	8, 10	8,10		8, 10	8, 10
Golf Course Basins		10	10			10	
Gravelly Ford Canal-Recharge Basin				10, 8			
Increase number of surface water users	2	2	2				
Increase road crossing capacities	7, 8	7, 8	7, 8	7, 8			
Increase surface water storage			1				
Increased water wasting enforcement programs	2				2		
Lake Madera	1, 10	1, 10					
Liberty High School Demonstration Project	2,4,5						2,4,5

Project	Madera Co.	MID	CWD	GFWD	City of Chowchilla	City of Madera	SEMCU
Madera Ranch Water Bank		9					
Madera Ranchos Surface Water Treatment Plant	5						5
Madera Ranchos Wastewater Treatment Plant	3						2
Residential Metering/Rates	2					2	
Schmidt Creek Flood Control and Groundwater Recharge Project						8,10	
SWC Road 29 and Ave 29 Basin	10						
Vegetation Removal in Creeks/Rivers	7,6	7,6	7, 6	7,6			
Water conservation outreach programs	2				2		

Legend:
1 - Increase surface water storage
2 – Urban or agricultural water conservation
3 – Surface water treatment
4 – Work with adjacent entities (Merced County, Mendota Pool, Exchange Contractors, etc.)
5 – Water recycling
6 – Additional surface water supplies
7 – Increase conveyance capacity
8 – Flood and storm water capture
9 – Groundwater banking
10 – Groundwater recharge (existing and new)

9.4. Plan Re-evaluation

The Regional Groundwater Advisory Committee (GAC), which is comprised of representatives from each participant in this GMP, will be responsible for monitoring the progress in implementing the GMP objectives. Refer to Section 4.1 for more information on the membership, policies, and procedures of the GAC. In the future the GAC may be supplanted with a Joint Powers Authority. The GAC will discuss progress in implementing this plan, and the effectiveness of the plan, at each regularly scheduled meeting. As new policies, practices, and ordinances become necessary or desirable, this GMP will be amended as necessary. Each agency will also reevaluate sections pertaining to their jurisdiction annually and may choose to modify specific sections of the GMP.

This GMP will be updated as necessary. An important component of the update will be a reevaluation of overdraft and the effectiveness of overdraft mitigation measures.

Existing Activities

None.

Planned Actions

- Update the GMP at least every five years through a formal public process, or more frequently if a sufficient quantity of revisions, updates and additions have been identified.
- Evaluate the effectiveness of the GMP and need for an update at least once a year.
- Document recommendations for improving or updating the GMP in each Annual Groundwater Report.

9.5. Dispute Resolution

Madera County has a special Water Appeals Board (County Code Chapter 13.06.010) to resolve issues concerning water. The water appeals board may affirm, reverse or modify determinations of administrative staff. The other GMP participants do not have specific procedures for addressing groundwater disputes.

Well disputes related to pumping interference have occurred in the GMP area. Some private landowners have believed that agency wells are impacting their private wells. Sometimes agency-owned and private wells are sited close together, and one or both of the wells should be moved to prevent interference. In addition, there have also been several complaints from residences indicating that they believe their wells have been impacted by nearby agricultural wells.

Groundwater disputes between landowners are not the responsibility of the local water management agencies; however, when asked to, they may choose to help resolve disputes as an impartial mediator. Such efforts are intended to maintain amicable relationships among landowners, educate landowners on groundwater management goals and policies, and avoid an adjudication of the local groundwater basin.

Developing a county-wide groundwater management organization is being considered to help implement the goals and objectives of this GMP. Staff could also assist with groundwater related disputes, especially if they involve regional water management issues or disputes between two separate agencies. Several alternatives for a regional groundwater management organization are discussed in Section 4.1 – Groundwater Advisory Committee.

Existing Activities

- Resolve disputes through existing formal dispute resolution policies.

Planned Actions

- Evaluate the merits and feasibility of developing a county-wide groundwater management program.

9.6. Program Funding and Fees

Numerous alternatives are available to the GMP Participants for funding existing and planned actions described in this plan. The GMP Participants have discussed these options, and each has indicated which funding alternatives may prove practical and feasible for their agency's use on capital and/or operating expenses necessary to implement this plan. These alternatives and agency selections are listed in **Table 9.2**, and described in the text following:

Table 9.2 – Potential Funding Sources

Funding Source	Madera County	MID	CWD	GFWD	City of Chow.	City of Madera	SEMCU
Development impact fees	x				x	x	
Well permit fees	x						
Property assessments (per acre charge)	x	x	x	x		x	
Property assessments (based on demands and crop usages)	x						
Groundwater pumping surcharge (metered or tiered)	x					x	
Private funding incentives	x						
Grants	x	x	x	x	x	x	x
Local bond measure	x					x	
District assessments	x	x	x	x			
Williamson Act fees	x						
State and Federal funding	x	x	x	x	x	x	x

Development Impact Fees

New building permits and entitlements for projects that would use groundwater could be subject to a fee based on the acreage developed, the number of residential units proposed and/or the estimated water usage of proposed landscape/agricultural plantings.

Well Permit Impact Fee

During the permitting process, a groundwater impact fee could be assessed on each new well constructed. The fee could vary based on the size or estimated pumping capacity of the well. This fee could be extended to well rehabilitations which result in increased well capacity.

Property Assessments (Per-Acre Fee)
A per-acre fee (or a per-parcel fee) could be harder to implement than some of the other alternatives, since both could be construed as property taxes and could therefore require a super-majority vote of the affected property owners to put into effect. There would, however, be advantages to this funding method. It could apply county-wide (or within a defined benefitted subarea) and would have the potential to raise relatively large sums of money annually without placing excessive burden on any single owner or group of owners.

Property Assessments (Per Demand and Crop Water Usage)
Under AB 3030, local agencies which have prepared and adopted Groundwater Management Plans have the authority to limit groundwater extractions and implement water replenishment fees based upon the amount of groundwater extracted. Extraction-based fees must first be approved by majority vote of impacted landowners. These could be considered realistic alternatives if the State begins to regulate groundwater extractions, or if a groundwater basin adjudication appears imminent.

Groundwater Surcharge (Based on Calculated Water Demand)
A groundwater extraction surcharge could be assessed on agricultural lands within the GMP area based on anticipated water demand, which could be determined from the cropping data that is already submitted to the Madera County Agricultural Commissioner's Office.

Anticipated water demand would be based on standard evapotranspiration rates for each crop and land use in the GMP area. This fee would be equitable both to landowners that use little groundwater, such as ranchers, and to heavier users such as tree orchards. Credit could also be allowed for parcels that receive surface water deliveries which offset groundwater pumping.

Groundwater Surcharge (Based on Actual Volume Pumped)
A groundwater surcharge could be assessed based on the actual volume of groundwater pumped, which would require metering of all wells within the GMP area. Groundwater extractions could be reported in several fashions.

1. Self Reporting. Each property owner would report their groundwater extractions to the County or an established Groundwater Management Authority. The form for the reporting, as well as frequency of reporting and billing, would be up for later determination.

2. Manual Reading and Reporting. The County or an established Groundwater Management Authority could manually read and record the meter readings for

billing purposes. This would incur significant ongoing costs both for labor to carry out the readings as well as costs for vehicles, fuel, and other necessary items.

3. Automated Reading and Reporting. New meters could be installed (and older meters retrofitted) with automatic reading and reporting capabilities incorporating radios and repeaters. The County or an established Groundwater Management Authority could receive this data electronically, reducing processing and administrative costs. Such automated reading and reporting is the current standard of the industry for municipal water metering, based upon the rapid payback of the capital investment in self-reading meters by the reduction in direct and indirect expenses.

Private Funding Incentives

Private organizations and foundations are often-overlooked sources for grants. They will often fund grant application preparation, organizational capacity building, feasibility studies and public education. Operations funding is difficult to get through grants, which are most often limited to one-time expenditures.

Private foundation funding may not be available for construction projects, but often is available for “capacity building,” increasing the skills and abilities of an agency to actually pursue major funding through training in grant writing and project administration skills. Understanding how to create and structure grant applications is critically important to winning grant funds, and each funding agency or foundation is different in how it perceives needs, benefits and the overall mission of the applying agency. An established Groundwater Management Authority will strongly benefit from mastery of these skills.

Private Property Owners

Private property owners could also fund/purchase land conservation easements from other land owners, essentially “Buying" groundwater rights, or paying water users to forgo pumping or reduce their ground water extractions. This approach can be very effective in reducing groundwater overdraft, while avoiding the potential equity concerns associated with mandatory reductions in ground water extractions. However, monitoring and enforcement are critical for ensuring the success of the purchase of conservation easements/ground water rights. This is clearly required to ensure that water right or license holders do not continue to pump contrary to the program or agreement.

Grants and Loans (Public and Private Sources)

Grants designed to fund projects addressing several of the Basin Management Objectives may be available both through public grant programs and from private foundations. The GMP Participants will pursue available grants and low-interest loans from the DWR as well as other State and Federal agencies. The GMP participants realize that funding from State and Federal agencies for groundwater projects will be partially based on the group’s progress in implementing this GMP.

Water quality projects can potentially be funded through State programs addressing water and wastewater projects. Funding from the Federal government is available for water and wastewater projects benefitting small and disadvantaged communities. Potential public funding programs include:

- IRWMP Implementation Grants (Department of Water Resources)
- Local Groundwater Assistance Grants (Department of Water Resources)
- Water Use and Energy Efficiency Grants (United States Bureau of Reclamation)
- State Revolving Fund (Municipal Water Projects – CDPH)
- Clean Water State Revolving Fund (Wastewater Projects – RWQCB)
- Rural Utilities Service (USDA – Water and Wastewater Projects)

Local Bond Measures

Local agencies can propose funding of specific capital improvements via sale of local general obligation bonds, to be paid back by adding incrementally to the property tax collected from each parcel within a benefitted area. The range of projects so financed can be very broad, though generally a project list must be included in the measure that proposes sale of the bonds. The measure is subject to a vote in the benefitted area, and must pass by a two-thirds majority vote. (Only school facilities were affected by the new 55% approval rule passed in Proposition 39 in 2000.)

Under another process involving local bonds, the County and participating Cities and Districts each have the authority to finance capital improvement projects and collect repayment charges from the benefited parties. The authorizing legislation used most often is the Assessment Act of 1913. That Act allows local agencies broad authority to plan and propose capital projects benefitting a group of property owners, and provides a legal framework for spreading the costs of the project (construction, design, legal, finance) back to the benefitted parties.

Frequently, funding comes from the sale of tax-exempt bonds by the local agency, secured by the value of the benefitted properties, and paid back over 20 years by the property owners. The assessment district process can be initiated and driven forward by the local agency. Property owners are kept informed of the project and are given an opportunity to protest the assessments before they are finalized. An assessment district can proceed so long as less than half of the benefitted property owners protest the assessments.

Assessments on District Lands

If irrigation and water districts choose to annex lands and expand into un-districted areas, they would have the authority to collect assessments from the landowners in the newly-annexed areas. These assessments could be parcel-based or area-based. The revenues collected could be used to acquire additional water supplies for delivery or groundwater recharge, or to develop irrigation efficiency or groundwater recharge projects.

Annexation of lands outside a district requires petition of the landowners within the area to be annexed, or is sometimes initiated by a vote of the district's board of directors. The annexation action requires approval by the Local Agency Formation Commission (LAFCo) which will, among other responsibilities, check to make sure that no other districts are already providing the same or similar services to the area in question, and will verify that the proposing district has the managerial and financial resources to manage the annexed lands.

Requirement for an election prior to annexation depends upon the number of people living within the proposed annexed area. If there are up to eight people in the area, the annexation can proceed as an "uninhabited annexation" without a vote. Greater populations within the area require a majority vote of the residents in order to proceed.

Williamson Act Fees

The Williamson Act of the State of California (officially, the California Land Conservation Act of 1965) is a California law that provides a reduction of property tax to owners of farmland and open-space land in exchange for a ten-year agreement that the land will not be developed or otherwise converted to another use. The motivation for the Williamson Act is to promote voluntary land conservation, particularly farmland conservation.

Subsequently, the Open Space Subvention Act of 1971 provided local governments an annual subvention payment of lost property tax revenues from the state. In 2010, legislation was passed by the California State Senate and State Assembly and sent to the Governor for signing in the form of Senate Bill 1142. This bill was created in response to the economic downturn and the State's revenue shortfalls, and suspended the State's subvention payments to local agencies and Counties for the Williamson Act contracts.

The County has approximately 600,000 acres in Williamson Act Contracts. The County has continued to honor the Contracts and provide a tax reduction to landowners without the States subvention payments. The estimated loss of tax revenue to Madera County was approximately $780,000 during the 2012-2013 tax year.

The County could consider not renewing the contracts, or impose an additional fee on contracts which are not funded by State subventions. The revenues collected could be set aside for groundwater management, construction of infrastructure-related projects to perform groundwater recharge, or acquisition of additional surface water supplies to improve groundwater conditions in Madera County.

State and Federal Funds

Because of the magnitude of the groundwater overdraft in the GMP area and the importance of Madera County's agribusiness to the overall economy of the state and nation, it is reasonable to think that the State and Federal governments could choose to help finance projects to mitigate overdraft. This assistance could take the form of direct project funding contained in legislation approved in Sacramento or Washington, D.C.

Accomplishing this goal would require concerted efforts among the GMP participants to select and develop a project or projects that could be particularly beneficial yet don’t have alternative financing sources. Once that is done, the participants would need to work closely with legislators and congressional representatives to convince those people of the merits of the project, and then see if funding approval can be obtained.

This funding strategy is one of the most complex and hard to achieve of any of those listed, but carries one of the largest potential rewards in that the funding capacity of the State and Federal governments is much larger than anything the GMP participants and the people of Madera County can accomplish on their own.

Existing Activities

- Regularly research grant and loan opportunities from the State and Federal governments and apply for these opportunities when they appear advantageous to the GMP participants.

Planned Actions

- Identify which funding mechanisms described above will be adopted by each GMP participant to fund local and regional groundwater management efforts.
- Move toward creation of a Joint Powers Authority for groundwater management, which would be the most logical agency to implement many of these proposed funding strategies.
- Share information on funding opportunities with other agencies that may be potential partners in multi-agency groundwater projects.
- Perform a financial study to estimate the long-term cost of mitigating groundwater overdraft.
- Develop projects to the point of funding viability, so that they can be moved quickly to completion when funding is secured. Potential projects must be more than a listing, but must include background information, technical and financial justification, schematic (or greater) design documents and an attainable schedule.

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CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX H – CONSUMER CONFIDENCE REPORT (2015)

The City of
MADERA
VALLEY CENTRAL

April 10, 2015

TO: CITY OF MADERA WATER CUSTOMERS

SUBJECT: 2014 CITY OF MADERA WATER SYSTEM CONSUMER CONFIDENCE REPORT

Este informe contiene información muy importante sobre su agua potable. Traduzcalo, o habla con alguien que lo entiende bien.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. City of Madera is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

The City of Madera is required by the State Water Resources Control Board to report annually to all customers regarding water quality. The enclosed report summarizes water quality sample results for 2014. You may also view this report on the City of Madera's web site www.cityofmadera.org. All samples were collected from eighteen groundwater wells. Minimum, maximum, and average values are listed for all elements that were detected.

Significant time and expense by the City ensures that consumers are provided with water that meets or exceeds drinking water standards. The City's stringent testing program is in full compliance with State and Federal requirements.

Questions regarding this report should be directed to John Botwright, Water Quality Specialist, of the City Water Quality Division at (559) 661-5465.

David Randall
Public Works Operations Director

CITY OF MADERA WATER QUALITY REPORT 2014

Primary Standards	**MCL**	**PHG (MCLG)**	**RANGE OF DETECTION**			**AVERAGE**	**U.O.M.**	**TYPICAL SOURCE OF CONTAMINANT**
Arsenic	10.00	0.004	N/D	TO	4.90	1.01	ug/L	Erosion of natural deposits; runoff from orchards; glass and electronics production wastes.
Barium	1000.00	2000.00	N/D	TO	140.00	7.78	ug/L	Discharges of oil drilling wastes and from metal refineries; erosion of natural deposits.
Nitrate (as NO3)	45.00	45.00	2.90	TO	24.00	8.26	mg/L	Runoff from fertilizer use; leaching from septic tanks and sewage erosion of natural deposits.
Dibromochloropropane (DBCP)*	0.2	0.0017	N/D	TO	1.30	0.16	ug/L	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards.
Chlorine Residual	4.0	4.0	0.1	TO	0.8	0.25	mg/L	Drinking water disinfectant added for prcautionary disinfection
Total Coliform Bacteria [Total Coliform Rule] % positive samples	More than 5% of samples are positive	0	Amount detected 0			N/A	NO VIOLATIONS	Naturally present in the environment
Secondary Standards								
Aluminum	200		0.00	TO	**280***	15.56	ug/L	Erosion of natural deposits; residual from surface water treatment
Iron	300		0.00	TO	**700***	38.89	ug/L	Leaching from natural deposits; industrial wastes
Chloride	500.00		14.00	TO	41.00	20.83	mg/L	Runoff/leaching from natural deposits; seawater influence.
Color	15.00		N/D	TO	5.00	0.67	units	Naturally-occurring organic materials
Odor	3.00		N/D	TO	0.00	0.00	units	Naturally occurring organic materials.
pH (Laboratory)	6.5 - 8.5		6.10	TO	8.10	7.78	Std. units	
Specific Conductance	1600.00		200.00	TO	560.00	268.89	umho/cm	Substances that form ions when in water; seawater influence.
Total Filterable Residue (TDS)	1000.00		170.00	TO	380.00	208.89	mg/L	Runoff/Leaching from natural deposits.
Sulfate	500.00		3.50	TO	28.00	7.43	mg/L	Runoff/leaching from natural deposits; industrial wastes.
Lab Turbity	5.00		N/D	TO	3.10	0.23	NTU	*Turbidity is a measure of the cloudiness of the water.* We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.
General Minerals								
Bicarbonate	N/A		77.00	TO	260.00	116.17	mg/L	
Calcium	N/A		13.00	TO	52.00	20.83	mg/L	
Fluoride	20000.00	1000.00	N/D	TO	1.70	0.91	ug/L	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories.
Magnesium	N/A		3.80	TO	15.00	6.32	mg/L	
Potassium	N/A		N/D	TO	7.50	2.84	mg/L	
Sodium	N/A		19.00	TO	44.00	25.39	mg/L	
Total Alkalinity	N/A		63.00	TO	210.00	94.78	mg/L	
Total Hardness (as CaCO3)	N/A		49.00	TO	190.00	78.22	mg/L	
MBAS	0.50		N/D	TO	0.050	0.003	mg/L	Municipal and industrial waste discharges
Organics								
Tetrachloroethylene (PCE)	5.00	0.06	N/D	TO	26.00	0.00	ug/L	Discharge from factories, dry cleaners and auto shops (metal degreaser)
Radioactivity								
Gross Alpha	15.00		N/D	TO	6.07	0.87	pCi/L	Erosion of natural and man-made deposits
Uranium	20.00	0.43	0.00	TO	1.15	0.40	pCi/L	Erosion of natural deposits
Unregulated Organics								
Vanadium	N/A	50.00	11.00	TO	30.00	20.67	ug/L	
tert-Butyl Alcohol (TBA)	N/A		N/D	TO	2.10	0.12	ug/L	
Unregulated Inorganics								
Hexavalent Chromium VI	0.10		N/D	TO	3.20	1.38	ug/L	N/A
STAGE 2 DBPR Monitoring								
Total Trihalomethanes (TTHM) (ug/L)	80.00	N/A	N/D	TO	0.00	0.00	ug/L	***8-21-14 Byproduct of drinking water chlorination***
Haloacetic Acids (HAA5) (ug/L)	60.00	N/A	N/D	TO	0.00	0.00	ug/L	***8-21-14 Byproduct of drinking water chlorination***

LEAD AND COPPER

Contaminant		**No. of samples collected**	**90th Percentile level detected**	**No. of sites exceeding action**	**Action level**	**MCLG**	**TYPICAL SOURCE OF CONTAMINANT**
Lead (ug/L)	Sampled 6-2013	30	<.005	2	15	0.2	Internal corrosion of household water plumbing systems ; discharges from industrial manfacturers, erosion of natural deposits.
Copper (mg/L)	Sampled 6-2013	30	0.24	0	1.3	0.3	

The State allows the City to monitor for some contaminants less than once per year because the concentration of these contaminants do not change frequently. Some of the above data, though representative, is more than one year old, the data ranges from 1996 to 2013.

ABBREVIATION KEY

MCL = Maximum Contaminant Level
mg/L = Milligrams per Liter or parts per million
ug/L = Micrograms per Liter or parts per billion
NTU = Nephelometric Turbidity Units
PHG = Public Heath Goal
MCLG= Maximum Contaminant Level Goal
RAL= Regulating Action Level
TT= Treatment Technique

N/A = Not Applicable
pCi/L = Picocuries per Liter
N/D = Non-Detect
U.O.M. = Unit of Measurement
TON = Threshold odor number
umho/cm= Micromhos per Centimeter
PDWS= Primary Drinking Water Standards
MRDL= Maximum Residual Disinfection Level
MRDG= Maximum Residual Disinfection Goal

REQUIRED PUBLIC NOTICE

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their heath care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline 1(800) 426-4791.

DEFINITIONS

Maximum Contaminant Level or (MCL): The highest level of a contaminant that is allowed in drinking water. **Primary MCLs** are set as close to the PHGs(or MCLGs) as is economically and technologically feasible. **Secondary MCLs** are set to protect the odor, taste, and appearance of drinking water.

Primary Drinking Water Standard or PDWS: MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Public Health Goals or PHG: The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Contaminant Level Goal or MCLG: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

HEALTH EFFECTS FOR INORGANIC CONTAMINANTS

Nitrate: Nitrate in drinking water at levels above 45 mg/L is a health risk for infants of less than six months of age. Such nitrate levels in drinking water can interfere with the capacity of the infant’s blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. Nitrate levels above 45 mg/L may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with certain specific enzyme deficiencies. If you are caring for an infant, or you are pregnant, you should ask advice from your health care provider.

ARSENIC: While drinking water meets the Federal and State standards for arsenic, it does contain low levels of arsenic. The Arsenic standard balances the current understanding of arsenic's possible health affects against the cost of removing arsenic from drinking water. The U.S. Environmental Protection Agency continues to research the health affects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

TREATMENT

Chlorination: Each well site has a chlorine generation system which produces a 0.8% chlorine solution and dosage to the distribution system is set at 0.25 Parts Per Million.

REQUIRED PUBLIC INFORMATION

1. The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

2. Contaminants that could be present in source water include:

(**a**) Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

(**b**) Inorganic contaminants, such as salts and metals, that can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.

(**c**) Pesticides and herbicides, that may come from a variety of sources such as agriculture, urban water runoff, and residential uses.

(**d**) Organic chemical contaminants, including synthetic and volatile organic chemicals, that are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, agricultural application, and septic systems.

(**e**) Radioactive contaminants, that can be naturally-occurring or be the result of oil and gas production and mining activities.

3.In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency(USEPA) and the State Water Resources Control Board prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that provide the same protection or public health.

City of Madera
Source Water Assessment

A source water assessment was conducted for the City of Madera water system in 2003 and is ongoing as water wells are being developed. A completed copy of this report may be viewed at City of Madera, Public Works Department 1030 South Gateway Drive Madera, CA 93637 or, a copy may be requested by contacting:

John Botwright, Water Quality Specialist
(559) 661-5465

The following chart summarizes potential sources of contamination, in the vicinity of each water well, that could affect water quality:

Activities	Water Wells
Airports - Maintenance/fueling areas	#26
Automobile - Body shops, Historic gas stations, Machine shops, Junk/scrap salvage yards	#25
Automobile – Gas stations	#17, #18, #20, #21, #22, #26
Automobile - Repair shops	#18, #25
Boat services/repair/refinishing, sewer collection systems, pesticide/fertilizer/petroleum storage & transfer area	#18, #31
Chemical/petroleum processing/storage, dry cleaners, injection wells/dry wells/sumps	#28, #17
Dry cleaners, injection wells/dry wells/sumps	#28
Fertilizer/pesticide/herbicide application, storm drain discharge points	#29, #31, 32, #33, #34
Grazing (>5 large animals or equivalent per acre)	#23
Historic waste dumps/landfills	#25, #26
Housing – high density (>1 house / 0.5 acres)	#15, #16, #17, #21, #22, #23, #24, #25, #29, #31, #32, #33, #34
Metal plating/finishing/fabricating	#26, #27, #30
Military installations	#24
Transportation corridors - Road right - of - ways (herbicides use areas)	#15, #16, #17, #29
Waste Transfer/Recycling stations	#17, #31, #34

DISCUSSION OF VULNERABILITY

There is no current Maximum Contaminant Level (MCL) exceedance noted in the State Water Resources Control Board Water Quality Inquiry (WQI) database for City of Madera Water Wells: 15, 16, 17, 18, 20, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32, 33 and 34. However, documentation that the following elements have been found in Water Wells 21, and 33 are included in the database:

Water Well	Chemical	Sample Date	Level Detected	MCL	DLR
#21	DBCP	6/20/2013	0.10 ug/L	0.20 ug/L	0.01ug/L
#33	DBCP	2/22/2013	0.088 ug/L	0.20 ug/L	0.01ug/L
#21	Aluminum	11/20/2014	280 ug/L	200 ug/L	50 ug/L
#21	Iron	11/20/2014	700 ug/L	300 ug/L	100 ug/L

ADDITIONAL COMMENTS:

Water Well 33 A water sample was collected 3/1/2005 during initial drilling and was detected for DBCP. This well was put into service on 8/18/2006 was tested quarterly and has never exceeded the MCL for DBCP.

Water Well 21 A water sample was collected 11/20/2014 after the well had been rehabilitated and secondary MCL was detected for Aluminum and Iron. The City is now monitoring quarterly for Aluminum and Iron at this source. First quarter 2015 sampling results show N/D for both Aluminum and Iron. Secondary MCL standards are in place to establish an acceptable aesthetic quality of the water.

VIOLATION OF TT OR MONITORING AND REPORTING REQUIREMENTS:

MONITORING AND REPORTING VIOLATION: The City was required to monitor for Hexavalent Chromium in 2014 and did so as part of EPA UCMR3 Monitoring. The results of that Hexavalent Chromium monitoring were not uploaded to the state database in 2014 because of a misunderstanding about the reporting requirements. The City monitored for Hexavalent Chromium on 2/15/2015 after the mistake was noticed.

CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX I - WATER SHORTAGE CONTINGENCY PLAN

REPORT TO CITY COUNCIL

MEETING DATE: May 20, 2015

AGENDA ITEM NUMBER: C-4

Approved By:

PUBLIC WORKS DIRECTOR

CITY ADMINISTRATOR

SUBJECT:

Consideration of an Urgency Ordinance Enacting Water Regulations in Response to the Governor's Declaration of a State of Emergency and Mandates for Water Conservation

and,

Consideration of Introduction and First Reading of an Ordinance Regarding Water Regulations

and,

Consideration of a Resolution Enacting Drought Water Restriction Level C

RECOMMENDATION:

Staff recommends that the Council consider the proposed water regulations and adopt them as an urgency ordinance and take parallel action by introducing an identical ordinance for adoption pursuant to the non-urgency process; Staff further recommends that the Council adopt a resolution enacting drought water restriction Level C as defined in the new ordinance.

SUMMARY:

The Council is being asked to implement new water regulations that will restrict water usage, based on progressive levels that can be enacted as drought condition worsen and water reductions become necessary to meet State water conservation mandates. The immediate significant change would be to limit outdoor watering to one day per week by enacting the proposed level C Restrictions. If necessary for further water conservation, the subsequent level of restriction would eliminate all outdoor watering except for drip irrigation of trees and bushes. If compliance is still not achieved, the next level of restrictions would eliminate all outdoor watering, As an Alternative, the Council could choose to implement an ordinance to place residents on specific maximum water budgets, with fines for overages. Implementation of this alternative would not be feasible until the required software tools are in place.

DISCUSSION:

The continued drought conditions prompted the Governor to declare a drought state of emergency over a year ago. On April 1st of this year, the Governor enacted a statewide mandatory 25% water reduction, with subsequent regulations being drafted by the State Water Resources Control Board. The City of Madera has been identified as a tier seven water supplier that is being mandated to reduce residential consumption on a per capita basis of 28% from 2013 consumption levels. The state has determined that we have already reduced consumption by 9% which leaves an addition net reduction of 19% to meet the State mandates.

Currently, the Water Department is operating based on our Water Management Plan drought emergency contingency plan at stage III restrictions, which include increasing the water conservation program staff to four employees to provide public information and enforcement when necessary. Water conservation activities under stage III have been largely focused on monitoring visible water wasting, and educating the public about the regulations and means of conserving water. The ratio of public contact/informal warnings verses written citations is about 3:1.

Studies from 2010 found that 58% of residential water usage in California is attributed to outside watering. While these ratios have undoubtedly declined from increased public awareness of the issues and water meters which were installed in 2013, it is still believed that there is a significant percentage of water that is utilized in outdoor watering. Hence, the biggest potential for saving is to try and reduce water consumption by restricting when outdoor watering can occur. Staff is hopeful that changing from watering two days a week to one day a week will provide us with a significant decrease in consumption; the actual percentage of reduction is highly speculative. Our intention is to implement these measures in good faith of meeting our goal so that the State does not levy any fines against the City. These fines can be up to $10,000 per day. If the results of the restriction do not yield sufficient reductions to appease the State, we would then recommend moving to the higher levels of water restrictions.

The regulations are being adopted as an urgency ordinance, but citations for infractions of the new provisions would not be implemented for the first 30 days.

Another alternate approach to reductions is to place customers on specific water consumption budgets; allowing them to manage where and when they use their allocation of water. Enforcement of the budgets would be achieved through significant fines for overages as has been implemented in other jurisdictions. Implementing this method has two problems.

First there is a due process issue. Customers would need to be provided a means to contest fines, which is impracticable for the City if experienced on a large scale. The Governor has requested the State Legislature enact legislation to empower local authorities to do enforcement of fines administratively rather than as infractions, but this power does not yet exist.

Second, we currently do not have the means for the public to readily monitor their own consumption. While we currently can look up usage for individual accounts, it is not practical for staff to do so for all 13,000 customers. There is software available that can make the information available to the public on-line and in monthly statements, which would even have the ability to push out warnings of excessive usage patterns. However, the City's current systems do not provide this functionality. We are currently in the process of converting our existing water meter data management software to a new version which has the capacity to do these things if we opt for a few additional features that are available. If the current effort to complete the transfer of operating systems will still take several months before it is fully functional. Therefore, we do not see using water budgets and fines as an initial methodology for reducing water consumption, but these could be considered in the future.

NEW PROVISIONS:

The proposed changes to the Municipal Ordinance restricting water usage are detailed in the attached ordinance and the principal provisions are summarized below:

Drought Levels

A series of 5 drought water restriction levels are proposed to be codified in the Municipal code which can be enacted when necessary by a resolution of the City Council. They are as follows:

Level A

Limited Provisions:

Outdoor application of water for irrigation and recreation uses shall be restricted to the hours of 7:00 pm to 10:00 am.

Level B

Moderate Provisions:

Outdoor application of water for irrigation and recreation uses shall be restricted to the hours of 7:00 pm to 10:00 am and restricted to usage on Sunday and Thursday for even addressed parcels and Saturday and Wednesday for odd addressed parcels. *(This matches current restrictions that are in place)*

Level C

Significant Provisions:

Outdoor application of water for irrigation and recreation uses shall be restricted to the hours of 7:00 pm to 10:00 am and restricted to usage on Sunday for even addressed parcels and Saturday for odd addressed parcels. *(This is the level currently being suggested)*

Level D

Aggressive Provisions:

Outdoor application of water for irrigation of plants shall be limited drip system designed to only irrigate trees and bushes to minimally maintain their viability. Irrigating of lawn/turf using any method of watering shall be prohibited.

Level E

Extreme Provisions:

All Outdoor application of water for irrigation of plants other than editable crops for personal consumption shall be eliminated.

Importation of Water

Other than recycled or "Gray" water, utilizing water from outside of the City for outdoor watering is prohibited. This prevents people from obtaining water from wells surrounding the City for landscape irrigation which has the same impact on our aquifer as if they used City water.

Exceptions

The proposed ordinance has been written to try and address the most likely situations, but there will always be special cases. Hence, a provision that allows for the Public Works Department to grant exceptions to the regulations in cases where it is impractical to enforce the provisions is included in the proposed ordinance. The criteria for granting exceptions is when a "circumstance causes a severe hardship that is unique and not common to other water customers, and would be significantly injurious to public health, safety, public economic welfare, or would by its implementation precludes the reasonable ability to enjoy the functionality of the premises…. Issues of convenience for economic efficiencies shall not constitute cause for exceptions hereunder. The Department in granting the exceptions may make such conditions as it deems necessary to maximize water conservation. Examples include but are not limited to; allowing a playfield to be watered on days when is not normally used, preserving significant wildlife habitat, and accommodations for special public events, etc." This will allow situations such as allowing additional watering needed to maintain a playing field in a park so that it does not prevent the field from being lost.

There a few hot button topics that while they may not represent a large amount of water, the Public regularly complain about them and we recommend we address them as follows:

Fundraising Car Washes

The typical fundraising carwashes for a funeral donations, sports team, church etc. is allowed under our current ordinance. The Council could, if it preferred, prohibit them. As an alternative, car washes could be required to conform with a set of criteria that attempts to implement some controls and discourage unnecessary water wasting, such as:

Community fund raising events for recognized nonprofit organization may hold car washes provided they comply with the following:

1. Register with and receive approval from the Public Works Department for the carwash a minimum of 10 days in advance of the event.
2. No more than 6 events shall be held by any organization in a year.
3. Washing shall be performed using best practices to conserve water, including but not limited to use of power washers in place of regular hose pressure.
4. The event shall endeavor to not use more than 25 gals per vehicle.
5. Events must be held where the water is supplied from a metered water service.

Recreational Water

Some members of the public have expressed irritation that residents with pools are not restricted from using water for recreational use while their landscape irrigation is being restricted. Some jurisdictions are considering moratoriums on new pools, which staff has not recommended. Currently, new pools or changing water in pools is not prohibited. The current provision restricts "frequent empting of a pool between May 1 and September 30."

No new restrictions have been recommended due to the difficulty in enforcing the provisions on pools that are mostly located in private rear yards which are generally outside of public view. The Council could consider requiring additional conservation measures for pools during the later drought levels D and E when lawns would also be lost. A possible set of restrictions could be:

- When water restrictions are in levels D and E, all outdoor recreation water bodies such as pools, spas, etc, must have covers in place when not occupied in order to reduce evaporation.
- The changing of more than 50% of water in outdoor swimming pools, recreational or ornamental water bodies, water fountains etc. is prohibited during drought levels D and E. This includes but is not limited to: Wading Pools and water slides over 20 gallons capacity. Routine filling to maintain water levels is acceptable and water necessary to maintain wildlife habitat is permissible.

FINANCIAL IMPACT:

The expenses for implementing and administering these enforcement issues occur within the Water Fund and would not have any impact on the General Fund. The forced reduction in consumption would have the effect of reducing revenues to the water budgets, but would not cause equal reductions in expenses. Reductions in revenues could result in the Fund Balance being reduced and/or maintenance and Capital Projects having to be delayed causing increased deferred liabilities in the water system infrastructure.

In a separate agenda item new water and sewer rates are being considered for adoption. The proposed rates anticipate an immediate 15% reduction in overall consumption based on the State's mandate to reduce residential consumption. It assumes an additional 2% reduction in each of the following four years. Hence, depending on the actual amount of reductions we achieve the impact may not be significant. If restrictions were to be lifted or consumption not achieved and revenue continued at historical levels any unanticipated increases in revenue could be used to reduce scheduled rate increases.

CONSISTENCY WITH THE VISION MADERA 2025 PLAN:

The proposed action is not specifically addressed as part of action Plan, but is not in conflict with it and is sympathetic of the underling principals of the 2025 Plan.

ORDINANCE NO._____

AN URGENCY ORDINANCE OF THE CITY COUNCIL OF THE CITY OF MADERA AMENDING PORTIONS OF CHAPTER 5, OF TITLE V OF THE MADERA MUNICIPAL CODE RELATING TO WATER SERVICE RESTRICTIONS

WHEREAS, the Governor of the State of California has declared a State of Emergency to exist throughout the State of California due to severe drought conditions.

WHEREAS, on April 1, 2015, the Governor issued Executive Order B-29-15, which directed the State Water Resources Control Board (Water Board), to impose restrictions to achieve a statewide 25% reduction in potable urban water usage through February 28, 2016.

WHEREAS, these restrictions will require water suppliers to California's cities and towns to reduce usage as compared to the amount used in 2013.

WHEREAS, on April 7, 2015, the Water Board issued a Draft Regulatory Framework, which could require the City of Madera to reduce water usage by 32%.

WHEREAS, the City needs to prepare for the necessary reductions in water usage by amending the Municipal Code to specifically provide for the City Council to respond to drought emergencies by adopting a resolution mandating water usage regulations on customers and penalties for violations.

WHEREAS, in adopting this urgency ordinance, the Council finds that it is needed for the immediate preservation of the public peace, health, and safety. This finding is based upon the State of Emergency declared by the Governor for drought conditions, the pending Water Board regulations that will mandate Madera reduce water usage by as much as 32% from 2013 levels, and the need to begin taking steps to meet that reduction in water usage before a regular ordinance can be adopted, all for the benefit of the community in addressing the drought, and as further supported by the preceding findings.

THE CITY COUNCIL OF THE CITY OF MADERA, CALIFORNIA, DOES ORDAIN AS FOLLOWS:

Section 1. Recitals. The Recitals set forth above are true and correct and incorporated herein by reference.

Section 2. Section 13, of Chapter 5, of Title V of the Madera Municipal Code is hereby amended to read as follows:

(A) Drought Levels: When the City Council by resolution determines that water supplies are limited and additional conservation measures are necessary to reduce water consumption, the Council may enact one of five drought water restriction levels A through E as set forth in this subsection, and restrictions under each section shall be enforced for such period of time as designated by the City Council or until lifted by them by separate resolution.

Level A
When the City Council by resolution determines it is warranted that additional water restrictions are necessary to reduce water consumption by limited means, the following restrictions shall apply:

Outdoor application of water for irrigation and recreation uses shall be restricted to the hours of 7:00 p.m. to 10:00 a.m.

Level B
When the City Council by resolution determines it is warranted that additional water restrictions are necessary to reduce water consumption by moderate means, the following restrictions shall apply:

Outdoor application of water for irrigation, recreation uses shall be restricted to the hours of 7:00 p.m. to 10:00 a.m., and restricted to usage on Sunday and Thursday for parcels with even numbered street addresses and Saturday and Wednesday for parcels with odd numbered street addresses.

Level C
When the City Council by resolution determines it is warranted that additional water restrictions are necessary to reduce water consumption by significant means, the following restrictions shall apply:

Outdoor application of water for irrigation and recreation uses shall be restricted to the hours of 7:00 p.m. to 10:00 a.m., and restricted to usage on Sunday for parcels with even numbered street addresses and Saturday for parcels with odd numbered street addresses.

Level D
When the City Council by resolution determines it is warranted that additional water restrictions are necessary to reduce water consumption by aggressive means, the following restrictions shall apply:

Outdoor application of water for irrigation of plants shall be limited drip system designed to only irrigate trees and bushes to minimally maintain their viability.

Level E

When the City Council by resolution determines it is warranted that additional water restrictions are necessary to reduce water consumption by extreme means, the following restrictions shall apply:

All outdoor application of water for irrigation of plants other than edible crops for personal consumption shall be eliminated.

(B) Exception: The City in enforcing the above provisions may use reasonable discretion in its interpretation in order to affect the water conservation purpose and reasonableness in application of the restrictions. Exception to these provisions may be granted by the Public Works Department when a written application for an exception is filed with the Public Works Department and the Department makes written determinations that compliance with these regulations in a particular circumstance causes a severe hardship that is unique and not common to other water customers, and would be significantly injurious to public health, safety, public economic welfare, or would by its implementation precludes the reasonable ability to enjoy the functionality of the premises. The burden of proof that enforcement of the provisions would cause severe hardships upon the applicants, and demonstration that a situation is unique and significantly injurious to the public interests is upon the applicant. Issues of convenience for economic efficiencies shall not constitute cause for exceptions hereunder. The Department in granting the exceptions may make such conditions as it deems necessary to maximize water conservation. Examples include but are not limited to; allowing a playfield to be watered on days when it is not normally used, preserving significant wildlife habitat, and accommodations for special public events, etc.

(C) Food for personal consumption: Watering of plants by drip irrigation that is grown as food for personal consumption (not for medicinal use) shall always be allowed to be watered on any day of the week between the hours of 7:00 p.m. to 10:00 a.m.

(D) Household Gray Water: Up to 100 gallons per household per parcel per day of reused domestic water from showers, washing, etc. "Gray Water" may be reutilized for outdoor watering, subject to applicable health and safety regulations.

(E) Importation of Water: Except as permitted elsewhere in this section, no water which is obtained from a source other than the City's municipal water system may be used for outdoor watering.

(F) Imported Recycled and Gray Water: Recycled or "gray" water imported from outside of the City may be used for outside watering with no restrictions other than applicable health and safety regulation.

(G) Penalties for Violation of Restrictions: Violation of the provisions of this section shall be an infraction, and fines shall be imposed pursuant to Section 1-9.06(B) of the Madera Municipal Code.

Section 3. Subsection (D) of Section 3, of Chapter 5, of Title V, of the Madera Municipal Code is hereby amended to read as follows:

> The city shall not approve and/or authorize any permit, entitlement, allow a new water service connection, or new utility account utilizing a service connection that does not have a water meter as required by this chapter. The city shall not approve and/or authorize any permit or entitlement, where the existing meter does not meet current standards. The meter must be replaced or improved to meet the current standards at the property owner's expense.

Section 4. Subsection (F) of Section 3, of Chapter 5, of Title V, of the Madera Municipal Code is hereby added to read as follows:

> No more than one meter per dwelling unit shall be installed on any residentially zoned property, except where there are four or more residential units a separate meter for landscaping and common facilities may be installed.

Section 5. If any section, subsection, sentence, clause or phrase of this Ordinance is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this Ordinance. The City Council hereby declares that it would have passed this Ordinance and each section, subsection, sentence, clause or phrase thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses or phrases be declared unconstitutional or void for any other reason.

Section 6. Effective Date. The City Council hereby declares, on the basis of the findings set forth above, that an emergency exists and that this Ordinance is necessary to preserve the public peace, health and safety. Accordingly, this Ordinance is adopted as an urgency ordinance and shall take effect and be in force immediately upon its adoption.

* * * * * * * * * *

ORDINANCE NO._____

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF MADERA AMENDING PORTIONS OF CHAPTER 5, OF TITLE V OF THE MADERA MUNICIPAL CODE RELATING TO WATER SERVICE RESTRICTIONS

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WHEREAS, in adopting this urgency ordinance, the Council finds that it is needed for the immediate preservation of the public peace, health, and safety. This finding is based upon the State of Emergency declared by the Governor for drought conditions, the pending Water Board regulations that will mandate Madera reduce water usage by as much as 32% from 2013 levels, and the need to begin taking steps to meet that reduction in water usage before a regular ordinance can be adopted, all for the benefit of the community in addressing the drought, and as further supported by the preceding findings.

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Level A

When the City Council by resolution determines it is warranted that additional water restrictions are necessary to reduce water consumption by limited means, the following restrictions shall apply:

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Level C

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Level E

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(B) Exception: The City in enforcing the above provisions may use reasonable discretion in its interpretation in order to affect the water conservation purpose and reasonableness in application of the restrictions. Exception to these provisions may be granted by the Public Works Department when a written application for an exception is filed with the Public Works Department and the Department makes written determinations that compliance with these regulations in a particular circumstance causes a severe hardship that is unique and not common to other water customers, and would be significantly injurious to public health, safety, public economic welfare, or would by its implementation precludes the reasonable ability to enjoy the functionality of the premises. The burden of proof that enforcement of the provisions would cause severe hardships upon the applicants, and demonstration that a situation is unique and significantly injurious to the public interests is upon the applicant. Issues of convenience for economic efficiencies shall not constitute cause for exceptions hereunder. The Department in granting the exceptions may make such conditions as it deems necessary to maximize water conservation. Examples include but are not limited to; allowing a playfield to be watered on days when it is not normally used, preserving significant wildlife habitat, and accommodations for special public events, etc.

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(F) Imported Recycled and Gray Water: Recycled or "gray" water imported from outside of the City may be used for outside watering with no restrictions other than applicable health and safety regulation.

(G) Penalties for Violation of Restrictions: Violation of the provisions of this section shall be an infraction, and fines shall be imposed pursuant to Section 1-9.06(B) of the Madera Municipal Code.

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Section 4. Subsection (F) of Section 3, of Chapter 5, of Title V, of the Madera Municipal Code is hereby added to read as follows:

> No more than one meter per dwelling unit shall be installed on any residentially zoned property, except where there are four or more residential units a separate meter for landscaping and common facilities may be installed.

Section 5. If any section, subsection, sentence, clause or phrase of this Ordinance is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this Ordinance. The City Council hereby declares that it would have passed this Ordinance and each section, subsection, sentence, clause or phrase thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses or phrases be declared unconstitutional or void for any other reason.

Section 6. Effective Date. This ordinance shall be effective and of full force and effect at 12:01 a.m. on the 31st day after its passage.

* * * * * * * * * *

RESOLUTION NO. ____
A RESOLUTION OF THE COUNCIL OF THE CITY OF MADERA, CALIFORNIA, ENACTING LEVEL C DROUGHT WATER RESTRICTIONS

WHEREAS, the Governor of the State of California has declared a State of Emergency to exist throughout the State of California due to severe drought conditions.

WHEREAS, on April 1, 2015, the Governor issued Executive Order B-29-15, which directed the State Water Resources Control Board (Water Board), to impose restrictions to achieve a statewide 25% reduction in potable urban water usage through February 28, 2016.

WHEREAS, these restrictions will require water suppliers to California's cities and towns to reduce usage by 25% as compared to the amount used in 2013.

WHEREAS, on April 7, 2015, the Water Board issued a Draft Regulatory Framework, which could require the City of Madera to reduce water usage by 32%.

WHEREAS, section 5-5.13 provides for the City Council to determine and enact a level of water restrictions that is needed to provide additional conservation measures to address the severity of the situations and achieve desired water conservation for the City, and

WHEREAS, the City Council did consider recommendations to enact level C water restriction levels at its regular meeting on May 20, 2015, and determined level C water restrictions to be necessary for conservation of the City's water.

NOW THEREFORE, THE CITY COUNCIL OF THE CITY OF MADERA HEREBY finds orders and resolves as follows:

1 . The above recitals are true and correct.

2.Pursuant to Section 5-5.13 of the City of Madera Municipal Code, Drought water Restriction Level C is hereby enacted.

3. This resolution is effective immediately.

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CITY OF MADERA
DEPARTMENT OF PUBLIC WORKS
AMENDMENT TO URBAN WATER MANAGEMENT PLAN

TITLED

WATER SHORTAGE CONTINGENCY PLAN

a Component of the City of Madera Urban Water Management Plan

CITY OF MADERA
205 West 4th Street
Madera, CA 93637
Phone: (209) 661-5466
FAX: (209) 661-0760

Prepared by:

David L. Chumley, Director of Public Works
Al Holguin, Water Specialist (Contact Person)

ADOPTED BY RESOLUTION NUMBER 95-52
April 5, 1995

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SECTIONS

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DROUGHT STAGES

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SECTION 1 COORDINATED PLANNING

California Water Code Section 10620 (d) (2) : Each urban water supplier shall coordinate the preparation of its urban shortage contingency plan with other urban water suppliers and public agencies in the area, to the extent practicable.

1.1 WATER SOURCE

All City of Madera water supply is from groundwater wells. The same water strata is shared in common with other special districts and agricultural interests. These districts serve less than 3,000 customers and are not required to prepare a Water Shortage Contingency Plan. Copies of the City Plan will be made available to these special districts.

1.2 DISASTER PLANNING

The City of Madera Water Shortage Contingency Plan will be provided to the Madera County Office of Emergency Services for their information. Through a correlated effort between the City and County, the City Plan may become a part of the Madera County Disaster Plan.

1.3 CITY OF MADERA WATER SHORTAGE COORDINATION

The City Water Shortage Response Team is chaired by the Water Division Supervisor. The team includes representatives from Engineering, Fire, Building, Parks and Administration. The team met and reviewed the Draft Water Shortage Contingency Plan prior to presentation to City Council. During water shortages stages 1, or 2, the team will meet at the beginning of the heavy pumping season and as often as necessary thereafter. In the more critical stages of 3, or 4, the team will meet as needed to handle changing conditions.

1.4 PUBLIC MEETINGS

On April 5, 1995 a Public Meeting was held on the development of this Water Shortage Contingency Plan. City Staff proposed water usage limitations for each water shortage stage. The final version of this Plan was adopted by the Madera City Council on April 5, 1995.

SECTION 2 PAST, CURRENT AND PROJECTED WATER USE

California Water Code Section 10631 (e) (1) : Past, current and projected water use and to the extent records are available, a breakdown of those uses on the basis of residential single family, residential multifamily, industrial, commercial, governmental and agricultural use.

2.1 WATER USE HISTORY

The Historical Water Use Data in Table 1 was provided by the City of Madera Water Division.

TABLE 1 HISTORICAL WATER USE DATA

FISCAL YEAR	BILLION GALLONS
1989/1990	3.395
1990/1991	3.101
1991/1992	3.126
1992/1993	3.053
1993/1994	3.528

2.2 PROJECTED WATER USE

The Projected Water Use Table 2 was created by using a five year moving average based upon past water use shown in Table 1 . This approach compensates for the summertime temperature variations which are experienced from year to year. Those years with extreme 100+ degree temperatures for long periods of time, particularly in early Spring and/or late Fall will result in significant increases in water usage. Unusually cool summers will result in much lower annual statistics. The following are projections in billion gallons per year:

TABLE 2 PROJECTED WATER USE

FISCAL YEAR		
1993/1994	3.528	(Actual)
1994/1995	3.209	(Projected)
1995/1996	3.203	(Projected)
1996/1997	3.223	(Projected)
1997/1998	3.243	(Projected)
1998/1999	3.281	(Projected)

2.3 WATER CUSTOMER CATEGORIES

Water connections depicted in Table 3 are based upon June 30, 1994 data. The City of Madera historically required installation of meters only if customers were considered to be large volume users. Effective January 1, 1992 all new services were required to be equipped with meters.

TABLE 3 CUSTOMER TYPES, FLAT RATE AND METERED CONNECTIONS

Customer Type	Flat Rate	Metered	Total
Residential (Single & Multiple Families)	7, 805	28	7, 833
Industrial	30	15	45
Commercial	685	130	815
Governmental	60	17	77
Total	8, 580	190	*8, 770

* Does not include City facilities such as Parks, Airport, Buildings, Landscaped areas, etc.

SECTION 3 WORST CASE WATER SUPPLY AVAILABILITY FOR FY 94/95 THROUGH 97/98

California Water Code Section 10631 (e) (2) : An estimate of the minimum water supply available at the end of 12,24 and 36 months, assuming the worst case water supply shortages.

3.1 WATER SUPPLY SOURCE

The City of Madera's current water supply is provided by 11 groundwater wells with a maximum pumping capacity of 1,098,780 gallons per hour. These wells are strategically located to maintain pressure levels and to provide adequate fire flows. They also provide backup capability for one another during P.G.E. outage, mechanical failure or other downtime.

In addition, well #26 at the airport is capable of pumping 108,000 gallons per hour. This flow is mainly for emergency fire flow purposes at the Airport Business Park. The well is to far from the majority of the City to benefit routine daily consumption needs.

3.2 CURRENT AND FUTURE AVAILABLE WATER SUPPLY

Table 4, (page 5) shows the 1993/1994 maximum gallons per hour (G.P.H.) available to be 1,110,840. The estimated peak G.P.H. pumped was 1,002,420 . This represents a minimal estimated peak reserve pumping capacity of 9.76%. "Worst Case" water supply situations are estimated for each of the next four years.

TABLE 4

ESTIMATED WORST CASE WATER SUPPLY

	F.Y. 93/94	F.Y. 94/95	F.Y. 95/96	F.Y. 96/97	F.Y. 97/98
	ACTUAL	**ACTUAL**	PROJECTED	PROJECTED	PROJECTED
WELL #	**G.P.M. (1)**	**G.P.M. (1)**	**G.P.M.**	**G.P.M. (2)**	**G.P.M.**
15	2, 112	1, 915	1, 915	1, 723	1, 723
16	N/A	1, 150	1, 150	1, 035	1, 035
17	1, 323	1, 178	1, 178	1, 061	1, 061
18	1, 818	1, 718	1, 718	1, 547	1, 547
20	**1, 807**	1, 807	1, 807	1, 627	1, 627
21	1, 546	1, 326	1, 326	1, 194	1, 194
22	2, 394	2, 316	2, 316	2, 085	2, 085
23	2, 046	1, 856	1, 856	1, 671	1, 671
24	1, 988	**1, 400**	1, 400	1, 260	1, 260
25	1, 980	1, 797	1, 797	1, 618	1, 618
26	FIRE FLOW WATER WELL AT AIRPORT (3)				
28	1, 500	1, 850	1, 850	1, 665	1, 665
29	N/A	N/A	1, 300	1, 170	1, 170
30	N/A	N/A	2, 000	1, 800	1, 800
MAX. G.P.M.					
AVAILABLE	18, 514	18, 313	21, 613	19, 456	19, 456
MAX G.P.H.					
AVAILABLE	**1, 110, 840**	**1, 098, 780**	**1, 296, 780**	**1, 167, 360**	**1, 167, 360**
MAX. G.P.D.					
AVAILABLE	26, 660, 160	26, 370, 720	31, 122, 720	28, 016, 640	28, 016, 640
ESTIMATED					
PEAK G.P.H.					
PUMPED	**1, 002, 420**	**1, 014, 780**	**1, 055, 371 (4)**	**1, 097, 585 (4)**	**1, 141, 488 (4)**
PEAK G.P.D.					
PUMPED	16, 277, 000	17, 860, 000	18, 574, 400 (4)	19, 317, 376 (4)	20, 090, 071 (4)
ESTIMATED	**9. 76 % (5)**	**7. 64 % (6)**	**18. 62 %**	**5. 98 %**	**2. 22 %**
PEAK	**1, 807 G.P.M.**	**1, 400 G.P.M.**	**4, 024 G.P.M.**	**1, 163 G.P.M.**	**432 G.P.M.**
RESERVE	**108,420 G.P.H.**	**84,000 G.P.H.**	**241, 440 G.P.H.**	**69, 780 G.P.H.**	**25, 920 G.P.H.**

REVISED 4/14/95

1) Based on Annual P.G.E. water flow test results.
2) The Projected 1996/97 "Worst Case" is based on a 10% pumping efficiency loss. This would occur if pumps in each well had to be lowered due to a declining water table and/or bowls loose efficiency due to wear.
3) Well #26 at the airport is mainly for emergency fire flow purposes only. It is capable of pumping 1,800 gallons per minute.
4) Projected gallons used per hour/day were increased by 4%.
5) Well #20 was off and represented 9.76% of total available capacity on the peak water use day of the year. This critical situation lasted for approximately two hours on that day (See Table 5, page 6). If it had been needed, there would have been 0% reserve.
6) Well #24 was off and represented 7.64% of total available pumping capacity on the peak water use day of the year. This critical situation lasted for approximately 4 hours on that day (See Table 6, page 7). If it had been needed, there would been 0% reserve.

TABLE 5

CITY OF MADERA
HOURLY WATER WELL USE
PEAK DAY FOR F.Y. 1993/94
JULY 14, 1993 WEDNESDAY (16,277,000 GALLONS PUMPED)

WELL	(a.m.)												(p.m.)										PEAK HOURS	
	1	2	3	4	5	6	7	8	9	10	11	noon	1	2	3	4	5	6	7	8	9	10	*11*	*midnight*
#15	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	*ON*	*ON*
#16	OFF FOR REPAIR																							
#17	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*
#18	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	*ON*	*ON*
#20	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	**OFF**	**OFF**
#21	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	*ON*	*ON*
#22	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	*ON*	*ON*
#23	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	ON	ON	ON	*ON*	*ON*
#24	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*
#25	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*
#26	FIRE FLOW WATER WELL AT AIRPORT																							
#27	OFF LINE DUE TO HIGH EDB LEVELS																							
#28	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*

TABLE 6

CITY OF MADERA
HOURLY WATER WELL USE
PEAK DAY FOR F.Y. 1994/95
JULY 14, 1994 WEDNESDAY (17,860,000 GALLONS PUMPED)

WELL	(a.m.)											noon	(p.m.)							*PEAK HOURS*				midnight
	1	2	3	4	5	6	7	8	9	10	11		1	2	3	4	5	6	7	*8*	*9*	*10*	*11*	
#15	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	*ON*	*ON*	*ON*	*ON*	ON
#16	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*	*ON*	*ON*	ON
#17	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*	*ON*	*ON*	ON
#18	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	*ON*	*ON*	*ON*	*ON*	OFF
#20	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	*ON*	*ON*	*ON*	*ON*	ON
#21	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*	*ON*	*ON*	ON
#22	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	ON	*ON*	*ON*	*ON*	*ON*	ON
#23	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*	*ON*	*ON*	ON
#24	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
#25	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*	*ON*	*ON*	ON
#26	**FIRE FLOW WATER WELL AT AIRPORT**																							
#27	**OFF LINE DUE TO HIGH EDB LEVELS**																							
#28	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	*ON*	*ON*	*ON*	*ON*	ON

SECTION 4 STAGES OF ACTION

California Water Code Section 10631 (e) (3): Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage.

4.1 WATER PURVEYOR RESPONSIBILITIES

The City of Madera has a legal responsibility to provide potable water to the community which complies with all health and safety standards. In order to minimize the social and economic impact of water shortages, the city will manage water supplies prudently. This plan is designed to provide a minimum of 50 percent of normal supply during a critical or extended water shortage. Triggering levels are established to ensure that water use reduction goals are achieved. Deficit reduction objectives are shown in Drought Stages 1, 2, 3 and 4. (Pages 10-14)

4.2 WATER USE REDUCTION TRIGGERS

The City's only water source is groundwater. Rationing stages may be triggered by steadily decreasing standing groundwater levels, drier than normal weather conditions, or both. The City's Drought Stage Initiating Conditions are shown in Drought Stages 1, 2, 3 and 4. (Pages 10-14)

SECTION 5 MANDATORY PROHIBITIONS ON WATER USE

California Water Code Section 10631 (e) (4) : Mandatory provisions to reduce water use which include prohibitions against specific wasteful practices, such as gutter flooding.

The City has previously adopted "No Water Waste Regulations" which are contained in the Madera Municipal Code, Title 5, Chapter 5. Some modifications to these regulations will be required by the City Council for Stages #3, and #4 . Required consumer actions are shown in Drought Stages 1, 2, 3 and 4. (Pages 10-14)

SECTION 6 CONSUMPTION LIMITS

California Water Code Section 10631 (e) (5) : Consumption limits in the most restrictive stages. Each urban water supplier may use any type of consumption limit in its water shortage contingency plan that would reduce water use and is appropriate for its area. Examples of consumption limits that may be used include, but are not limited to, percentage reductions in water allotments, per capita allocations, an increasing block rate schedule for high usage of water with incentives for conservation, or specific uses.

The majority of water services in the City of Madera are not metered. Large Commercial and Industrial users are metered. Consumption limits are shown in Drought Stages 1, 2, 3 and 4 under Public Agency Actions. (Pages 10-14)

SECTION 7 PENALTIES OR CHARGES FOR EXCESSIVE USE

California Water Code Section 10631 (e)(6) Penalties for excessive use.

The City of Madera Penalties For Non-Compliance of Water Use Regulations are shown in Drought Stages 1, 2, 3 and 4. (Pages 10-14)

SECTION 8 ANALYSIS OF REVENUE AND EXPENDITURE IMPACTS

California Water Code Section 10631 (e) (7) : An analysis of the impacts of the plan on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

Drought Stages 1, 2, 3 and 4 provide information on projected revenue impacts. Existing Water Revenues will cover expenditures for Stages #1 and #2. Water User rates are reviewed annually to determine need for increases. When a Water Shortage Emergency is declared for Stages #3, or #4, Water Revenues will be reviewed and adjusted if necessary.

SECTION 9 WATER USE MONITORING PROCEDURES

California Water Code Section 10631 (e) (9) : A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency plan.

All of the City of Madera water wells are linked to a telemetry monitoring system. This system shows the number of gallons which are being pumped. These figures are read and recorded on a daily basis and then this data is transferred to a computer disk for future reference or comparisons. Water-Use Monitoring Procedures are also shown in Drought Stages 1, 2, 3 and 4. (Pages 10 - 14)

STAGE #1 EXISTING CONDITIONS

DROUGHT STAGE INITIATING CONDITIONS

Continued decrease of water table due to weather conditions and overdraft pumping.

DEFICIT REDUCTION OBJECTIVE

Limit the additional volume of water consumed to the percentage of annual population increase.

WATER USE MONITORING PROCEDURES

In Drought Stage #1, water production figures are recorded daily and totals are incorporated into the City of Madera Water Production report.

PUBLIC AGENCY ACTIONS AND PROJECTED EXPENDITURES

1. Public Works Department initiates annual water conservation program with two Water Patrol personal enforcing regulations 80 hours per week from April 1st to October 31st. **(COST $14,065)**
2. Voluntary water conservation measures are requested.
3. Prepare and mail Annual Water Use Regulations to all customers. **(COST $2,500)**
4. Check ground water levels quarterly.
5. **PROJECTED TOTAL COST ($16,565)**

REQUIRED CONSUMER ACTIONS

1. Outside irrigation limited to 3 days per week.
2. No hosing of paved surfaces.
3. No irrigation between 11 a.m. and 7 p.m.
4. No water is allowed to run into street or gutter.
5. Water leaks must be repaired within 5 days of citation.
6. Evaporative coolers must be equipped with water re-circulating devices.
7. No washing down of buildings other than for painting or other maintenance.
8. No continuous flow for recreational purposes
9. Require new commercial car washes to re-circulate their water.

PENALTIES FOR NON COMPLIANCE

VIOLATION #1.	Written warning issued.
VIOLATION #2.	$ 15.00 surcharge on next water bill.
VIOLATION #3.	$ 30.00 surcharge on next water bill.
VIOLATION #4.	$ 45.00 surcharge on next water bill and installation of a water meter at customers expense, and/or discontinuance of water service.

STAGE #2 POTENTIAL MODERATE SHORTAGE

DROUGHT STAGE INITIATING CONDITIONS

Weather forecasts predict a continuing trend of drier than normal conditions with a further deterioration of groundwater levels.

DEFICIT REDUCTION OBJECTIVE

Decrease water use by 5% to 10%.

WATER USE MONITORING PROCEDURES

Water production figures are recorded daily, totals are incorporated into the City of Madera Water Production report and daily production figures are reported to the Water Supervisor. The supervisor will compare the weekly production figure to the amount pumped during Stage #1 conditions. The targeted weekly reduction goal of 5% to 10% will be verified.

PUBLIC AGENCY ACTIONS AND PROJECTED EXPENDITURES

1. Publish and mail Annual Water Use Regulations. **(COST $2,500)**
2. Public Works Department initiates its annual water conservation program.
3. Add a third Water Patrol person to increase enforcement of regulations to 120 hours per week. **(COST $21,100)**
4. Increase public information campaign by explaining five stage rationing plan and forecasting future actions. To be distributed by mail to all customers. **(COST $2,500)**
5. Work with news media to publicize water saving recommendations and daily consumption figures.
6. Disseminate water saving technical information to specific customer types. **(COST $500)**
7. Recruit and train volunteers for speakers bureau.
8. Distribute water conservation kits to all customers which include shower head/faucet restrictors, toilet flush tank displacement devices and leak detection tablets. **(COST $5,000)**
9. Check ground water levels monthly.
10. **PROJECTED TOTAL (COST $31,600)**

REQUIRED CONSUMER ACTIONS

Voluntarily reduce water consumption by stricter adherence to Water Use Regulations.

PENALTIES

1. Same as Stage One.
2. Follow up letter after the 2nd violation.
3. Educational visit and warning after the 3rd violation.
4. Staff contact with water customer to resolve violation concerns and shut water service off, if necessary, with a reconnecting fee of $25.00 after the 4th violation.

STAGE #3 SERIOUS SHORTAGE

DROUGHT STAGE INITIATING CONDITIONS

Weather forecasts predict a continuing trend of drier than normal conditions. Standing ground water level has decreased to the point where City wells are in jeopardy of breaking suction.

DEFICIT REDUCTION OBJECTIVE

Decrease water use by 10% to 35%

WATER USE MONITORING PROCEDURES

In Drought Stage #3, water production figures are recorded daily, totals are incorporated into the City of Madera Water Production report and daily production figures are reported to the Water Supervisor and Public Works Director. The supervisor will compare the weekly production figure to the amount pumped during Stage #1 conditions. The targeted weekly reduction goal of 10% to 35% will be verified. Weekly Water User reports will be forwarded to the Public Works Director, the Water Shortage Response team, City Administrator and the Madera City Council.

PUBLIC AGENCY ACTIONS AND PROJECTED EXPENDITURES

1. Same as Drought Stage #2, items 1 through 8. **(COST $ 26,600)**
2. Implement the City of Madera Resolution which Declares a Water Shortage Emergency.
3. Review Water Revenues and adjust, if necessary, to cover increased P.G.E. and other costs.
4. Conduct public information campaign with regular media stories, public service announcements, paid announcements and direct mail to publicize the severity of the drought conditions. **(COST $5,000)**
5. Hire a part-time employee to coordinate the Water Conservation Program. Duties will include educating the public by presenting educational programs to schools, service clubs, large water users and other groups. **(COST $4,000)**
6. Distribute landscape conservation, drought tolerant garden and efficient irrigation information.
7. Publicize Stage 4 reduction requirements which will become necessary if conditions worsen.
8. Eliminate water use for fire hydrant flushing other than absolutely necessary for maintenance or fire flow requirements.
9. Discontinue irrigation of selected turf areas at parks and school sites which would not create hazards to users.
10. Require Ultra Low Flow (ULF) toilets, water efficient shower heads and faucet aerators prior to sale of any property.
11. Require hot water re-circulating systems or on demand water heaters in new construction.
12. Initiate a high visibility ULF toilet replacement program to encourage the general public to take similar action. i.e.: Homes of elected officials/City Staff, parks restrooms, City Hall and other facilities. **(COST $5,000)**
13. Lower the bowls, if necessary, on City Water Wells. **(COST FOR 5 WELLS $25,000)**
14. Check groundwater levels weekly.
15. **<u>PROJECTED TOTAL COST ($65,600)</u>**

Continued on page 13

-continued- STAGE 3 SERIOUS SHORTAGE

REQUIRED CONSUMER ACTIONS

1. Stricter adherence to Water Use Regulations and outside watering is limited to two days a week.
2. Water served to restaurant customers only upon request for conservation and public awareness of drought conditions.
3. Existing commercial car washes required to install water re-circulating equipment.

PENALTIES

Same as Stage #2 except:
VIOLATION #2. $30.00 surcharge on next water bill and educational visit from City staff.
VIOLATION #3. $45.00 surcharge on next water bill; possible installation of a water meter, flow restriction device on service connection or discontinuance of service if situation is not resolved.

STAGE #4 CRITICAL EMERGENCY SHORTAGE

DROUGHT STAGE INITIATING CONDITIONS

Customer demands and system pressure requirements cannot be met.

DEFICIT REDUCTION OBJECTIVE

Decrease water use by 35% to 50%.

WATER USE MONITORING PROCEDURES

During Drought Stage #4 production figures will be reported to the supervisor twice daily and to the Public Works Director and Water Shortage Response team on a daily basis to ensure that the reduction goal of 35% to 50% is being met. Reports will also be provided to the City Administrator and City Council.

PUBLIC AGENCY ACTIONS AND PROJECTED EXPENDITURES

1. Same as Drought Stage #3. **(COST $ 65,000)**
2. Implement the City of Madera Water Quality Emergency Notification Plan. This may include boil water notices and chlorinating of the distribution system due to low pressure. **(COST $10,000)**
3. Moratorium on new water services until shortage ends.
4. Discontinue irrigation of park and school district athletic fields.
5. Rate increases to finance system improvements.
6. Require all homes and businesses to install low flow shower heads and toilet flush tank displacement devices and repair all leaks. Employ seasonal compliance officer for random inspections. **(COST $7,000)**
7. Check ground water levels weekly.
8. **PROJECTED TOTAL COST ($82,600)**

REQUIRED CONSUMER ACTIONS

1. Install low flow shower heads and toilet flush tank displacement devices.
2. Outside watering limited to one day per week.

PENALTIES

Same as Stage #3 and City Council considers increasing surcharges for violation of Water use regulations.

SECTION 10 IMPLEMENTATION OF THE PLAN

California Water Code Section 10631 (e) (8) : A draft water shortage contingency resolution or ordinance to carry out the urban water shortage contingency plan.

The Madera City Council has adopted this Water Shortage Contingency Plan by Resolution Number: 95-52.

SECTION 11 PLAN ADOPTION STANDARDS

California Water Code Section 10621 (a) : Each urban water supplier shall, not later than January 31, 1992, prepare, adopt, and submit to department an amendment to its urban water management plan which meets the requirements of subdivision (e) of Section 10631.

The City of Madera prepared this Water Shortage Contingency Plan during February, 1995. The Plan was adopted on April 5, 1995. The Plan includes all the information necessary to meet the requirements of subdivision (e) of California Water Code Section 10631.

California Water Code Section 10642 : Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to California Water Code Section 6066 of the Government Code. A privately owned water supplier shall provide and equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

A public meeting date and location of copies of the draft Water Shortage Contingency Plan for public review were properly noticed in the Madera Tribune newspaper. Copies of the draft plan were available for public review at the City Department of Public Works, City Clerk's office and the Public Library. The City held a public meeting on April 5, 1995 on the Water Shortage Contingency Plan.

ATTACHMENT "A" RELEVANT SECTIONS OF THE CALIFORNIA GOVERNMENT & CALIFORNIA WATER CODES

Sections of the California Government Code

Section 6061. Publication of notice pursuant to this section shall be for one time.

Section 6066. Publication of notice pursuant to this section shall be once a week for two successive weeks. Two public notices in a newspaper published once a week or more often with at least five days intervening between respective publication dates, not counting such publication dates, are sufficient. The period of notification commences upon the first day of publication and terminates at the end of the fourteenth day including therein the first day.

Sections of the California Water Code
Chapter 3 - Water Shortage Emergencies

Section 350. The governing body of a distributor of a public water supply, whether publicly or privately owned and including a mutual water company, may declare a water shortage emergency condition to prevail within the area served by such distributor wherever it finds and determines that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply of the distributor to the extent that there would be insufficient water for human consumption, sanitation, and fire protection.

Section 351. Excepting in event of a breakage or failure of a dam, pump, pipe line or conduit causing an immediate emergency, the declaration shall be made only after a public hearing at which consumers of such water supply shall have an opportunity to be heard to protest against the declaration and to present their respective needs to said governing board.

Section 352. Notice of the time and place of hearings shall be published pursuant to Section 6061 of the Government Code at least seven days prior to the date of hearing in a newspaper printed, published, and circulated within the area in which the water supply is distributed, or if there is no such newspaper, in any newspaper printed, published, and circulated in the county in which the area is located.

Section 353. When the governing body has so determined and declared the existence of an emergency condition of water shortage within its service area, it shall thereupon adopt such regulations and restrictions on the delivery of water and the consumption within said area of water supplied for public use as will in the sound discretion of such governing body conserve the water supply for the greatest public benefit with particular regard to domestic use, sanitation, and fire protection.

Section 354. After allocating and setting aside the amount of water which in the opinion of the governing body will be necessary to supply water needed for domestic use, sanitation, and fire protection, the regulations may establish priorities in the use of water for other purposes and provide for the allocation, distribution, and delivery of water for such other purposes, without discrimination between consumers using water for the same purpose or purposes.

-continued-

Sections of the California Water Code
Chapter 3 - Water Shortage Emergencies
-continued-

Section 355. The regulations and restrictions shall thereafter be and remain in full force and effect during the period of the emergency and until the supply of water available for distribution within such area has been replenished or augmented.

Section 356. The regulations and restrictions may include the right to deny such applications for new or additional service connections, and provisions for their enforcement by discontinuing service to consumers willfully violating the regulations and restrictions.

Section 357. If the regulations and restrictions on delivery and consumption of water adopted pursuant to this chapter conflicts with any law establishing the rights of individual consumers to receive either specific of proportionate amounts to the water supply available for distribution within service area, the regulations and restrictions adopted pursuant to this chapter shall prevail over the provisions of such laws relating to water rights for the duration of the period of emergency; provided, however, that any distributor of water which is subject to regulation by the State Utilities Commission shall before making such regulations and restrictions effective secure the approval thereof of the Public Utilities Commission.

Section 358. Nothing in this chapter shall be constructed to prohibit or prevent review by any court or competent jurisdiction of any finding or determination by a governing board of the existence of an emergency or of regulations or restrictions adopted by such board, pursuant to this chapter, on the ground that any such action is fraudulent, arbitrary, or capricious.

ATTACHMENT "B" "SAMPLE" RESOLUTION TO DECLARE A WATER SHORTAGE EMERGENCY

***NOW, THEREFORE, BE IT RESOLVED** by the City Council of the City of Madera as follows:*

***PURSUANT** **to California Water Code Section 350 et seq.**, the Council has conducted duly noticed public hearings to establish the criteria under which a water shortage emergency may be declared.*

***WHEREAS**, the Council finds, determines and declares as follows:*

(a) Weather forecasts predict a continuing trend of warmer, drier than normal conditions.

(b) Ground Water depths have decreased to the level that a significant number of the City wells are breaking suction.

(c) Impending low system water pressure threatens fire protection, health, and sanitation.

(d) For the foregoing reasons, when the amount of water supply available to the City for service to customers falls below Stage #2 triggering levels established in Section #4 of the Water Shortage Contingency Plan, the City has determined that the water supply may not be adequate to meet the ordinary demands and requirements for fire protection, consumers, and sanitation and this condition is likely to exist until precipitation an inflow dramatically increase or the water wells are lowered to deeper depths.

***NOW, THEREFORE, BE IT RESOLVED** that the City Council of the City of Madera hereby directs the City Administrator to find, determine, declare and conclude that a water shortage emergency exists that threatens the adequacy of water supply for human consumption, sanitation and fire protection requirements, until the City's water supply is deemed adequate. After the declaration of a water shortage emergency, the City Administrator is directed to determine the appropriate Rationing Stage and implement the City's Water Shortage Contingency Plan.*

***FURTHERMORE**, the Council shall periodically conduct proceedings to determine additional restrictions and regulations which may be necessary to safeguard the adequacy of the water supply for domestic, sanitation and fire protection requirements.*

CITY OF MADERA
URBAN WATER MANAGEMENT PLAN

APPENDIX J - WATER RATES

RESOLUTION NO: 15-156

Resolution of the City Council of the City of Madera Establishing Monthly Rates To Be Charged For Water Furnished By the City and Repealing Resolution 10-118 and All Other Resolutions In Conflict Herewith

WHEREAS, the City of Madera previously adopted Resolution 10-118 establishing rates for water furnished by the City for the period between July of 2010 and July of 2015; and

WHEREAS, the City of Madera desired to establish water rates which were based on the actual and projected costs of providing services between July of 2015 and July of 2020; and

WHEREAS, the City Council considered a Cost of Service analysis prepared by Raftelis Financial Consultants, a firm with expertise in the analysis of municipal water and sewer utility costs; and

WHEREAS, the Council has caused notices to be sent to all affected customers and property owners regarding the proposal to amend the rates for water use at least 45 days in advance of a noticed public hearing held on July 15, 2015; and

WHEREAS, the Council finds that no majority protest was presented against the proposed rates for water service before or during the public hearing and finds that the proposed rates shall be made effective July 26, 2015.

NOW THEREFORE, THE CITY COUNCIL OF THE CITY OF MADERA HEREBY finds, orders and resolves as follows:

1. The above recitals are true and correct.
2. No majority protest was presented against the proposed rates for water service.
3. The monthly rates to be charged for the use of water furnished by the City, enumerated in Attachment A to this Resolution, are hereby adopted.
4. Resolution 10-118, and all other resolutions in conflict herewith, are hereby repealed.
5. This resolution is effective immediately upon adoption.

* * * * * * *

PASSED AND ADOPTED by the City Council of the City of Madera this 15th day of July, 2015 by the following vote:

AYES: Council Members Poythress, Oliver, Rigby, Bomprezzi, Medellin, Holley, Robinson.

NOES: None.

ABSTENTIONS: None.

ABSENT: None.

APPROVED:

ROBERT L. POYTHRESS, Mayor

ATTEST:

Sonia Alvarez

SONIA ALVAREZ, City Clerk

March 27, 1907

APPROVED AS TO LEGAL FORM:

BRENT RICHARDSON, City Attorney

Resolution Attachment A

City of Madera Water Rates: Fiscal Year 2016-2020

Residential Tiered Rates[1]	Allotment	FYE 2016	FYE 2017	FYE 2018	FYE 2019	FYE 2020
Tier 1	0-10	$1.00	$1.33	$1.63	$1.84	$1.93
Tier 2	11-33	$1.52	$1.90	$2.25	$2.50	$2.60
Tier 3	>33	$2.64	$3.20	$3.69	$4.05	$4.22

Multi-Residential Tiered Rates[1]	Allotment	FYE 2016	FYE 2017	FYE 2018	FYE 2019	FYE 2020
Tier 1	10	$1.06	$1.40	$1.72	$1.93	$2.03
Tier 2	>10	$2.11	$2.53	$2.92	$3.18	$3.32

Non-Residential Rates[1]	FYE 2016	FYE 2017	FYE 2018	FYE 2019	FYE 2020
Uniform Rate	$1.49	$1.87	$2.22	$2.47	$2.58

Total Monthly Fixed Cost by Meter Size[2]	FYE 2016	FYE 2017	FYE 2018	FYE 2019	FYE 2020
5/8"	$9.55	$12.41	$14.89	$16.38	$16.88
3/4"	$10.80	$14.04	$16.84	$18.53	$19.09
1"	$13.30	$17.29	$20.74	$22.82	$23.51
1 1/2"	$19.55	$25.41	$30.49	$33.54	$34.56
2"	$27.05	$35.16	$42.19	$46.41	$47.82
3"	$50.80	$66.04	$79.24	$87.17	$89.81
4"	$85.80	$111.54	$133.84	$147.23	$151.69
6"	$169.55	$220.41	$264.49	$290.94	$299.76
8"	$307.05	$399.16	$478.99	$526.89	$542.86

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1. Rate per CCF of water usage. CCF is hundred cubic feet (748.05 gallons).

2. Monthly charges per account/meter.

Flat Rate Water Charges	Units	FYE 2016	FYE 2017	FYE 2018	FYE 2019	FYE 2020
CAR DLR	WATER SERVICE/BLDG/1000	$7.11	$9.24	$11.09	$12.20	$12.57
CAR SERV	WATER SERVICE/BAYS	$4.75	$6.17	$7.40	$8.14	$8.39
DEPT/RET	WATER SERVICE/BLDG/1000	$7.11	$9.24	$11.09	$12.20	$12.57
GAMES	WATER SERVICE/BLDG/1000	$16.51	$21.46	$25.76	$28.33	$29.18
GRANNY	PRIMARY WITH SECONDARY UNIT	$37.97	$49.36	$59.24	$65.16	$67.12
GROC/MOR	WATER SERVICE/BLDG/1000	$7.11	$9.24	$11.09	$12.20	$12.57
HOSP RM	PER BED WATER USE	$5.93	$7.71	$9.25	$10.17	$10.48
HOSP/CON	WATER SERVICE/BEDS	$5.93	$7.71	$9.25	$10.17	$10.48
HOTEL/W	WATER SERVICE/ROOMS	$7.11	$9.24	$11.09	$12.20	$12.57
HOTEL/WO	WATER SERVICE/ROOMS	$5.93	$7.71	$9.25	$10.17	$10.48
LIB/CHUR	WATER SERVICE/SEAT	$0.26	$0.34	$0.41	$0.45	$0.46
LT MFG	WATER SERVICE/BLDG/1000	$3.81	$4.95	$5.94	$6.54	$6.73
MFR/MULT	MFR MULTI ACCT PER PARCEL	$16.03	$20.84	$25.01	$27.51	$28.33
MFR/SING	MFR SINGLE ACCT PER PARCEL	$16.89	$21.95	$26.34	$28.98	$29.85
OPN AIR	WATER SERVICE/SEAT	$0.16	$0.21	$0.25	$0.28	$0.28
PROF BLD	WATER SERVICE/BLDG/1000	$14.14	$18.39	$22.06	$24.27	$25.00
REST IN	WATER SERVICE/SEAT	$1.47	$1.91	$2.29	$2.52	$2.60
REST OUT	WATER SERVICE/BLDG/1000	$14.14	$18.39	$22.06	$24.27	$25.00
SCHOOLS	WATER SERVICE/STUDENTS	$1.13	$1.47	$1.76	$1.94	$2.00
SFR	MINIMUM WATER RATE	$26.46	$34.39	$41.27	$45.40	$46.76
STRP/MAL	WATER SERVICE/BLDG/1000	$11.78	$15.31	$18.37	$20.21	$20.82
WRHSE	WATER SERVICE/BLDG/1000	$1.00	$1.30	$1.56	$1.72	$1.77

Appendix C

San Joaquin Valley Groundwater Basin
Madera Subbasin

- Groundwater Subbasin Number: 5-22.06
- County: Madera
- Surface Area: 394,000 acres (614 square miles)

Basin Boundaries and Hydrology

The San Joaquin Valley is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern Rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern Lakes.

The Madera subbasin consists of lands overlying the alluvium in Madera County. The subbasin is bounded on the south by the San Joaquin River, on the west by the eastern boundary of the Columbia Canal Service area, on the north by the south boundary of the Chowchilla Subbasin, and on the east by the crystalline bedrock of the Sierra Nevada foothills. Major streams in the area include the San Joaquin and Fresno Rivers. Average annual precipitation is 11 inches throughout the majority of the subbasin and 15 inches in the Sierran foothills

Hydrogeologic Information

The San Joaquin Valley represents the southern portion of the Great Central Valley of California. The San Joaquin Valley is a structural trough up to 200 miles long and 70 miles wide. It is filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains, respectively. Continental deposits shed from the surrounding mountains form an alluvial wedge that thickens from the valley margins toward the axis of the structural trough. This depositional axis is below to slightly west of the series of rivers, lakes, sloughs, and marshes, which mark the current and historic axis of surface drainage in the San Joaquin Valley.

Water Bearing Formations

Hydrogeologic units in the Madera Subbasin consist of unconsolidated deposits of Pleistocene and Holocene age. These deposits are divided into continental deposit of Tertiary and Quaternary age, and continental deposits of Quaternary age. Continental deposits of Quaternary age include older alluvium, lacustrine and marsh deposits and younger alluvium. The continental deposits of Quaternary age crop out over most of the area and yield probably more than 95 percent of the water pumped from wells.

Although younger alluvium and flood-basin deposits yield small quantities of water to wells, the most important aquifer in the area is the older alluvium. It consists mostly of intercalated lenses of clay, silt, sand, and some gravel.

The lacustrine and marsh deposits (which contain the E-clay) do not crop out in the area but occur within the older alluvium and underlie the western portion of the subbasin at depths ranging between 150 and 300 feet (DWR 1981). These deposits restrict the vertical movement of ground water and divide the water-bearing deposits into confined and unconfined aquifers. Continental deposits of Tertiary and Quaternary age include the Ione Formation which outcrops on the Subbasin's eastern margin. This unit may yield small quantities of water to wells but is not an important aquifer.

The estimated average specific yield of this groundwater subbasin is 10.4 percent (based on DWR San Joaquin District internal data and that of Davis 1959).

Restrictive Structures

Groundwater flow is generally southwestward in the eastern part of the subbasin and to the northwest in the southern portion, away from the recharge area along the San Joaquin River. During 1999, a groundwater mound occurred in the northwest portion of the subbasin with accompanying depressions to the north and south, and a large depression in the subbasin's southeast corner (DWR 2000). Based on current and historical groundwater elevation maps, groundwater barriers do not appear to exist in the subbasin.

Groundwater Level Trends

Changes in groundwater levels are based on annual water level measurements by DWR and cooperators. Water level changes were evaluated by quarter township and computed through a custom DWR computer program using geostatistics (kriging). On average, the subbasin water level has declined nearly 40 feet from 1970 through 2000. The period from 1970 through 1978 showed steep declines totaling about 30 feet. The nine-year period from 1978 to 1987 saw stabilization and rebound of about 25 feet, taking the water levels close to where they were in 1970. 1987 through 1996 again showed steep declines, bottoming out in 1996 at about 45 feet below 1970 levels. Water levels rose about 8 feet from 1996 to 2000. Water levels declines have been more severe in the eastern portion of the subbasin from 1980 to the present, but the western subbasin showed the strongest declines before this time period.

Groundwater Storage

Estimations of the total storage capacity of the subbasin and the amount of water in storage as of 1995 were calculated using an estimated specific yield of 10.4 percent and water levels collected by DWR and cooperators. According to these calculations, the total storage capacity of this subbasin is estimated to be 18,500,000 af to a depth of 300 feet and 40,900,000 af to the base of fresh groundwater. These same calculations give an estimate of 12,600,000 af of groundwater to a depth of 300 feet stored in this subbasin as of 1995 (DWR 1995). According to published literature, the amount of stored groundwater in this subbasin as of 1961 is 24,000,000 af to a depth of $\leq$ 1000 feet (Williamson 1989)

Groundwater Budget (Type B)

Although a detailed budget was not available for this subbasin, an estimate of groundwater demand was calculated based on the 1990 normalized year and data on land and water use. A subsequent analysis was done by a DWR water budget spreadsheet to estimate overall applied water demands, agricultural groundwater pumpage, urban pumping demand and other extraction data.

Natural recharge was estimated to be 21,000 af. Artificial recharge and subsurface inflow were not determined. Applied water recharge was calculated to be 404,000 af. Annual urban extraction and annual agricultural extraction were estimated as 15,000 af and 551,000 af, respectively. There were no other extractions, and subsurface outflow was not determined.

Groundwater Quality

Characterization. The majority of this subbasin is generally a calcium-sodium bicarbonate type, with sodium bicarbonate and sodium chloride at the western margin of the subbasin along the San Joaquin River (Mitten 1970). TDS values range from 100 to 6,400 mg/L, with a typical range of 200 to 400 mg/L. The Department of Health Services, which monitors Title 22 water quality standards, reports TDS values in 40 wells ranging from 100 to 400 mg/L, with an average value of 215 mg/L. EC values range from 180 to 600 µmhos/cm, with an average value of 251 µmhos/cm (based on 15 wells).

Impairments. There are localized areas of high hardness, iron, nitrate, and chloride. One well is currently undergoing GAC filtration for the removal of EDB/DBCP (Glos 2001).

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]
Inorganics – Primary	44	0
Radiological	44	0
Nitrates	43	1
Pesticides	46	3
VOCs and SVOCs	45	0
Inorganics – Secondary	44	7

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).

[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.

[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: 40 – 4,750	Average: 750 – 2,000
	Total depths (ft)	
Domestic		
Municipal/Irrigation	Range: 100 - 600	

Active Monitoring Data

Agency	**Parameter**	**Number of wells /measurement frequency**
DWR (incl. Cooperators)	Groundwater levels	378 Semi-annually
Department of Health Services (including cooperators)	Title 22 water quality	127 Varies

Basin Management

Groundwater management:	Discussions taking place between purveyors to create draft AB3030 Plan.
Water agencies	
Public	Gravelly Ford W.D., Madera I.D.; Root Creek W.D.
Private	None

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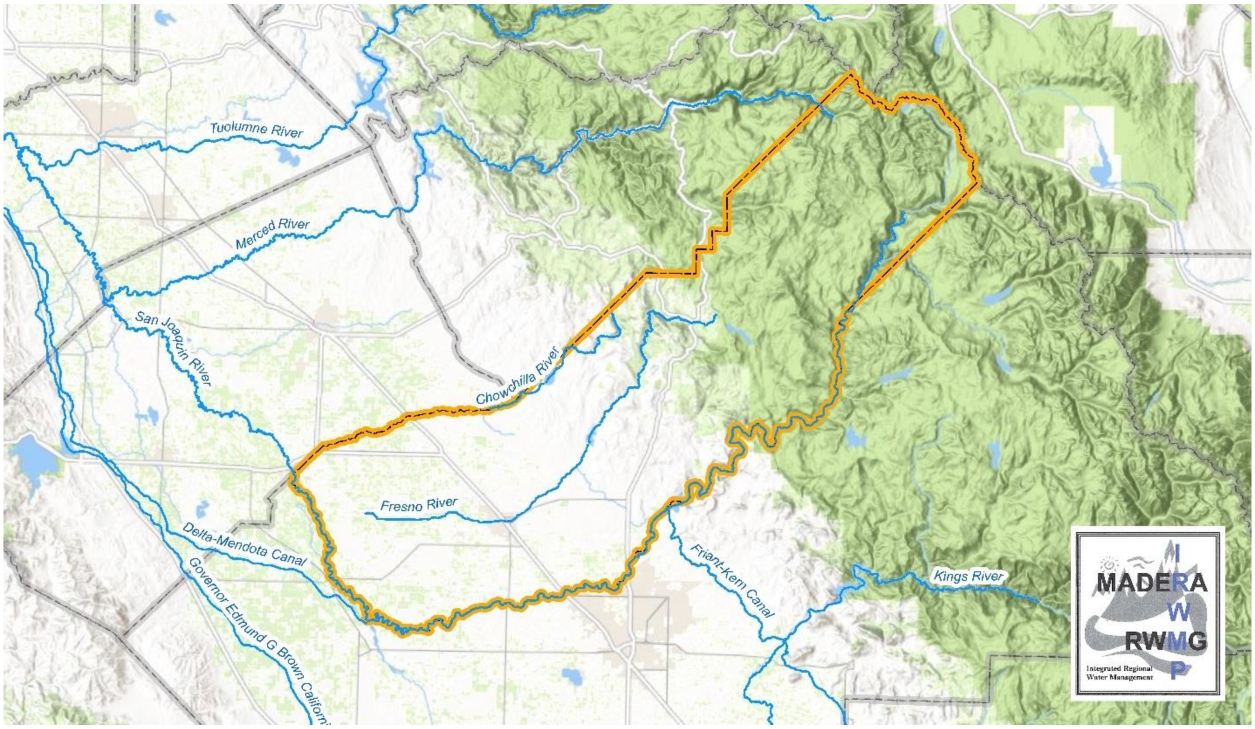
Errata

Changes made to the basin description will be noted here.

Appendix D

MADERA INTEGRATED REGIONAL WATER MANAGEMENT PLAN PROPOSITION 1 UPDATE



MAY 2019

MADERA IRWMP PROPOSITION 1 UPDATED MADERA IRWMP PROPOSITION 1 UPDATE

Prepared for:

Madera Regional Water Management Group.
P. O. Box 1061
Coarsegold, CA 93614
Contact Person: Jeannie Habben

Consultant:

2816 Park Avenue
Merced, CA 95348
Contact: Garth Pecchenino, P.E.
Phone: (661) 616-2600(209) 723-2066

May 2019

Project #180028

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ABBREVIATIONS

µg/L	Micrograms per liter
µmhos/cm	Micromhos per centimeter
µS/cm	Microsiemens per centimeter
AF	acre-feet
AWMP	Agricultural Water Management Plan
BMP	Best Management Practices
CALFED	CALFED Bay Delta Program
CARB	California Air Resources Board
CAS	California Aquifer Susceptibility
CASGEM	California State Groundwater Elevation Monitoring
CCID	Central California Irrigation District
CDEC	California Data Exchange Center
CDPH	California Department of Public Health
CEDEN	California Environmental Data Exchange Network
CEIC	California Environmental Information Clearinghouse
CEQA	California Environmental Quality Act
CERES	California Environmental Resources Evaluation System
CHSC	California Health and Safety Code
CIEA	California Indian Environmental Alliance
CII	commercial, industrial and institutional
CIMIS	California Irrigation Management Information System
CIWQS	California Integrated Water Quality System
CNRA	California National Resources Agency
CSA	County Service Area
CTS	California Tiger Salamander
CV-SALTS	Central Valley Salts Coalition
CVP	Central Valley Project
CWAP	California Water Action Plan
CWC	California Water Code
CWI	California Water Institute
CWP	California Water Plan

CZO	Critical Zone Observatory
DAC	Disadvantaged Community
DACI	Disadvantaged Community Involvement
DACTI	Disadvantaged Community Tribal Involvement
DDW	State Water Resources Control Board, Division of Drinking Water
DFW	Department of Fish and Wildlife
DMM	Demand Management Measures
DWR	Department of Water Resources
EA	Environmental Assessment
EDAC	Extreme Disadvantaged Community
EC	Electrical Conductance
ESA	Economically Stressed
ET	Evapotranspiration
EWMP	Efficient Water Management Practices
GAMA	Groundwater Ambient Monitoring and Assessment
GHG	Greenhouse Gas
GMP	Groundwater Management Plan
GSA	Groundwater Sustainability Act
GSP	Groundwater Sustainability Plan
HTK	Historical Tribe Known
I&M	Inventory and Monitoring
Index	Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
IWRIS	Integrated Water Resource Information System
JPA	Joint Powers Authority
KDSA	Kenneth D. Schmidt and Associates
KRCD	Kings River Conservation District
KREW	Kings River Experimental Watershed
KRFMP	Kings River Fisheries Management Program
KRWA	Kings River Water Association
LAFCO	Local Agency Formation Commissions
mAF	million-acre feet
MCL	Maximum Contaminant Level
MD	Maintenance District
MHI	Median Household Income
MOU	Memorandum of Understanding
MSL	mean sea level
MSR	Municipal Service Review
mya	Million Years Ago
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service

O&M	Operation and Maintenance
POTW	Publicly Owned Treatment Works
RNHA	Regional Housing Needs Allocation
RWMG	Regional Water Management Group
RWQCB	Regional Water Quality Control Board
SFPUD	Sierra Foothills Public Utility District
SGMA	Sustainable Groundwater Management Act
SIEN	Sierra Nevada Network
SJER	San Joaquin Experimental Range
SLDMWA	San Luis & Delta Mendota Water Authority
SNAMP	Sierra Nevada Adaptive Management Project
SNMP	Salt and Nitrate Management Plan
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Recourse Control Board
SWFM	Storm Water Flood Management
SWWG	Sierra Water Workgroup
TAC	Tribal Advisory Committee
TDS	Total Dissolved Solids
TMF	Technical, Managerial and Financial
URA	Under-Represented (or Under – Served) Area
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
VA	Vulnerability Assessment
WDL	Water Data Library
WSJV	Western San Joaquin Valley
WUC	Water Utility Climate
WUCA	Water Utility Climate Alliance
WWTF	Waste Water Treatment Facility

SECTION 1 - EXECUTIVE SUMMARY

The 2018 Madera Regional Water Management Group (RWMG) Integrated Regional Water Management Plan (IRWMP) Update was prepared with significant input from stakeholders in the Madera Region. The executive summary summarizes the content of the 2018 RWMG IRWMP and highlights the modifications to the 2014 IRWMP document. This document builds on the framework of the 2014 IRWMP, as well as local and regional planning efforts.

The 2018 Plan Update focuses on new requirements in the 2016 IRWMP Program Guidelines that will make the Plan and implementation project applications compliant with those Guidelines, and this places the Madera RWMG in a position to qualify projects for funding from the State.

The Madera RWMG formed in 2010 has brought together stakeholders from all areas of Madera County through public outreach. These stakeholders include the County, the cities of Chowchilla and Madera, Special Districts including water districts, irrigation districts, municipal service districts, and conservation districts, Disadvantaged communities (DAC), and Native American Tribal entities for the common goal of providing a defined road map for managing water supply and needs for the future.

There are two distinct areas within the region, the Foothill/Mountain and the Valley Floor. Each has their specific needs and goals. The collaboration between the stakeholders has produced a list of 108 projects which have been reviewed and meet the goals set out in this Proposition 1 Update to the Madera IRWMP.

This supplemental Proposition 1 Update incorporates additional goals to the goals set out in the 2014 Madera IRWMP prepared by Provost and Prichard. These additional goals include:

- **Conservation** – The reduction of energy consumption embedded in water use to reduce greenhouse gas emissions, consideration of California Air Resources Board strategies, and options for carbon sequestration.

- **Improve Flood Control and Protection** – Plan for changes in amount, intensity, timing, quality, and availability of water runoff and recharge.

- **Improve Watershed Management** – Plan for changes in amount, intensity, timing, quality, and availability of water runoff and recharge.

- **Expand Stakeholder Education** – Expand the outreach program through community involvement with DACs and Native American Tribes.

Changes from the 2014 IRWMP include the following:

- Regional Description

- Objectives

- Resource Management Strategies
- Project Review Process
- Plan Performance Monitoring
- Relation to Local Water Planning
- Relation to Local Land Use Planning
- Updated description of climate change vulnerabilities and adaptation strategies.
- Current discussion on the impacts of the drought to the Region.
- Added descriptions on the changes in the regional planning, progress on the groundwater sustainability planning efforts and regional water reliability goals.

Project monitoring is important to track the successes and benefits of a project, ensure it is being operated properly, comply with laws and regulations, and to monitor the Madera IRWMP process and benefits. The Madera IRWMP contains performance measures and monitoring methods to ensure the objectives of the Plan are met. These performance measures will be evaluated to promote adaptive management for climate change and changing conditions. Examples of project-specific monitoring can include monitoring water quality, groundwater depth, flood frequency, and effects a project may have on habitat or particular species. Project-specific monitoring is the responsibility of the agency(s) or group(s) that are implementing a project and expect to directly benefit from the project. These agency(s) are also responsible for developing project monitoring plans.

1.1 - Strategies

Throughout this document there will be discussions on the major points to an IRWM Plan and the updates to be in compliance with the new 2016 Prop 1 guidelines. The specific nature of a strategy is to develop methods or approaches for achieving the goals and objectives of the IRWM Plan as it resolves specific issues in the Region. This will be recognized in various Tables in each specific section to address the revisions as provided in the 2016 update guidelines for Prop 1. The Team and Stakeholders have made every effort to establish targets with deadlines if possible, for each section. A monitoring program is also presented to provide the ability to measure the outcomes of each actionable strategy. This will allow the RWMG to see the progress toward the goals and objectives of the IRWM update.

SECTION 2 - INTRODUCTION

An Integrated Regional Water Management Plan (IRWMP) provides an effective process to address complex water resources challenges within the region. IRWMP's require the support and input from stakeholders to identify major water and related resource management issues to provide potential solutions. These interests need to balance the economic and societal benefits, while maintaining the ecosystem that is important to water resource sustainability. The process of creating an IRWM Plan is locally-driven and includes input from many diverse stakeholders. An IRWM Plan investigates a broad spectrum of water issues including water supply, flood management, water quality, environmental restoration, recreation, land use, environmental justice, stakeholder involvement, and far reaching community and statewide interests. A key difference in IRWMP as compared to other planning documents is that IRWMP integrate multiple water management strategies to solve multiple priority challenges. IRWMP can help attract state and other funding to support regional projects. Millions of dollars have been allocated for IRWM Planning and Projects by the state through Propositions 50 and 84. Grants are ultimately awarded through the California Department of Water Resources after an evaluation where projects are measured against criteria outlined in individual Proposal Solicitation Packages (PSP) or Requests for Proposals (RFP).

The Madera RWMG has been actively involved throughout the IRWM Plan development process while also bringing together various water resource officials from special districts, Cities, and County government since the Region's initial IRWMP approved in 2008. The Madera RWMG has actively been coordinating with local community leaders and non-profit organizations to involve disadvantaged communities (DACs) as part of the IRWMP. The Program is designed to encourage integrated regional strategies for management of water resources by providing funding for projects and programs that support integrated water management. In 2014, the Madera RWMG updated the original Madera IRWMP to conform with Proposition 84 requirements for Safe Drinking Water, Water Quality and Supply, Flood Control, and the River and Coastal Protection Bond Act of 2006.

This update incorporates the requirements set forth in the Proposition 1, the Water Quality, Supply, and Infrastructure Improvement Act of 2014 and brings forth the previous content of the original IRWM plan and the 2014 update to be in compliance with 2016 IRWMP Standards identifies actions to adapt to and mitigate the impacts of climate change and highlights regional accomplishments in IRWM planning.

2.1 - Mission Statement

"The mission of the Regional Water Management Group (RWMG) will facilitate future coordination, collaboration, and communication for comprehensive management of water resources in the Madera Region. Through the mutual understanding among entities in the Madera Region regarding their joint efforts toward Integrated Regional Water management governance, development, planning, funding, and implementation to ensure that clean, adequate and affordable water supplies are available now and, in the future, to sustain this region and its responsible growth."

2.2 - Governance

In 2010, the Madera RWMG was formed through the adoption of a Memorandum of Understanding (MOU) and a set of Bylaws to provide governance of the group. The Madera RWMG has been meeting monthly since its inception. The Madera RWMG rotates the location of the monthly meetings among three (3) locations to allow for easier access for stakeholders throughout the County. The voting members are as follows:

- Chowchilla Water District
- City of Chowchilla
- City of Madera
- Fairmead Community and Friends
- Gravelly Ford Water District
- Madera County
- Madera Irrigation District
- Madera Valley Water Company
- Madera Water District
- North Fork – Mono Rancheria
- Self Help Enterprises
- Southeast Madera County United - Madera Ranchos (SEMCU)

2.3 - Goals

To progress forward on the vision through this document the stakeholders developed a series of regional goals.

1. Protect and enhance the quality of surface and groundwater.
2. Promote community stewardship of our Region's water resources.
3. Provide reliable and sustainable water resources, both surface and groundwater, of sufficient quality and quantity to meet the existing and future needs of the Region.
4. Share those resources to protect and enhance the environmental resources of the Regions watersheds.
5. Develop the necessary projects and operations to manage the flood water in the Region to reduce the impact to people, property and environmental resources.

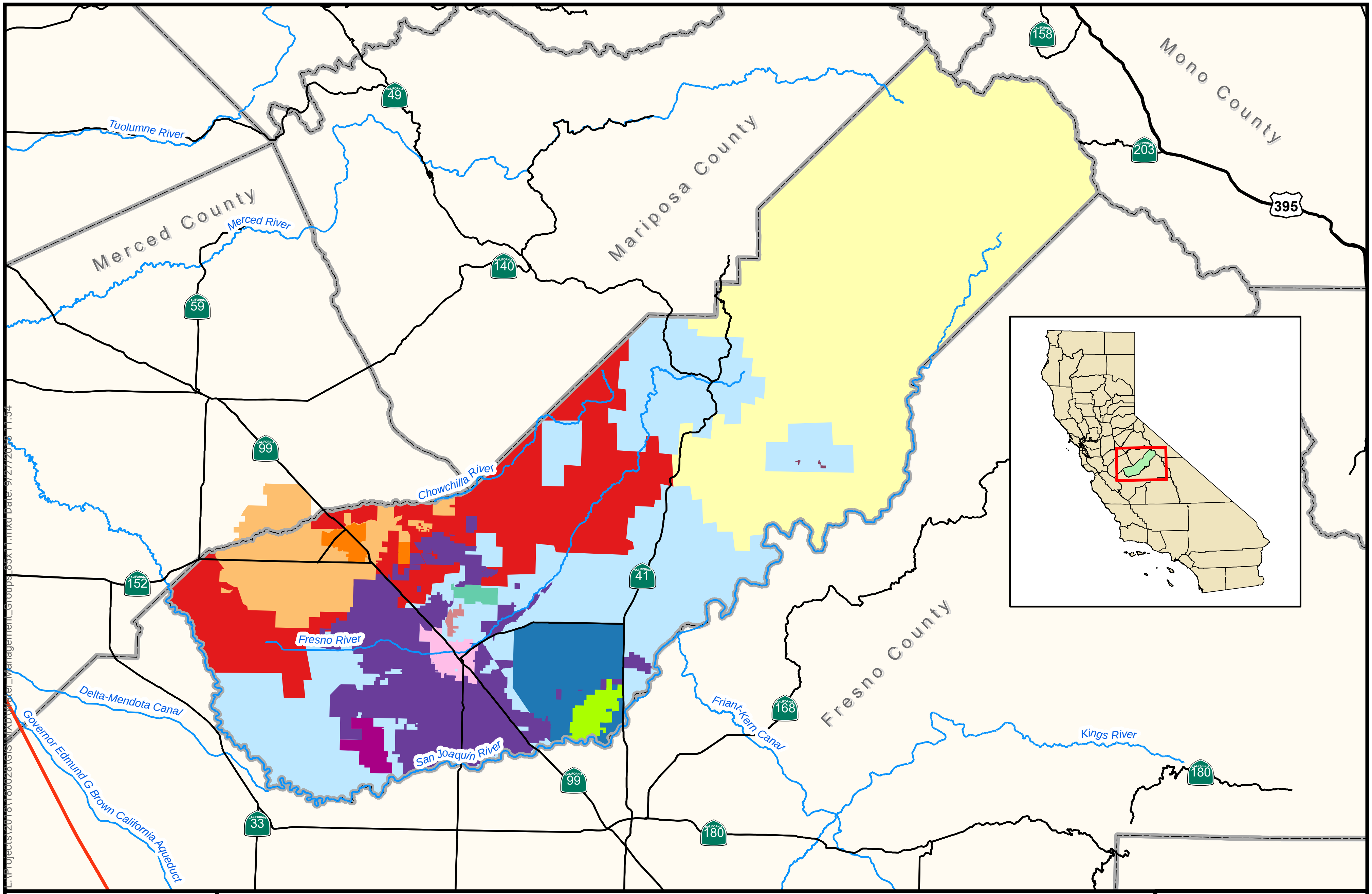

Figure 2-1 Participating Agencies - Madera Regional Water Management Group

2.4 - Accomplishments

In 2006, the County of Madera began the process of developing an IRWMP for managing and protecting water resources.

The first Madera IRWMP was completed for the Madera Region under Prop 50 on April 14, 2008. This is a complete plan under the Prop 50 Standards that includes both the foothill and the valley areas, creating many new partnerships and involvement.

November 2008 - Advisory committees formed to assist in deliberation of issues addressed in IRWMP or regional water issues.

On November 24, 2009, the Madera County Water Advisory Commission created the Formation Committee to create the Regional Water Management Group.

On January 2, 2010 the RWMG for the Madera Region was officially formed.

On June 6, 2011 - Madera Region was recommended for full acceptance as a region during the Region Acceptance Process.

On February 2, 2012 – grant funding was received from DWR for Facilitation Support Services with a contracted Facilitator.

In January 2013 - Finalized creation and writing of New Members Packet and application for Disadvantaged Communities (DAC)

On May 8, 2013 – Second grant funding is received from DWR for Facilitation Support with a contracted facilitator.

In September 2014 - Completed the Update of the Madera IRWM Plan to Prop 84 Standards

The following projects have been achieved since the Madera RWMG was officially formed:

- 2011/2012 – Round 1 Implementation Grant was funded for the full amount of the award – $9,413,947. Round 1 included the following projects;
    - Project #1 – Ash Slough Arundo and Sediment Removal
    - Project #2 – Cottonwood Creek, Dry Creek, & Berenda Creek – Arundo and Sediment Removal
    - Project #3 – Root Creek Recharge Project
    - Project #4 – Fuel Reduction for Forest Health & Fire Safety in the Sierra National Forest (The first Forest Management Project funded as part of an IRWM which recognizes Watershed Health as a whole.)

- 2012/2013 – Received recommendation for full funding, $271,438.00, for the Round 2 Planning Grant to update the IRWM Plan to Proposition 84 standards
    - The update to Proposition 84 standards was prepared by Provost and Pritchard, December 2014.
- June 25, 2014 Received approval of Formal Amendment 2 to relocate the above referenced Project #2 from Cottonwood Creek, Dry Creek, & Berenda Creek to Berenda Slough and an extension of Ash Slough.

The Madera RWMG has changed the way area stakeholders interact by implementing monthly meetings and conducting outreach to Disadvantaged Communities (DACs). Through outreach, DAC Stakeholders have worked together with the Madera RWMG for the inclusion of DAC water quality and wastewater issues to the list of projects included in this Update as shown in Appendix A. Outreach has spurred collaboration of groups which have historically operated independently.

2.5 - IRWMP Updates and Changes

The RWMG has established a goal of updating the IRWMP as needed to maintain information and regional goals as current, or to satisfy new IRWMP standards established by DWR. This update is driven by Proposition 1, the Water Quality Supply, and Infrastructure Improvement Act of 2014 and brings forth the previous content of the original IRWM plan and the 2014 update to be in compliance with 2016 IRWMP Standards identifies actions to adapt to and mitigate the impacts of climate change and highlights regional accomplishments in IRWM planning. To document on-going progress, the RWMG plans to periodically prepare a report which will include an updated project list, progress on current projects, changes to policies and procedures, and other relevant information that should be included in an IRWMP. These annual reports will be considered attachments to the adopted “Madera IRWMP Proposition 1 Update” and the information will be formally incorporated when the IRWMP is updated. This will help to formally archive important information each year and reduce the concentrated effort needed to accomplish the IRWMP updates

SECTION 3 - REGION DESCRIPTION

Through the Regional Acceptance Process from 2010 to 2011 the Department of Water Resources recommended full acceptance that the Madera IRWMP Region is all the lands within the County borders of Madera County. Hereafter, this area will be called the Madera Region or Region. The Madera Region is located in the geographic center of California, in the San Joaquin Valley and extending into the Sierra Nevada mountains. The borders of the Region are generally defined by the crest of the Sierras to the east, the San Joaquin River on the south and west, and the Chowchilla River on the north. The Region includes the incorporated areas of the City of Madera and City of Chowchilla in addition to all County lands, water districts, irrigation districts, or similar, private municipal services districts or utilities that are not under the jurisdiction of any City, State, or Federal agency.

The Region receives all of its water supply from runoff from the Sierras and groundwater. The imported water is delivered through the US Bureau of Reclamation Central Valley Project to contractors in the Region and by the rivers and creeks. The Region has no infrastructure to deliver water from the Delta.

3.1 - Foothill/Mountain Region

The communities in the Foothills and Mountains are unincorporated. The major communities include Ahwahnee, Bass Lake, Coarsegold, North Fork, Oakhurst, O'Neals, and Raymond. There are 122 special districts in the foothills Madera County. Almost all of the water use in the Foothills and Mountains is from groundwater with only three small water treatment plants relying on surface water from the San Joaquin River and its tributaries.

The recent drought has created the tree mortality issue with 129 million dead and dying trees in the Sierras. This has created serious watershed protection issues which has become an important goal of this plan. It is very common to see landslides, rock falls, and erosion associated with winter rains and flooding.

The predominant land uses in the Foothills and Mountains include agriculture (animal husbandry and cropping), residential and commercial (small towns and rural development), tourism, recreation, and natural resources such as the timber industry. However, the timber industry has been significantly reduced and impacted due to ever-increasing regulations. Most of the development in the Foothills and Mountains has occurred in the foothills with elevations ranging from 300 to 3,500 feet. The only true storage in the foothills is in the snow pack and the fractures.

The foothills are used for animal grazing, animal husbandry, irrigated and native pasture, small towns, and rural development. Cultivated agriculture, including vineyards and orchards, has recently increased in the area due to advances in agricultural technology and market demands. Relatively significant areas of commercial and residential development are located near the unincorporated communities of Oakhurst, Raymond, North Fork, Ahwahnee, Coarsegold, Indian Lakes, and Yosemite Lakes Park. Tourism and recreation are also important land uses in the foothills. For example, the economy of the communities of Bass Lake and Oakhurst is dependent on the recreation industry.

Groundwater in the Foothills and Mountains is drawn from wells and springs in weathered materials and fractures in the hard rock. Recharge to the groundwater is derived from precipitation on the local watershed. Average precipitation is generally about 14 inches per year in the lowest foothill areas to more than 50 inches per year in the higher parts of the watersheds. In the areas evaluated, groundwater was moving from topographically high areas toward topographically low areas, indicating that there was little or no recharge from stream channels in low topographic areas.

Groundwater quality contaminants of concern in the Foothills and Mountains include manganese, iron, high salinity, hydrogen sulfide gas, uranium, nitrate, arsenic, and methylbutylethylene (MBTE) with the MCL being exceeded in some areas. Despite these problems, there are substantial amounts of good-quality groundwater in each of the areas evaluated in the Foothills and Mountains. Iron and manganese are commonly removed by treatment. Uranium treatment is being conducted on a well by the Bass Lake Water Company. If this treatment does not prove to be feasible, the need for a surface water system may be more pressing in the Bass Lake-Oakhurst area due to the presence of uranium.

Only the San Joaquin River system (including Willow Creek) is currently used for domestic water supply. The water quality in the river has historically been good. However, at lower elevations it has sufficient organic matter resulting in elevated disinfection byproducts (DBP), which have caused individual water systems to violate DBP MCLs. The greatest impact of failing septic systems is due to overland flow to surface water bodies. However, failing septic systems can also degrade local shallow groundwater. Untreated wastewater contains excessive nutrients that can harm native plant and fish populations. Strict adherence to existing regulations and development of policies to protect water quality is therefore necessary in the County.

Madera IRWMP region has areas of nitrate, arsenic, perchlorate, or hexavalent chromium contamination, which have been previously identified in both the foothill and valley water systems during reviews of well test results provided within prior versions of the IRWMP (Volume II of 2008 IRWMP, Appendix E). The Plan will include a description of the location, extent, and impacts of the contamination, any prior actions undertaken to address the contamination, and a description of any new actions needed to address the contamination. Additionally, any likely climate change impacts on the region will be determined from a vulnerability assessment and any potential actions will be presented accordingly.

3.2 - Valley Region

Groundwater provides almost the entire urban and rural water use and about 75 percent of the agricultural water use in the Valley Floor. The remaining water demand is met with surface water.

Groundwater for the Valley Floor is pumped from the Madera, Chowchilla, and Delta-Mendota groundwater subbasins. Historically, the direction of groundwater flow in much of the Valley Floor was to the southwest, toward the valley trough (San Joaquin River downstream of Mendota). However, as groundwater pumping has increased, instead of flowing uniformly to the southwest, groundwater has been flowing away from the San Joaquin River to the northwest.

Groundwater quality contaminants of concern in the Valley Floor include high salinity (TDS), nitrate, uranium, arsenic, methane gas, iron, manganese, slime production, and dibromochloropropane (DBCP) with the maximum contaminant level (MCL) exceeded in some areas. Despite the water quality issues noted above, most of the groundwater in the Valley Floor is of suitable quality for irrigation. Groundwater of suitable quality for public consumption has been demonstrated to be present in most of the area at specific depths.

The Valley Floor has a long history of flooding, associated with the Fresno and Chowchilla Rivers and their tributaries. In the fall, residential flooding on the valley floor occurs due to hundreds of homes built below road grade capturing the road runoff (storm water). In the winter and spring, most of the flood control facilities experience some degree of failure due to the flows that are released from storage reservoirs. Floodway obstructions, limited channel capacity, and poor levee maintenance are the main factors causing flooding. Natural obstructions to flood flow include vegetation growing in floodway areas. Other obstructions include roadways, bridges, and culverts among others.

The Valley portion of the Madera Region is at an average elevation of about 300 feet above mean sea level and is approximately 100 miles from the ocean and separated from the coastal area by the Coastal Range Mountains, with most peaks ranging from 3,800 feet to 6,000 feet. Therefore, sea level rise is not a threat to the region.

DWR acknowledged in a white paper that California's Central Valley flood control system is deteriorating. Yet funding to maintain and upgrade flood protection infrastructure has sharply declined. Most project levees are maintained by local agencies such as reclamation and levee districts.

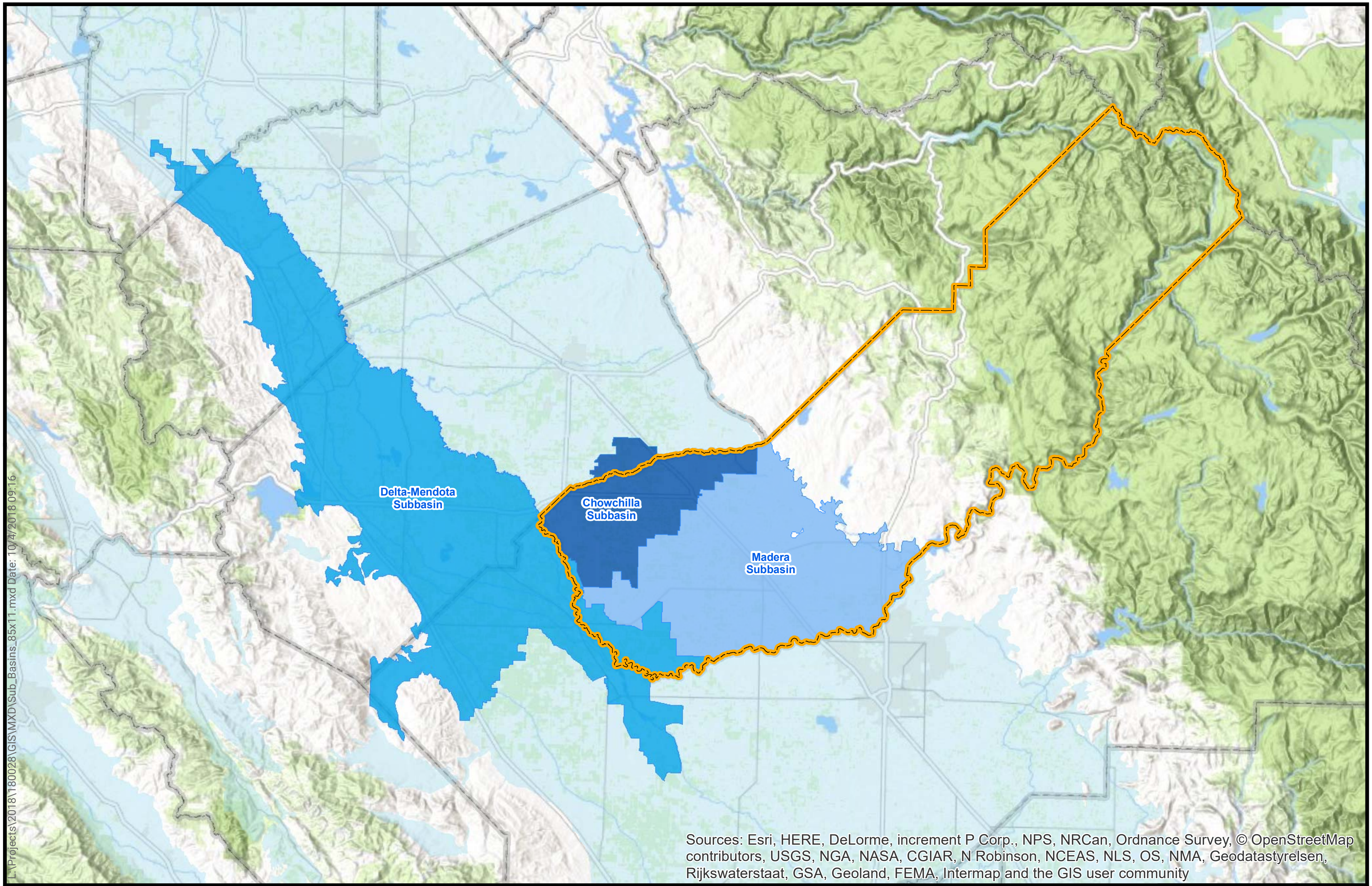

Figure 3-1 Basins

Sources: Esri, HERE, DeLorme, increment P Corp., NPS, NRCan, Ordnance Survey, © OpenStreetMap contributors, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

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3.3 - San Joaquin River Hydrologic Region

This region is approximately 15,200 square miles and is located between the Sacramento River Hydrologic Region to the north, and the Tulare Lake Hydrologic Region to the south (DWR 2013b). The watershed is bordered on the east by the Sierra Nevada and on the west by the Coast Range mountains. The San Joaquin River begins in the high Sierra Nevada's and has historically flowed approximately 100 miles to the west then turned north flowing for 260 miles, where it joined the Sacramento River to form the Delta. By 1951 and the completion of the Central Valley project, San Joaquin River flows were captured at Friant Dam and diverted into two (2) canals. The Madera-Chowchilla canal flows to the North with 100% of its delivery to Madera County and the Friant-Kern canal flows to the South. These canals service the Eastern side of the San Joaquin valley from Madera County to Kern County through 30 contracts with Cities and Irrigation districts. The portion of the river between Friant Dam and Sack Dam (approximately 85 miles) routinely dries out during much of the year. Continuous flows return for the final 60-miles of river, from Lander Avenue to the Delta and are comprised of ephemeral flows from the Coast Range, fresh water flows from the Sierra Nevada, and agricultural drainage. Main tributary rivers of the San Joaquin River include the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced to the east and during flood flows from the Friant Canal, the Chowchilla Bypass, and Fresno Rivers to the southeast.

3.3.1 - CHOWCHILLA SUBBASIN

The Chowchilla Subbasin is identified as Basin 5-22.05 by DWR in Bulletin 118. The Subbasin covers an area of 248 square miles and is located in Madera County with a small portion in Merced County. The Subbasin is bounded by the Columbia Canal Company Service Area and San Joaquin River on the west. To the north, the Chowchilla Subbasin is bound by the southern portion of the Merced Subbasin. The southern boundary consists of an irregular pattern and borders the northern portion of the Madera Subbasin. Groundwater recharge is primarily from deep percolation of applied irrigation water. The Chowchilla Subbasin has been determined to be in critical overdraft.

3.3.2 - MADERA SUBBASIN

The Madera Subbasin is identified as Basin 5-22.06 by DWR in Bulletin 118. The Subbasin covers an area of 614 square miles and is located entirely within Madera County. It is bounded on the south by the San Joaquin River, on the west by the eastern line of the Columbia Canal Service Area, on the north by the south line of the Chowchilla Subbasin, and on the east by the crystalline basement bedrock of the Sierra Nevada foothills. The Madera-Chowchilla canal delivers water to this area for irrigation. Groundwater recharge is primarily from deep percolation of applied irrigation water. The Madera Subbasin has been determined to be in critical overdraft.

3.3.3 - *DELTA-MENDOTA SUBBASIN*

The Delta-Mendota Subbasin is identified as Basin 5-22.07 by DWR. The Subbasin covers an area of 1,170 square miles. It lies largely in Fresno County along with portions of Madera, Merced, Stanislaus, and San Benito counties. It is bounded on the west by the Coast Range mountains, on the north by the Stanislaus/San Joaquin county line, and on the east generally by the San Joaquin River. The southern boundary is irregular and consists of portions of the western Kings Subbasin and the Westside Subbasin. DWR Bulletin 118 states that groundwater levels within the Delta-Mendota Subbasin have been relatively stable and this Subbasin is not considered to be in overdraft. Groundwater recharge is primarily from deep percolation of applied irrigation water.

3.4 - Watersheds

Major rivers in the Region include the San Joaquin, Fresno, and Chowchilla. No substantial flood control or irrigation facilities exist to serve the foothill or mountain areas. The Region is home to several reservoirs which provide both irrigation water and flood protection to the Valley area. The major watersheds are shown in Figure 3-2.

Eastman Lake, operated by the US Army Corps of Engineers, is in the foothills on the Chowchilla River. Bass Lake, operated by Pacific Gas & Electric, is impounded by Crane Valley Dam, located in the foothills on Willow Creek, which flows into the San Joaquin River above Millerton Lake. Millerton Lake, behind Friant Dam, operated by the United States Bureau of Reclamation, is on the San Joaquin River in the foothills at the eastern edge of the Valley. Mammoth Pool, Dam 6 Lake, and Redinger Lake are located along the San Joaquin River above Millerton Lake and are operated for power generation and recreation by Southern California Edison. On the Fresno River the US Army Corp of Engineers constructed Hidden Dam forming Hensley Lake for flood control, irrigation storage, and recreation. From Hensley Lake controlled flows continue down the Fresno River to the Chowchilla Canal.

The Eastside Bypass and the Chowchilla Bypass are the backbone of the flood control conveyance facilities in the Valley, providing additional flow capacity above and beyond that available in the San Joaquin River channel below Friant Dam. Madera Irrigation District and Chowchilla Water District have extensive irrigation canal systems supplied with water primarily from the San Joaquin, Chowchilla, and Fresno Rivers.

A portion of the Merced River watershed lies within the Region, although it drains into the Merced IRWM planning area to the north, and the Merced River comes together with the San Joaquin River in Merced County, north of the Region boundary.

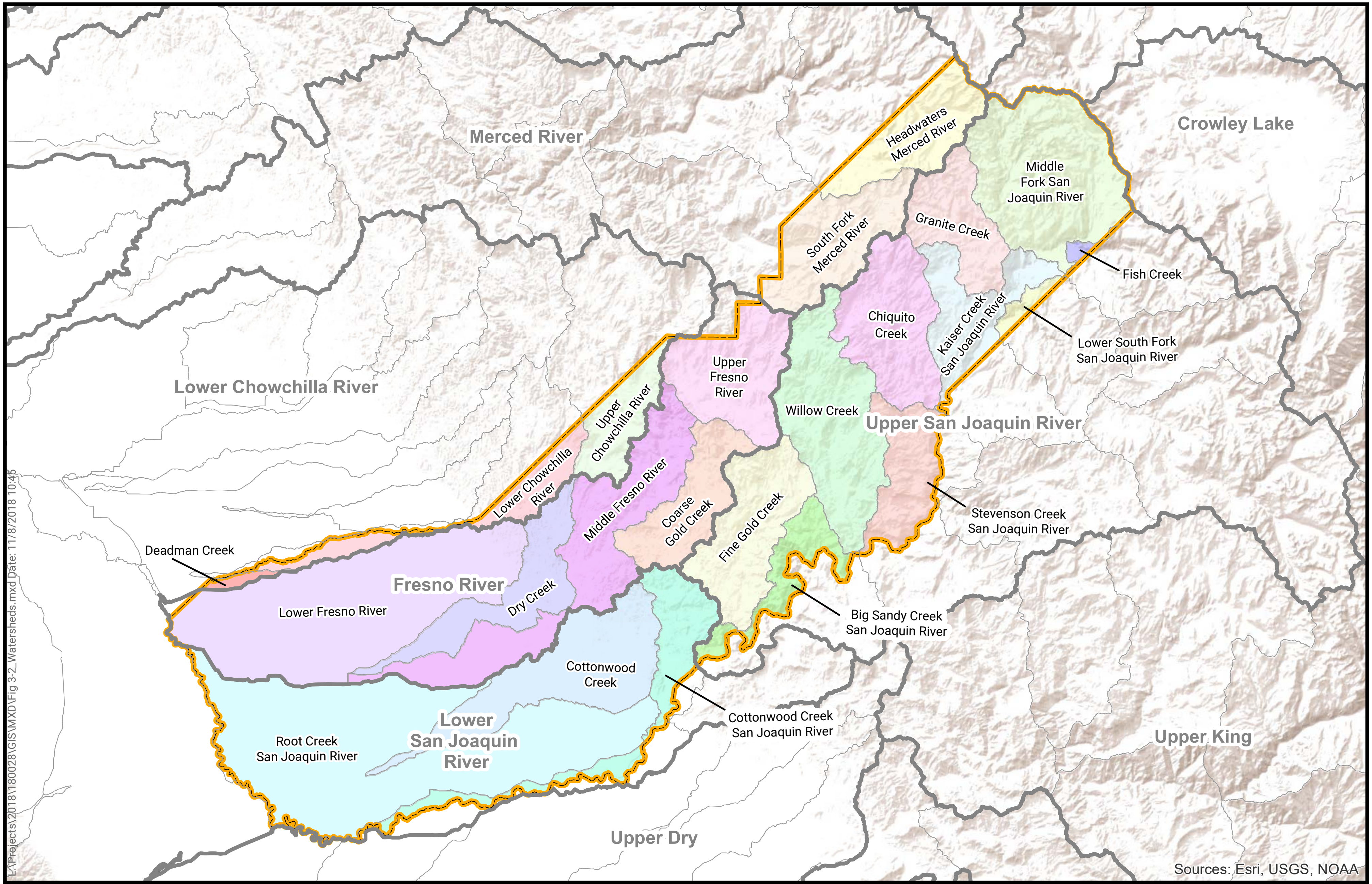


Figure 3-2 Watersheds

3.5 - Land Subsidence

Land subsidence occurs when groundwater levels in confined aquifers decline due to excessive withdrawals of water. This results in compaction of fine-grained sediments (clays) above and within the aquifer system as water is removed from pores between the grains of the sediments. Over time, as more water is removed from the area; the ground level sinks. Land subsidence can lead to reduced conveyance capacity in canals and damage to structures such as canals, levees, buildings, and wells. Subsidence can also cause flooding by creating low spots or reducing gradients in natural channels.

Within the valley of Madera County, land subsidence is a great concern. The area of the most significant subsidence is in the far western portion of the county. As shown in Figure 3-3 this area of the county in 2017 had subsidence ranging from 3 up to 15 inches. These areas with significant subsidence are in both the Chowchilla and Madera Subbasins.

As part of SGMA requirements, Groundwater Sustainability Agencies, the Chowchilla GSA and the Madera GSA, have been formed and they are preparing Groundwater Sustainability Plans (GSP) which will be completed in 2020. These plans will address land subsidence as an undesirable result.

3.5.1 - Cause of Local Land Subsidence

Land subsidence in the Valley portion of the Region is caused by pumping groundwater from the deeper confined aquifer that is separated from the shallower unconfined aquifer by the Corcoran Clay. The Corcoran Clay is the regional aquitard throughout the San Joaquin Valley and is prevalent throughout the western half of the valley area. The area of greatest land subsidence in the Region coincides with the area underlain by the Corcoran Clay, in western Madera County, particularly along the Eastside Bypass.

3.5.2 - History of Land Subsidence in Area

Land subsidence in the Region is of historic and ongoing significance. Between 1926 and 1972, subsidence resulted in between 1.0 and 4.0 feet of ground surface elevation drop within the western half of the Valley portion of the Madera Region. The area of greatest subsidence occurred roughly along the path of the East Side Bypass flood control structure of the San Joaquin River (Bull, 1975).

The majority of subsidence has occurred since 1940, when large turbine pumps came into widespread use for extracting water from the deeper confined aquifer. Availability of surface water from the Delta-Mendota Canal and the California Aqueduct resulted in decreased groundwater demand, stabilization of groundwater levels, and a reduced rate of subsidence. Drought conditions during 1976-1977 and 1987-1992 restricted surface water deliveries, resulting in increased demand for groundwater supply and increased subsidence rates. Drought and regulatory reductions in surface water deliveries (especially the San Joaquin River Restoration) from 2007 through 2014 have brought about unprecedented withdrawals of water from the deeper confined aquifer to meet local water demand.

3.5.3 - *LOSS OF STORAGE DUE TO SUBSIDENCE*

According to a 1995 USGS report, the primary cause of land subsidence in the Valley has been the compaction of fine-grained silt and clay sediments in the aquifer system following extensive long-term withdrawal of groundwater in excess of recharge. This subsidence, due to compaction of fine-grained sediments, began in the 1920s. As groundwater levels declined severely during the 1960s, fine-grained sediments lost water from pore spaces and became compacted from the weight of the overlying soil. When withdrawal rates decreased, and water levels were allowed to recover, compaction rates slowed significantly.

Increased groundwater pumping during the 1976-77 drought increased the rate of subsidence, some of which even resulted from compaction of coarse-grained sediments. When groundwater levels recovered in 1978 following the end of the drought years, the compacted coarse-grained sediments regained some of their original volume when the former or near former pore pressure was attained and the land surface rebounded. However, the fine-grained sediments remained compacted and will never recover.

The fine-grained portions of the aquifer are not typically considered water producing portions. The minimal amount of storage loss in the coarser grained sediments, the usable part of the aquifer, is for the most part recoverable and is not considered an appreciable loss of storage space in the usable parts of the aquifer.

3.5.4 - *RECENT LAND SUBSIDENCE IMPACTS*

Groundwater pumping that results in renewed compaction and land subsidence in the Valley could cause serious operational, maintenance, and construction-design problems for the California Aqueduct, the San Luis & Delta-Mendota canals, and other water-delivery and flood- control canals in the San Joaquin Valley. Subsidence has reduced the flow capacity of several canals that deliver irrigation water to farmers and transport floodwater out of the valley. Several canals managed by the San Luis & Delta-Mendota Water Authority (SLDMWA) and the Central California Irrigation District (CCID) have had reduced freeboard and structural damages that have already required millions of dollars of repairs, and more repairs are expected in the future (Sneed, et al. 2013). These instances of land subsidence are not in the Region but are adjacent to the westerly portions of the area near the San Joaquin River and indicate that subsidence is occurring in broad area of the central part of the San Joaquin Valley. Within the Region, subsidence near the San Joaquin River and its flood control structures may cause flooding of Highway 152 and a local Alview elementary school. It may also threaten valuable farmland and dairies while possibly jeopardizing the San Joaquin River Restoration Program.

Recent work by the USGS, USBR, DWR and Kenneth D. Schmidt and Associates (KDSA) indicates that the greatest amount of subsidence in the Region is in the area of the East Side Bypass. This is also referred to as the Red-Top Area, which is located in the west-northwest portion of the Region near the axis of the valley where the majority of the historic land subsidence has been documented. The maximum subsidence near the Eastside Bypass has amounted to approximately seven (7) feet.

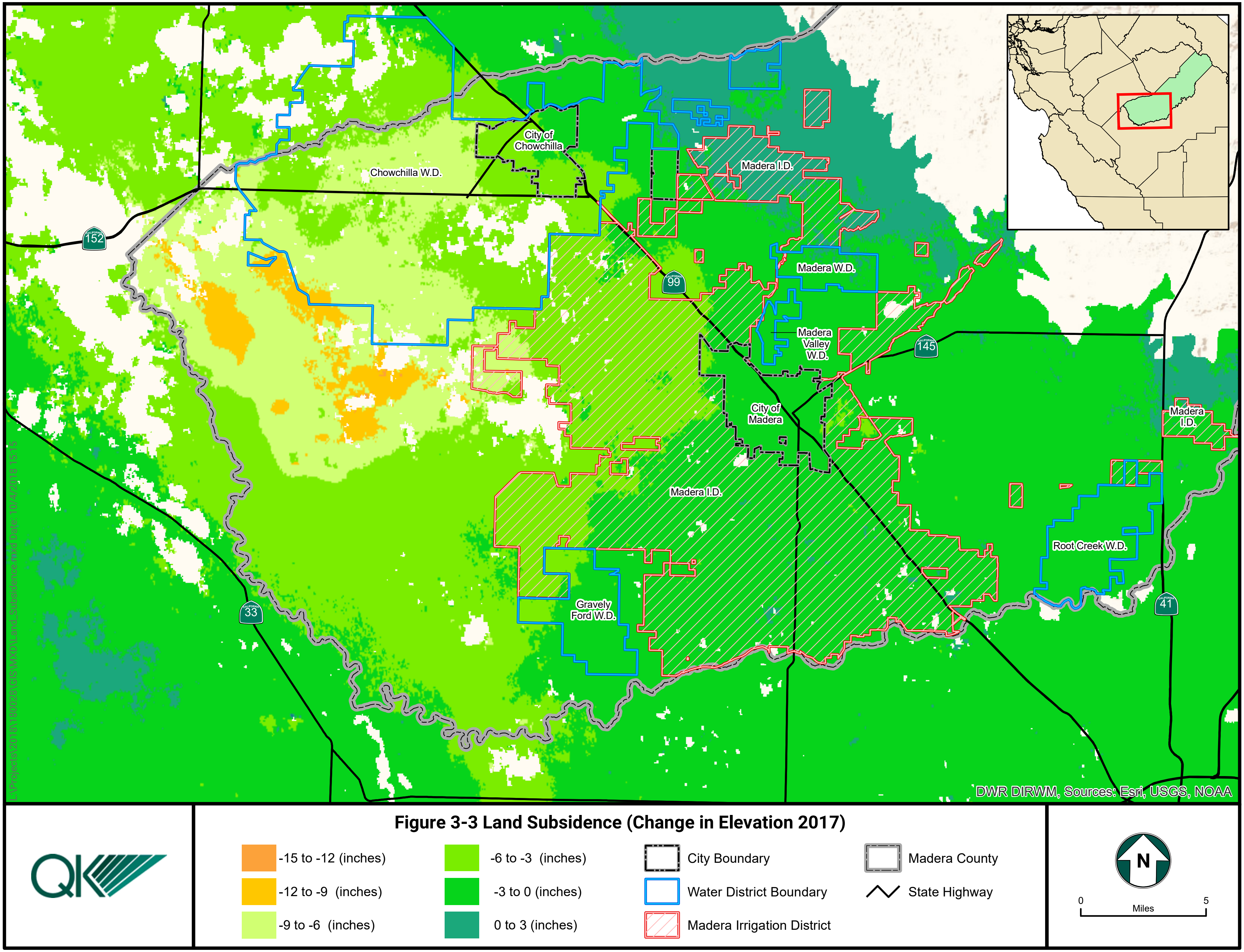


Figure 3-3 Land Subsidence (Change in Elevation 2017)

3.6 - Water Quality Problem Areas

3.6.1 - ARSENIC AND URANIUM

Water quality data in the Region is limited and Madera County Environmental Health records were searched for nitrate, arsenic, perchlorate, and hexavalent chromium contamination per AB1249. When searching violations of public water systems exceeding MCLs in both the Valley and Foothill /Mountain areas of the Region the most prevalent are for Arsenic and Uranium. In 2018 28 water systems were in violation for Arsenic and 19 for Uranium. There was also one violation for exceeding the MCL for Perchlorate in the Valley area.

Two groups have been formed to assist the Disadvantaged Communities. One is for the Foothill/Mountain area and the other for the Valley area. These groups are preparing reports that will address areas of contamination along with other projects to assist the communities. These reports will be added to this plan once they have released.

3.6.2 - SALT AND NITRATE

Communities in the Central Valley rely on surface and groundwater for many beneficial uses including agriculture and drinking water supplies. However, elevated salt and nitrate concentrations in portions of the Central Valley impair or threaten to impair the region's water and soil quality which, in turn, adversely affects agricultural productivity and/or drinking water supplies.

The salinity and nitrate problems in the Central Valley are complex, multi-faceted and present a daunting challenge for the Central Valley Regional Water Quality Control Board (Central Valley Water Board or Board) to confront alone. To assist in the Board's long-term planning efforts, a broad group of agriculture, cities, industry, and regulatory agencies joined together in 2006 to form the Central Valley Salinity Alternatives for Long-Term Sustainability Initiative (CV-SALTS). The CV-SALTS Executive Committee is a decision-making body with 30 voting members that represent diverse stakeholder groups including agriculture, cities, industry, regulatory agencies, and community and environmental justice representatives. In addition, dischargers participating in CV-SALTS formed the non-profit Central Valley Salinity Coalition (CVSC) to manage and fund the effort and have entered into a Memorandum of Agreement with the State Water Board and the Central Valley Water Board to formalize their commitment. Goals adopted by CV-SALTS include:

- Sustain the Valley's lifestyle
- Support regional economic growth
- Retain a world-class agricultural economy
- Maintain a reliable, high-quality water supply
- Protect and enhance the environment

CV-SALTS was tasked with developing a Salt and Nitrate Management Plan (SNMP) for the entirety of the Central Valley Regional Water Quality Control Board's (Central Valley Water Board's) jurisdictional area. Although broader in overall scope, the SNMP was also developed to meet requirements set forth in the State Recycled Water Policy, adopted in 2009 by the State Water Resources Control Board (State Water Board). The Recycled Water Policy provides statewide direction regarding the appropriate criteria to be used when issuing permits for recycled water projects. In addition, the Recycled Water Policy articulates the State Water Board's policy that every groundwater basin/subbasin in California needs to have a consistent salt/nutrient management plan (i.e., SNMP). To ensure that such plans were developed in a timely manner, the Recycled Water Policy establishes criteria and timelines for their development.

CV-SALTS participants, including the Central Valley Water Board, have worked together to develop this SNMP to address salinity and nitrate concerns in the Central Valley Region in a comprehensive, consistent, and sustainable manner, both environmentally and economically. CV-SALTS participants are also committed to evaluating, promoting, and initiating options to provide safe drinking water to communities already impacted by salt and nitrates. To this end, this Central Valley SNMP builds on a range of water quality management policies and implementation programs already in existence, proposes additional policies and tools needed to provide the Central Valley Water Board with flexibility in addressing legacy and ongoing loading of salt and nitrate in the diverse region, and presents a comprehensive regulatory and programmatic approach for the sustainable management of salt and nitrate.

Combined, the development of the SNMP and the proposed, corresponding Basin Plan amendments will establish a revised regulatory framework and provide the flexibility necessary to make salt and nitrate management decisions at the appropriate temporal, geographic, and/or management scales. The SNMP will be reviewed and revised as needed to support state and regional policies, regulations, and/or new technical information developed during SNMP implementation.

3.6.3 - CENTRAL VALLEY SALT AND NITRATE MANAGEMENT PLAN

Central Valley Water Board has flexibility in addressing legacy and ongoing loading of salts and nitrates in the diverse region and while presenting a comprehensive regulatory and programmatic approach for the sustainable management of salt and nitrate.

Combined, the development of the SNMP and the proposed, corresponding Basin Plan amendments will establish a revised regulatory framework and provide the flexibility necessary to make salt and nitrate management decisions at the appropriate temporal, geographic and/or management scales. The SNMP will be reviewed and revised as needed to support state and regional policies, regulations, and/or new technical information developed during SNMP implementation and establishes criteria and timelines for their development.

3.7 - Groundwater Levels

Groundwater levels are one of the most critical parts for planning future water efforts. The Chowchilla, Delta Mendota, and Madera subbasins have been designated as in critical overdraft. To meet SGMA compliance, Groundwater Sustainability Agencies (GSA) have been formed and are working together to develop Groundwater Sustainability Plans (GSP) to improve the declining groundwater levels. The level of overdraft varies between the GSAs as some have imported water supplies and some areas rely entirely on groundwater.

Groundwater levels have been in decline and without changes to area wide policy, this trend will continue. The Department of Water Resources is requiring that all basins in critical overdraft meet sustainability goals by 2020. To achieve this goal, water supplies need to be increased or there needs to be a reduction in demand. One way to reduce demand is to take farmland out of production. Implementation conservation measures of water resources will also reduce demand but likely not to the magnitude that will fix the overdraft problem.

The following Figure 3-4 Depth to Groundwater show contours for Spring 2016 water level measurements.

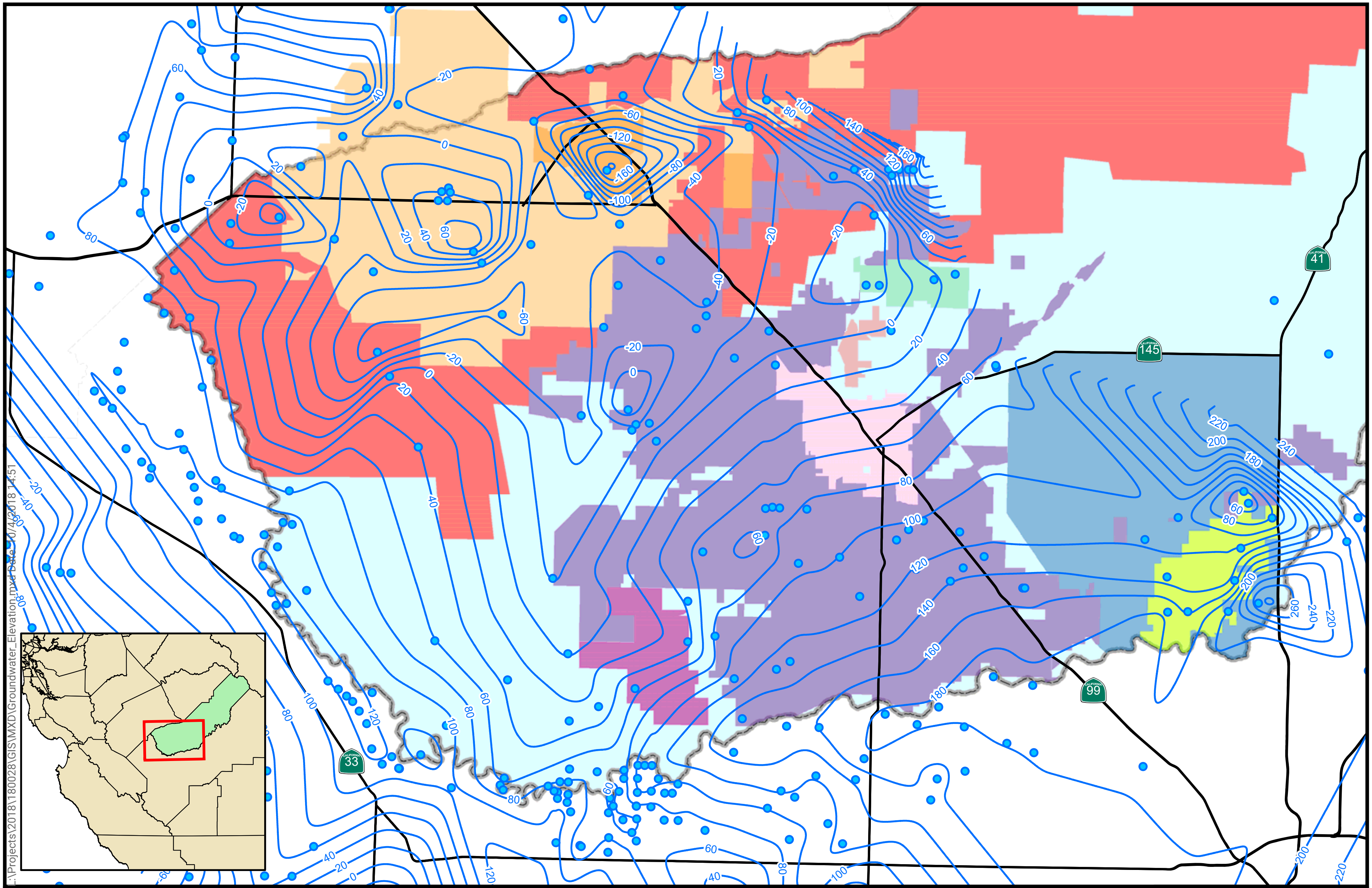


Figure 3-4 Groundwater Elevations (Spring 2016)

● Water Well (Total: 265)
Ground Water Elevation (ft)
State Highway
City of Chowchilla
Chowchilla WD
Chowchilla Red Top RCD
Coarsegold RCD
Gravelly Ford WD
City of Madera
Madera WD
Madera ID
Madera Valley WD
Root Creek WD
South East Madera United
Madera County

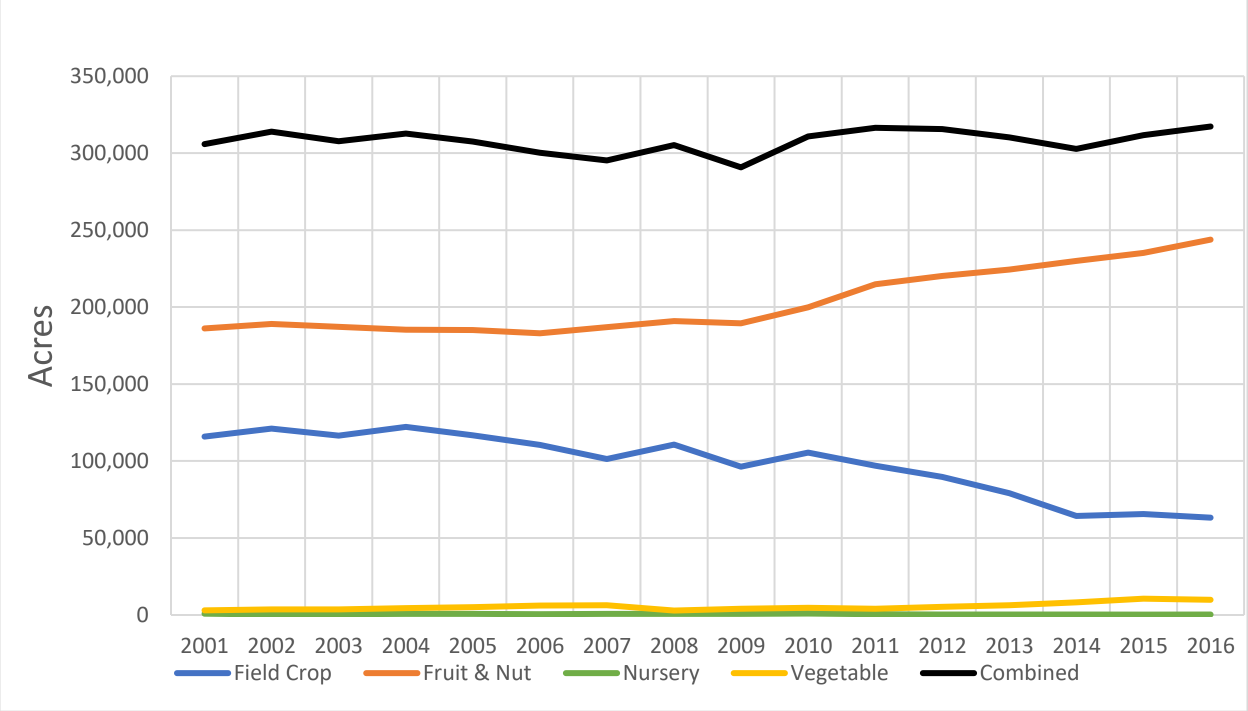
N

0 Miles 5

3.8 - Agricultural Water Demands

The water demands for the area have remained relatively constant over the past 15 years. The amount of applied water to Ag land has been averaging 1,030,000 AF per year. During this same 15-year period the total of irrigated acreage remained constant. According to the Madera County Agricultural Commissioner's office, there has been shift from field crops to permanent crops consisting primarily of fruit and nuts, as noted in Table 3-1 below.

Table 3-1 Madera County Crop Information (2016)



SECTION 4 - PLAN OBJECTIVES

4.1 - New Objectives Added for Proposition 1 Update

Through the Proposition 1 Update process new objectives have been incorporated into the goals of the plan. New measurable criteria have been added to evaluate progress for meeting these goals. The following is a list of the additional new objectives:

- Adapting to changes in the amount, intensity, timing, quality, and variability of runoff and recharge;
- Consider the effect of sea level rise on water supply conditions and identify suitable adaptation measures;
- Reduction of energy embedded in water, and ultimately reducing GHG emissions
- Evaluate different ways to meet IRWM plan objectives, where practical, consider the strategies adopted by CARB in its AB 32 Scoping Plan;
- Consider carbon sequestration and renewable energy options are integrally tied to supporting IRWMP objectives.

Water is used by a diverse group of stakeholders in the Madera Region for a variety of needs including municipal and industrial, agriculture, hydropower, and environmental flows. Water management issues for the region are broad and include water supply, water quality, flood management, environmental stewardship, regional self-sufficiency, and infrastructure development. This wide spectrum of water users and issues challenges water managers in the region. The regional goals expressed in this Plan were created to address the entirety of the Region's water management needs, issues, and conflicts.

The regional goals and measurable objectives were established through a collaborative process that included meetings, stakeholder surveys, public workshops, and open discussions. This process included several iterations from 2006 through 2014. The groups involved included the Regional Water Management Group and the general public. The process produced several lists of issues, conflicts, potential goals and objectives in the region. These were combined into the final list of regional goals and measurable objectives found in this Plan. The final list was reviewed and approved by the RWMG in the form of a Draft Goals and Objectives Chapter and then subsequently with approval of the IRWMP.

In the 2015 Provost & Prichard report, goals for the Valley area and the Foothill/Mountain areas were developed per the requirements of Proposition 84 Integrated Regional Water Management Plan. The goals established in the 2015 report are as follows.

4.2 - Valley Goals

- Achieve groundwater sustainability
- Expand Stakeholder Education
- Assure groundwater quality meets drinking and irrigation water quality standards
- Improve Flood Control and Protection

- Conservation

4.3 - Foothill/Mountain Goals

- Create practical, enforceable policies resulting in sustainable groundwater management
- Improve water quality
- Improve Watershed Management
- Expand Stakeholder Education
- Conservation

4.4 - Additional Goals for Proposition 1

The goal of conservation will apply to both the Valley and Foothill/Mountain areas. Specific to this goal is the reduction of energy. By reducing energy embedded in water use, this will in turn reduce GHG emissions. The design of proposed water projects will consider energy reduction as a high priority.

Also, as consideration in the designs, California Air Resources Board (CARB), strategies for reduced emissions will be evaluated and incorporated.

Another new goal is to consider options for carbon sequestration and using renewable energy where such options are integrally tied to supporting IRWM Plan objective.

The goals, including the additional new goals, are show in the following Table 4-1. The number of projects and ranking of the projects to achieve the objectives is attached as Appendix A.

Table 4-1 - Summary of Objectives and Goals

Goals for Valley Region		*Total Projects that Achieve Objective*	*Score of Project Achieving objective (avg. 0-5)*
1 - Achieve groundwater sustainability			
a.	Increase regional capacity for direct recharge by 50,000 AF/Year	39	2.86
b.	Integrate flood/storm water conveyance infrastructure and regional irrigation system	39	2.21
c.	Expand CASGEM groundwater monitoring network to semi-annually measure regional groundwater on a per-aquifer basis	39	2.36
d.	Improve water reliability	39	2.79
e.	Expand water conservation efforts	39	2.64
2 - Expand Stakeholder Education			
a.	Community education on water issues	6	2.71
b.	Native American Tribes	6	2.57
3 - Assure groundwater quality meets drinking and irrigation water quality standards			
a.	Identify problem areas	15	2.79
b.	Identify strategies to address chemical Constituents of Concern	15	2.11
c.	Propose projects to address waters which do not meet State Public Health Goals or irrigation standards	15	2.29
4 – Improve Flood Control and Protection			
a.	Improve flood conveyance capacity	32	2.21
b.	Improve water storage capacity	32	2.71
c.	Adapt to changes in amount, intensity, timing, quality and availability of runoff and recharge	32	3.22
5 – Conservation			
a.	Reduce energy consumption, especially the energy embedded in water use, and ultimately reducing GHG emissions	23	2.78
b.	Consider, where practical, the strategies adopted by California Air Resources Board (CARB) in its AB 32 Scoping Plan, when evaluating different ways to meet IRWM plan objectives	23	2
c.	Consider options for carbon sequestration and using renewable energy where such options are integrally tied to supporting IRWM Plan objective	23	2.11

Table 4-1 (cont.) - Summary of Objectives and Goal

		Total Projects that Achieve Objective	Score of Project Achieving objective (avg. 0-5)
Goals for Foothill/Mountain Region			
6 - Create practical, enforceable policies resulting in sustainable			
a.	Determine strategies to enhance sustainability in foothill and mountain water supplies	7	2.38
b.	Develop policies to improve hard rock well sustainability and quantity	7	2.17
c.	Develop sources of surface water supply	7	2.58
d.	Implement water conservation policies to achieve the State's "20 x 2020" goal	7	2.33
e.	Fully utilize recycled wastewater from County maintained districts and urban areas	7	2.17
f.	Develop and implement a comprehensive groundwater monitoring program by 2020	7	2.58
7 - Improve Water Quality			
a.	Promote community awareness of potential water quality issues	7	2.5
b.	Protect source water areas	7	2.67
8 – Improve Watershed Management			
a.	Manage forest density to increase surface runoff	18	2.5
b.	Manage vegetation to reduce fire risk and attempt to keep fires within their natural range of variability.	18	2.42
c.	Reduce erosion and sedimentation.	18	2
d.	Promote natural water storage through meadow, stream, wetlands and floodplain restoration.	18	2.5
e.	Adapt to changes in amount, intensity, timing, quality and availability of runoff and recharge	18	3.22
9 - Expand Stakeholder Education			
a.	Community education on water issues	2	2.75
b.	Develop programs to increase communications with Native American Tribes	2	2.56
10 – Conservation			
a.	Reduce energy consumption, especially the energy embedded in water use, and ultimately reducing GHG emissions	4	2.44
b.	Consider, where practical, the strategies adopted by California Air Resources Board (CARB) in its AB 32 Scoping Plan, when evaluating different ways to meet IRWM plan objectives	4	2.5
c.	Consider options for carbon sequestration and using renewable energy where such options are integrally tied to supporting IRWM Plan objective	4	2.11
11 – Climate Change (Valley/Foothill Regions)			
a.	Plan addresses potential impacts of future climate change		2.44
b.	Long term reduction of greenhouse gases	4	2.5
c.	Promote public education about impacts of climate change	4	2.11

4.5 - Valley Goals

4.5.1 - GOAL NO. 1: ACHIEVE GROUNDWATER SUSTAINABILITY

This goal has been carried over from the 2014 IRWMP because it was highlighted as the "over-arching goal" of the IRWMP process. Additionally, it remains the top priority of the

SGMA process as well as it aims to preserve groundwater supply for residents of the valley floor.

Groundwater overdraft in Madera County currently calculated to be approximately 250,000 AF/year for both the Chowchilla and Madera Subbasins. This is calculated from the Madera Regional Groundwater Plan (Provost & Pritchard, 2014) and the Root Creek Water District Groundwater Management Plan (Provost & Pritchard, 2012). All stakeholders recognize that this is not sustainable and equally recognize that the problem is of such magnitude that effective and lasting changes cannot be instantly implemented.

Achieving groundwater sustainability, which this report defines as limiting net groundwater use to not more than the natural recharge of the underlying aquifers, will require a coordinated and ongoing effort. The objectives are presented in order of desired implementation.

Objective 1a: Increase regional capacity for direct recharge by a minimum of 50,000 AF/Year.

Current direct recharge capacity within the RWMG boundaries is limited to losses within canals, river channels, and some basins operated by local water and irrigation districts. Several studies by MRWMG members and stakeholders over the past decade have identified areas where direct recharge could be effectively used to replenish the deep aquifer, but to date funding limitations have precluded construction of any of these major facilities.

Land and facilities are only a part of the recharge challenge. Without water supplies, there is no recharge, so also included in this objective is the expansion of the variety and volume of water supplies available to the Group members for recharge use. As a practical matter, firm water supplies are expensive and difficult to secure. Therefore, it is expected that this effort will focus on increasing capacity to convey and retain high-flow supplies in the years when they are available.

Funding for both facilities and water supplies may come from grants, local operational funds, property assessments, or other mechanisms selected by the Members. Local funding will be focused on a sub-regional basis on projects benefitting those supplying the funds.

Groundwater recharge will be an important part of achieving the goal of groundwater sustainability. Under this objective, the RWMG will identify potential sites for recharge facilities, water supplies that can be used for recharge, and funding opportunities.

Objective 1b: Integrate flood/storm water conveyance infrastructure and regional irrigation system.

Storm water remains an under-utilized resource within the RWMG area. The RWMG plans to develop the means and facilities to capture, retain, and make beneficial use of storm water flowing through the region which is now lost to evaporation because it is impounded in areas with impermeable soils and does not effectively percolate to the groundwater. This objective may include construction of new retention/percolation basins sited in areas where percolation can reach the aquifer.

This objective may also include strategies to convey flood water into public irrigation canals to supplement surface water delivered from the San Joaquin River. All strategies will require compliance with NPDES regulations for storm water management.

Objective 1c: Expand CASGEM groundwater monitoring network to semi-annually measure regional groundwater on a per-aquifer basis.

Since 2011, several of the RWMG members have been collaborating on an area-wide groundwater monitoring program known as the California State Groundwater Elevation Monitoring program, or CASGEM. The program is a solid start toward developing a more regional knowledge of groundwater conditions and has already generated useful data for the participating agencies.

There is, however, a need for greater data precision and integration as the RWMG moves toward management of the groundwater aquifer throughout the region. Semi-annual well monitoring will enhance the understanding of aquifer variations resulting from rainfall and irrigation pumping throughout the year. Integrating data on a per-aquifer and sub-regional basis will aid in creating specific sustainability parameters in each area of the RWMG's boundaries in a manner that is most equitable for all stakeholders. The regional monitoring program could be expanded to include additional agencies and monitoring entities.

Objective 1d: Improve Water Reliability.

Water is necessary for human consumption, personal hygiene, and many economic activities in Madera County. Improved water reliability can allow agencies to meet peak demands, provide water supplies during power outages, maintenance and facility malfunctions, and provide minimum water supplies during droughts. This objective can be achieved by developing new water supplies, establishing a diverse portfolio of water supply options, securing outside water agreements to import water to the RWMG area, making greater use of floodwater supplies through surface and subsurface storage projects, and increasing redundancy in water systems.

Objective 1e: Expand Water Conservation Efforts.

There are limited water supplies in Madera County and stretching the existing water supplies is important. This objective can be achieved through water conservation by urban, industrial, commercial, municipal, and agricultural water users.

In response to the requirements of SB 7x-7, also known as the Water Conservation Act of 2009, goals of reducing per-capita water use by 20% by 2020. This is known as the State's 20x2020 goal. Urban water conservation can include many methods such as metering, public education, low-flow devices, ordinances, etc. As a result, implementation of effective indoor demand reduction measures will have a proportionally greater impact on demand reduction. Concerted efforts to replace traditional indoor water fixtures and older appliances with water-conserving fixtures and appliances conforming to the latest standards will be an effective tool for achieving demand reduction goals.

Numerous methods are also available for agricultural water conservation such as tailwater recovery, spill prevention, metering, etc. The ultimate goal is to reduce consumption on a per capita or per acre water basis and achieve more with the same water supplies.

4.5.2 - GOAL NO. 2: EXPAND STAKEHOLDER EDUCATION

The Madera RWMG is required to implement strategies to raise stakeholder and citizen awareness of State objectives for water management issues, including the magnitude of the challenge, potential mitigations, feasible projects, funding options, and consequences for failure to take effective action. This objective is critical and related to the success of other objectives, as many of the objectives require the support or at least the consent of the stakeholders and/or citizens throughout the Madera RWMG plan area to be implemented.

Objective 2a: Community education on water issues.

Develop programs and resources for use by members in a variety of public educational settings. Subjects to be addressed will include description of the regional water situation, the seriousness and urgency of the problem at hand, how and why the situation has developed over time, how other areas within California have addressed similar situations, options for mitigation that have been identified locally, options for financing those mitigations, and potential consequences of failing to take timely and effective action.

Numerous venues are available for public education. These may include:

- Presentations to agencies and organizations
- Service club and interest-group presentations
- Flyers and informational handouts
- Public Service Announcements to be released on radio, television, or in the press
- Development of educational websites to be linked to member and other agency sites
- Other public outreach methods described in Stakeholder Involvement outline in Section 9

Objective 2b: Native American Tribes

Develop programs which will further increase communications between the Madera RWMG and Native American tribes within the region to listen to concerns and to educate on proposed programs which will preserve and manage water supplies for the future. Work with Tribal Conservation Districts and Regional Tribal Advisory Committee shall follow the IRWM Tribal Guidelines.

4.5.3 - GOAL NO. 3: ASSURE GROUNDWATER QUALITY MEETS DRINKING AND IRRIGATION WATER QUALITY STANDARDS

Certain areas within the RWMG boundaries, including both municipal and agricultural users, face water quality issues. These issues range from excessive TDS that makes irrigation less effective, to levels of contamination that exceed State Public Health Goals and Maximum Contaminant Levels for a variety of constituents of concern. Within the Madera RWMG area, certain wells have needed treatment for nitrates, iron, manganese, arsenic, and high heterotrophic plate count (which leads to a "blue slime" in the water).

Objective 3a: Identify problem areas.

Identify and map areas with water quality issues within the Madera RWMG boundaries. These maps will include extent of contaminant, the depth range where the contaminant has been found, and typical concentrations that have been found in groundwater.

Objective 3b: Identify strategies to address chemical constituents of concern.

Once the extent of each contaminant is identified, the Madera RWMG members will work together to identify common solutions for each constituent of concern, looking for ways to apply a common solution to a problem that may affect more than one-member agency. Such solutions may include wellhead treatment, blending to improve quality, centralized treatment, and zone selection for new wells to avoid contaminated water altogether.

Objective 3c: Propose projects to address waters which do not meet State Public Health Goals or irrigation standards.

Improvement projects will be conceived to address problematic waters. These projects will likely include treatment projects but could also include alternatives for supplies that would eliminate the need to use a contaminated supply. These projects will be formalized and considered by the Madera RWMG for including in future funding applications.

4.5.4 - GOAL NO. 4: IMPROVE FLOOD CONTROL AND PROTECTION

Much of the valley is relatively flat and susceptible to flooding from various creek, sloughs, and rivers. Recent history has shown that flooding can cause major damage in Madera County. Flood control and protection can be enhanced with building ordinances, water storage, and flood conveyance. Climate change could also alter the timing, frequency and magnitude of flooding. A range of future conditions needs to be identified and new policies, programs, and projects developed to accommodate the anticipated changes in flooding.

Objective 4a: Improve flood conveyance capacity.

Many sloughs, streams, flood bypass channels, irrigation canals, and rivers convey flood flows in Madera County. Maintaining or increasing the capacity of these channels will allow some flood waters to pass through the County without causing flooding or damage. Greater capacity could also increase the ability to convey and deliver water to flood control and recharge basins. Land subsidence is believed to have reduced the capacity of some facilities. In addition, vegetation such as Arundo donax has clogged some sloughs and reduced their conveyance capacity. Vegetation removal and eradication is a viable alternative to restore these facilities.

Objective 4b: Improve water storage capacity.

Increasing storage capacity can provide better re-regulation of water supplies and also conserve water for later use. Storage can be increased by building new dams, raising existing dams, off-channel reservoirs, silt removal, and groundwater recharge basins. Raising existing dams provides the greatest potential benefits in the Madera IRWMP area. Recharge basins have lower ability to quickly capture flood flows but are still considered effective and an important part of the overall strategy.

Objective 4c: Adapt to changes in amount, intensity, timing, quality, and availability of runoff and recharge.

With highly variable weather patterns, climate change may alter the amount, intensity, timing, quality, and availability of run off will need to have an adaptive management plan. Climate change could create instances where there may be longer time between wet events and, conversely, the runoff may be greater than normal. Projects that can accommodate larger variability will provide greater benefit.

4.5.5 - GOAL NO. 5: IMPROVE CONSERVATION

Conservation of natural resources is a goal that can span across many areas of water operation and management. The following objectives that will be evaluated in project review:

Objective 5a: Reduce energy consumption.

Reduction of energy consumption embedded in water use to ultimately reduce GHG emissions. Energy is the largest variable cost with regards to water conveyance and delivery. Increasing efficiency in pump stations will reduce energy consumption resulting in a reduction of GHG.

Objective 5b: Reduce emissions.

The objective of reducing emissions will be considered in the review of potential projects. Strategies adopted by California Air Resources Board (CARB) in its AB 32 Scoping Plan will be utilized as guidelines when evaluating different ways to meet Madera IRWM plan objectives. Projects will be evaluated on whether they implement the strategies adopted by CARB and the overall total number of projects will be used to measure effectiveness of the IRWMP adopted projects.

Objective 5c: Reduce carbon footprint.

The reduction of carbon footprint associated with water related operations is an objective of the Madera IRWMP. Options for carbon sequestration and using renewable energy will be evaluated in the review of potential Valley Projects.

4.6 - Foothill and Mountain Goals

4.6.1 - GOAL NO. 6: CREATE PRACTICAL, ENFORCEABLE POLICIES RESULTING IN SUSTAINABLE GROUNDWATER MANAGEMENT

This is a task that will fall primarily to the County of Madera along with the help from the local Maintenance Districts, Special Districts, and water companies. The County will take a lead role in organizing tasks such as organizing stakeholder meetings and outreach into the communities. The County will facilitate the process to develop a water management strategy between all the Foothill conveyance systems to achieve the best possible management of the area.

Objective 6a: Determine strategies to enhance sustainability in foothill and mountain water supplies.

Under this objective, the members will work to identify viable and beneficial strategies to stabilize and enhance supplies from hard rock wells. Projects will be developed that increase infiltration of storm water and other sources.

Objective 6b: Develop policies to improve hard rock well sustainability and quantity.

These potential policies may include enhancing supply to the hard rock areas, managing the number and size of extractions and other measures.

Objective 6c: Develop sources of surface water supply.

As discussed above, virtually all surface water in the area is controlled by long-time riparian and appropriative rights-holders. Actions under this objective must include a dual-pronged approach to identify the possibilities for increasing surface runoff while at the same time negotiating with existing rights-holders to allow increases in surface water runoff. As a result of new any practices, supplies may then be diverted by foothill and mountain users, so that those increases do not automatically accrue to the existing rights-holders.

Objective 6d: Implement water conservation policies to achieve the State's 20x2020 goal.

SB7x-7, also known as the Water Conservation Act of 2009, set a goal of reducing per-capita water use by 20% by 2020. This is known as the State's 20x2020 goal. As with the Valley, achieving sustainability in the foothill region is a balance between increasing supply while reducing demand. This objective addresses the latter. Because of the nature of foothill and mountain development, characterized by native landscapes with little need for irrigation, the indoor/outdoor water demand balance in the foothill/mountain area is skewed farther to the indoor side. As a result, implementation of effective indoor demand reduction measures will have a proportionally greater impact on demand reduction here. Concerted efforts to replace traditional indoor water fixtures and older appliances with water-conserving fixtures and appliances conforming to the latest standards will be an effective tool for achieving demand reduction goals.

Objective 6e: Fully utilize recycled wastewater from County-maintained districts and urban areas.

In areas such as Oakhurst, where municipal wastewater treatment is available, the potential exists to make and utilize recycled water for outdoor irrigation of public spaces and landscaping. Doing so will require construction of additional Wastewater Treatment Facilities to treat at least a portion of effluent to Title 22 standards and construction of sufficient "purple pipe" recycled water distribution systems to serve eligible public spaces and landscape areas in these communities.

Objective 6f: Develop and implement a comprehensive groundwater monitoring program by 2020.

Groundwater monitoring is an effective tool to understand the change in underground storage of water, as well as gaining information about sources and flow directions of the underground. Groundwater monitoring is difficult in hard-rock areas but understanding the current conditions as well as possible is important.

4.6.2 - GOAL NO. 7: IMPROVE WATER QUALITY

Existing issues include certain wells with levels of arsenic, iron, manganese, nitrate, gross alpha radiation, and uranium over DDW Maximum Contaminant Levels. Each of these is a naturally-occurring substance, characteristic of water stored in decomposing granite aquifers. As a result, prevention of these contaminants is not possible. Objectives under this goal must focus on treatment and mitigation of these natural effects.

Objective 7a: Promote community awareness of potential water quality issues.

Since many wells in the foothill and mountain areas are private and serve only the property owner, quality testing requirements are less rigorous than those imposed on public water systems. Strategies under this objective should focus on education about the need for regular water testing and on the symptoms of contamination where those are observable by the user.

Objective 7b: Protect Source Water areas.

Identify source water areas for the local aquifers and determine feasible means to protect water supplies from contamination before the water enters the underground fractures.

4.6.3 - GOAL NO. 8: IMPROVE WATERSHED MANAGEMENT

A large portion of the Madera IRWMP area includes wild watershed lands that hold the source waters used in large quantities for agricultural, urban, and environmental uses. This goal includes promoting best management practices for range, forest, and alpine lands to protect ecosystems thereby improving water supplies and water quality. It also includes preserving open space and natural habitats that protect and enhance water resources and native species.

Objective 8a: Manage forest density to increase surface runoff.

Many forests in the IRWMP area have been modified from natural conditions. Lack of old growth trees allows greater sunlight and precipitation to reach the forest floor resulting in denser forests. Thinning forests to reduce tree density and underbrush can increase runoff while having the ancillary benefit of reducing fire risks. Removal of invasive non-native vegetation, that has higher water use than native vegetation, can also improve water supplies.

Objective 8b: Manage vegetation to reduce fire risk and attempt to keep fires within their natural range of variability.

Forest and brush fires can lead to erosive conditions that contribute soil, nutrients, debris and ash into the water supplies. Local landowners can be educated and encouraged to reduce fire risk by using fire resistant and retardant landscaping. Land managers can reduce fire risk by creating strategic fuel breaks, conducting fuel treatments and forest restoration, thinning underbrush, and allowing low-intensity fires to consume accumulated fuel.

Objective 8c: Reduce erosion and sedimentation.

Excessive erosion and sedimentation can negatively impact wetlands, water courses, and storage capacity of reservoirs. Several measures can be taken to reduce erosion and sedimentation including slope stabilization, road maintenance and decommissioning, grading and drainage improvements, and best management practices during construction.

Objective 8d: Promote natural water storage through meadow, stream, wetlands, and floodplain restoration.

Natural features such as streams, meadows, wetlands and floodplains have been impacted and their ability to store water has been reduced. Restoration projects can help restore the natural habitat conditions, while simultaneously restoring natural hydrologic functions. Restoring these features can help to regulate water and reduce peak flows.

Objective 8e: Adapt to changes in amount, intensity, timing, quality and availability of runoff and recharge.

With highly variable climate changes the amount, intensity, timing, quality, and availability of run off will need to have an adaptive management plan. There may be longer time between wet events and the runoff may be greater than normal. Projects that can accommodate larger variability will provide greater benefit.

4.6.4 - GOAL NO. 9: EXPAND STAKEHOLDER EDUCATION

Implement strategies to raise stakeholder and citizen awareness of water management issues including the magnitude of the challenge, potential mitigations, and consequences for failure to take effective action.

Objective 9a: Community education on water issues.

See Objective 3a under Valley Goals. Similar objectives and strategies will apply in the Foothill/Mountain area.

Objective 9b: Native American Tribes

See Objective 3b under Valley Goals. Similar objectives and strategies will apply in the Foothill/Mountain area.

4.6.5 - GOAL NO. 10: CONSERVATION

Conservation of natural resources is a goal with objectives that span across many areas of water operation and management. The following objectives that will be evaluated in project review.

Objective 10a: Reduce energy consumption

Reduce energy consumption embedded in water use to ultimately reducing GHG emissions.

Objective 10b: Reduce emissions

Consider, where practical, the strategies adopted by California Air Resources Board (CARB) in its AB 32 Scoping Plan, when evaluating different ways to meet IRWM plan objectives.

Objective 10c: Reduce carbon footprint

The reduction of carbon footprint associated with water related operations is an objective of the Madera IRWMP. Options for carbon sequestration and using renewable energy will be evaluated in the review of potential Foothill and Mountain projects.

SECTION 5 - RESOURCE MANAGEMENT STRATEGIES

This Section supplements Chapter 6 of the 2014 IRWMP previously prepared by the Madera RWMG to incorporate additions for Prop 1 and the California Water Plan. Specifically, Table 6.1 of the 2014 IRWMP provides resource management strategies and their applicability to the Valley and/or Foothill/Mountain Areas.

The California Water Plan (CWP) has served as the long-term strategic plan for informing and guiding the sound management and development of water resources in the state. With updates every five years, this plan reaffirms the State's commitment to integrated water management.

The CWP Update 2013 lays out a comprehensive suite of actions intended to move California toward more sustainable management of water resources and more resilient water management systems. Ultimately, sustaining resiliency needs to be measured in terms of improved public safety, environmental stewardship, and economic stability.

5.1 - New CWP Criteria for Prop 1 Update

For this Prop 1 Update new criteria from the CWP 2013 have been considered and incorporated. The new criteria evaluated is as follows:

- Sediment Management
- Outreach and Engagement
- Water and Culture

5.2 - Update to CWP Criteria

5.2.1 - CLIMATE CHANGE

New tools for vulnerability assessments are available for developing strategies for the effects of climate change for the region. The review process for climate change strategies is shown in detail in Section 9.

5.2.2 - REDUCING ENERGY CONSUMPTION

The CWP criteria for reducing energy consumption has also been expanded to reducing energy embedded in water use. The goal is to reduce energy which in turn would reduce Green House Gas emissions. These criteria have been built into the objectives and goals of this Prop 1 Update.

5.2.3 - ADAPTATION STRATEGIES

Throughout the planning process, strategies have been reviewed at Madera RWMG meetings with stakeholders, water officials, City representatives, County representatives, elected officials, and community leaders. This process has brought together concerns and ideas for developing a plan which is adapting to changing conditions. A broader look at issues of climate change, energy reduction, water quality, and water supply adaptation is a must for a successful future. Adaptation strategies for Climate Change are included in Table 9-3, where they are grouped by climate change impacts and subsequently ranked by effectiveness of adaptation. Essentially, the more adaptation criteria the measure accommodates, the higher the measure is ranked within the list.

SECTION 6 - PROJECT REVIEW PROCESS

The adopted project review process accomplishes four key objectives identified in the IRWMP Guidelines and meets Proposition 1 requirements:

- Project Identification and Solicitation: The adopted process allows the Madera RWMG to solicit, and the Partners to identify, proposed projects which have the potential to meet the IRWMP goals and objectives.
- Project Selection: The adopted process allows the Madera RWMG to review and select projects from the proposals made by the Members and to list those selected projects in the Madera IRWMP.
- Publishing the Project List: The adopted process allows the Madera RWMG to communicate the list of projects in the Madera IRWMP to stakeholders and the public.
- Matching Projects to Funding Opportunities: The adopted process further allows the Madera RWMG to rank and select the most promising projects to include in specific grant applications, based upon the funding program's published scoring and ranking criteria, thereby increasing the chances that the Madera RWMG's grant application will be favorably reviewed, scored, and funded.

6.1 - Review of New Objectives

The Madera RWMG reviewed the new goals and objectives for the Prop 1 Update at their monthly meetings of the Madera group. These goals and objectives incorporate potential effects of climate change and its vulnerabilities of climate change such as amount, intensity, timing, quality, and variability of runoff and recharge. These objectives also consider the reduction of energy to ultimately reduce GHGs. The group ranked these objectives to understand the group's priorities. The following table, New Objectives for Prop 1 Update (2018), show a summary of the poll.

Table 6-1 - New Objectives for Prop 1 Update (2018)

No.	Objective	Low	Medium	High	Ave
2b	Native American Tribes	4	3	3	2.11
5a	Reduce energy consumption	1	3	6	2.78
5b	Air resources strategies	0	7	3	2.56
5c	Carbon sequestration	2	7	1	2.11
8e	Adapt to changes in amount, intensity, timing, quality, and availability of runoff and recharge	0	1	9	3.22
9b	Native American Tribes	1	5	4	2.56
10a	Reduce energy consumption	1	6	3	2.44
10b	Air resources strategies	0	8	2	2.44
10c	Carbon sequestration	3	6	1	2.00
		12	46	32	
Notes:	Valley Objectives				
	Foothill and Mountain Objectives				

6.2 - Integration of Objectives

The ranking of the new objectives was then incorporated into the overall ranking from the 2014 IRWMP update. The following Table Combines Objectives (2014, 2018) shows the combined rankings.

Table 6-2 - Combined Objectives (2014, 2018)

No.	Objective	Low	Medium	High	Ave
8e	Adapt to changes in amount, intensity, timing, quality, and availability of runoff and recharge	0	1	9	3.22
1a	Increase regional capacity for direct recharge by 50,000 AF/Year	0	2	12	2.86
2a	Community education on water issues (Valley)	0	3	11	2.79
1d	Improve water reliability	0	3	11	2.79
5a	Reduce energy consumption	1	3	6	2.78
9a	Community education on water issues	0	3	9	2.75
4b	Improve water storage capacity	1	2	11	2.71
7b	Protect source water areas	0	4	8	2.67
1e	Expand water conservation efforts	0	5	9	2.64
6c	Develop sources of surface water supply	0	5	7	2.58
6f	Develop and implement a comprehensive groundwater monitoring program by 2020	0	5	7	2.58
3a	Identify (water quality) problem areas	2	2	10	2.57
5b	Air resources strategies	0	7	3	2.56
9b	Native American Tribes	1	5	4	2.56
8a	Manage forest density to increase surface runoff	1	4	7	2.50
7a	Promote community awareness of potential water quality issues	0	6	6	2.50
8d	Promote natural water storage through meadow, stream, wetlands and floodplain restoration.	1	4	7	2.50
10a	Reduce energy consumption	1	6	3	2.44
10b	Air resources strategies	0	8	2	2.44
3b	Identify strategies to address chemical Constituents of Concern	1	6	7	2.43
8b	Manage vegetation to reduce fire risk and keep fires within natural range of variability	2	3	7	2.42
6a	Determine strategies to enhance sustainability in foothill and mountain water supplies	1	6	6	2.38
1c	Expand CASGEM groundwater monitoring network	1	7	6	2.36
6d	Implement water conservation policies to achieve the State's 20x2020 goal	1	6	5	2.33
3c	Propose projects to address waters which do not meet State Public Health Goals	2	6	6	2.29
4a	Improve flood conveyance capacity	2	7	5	2.21
1b	Integrate flood/storm water conveyance infrastructure and regional irrigation system	2	7	5	2.21
6b	Develop policies to improve hard rock well sustainability and quantity	2	6	4	2.17
6e	Fully utilize recycled wastewater from County-maintained districts and urban areas	3	4	5	2.17
5c	Carbon sequestration	2	7	1	2.11
8c	Reduce erosion and sedimentation.	3	6	3	2.00
2b	Native American Tribes	4	3	3	2.11
10c	Carbon sequestration	3	6	1	2.00
	Total	37	158	206	

The Madera RWMG after reviewing proposed projects by the stakeholders have compiled 108 projects which rank highly for meeting the Madera IRWMP goals as set out in this plan. These projects are identified in Appendix A.

SECTION 7 - PLAN PERFORMANCE AND MONITORING

Project monitoring is important to track the successes and benefits of a project, ensure it is being operated properly, complies with laws and regulations, and to monitor the IRWM process and benefits. The Madera IRWMP contains performance measures and monitoring methods to ensure the objectives of the Plan are met. These performance measures will be evaluated to promote adaptive management for climate change and changing conditions. Examples of project-specific monitoring can include monitoring water quality, groundwater depth, flood frequency, and effects a project may have on habitat or particular species. Project-specific monitoring is the responsibility of the agency(s) or group(s) that are implementing a project and expect to directly benefit from the project. These agency(s) are also responsible for developing project monitoring plans.

The Madera RWMG will require draft monitoring plans for projects that are considered for funding. Final monitoring plans are prepared after final designs are completed and are typically approved by regulatory or funding agencies. The Madera RWMG will request copies in order to provide complete reporting within the Madera RWMG.

Draft monitoring plans typically include the following information when applicable:

7.1 - General Information

- Project description
- Describe what is being monitored (water quality, water flows, etc.).
- Need for monitoring

7.2 - Monitoring Program Parameters

- Frequency and schedule
- Overall time period (e.g. 5 years, life of project, etc.)
- Locations
- Protocols
- Tools and equipment
- Pertinent laws and regulations
- Quality control procedures

7.3 - Project Specific Impacts/Benefit Analysis

As stated in the 2014 Plan (Chapter 8.5), in accordance with state law, the potential environmental impacts of all projects pursuant to the Madera IRWMP will be evaluated under the California Environmental Quality Act (CEQA). When funding requirements so dictate, additional environmental review will be done pursuant to the National Environmental Policy Act (NEPA).

As required under CEQA and NEPA, mitigation measures will be developed whenever feasible, for impacts which are determined to be significant. Project impacts and benefits must be described when projects are submitted to the Madera RWMG in the Project Information (Project Review Process) Form and prior to funding consideration. Grant Pre-applications must include thorough discussions of potential benefits and impacts, but will not require completion of CEQA. However, if an agency chose to complete CEQA review of a potential project, it could improve the chances of that project being recommended for inclusion in a funding application since there would be: 1) an increased certainty of the project's scope, benefits and impacts; and 2) a reduction in the time required to move the project to construction after approval of funding.

As a minimum, the benefit/impact analysis should address the topics found in a CEQA Environment Assessment (EA), including: aesthetics, air quality, biological resources, climate change, cultural resources, geology and soils, hydrology and water quality, land use and planning, noise, population and housing, public services and utilities, recreation, and transportation and circulation.

7.4 - Data Management Procedures

- Data storage and tracking
- Incorporation into Statewide databases
- Targets to be reached (if any)
- Measures to remedy or react to problems encountered during monitoring
- Reporting procedures

7.5 - Other Topics

- Funding source for on-going monitoring
- Responsibility for on-going monitoring

An important component of monitoring and data management is qualitative or quantitative trend analysis. When relevant, appropriate trend analysis will be a part of project monitoring plans. See Table 7-1 for a summary of the measurement criteria of the objectives in the Madera RWMG.

Table 7-1 Measurement Criteria for the Objectives of the Madera IRWMP

Measurement Criteria		
1 - Achieve Groundwater Sustainability		
	1a - Increase Regional Capacity for Direct Recharge	
		Number of groundwater recharge facilities in operation
		Number of acres developed for intentional recharge
		Number of acre-feet of water available for recharge use
		Number of acre-fee of water actually diverted for recharge use
		Quantity of groundwater irrigation replaced by imported surface water irrigation (in-lieu recharge)
	1b - Integrate flood/storm water conveyance infrastructure and regional irrigation system	
		Number of projects integrating flood/storm and irrigation system conveyance completed
		On-going evaluation of remaining opportunities to integrate flood/storm and irrigation system conveyance
	1C - Expand CASGEM groundwater monitoring network to semi- annually measure regional groundwater on a per-aquifer basis	
		Number of monitoring well sites in operation
		Number of monitoring wells for which a well log is available
		Number of member and affiliate agencies participating in the monitoring program
		Number of wells being monitored and reported twice annually
	1d - Improve water reliability	
		Number of water reliability projects implemented
		Increase in dry year water supply in acre-feet
		Number of acres/people with improved water reliability
	1e - Expand water conservation efforts	
		Number of acre-feet of water conserved
		Number of water conservation projects implemented
2 - Expand Stakeholder Education		
	2a - Determine most desirable form of organization and achieve buy-in from RWMG member agencies	
		Completion of internal report on available organizational options
		Completion of member vote on most desirable form of organization
	2b - Identify sources for ongoing operational funding for the independent local organization	
		Report to IRWMG summarizing funding options for the independent local organization
	2c - Seek special legislation as required to create the chosen special district	
		Identify local Assemblyman
		Complete Special Legislation bill
		Assemblyman introduces special legislation in the Assembly
3 - Assure groundwater quality meets drinking and irrigation water quality standards		
	3a, 9a - Community education on water issues	
		Number of new programs
		Number of days of educational activity provided
		New materials and dissemination
	3b - Native American Tribes	
		Number of meetings with Tribes
		Number of meetings Tribe representatives attend

Measurement Criteria continued		
4 – Improve Flood Control and Protection		
	4a - Identify water quality problem areas	
		Number of water quality studies
		Number of problem areas identified and characterized
	4b - Identify strategies to address chemical constituents of concern	
		Number of water quality studies
		Number of projects implemented to improve water quality
	4c - Propose projects to address waters which do not meet State Public Health Goals or irrigation	
		Number of projects implemented
		Number of projects completed that mitigate water quality violations
5 – Conservation		
	5a, 10a - Improve flood conveyance capacity	
		Number of projects completed
		Miles of channels improved
		Total increase in conveyance capacity in cfs
	5b, 10b - Improve water storage capacity	
		Number of storage projects completed
		Additional acre-feet of storage capacity developed
	5c, 10c -Adapt to changes in runoff and recharge	
		Number of years all storm water captured in county
		Additional acre-feet of storage capacity developed
6 - Create practical, enforceable policies resulting in sustainable groundwater management		
	6a -Reduce energy consumption	
		Number of projects approved that have energy reductions
		Number of years that have energy reductions
	6b - Air resources strategies	
		Number of projects approved with air improvement components
		Number of CARB strategies met
	6c - Reduce energy consumption	
		Number of projects with renewable energy components
		Number of projects with clean energy components
7 - Improve Water Quality		
	7a -Determine strategies to enhance sustainability in foothill and mountain water supplies	
		Number of local stakeholder meetings to discuss strategies and recommend to IRWMG
		IRWMG adopts foothill/mountain water supply sustainability strategies
	7b - Develop policies to improve hard rock well sustainability and quantity	
		Number of local stakeholder meetings to discuss strategies and recommend to IRWMG
		IRWMG adopts foothill/mountain hard rock well sustainability strategies
	7c - Develop sources of surface water supply	
		Number of meetings with Valley-based water rights-holders
		Number of local stakeholder meetings to discuss strategies and recommend to IRWMG
		IRWMG adopts foothill/mountain surface water enhancement strategies
	7d - Implement water conservation policies to achieve the State's 20x2020 goal	
		Number of local stakeholder meetings to discuss strategies and recommend to RWMG
		Number of outreach meetings with foothill/ mountain water purveyors
		IRWMG adopts foothill/mountain water conservation policies

Measurement Criteria continued

- 7e - Fully utilize recycled wastewater from County-maintained districts and urban areas
  - Identify and contact foothill/mountain Publicly Owned Treatment Works operators
  - Number of outreach meetings with identified POTW operators
  - Number of potential recycled water projects identified
  - Quantity of potential recycled water to be produced in identified projects
- 7f - Develop and implement a comprehensive groundwater monitoring program by 2020
  - Number of local stakeholder meetings to discuss strategies and recommend to RWMG
  - Number of potential groundwater monitor wells identified
  - Percentage of identified wells committed to a monitoring program
  - Number of semi-annual monitoring reports prepared

8 – Improve Watershed Management

- 8a - Promote community awareness of potential water quality issues
  - Number of new programs
  - Number of days of educational activity provided
  - New materials and dissemination
- 8b - Protect Source Water areas
  - Number of local stakeholder meetings to discuss strategies
  - Percentage of source water identified
  - Number of source water protection projects and programs identified

9 - Expand Stakeholder Education

- 9a - Manage forest density to increase surface runoff
  - Area of forest thinned
  - Estimated volume of increased runoff
- 9b - Manage vegetation to reduce fire risk and attempt to keep fires within their natural range of variability
  - Number of projects completed
  - Area of land managed to reduce unnaturally large fires
  - Number of acres of fuel breaks
- 9c -Reduce erosion and sedimentation
  - Amount of development that is relocated away from sensitive areas
  - Acreage of protected lands
  - Number of properly employed sediment/erosion BMPs
  - Number of studies evaluating land use and erosion/sedimentation
- 9d - Promote natural water storage through meadow, stream, wetlands and floodplain restoration
  - Number of meadows, wetlands, streams or floodplains restored
  - Number of acres/miles of areas restored.
  - Water temperatures pre-and post restoration
  - Groundwater level change
  - Number of special status species' habitat improved in restored areas
  - Number of acre-feet stored or delayed in runoff
- 9e - Adapt to change in amount, intensity, timing, quality, and availability of runoff and recharge
  - Number of acre-feet stored or delayed in runoff
  - Groundwater level change

10 - Climate Change

- 10a - Plan addresses potential impacts of future climate change
  - Increased flood flows
  - Increase in storage facilities to off-set longer dry cycles
- 10b - Long term reduction of greenhouse gases
  - Reduction in gas producing energy use
  - Supports efforts to develop alternative energy sources
- 10c -Promote public education about impacts of climate change
  - Relationship of climate change to water resources
  - Provides protection to the pristine natural resources from climate change impacts

SECTION 8 - LOCAL LAND USE AND WATER PLANNING

This Section supplements Chapter 13 of the 2014 IRWMP previously prepared by the Madera RWMG to incorporate any required additions for Prop 1.

8.1 - Madera Regional Water Management Group

The Madera RWMG has been actively involved in bringing together area-wide water resource officials from water districts, Cities, and County government since 2008 when the Region's initial Integrated Regional Water Management Plan (IRWMP) was approved. The Madera RWMG has actively been coordinating with local community leaders and non-profit organizations to involve disadvantaged communities as part of the IRWMP. The Program is designed to encourage integrated regional strategies for management of water resources by providing funding for projects and programs that support integrated water management.

The group has been bringing stakeholders and water administrators together through monthly meetings. The meeting locations rotate through three locations in the county to accommodate easier community access. The group also sponsors workshops and other events to educate and inform the public.

8.2 - Local Land Use Planning Documents

Local land use planning documents from the City of Madera, Madera County Local Agency Formation Commission, and Federal Agencies provided insight into the goals and specific needs. During the Prop 1 update, the following plans were reviewed, Madera County General Plan, Ahwahnee Area Plan, Coarsegold Area Plan, Gateway Village (Riverstone) Area Plan, Madera State Center Community College Specific Plan, and Rio Mesa Area Plan were reviewed. These documents are summarized in the following Table 8-1.

8.3 - Local Water Plans

In 2014, the Madera IRWM Plan that was prepared by Provost and Prichard identified local water plans. These plans are summarized in Table 8-2 with addition of Madera County's 2017 Stormwater Resource Plan.

8.4 - Stormwater Resource Plan

The Madera County Storm Water Resource Plan (SWRP) is a first of its kind watershed-based storm water plan that establishes an integrated and coordinated storm water runoff management strategy for the County. Development of the Madera County SWRP was funded through a Proposition 1 planning grant and is being led by the County of Madera in coordination with a Technical Advisory Committee, Stakeholder Group, and community members. The MSWRP is attached in Appendix B.

8.5 - Chowchilla Subbasin

The Chowchilla Subbasin exists within the larger San Joaquin Valley Groundwater basin. The County of Madera is the exclusive GSA for the portion of the Chowchilla Subbasin in the unincorporated area of the County, and not otherwise covered by another public agency. Other GSAs in the Chowchilla Basin include Chowchilla Water District, Triangle T Water District and Merced County. This Chowchilla Subbasin GSA group will have one Groundwater Sustainability Plan (GSP) to address the severe overdraft conditions that exist in the basin. The plan will go into effect in 2020 with the goal of sustainability by 2040.

8.6 - Madera Subbasin

The Madera Subbasin exists within the larger San Joaquin Valley Groundwater basin. The County of Madera is the exclusive GSA for the portion of the Madera Subbasin in the unincorporated area of the County, and not otherwise covered by another public agency. An Advisory Committee advises the Madera County GSA for the Madera Subbasin. There are multiple GSAs within the Madera Subbasin, including the Madera County GSA, City of Madera GSA, Madera Irrigation District, Root Creek Water District, Madera Water District, Gravelly Ford Water District, and New Stone Water District. There are four GSPs being prepared in the Madera Subbasin by Gravelly Ford Water District GSA, New Stone Water District GSA, Root Creek Water District GSA and the Madera GSA, these four are negotiating a coordination-agreement to cover the Madera Subbasin.

8.7 - Delta-Mendota Subbasin

The Delta Mendota Subbasin Coordination Committee oversees the governance of six (6) individual regions totaling approximately 747,000 acres, consisting of 24 individual GSAs, that are developing GSPs:

- North and Central Delta-Mendota Region GSP (315,927 acres)
- San Joaquin River Exchange Contractors Water Authority (SJRECWA) GSP (289, 912 acres)
- Grassland GSP (104,417 acres)
- Farmers Water District (WD) GSP (2,214 acres)
- Fresno County GSP (24,354 acres)
- Aliso WD GSP (26,636 acres)

The overall governance structure of the Coordination Committee is shown in Figure 8-1.

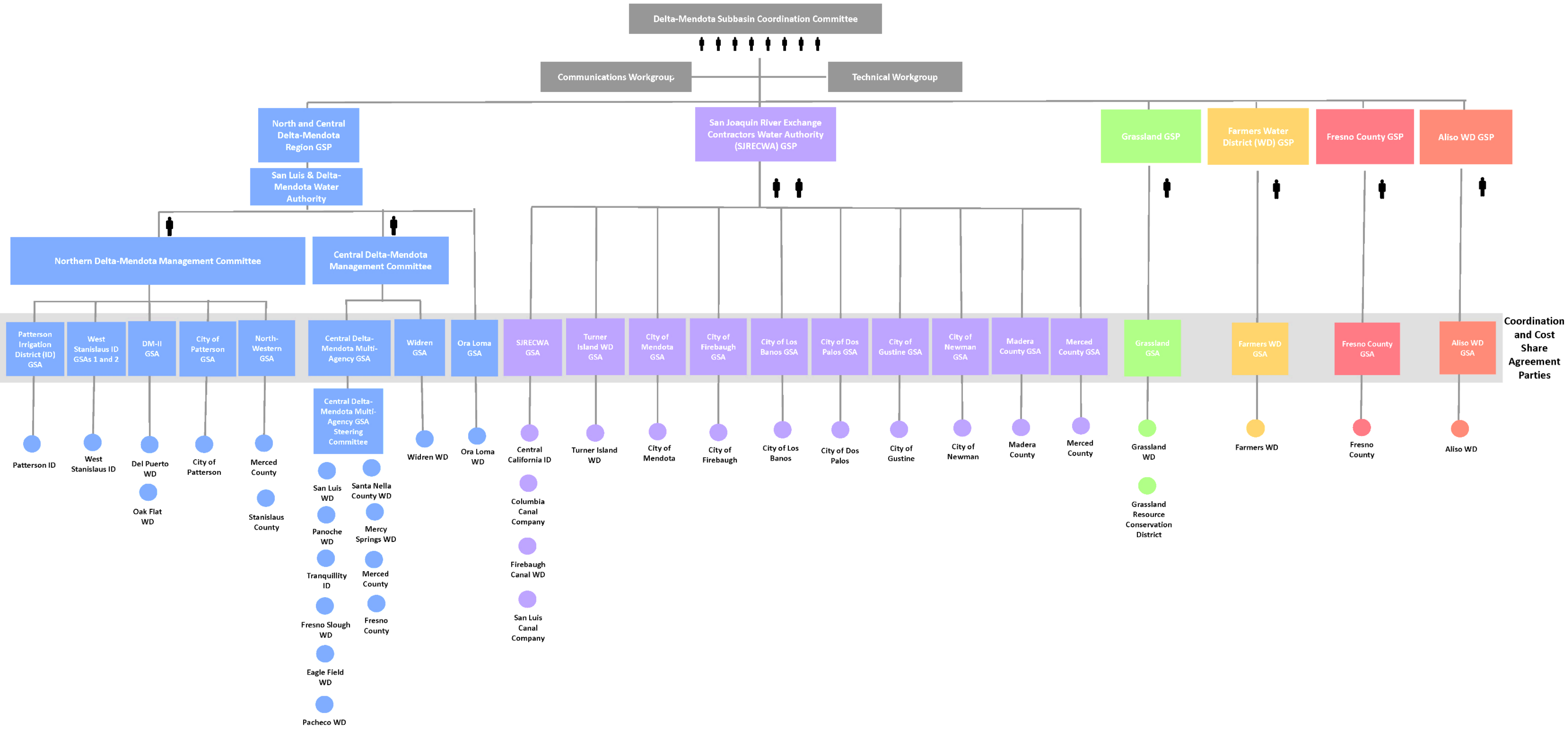


Figure 8-1
Delta-Mendota Subbasin SGMA Governance Structure

Table 8-1 –Land Use Planning Documents

	Reduce Water Use / Demand		Improve Operation Efficiency and Transfers				Increase Water Supply						Improve Water Quality						Practice Resources Stewardship								Improve Flood Management	Other
Agencies/Organizations and Type of Plan	Ag Water Use Efficiency	Urban Water use Efficiency	Conveyance - Delta	Conveyance - Regional & Local	System Reoperation	Water Transfers	Conjunctive Management & Groundwater	Desalination	Precipitation Enhancement	Recycled Municipal Water	Surface Storage - CALFED	Surface Storage - Regional & Local	Drinking Water Treatment & Distribution	Ground Water & Aquifer & Remediation	Matching Water Quality to Use	Pollution Prevention	Salt & Salinity Management	Urban Runoff Management	Ag Lands Stewardship	Economic Incentives (Loans, Grants, & Water Pricing)	Ecosystem Restoration	Forest Management	Land Use Planning & Management	Recharge Areas Protection	Water-dependent Recreation	Watershed Management	Flood Risk Management	Other Strategies
LAND USE PLANNING DOCUMENTS																												
Madera County																												
Ahwahnee Area Plan		×								×								×										
Coarsegold Area Plan		×								×								×					×					
Gateway Village Area Plan	×	×		×		×								×		×		×					×					
Gunner Ranch Area Plan		×								×								×										
Madera County General Plan		×																										
Madera State Center Community College Specific Plan		×																×										
North Fork/South Fork Community Center Area Plan																							×					
Oakhurst Area Plan		×																×	×				×					
Raymond Area Plan		×																	×				×					
Rio Mesa Area Plan		×								×								×										
Madera County Local Agency Formation Commission																												
Draft MSR for CSA #1 and CSA #21	No specific policies in the doc that apply.																											
Greater Rio Mesa Area MSR	No specific policies in the doc that apply.																											
Madera Ranchos MSR	No specific policies in the doc that apply.																											
Oakhurst MSR	No specific policies in the doc that apply.																											
MSR for EIGHT PUBLIC WATER DISTRICTS in MADERA COUNTY			×									×																
State of California																												
NA																												
Federal																												
Sierra National Forest - Forrest Land and Resource Management Plan, 1991	No specific policies in the doc that apply.																											
Badger Pass Ski Lodge Rehabilitation - FONSI		×																×										
Ansel Adams, John Muir, and Dinkey Lakes Wilderness																						×						

Table 8-2 – Local Water Plans

	Reduce Water Use / Demand		Improve Operation Efficiency and Transfers				Increase Water Supply								Improve Water Quality						Practice Resources Stewardship								Improve Flood Management	Other
Agencies/Organizations and Type of Plan	Ag Water Use Efficiency	Urban Water use Efficiency	Conveyance - Delta	Conveyance - Regional & Local	System Reoperation	Water Transfers	Groundwater Storage & Conjunctive Water Management	Desalination	Precipitation Enhancement	Water-use Efficiency	Stormwater Management	Water Recycling	Surface Storage - CALFED	Surface Storage - Regional & Local	Drinking Water Treatment & Distribution	Ground Water & Aquifer & Remediation	Matching Water Quality to Use	Pollution Prevention	Salt & Salinity Management	Urban Runoff Management	Ag Lands Stewardship	Economic Incentives (Loans, Grants, & Water Pricing)	Ecosystem Restoration	Forest Management	Land Use Planning & Management	Recharge Areas Protection	Water-dependent Recreation	Watershed Management	Flood Risk Management	Other Strategies
WATER PLANNING DOCUMENTS																														
County of Madera / Region																														
County of Madera: General Plan	x	x				x	x									x	x	x		x			x	x	x	x	x	x		x
County of Madera: AB 3030 Ground Water Management Plan		x				x	x					x		x	x	x	x	x	x	x	x				x	x		x		
County of Madera: Storm Water Quality Management Program							x										x	x		x						x		x		
Madera Regional Groundwater Management Plan, A partnership between: City of Chowchilla, Chowchilla Water District, City of Madera, Madera Irrigation District, South-East Madera County United	x	x		x			x							x	x	x			x	x	x	x			x	x		x	x	
City of Chowchilla (GP/EIR)																														
City of Chowchilla: Draft 2008 Urban Water Management Plan		x				x	x	x		x					x			x	x						x	x		x		
City of Madera																														
City of Madera 2010 Urban Water Management Plan		x			x	x		x						x														x		
City of Madera Storm Water Management Plan		x		x			x											x		x										x
Special Districts																														
Aliso Water District: Ground Water Management Plan (information not available)																														
Chowchilla-Red-Top-City Joint Powers Authority, AB 3030 Groundwater Management Plan (1997)	x					x	x	x						x	x	x		x	x		x				x	x		x		
Chowchilla Water District, Water Management Plan Five Year Update (2008 Criteria)	x					x	x														x	x			x	x		x		
Gravelly Ford Water District: 2009 Water Management Plan	x					x	x						x													x			x	x
Madera Irrigation District: (Agriculture) Water Management Plan, 5-year Update 2012	x					x																								
Root Creek Water District: AB 3030 Groundwater Management Plan, January 2012	x				x	x	x									x										x				
Madera County																														
Storm Water Resource Plan 2017							x										x	x								x		x		
State of California																														
California Water Action Plan	x	x	x		x		x	x		x	x		x	x		x		x	x	x		x	x	x	x	x	x	x	x	
Federal																														
Yosemite National Park - Wawona Water Conservation Plan		x					x															x	x							
Madera Irrigation District: (Agriculture) Water Management Plan, 5-year Update 2012	x					x																								
Root Creek Water District: AB 3030 Groundwater Management Plan, January 2012	x				x	x	x										x										x			
State of California																														
California Water Action Plan	x	x	x		x		x	x					x									x	x	x	x			x	x	
Federal																														
Yosemite National Park - Wawona Water Conservation Plan		x					x															x	x							

SECTION 9 - CLIMATE CHANGE

This Section supplements Chapter 16 of the 2014 IRWMP previously prepared by the Madera RWMG to incorporate any required additions for Prop 1.

California faces the prospect of significant water management challenges related to climate change and is already experiencing a wide array of effects. Impacts that are currently occurring and that are projected to continue include increased temperatures, sea level rise, a reduced winter snowpack, and altered precipitation patterns, including more frequent and intense storm events (CNRA, 2012). The previous measures and conclusions in Chapter 16 of the 2014 IRWMP for this region should also be reviewed on this topic for additional background information (Appendix D).

While it is clear that actions must be taken to reduce greenhouse gas (GHG) emissions to mitigate impacts on global climate, adaptation to already-occurring impacts is also crucial to continue to effectively manage the State's water resources. Water resource managers and customers can play key roles in improving water and energy efficiency, reducing GHG emissions, and improving stewardship of the State's natural resources (DWR, 2008)

The State Water Project Delivery Final Delivery Reliability Report 2011 (DWR 2012b) (the most recent version available at the time of this IRWM Plan) projects a temperature increase of 1.3° to 4.0 °F by mid-century and 2.7° to 8.1° F by the end of the 21st century, and that increased temperatures will lead to less snowfall at lower elevations and decreased snowpack. By midcentury it is predicted that Sierra Nevada snowpack will reduce by 25 percent to 40 percent of historical average. Decreased snowpack is projected to be greater in the northern Sierra Nevada, closer to the origin of SWP water, than in the southern Sierra Nevada. Furthermore, an increase in "rain on snow" events may lead to earlier runoff. Given these changes, water shortages worse than the 1977 drought could occur one out of every six to eight years by the middle of the 21st century and one out of every two to four years by the end of 21st century. Increased demand combined with declining flows will likely lead to decreased carryover storage from year to year.

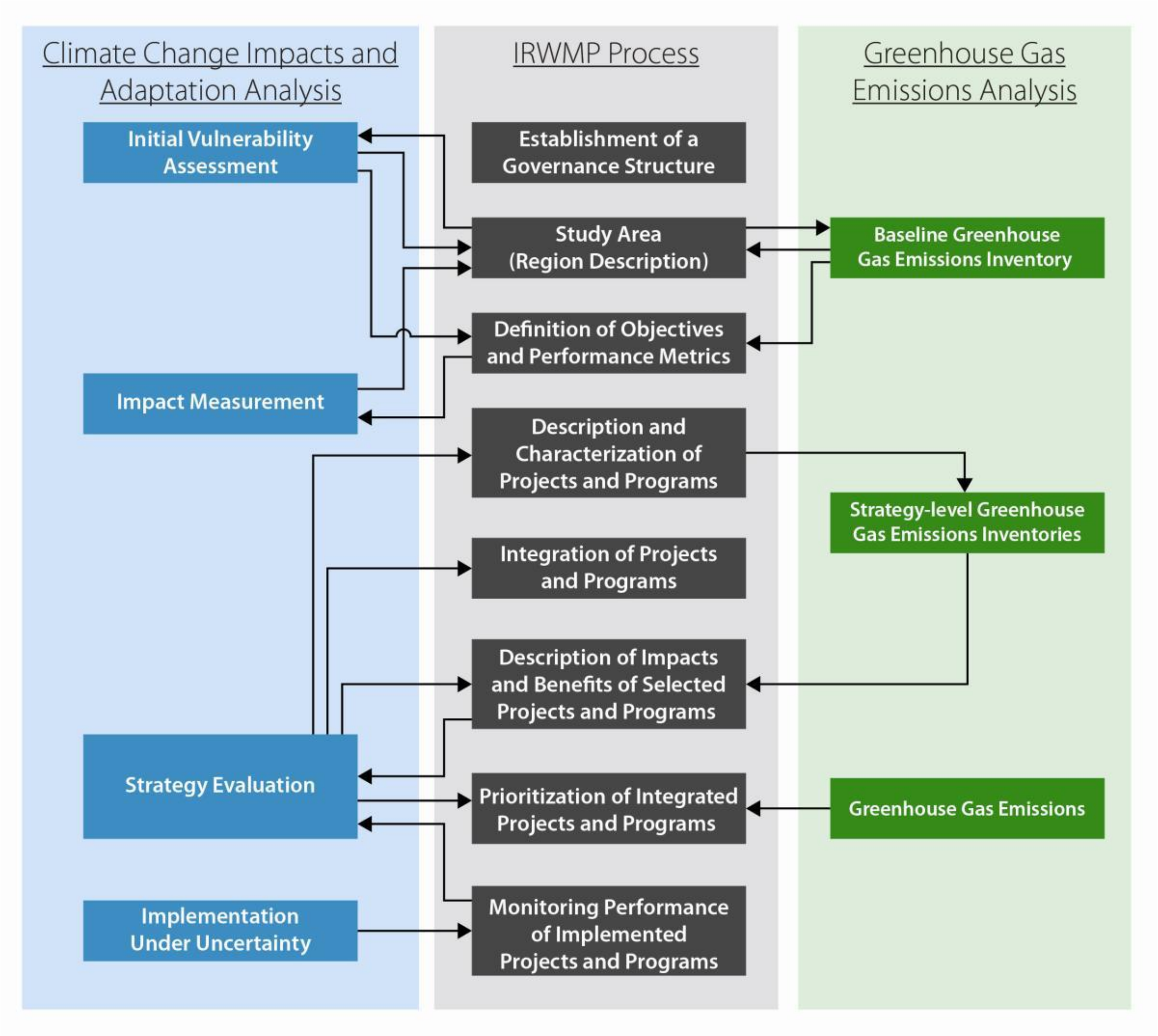
These changes have the potential to impact water demand, water supply, flood management, water quality, aquatic ecosystems, sea level rise, and hydroelectric resources. In some areas of the U.S., including California, the impacts of climate change on water resources are already being detected and encountered with other climate change events having little to no impact on the region despite being evident in other parts of the State, such as sea level rise. It is expected that more prominent impacts will be seen within the next 20 to 50 years.

9.1 - Assess Vulnerability

Identifying the region-specific water resources that are potentially vulnerable to climate change in a way that is both significant for the stakeholders involved and quantifiable is essential in being proactive regarding the effects of climate change. The interrelationship of the Madera IRWMP process and climate change is shown in Table 9-1. This flow chart expresses how projects and programs under Madera IRWMP can benefit the region and reduce emissions of greenhouse gases and the effects of climate change.

- **Characterizing a Region:** This step is part of any regional planning framework and involves identifying key water-related resources in the region and related infrastructure.
- **Identifying Qualitative Water-Related Climate Change Impacts:** Conduct a literature review of anticipated climate change impacts specific to the region and resources identified.
- **Identifying Key Indicators of Potential Vulnerability:** Identify simple, "back of the envelope" metrics for qualitatively assessing vulnerability to climate change for key water resources; and
- **Prioritizing Vulnerable Water Resources**: Based on qualitative metrics, prioritize the resources that are more likely to be vulnerable to climate change effects and have a significant impact on water management in the region.
- **Water infrastructure may be inadequate under greater climate variability.** Water storage infrastructure was designed for historic flow regime and development levels, and may not accommodate increased winter peak flows, or have adequate carryover storage for drought periods. The conveyance system was designed for a certain demand, and inadequate peaking capacity may exist during times of extraordinary heat (for irrigation demand). Conflicts over storage may increase among agricultural, domestic, hydropower, flood control, and environmental needs.
- **Decreased overall supply would likely result in a higher concentration of pollutants.** Increased concentrations of pollutants may occur from increased groundwater pumping for agriculture and/or municipalities. Local pollution from landfills may impact neighboring surface and/or groundwater quality, especially when combined with other agricultural pollutants such as nitrate and various pesticides. Pollutants may be concentrated in surface water from a combination of lower flows and return flows from irrigation. Salinity concentrations may also begin to pose increasing threats to arable land in the face of a changing climate, irrigation practices, or water supply regime.
- **Fire risk** is projected to rise significantly at higher elevations. The Cal-Adapt website facilitates projections for fire risk based on climate modeling under high and low GHG emission scenarios for specific areas in California.
- **Flooding may have the greatest effects on disadvantaged/under-represented communities.** The elderly and the young, and populations that lack resources or knowledge due to language or economic status are potentially the most vulnerable to the effects of flooding; adaptation strategies may require coordination with public health officials.

Table 9-1 - Relationship between IRWMP Process and Climate Change Analyses



9.1.1 - VULNERABILITY CONCLUSIONS

Based on the analysis from the 2014 IRWMP (Chapter 16.4), the following vulnerabilities were identified for the Madera Region. The listed vulnerabilities were reviewed during the preparation of this document and determined to still be valid. These vulnerabilities are listed in their order of importance:

1. Backup Water Supplies. The region has a reliable water supply, largely because groundwater has been a dependable backup supply during droughts and the dry season. However, groundwater levels are declining and groundwater demands may increase if climate change reduces precipitation and water yield, or causes earlier spring runoff that cannot be stored. If groundwater levels decline too much then the groundwater will become a less reliable supply, cause subsidence, increase energy demand and groundwater quality may decline. This vulnerability can be measured by several metrics, including groundwater overdraft, groundwater level decline, groundwater remaining in storage, and changes in well yields.

2. Inadequate Water Storage. Storage facilities in the Madera Region include several surface reservoirs and subsurface groundwater storage. These facilities have been successful in helping the region regulate seasonal and year-to-year surface water flows; however, there is still demand for more storage. The current facilities may be inadequate if warming reduces annual seasonal water storage in the form of snow. Obtaining permits to construct new large dams is extremely difficult and time intensive, and, therefore, storage would have to be developed by raising existing dams, and constructing groundwater banks and off-channel reservoirs, each of which still require environmental analysis and impact mitigation. This vulnerability can be measured by the volume of new storage developed in acre-feet, and the need can be assessed by measuring the quantity of carryover water remaining in storage year to year, or quantity of carry-over water and floodwater lost to the Region.

3. Climate Sensitive Crops. Warmer average temperatures could reduce losses from winter freezes to some crops such as citrus, but other crops such as stone fruit , pistachios and almonds depend on a required number of hours below a certain temperature each winter (known as “chilling hours”) to kill pests or ensure an effective dormancy. Higher temperatures could result in lower yields for these crops. No adaptation measures are available for this impact, other than changing crop types, which is expensive and very slow if permanent plantings are impacted. This vulnerability can be measured with the number of chilling hours below freezing, and impacts to crop productivity each year.

4. Flooding. Flooding can be a problem in areas of the Valley portion of Madera County lying along the San Joaquin River. Increases in high flows could create future problems since it is unlikely that large new flood control dams can be constructed. Therefore, proper floodplain zoning and limiting high-value development on floodplains is crucial to preventing future problems. Increasing flood channel capacity and constructing additional storage facilities is also important. This vulnerability can be measured by the number of essential structures constructed in the 200-year floodplain.

These vulnerabilities will be re-evaluated at least every five years to reflect changes in local cropping, water demands, water supplies, new facilities, and climate change projections.

9.2 - Measure Regional Impacts

To the extent appropriate, it is important to quantify climate change impacts to a region’s most vulnerable water resources. This step can be highly analytical or qualitative, depending on the system, estimated level of vulnerability, operational complexity, and resources available for the analysis. Climate model variables and relative reliability are shown in Table 9-2.

Table 9-2 Climate Model Variables and Relative Reliability for Water Resources Analysis

Water Management Issue	Climate Model Variables	Relative Reliability of Climate Model Output
Water Supply		
Long-term supplies - mean annual basin yield	Annual average temperature and precipitation	- High on temperature - Precipitation depends on geographic scale, higher at sub- continental scale - Regional climate model precipitation projections are more reliable than GCM projections
Long-term demand	Warm-season temperature and precipitation	Same as above
Shift in seasonality of runoff in snowmelt-dominated areas	Monthly temperature	Medium-High
Shift in seasonality of runoff in non- snowmelt-dominated areas	Seasonal precipitation	Medium-Low
Long-term supplies - variability in yield	Monthly temperature and precipitation	Medium-Low
Flooding		
Seasonal floods	Winter and spring precipitation	Medium-Low
Major storms/cyclones	Frontal systems; cyclone information and track	Low
Flash floods	Hourly precipitation in small geographic areas	Very Low
Water Quality		
Biological oxygen demand	Annual, seasonal, monthly air temperature (to estimate water temperature)	Medium-High
Dissolved oxygen	Annual, seasonal, monthly air temperature (to estimate water temperature)	Medium-High
Flow reduction	Annual, seasonal, monthly temperature, precipitation	Medium-High
Saline intrusion of groundwater	Sea level rise; annual temperature and precipitation	Low
Algal bloom	Annual, seasonal, monthly temperature	Medium-Low
Turbidity	Daily, hourly precipitation intensity	Low
Cryptosporidium	Daily, hourly precipitation intensity	Low

9.3 - Evaluate Strategies

The comparison and ranking of existing and potential resource management strategies based on their effectiveness in mitigating and adapting to climate change impacts is another important step in addressing the impacts of climate change. New potential projects or programs may also be identified during this step of the process. Evaluating strategies for climate change adaptive capacity provides a comprehensive evaluation of individual strategies or projects, as well as integrated project portfolios. This process will allow decision-makers to make well-informed management decisions and prevents the repetition of previously failed projects. These strategies are shown in Table 9-3.

Table-9-3 – Resource Management Strategies to Climate Change Adaptation

Resource Management Strategies	Climate Change Adaptation							
	Habitat Protection	Flood Control	Water Supply Reliability	Additional Water Supply	Water Demand Reduction	Sea Level Rise	Water Quality Protection	Hydropower
Reduce Water Demand								
Agricultural Use Efficiency			X		X		X	
Urban Water Use Efficiency			X		X		X	
Improve Operational Efficiency and Transfers								
Conveyance – Delta	X	X	X	X		X	X	
Conveyance – Regional/local	X	X	X	X			X	
System Reoperation		X	X	X				X
Water Transfers			X	X				
Increase Water Supply								
Conjunctive Management and Groundwater Storage		X	X	X			X	
Desalination			X	X				
Precipitation Enhancement				X				X
Recycled Municipal Water			X	X				
Surface Storage – CALFED	X	X	X	X			X	X
Surface Storage – Regional/local	X	X	X	X			X	X
Improve Water Quality								
Drinking Water Treatment and Distribution			X	X			X	
Groundwater Remediation/Aquifer Remediation			X	X				
Matching Quality to Use			X	X			X	
Pollution Prevention	X		X				X	
Salt and Salinity Management	X		X	X			X	
Urban Runoff Management	X	X					X	
Practice Resource Stewardship								
Agricultural Lands Stewardship	X	X			X		X	
Economic Incentives (Loans, Grants and Water Pricing)	X	X	X	X	X	X	X	X
Ecosystem Restoration	X	X	X			X	X	
Forest Management	X	X	X				X	
Land Use Planning and Management	X	X				X	X	
Recharge Area Protection		X	X	X			X	
Water-dependent Recreation	X	X	X				X	
Watershed Management	X	X	X	X		X	X	X
Improve Flood Management								
Flood Risk Management	X	X				X	X	X
Other Strategies								
Crop Idling for Water Transfers			X	X	X			
Dewvaporation or Atmospheric Pressure Desalination				X				
Fog Collection				X				
Irrigated Land Retirement			X		X			
Rainfed Agriculture					X			
Waterbag Transport/Storage Technology	X		X	X		X	X	

9.4 - Agricultural Practices and Reduction of Greenhouse Gases

The agricultural lands stewardship strategy includes measures that promote the continued use of agricultural lands and protect natural resources through the maintenance of agricultural lands. Erosion control measures are an example of agricultural land stewardship practices that support the viability of croplands while offering water resource benefits. This strategy contributes to the protection of open space and the traditional characteristics of rural communities. Further, it helps landowners maintain their farms and ranches rather than being forced to sell their land because of pressure from urban development.

Agriculture is a large component of the Madera County economy, contributing $2,017,446,000 in 2015 (Madera County Farm Bureau , 2016). The majority of these farms are owned by families, so there is a high potential for collaboration between stakeholders. There are many strategies that can be implemented to reduce greenhouse gas emissions that have been implemented across the state. The following Table 9-4 provides examples that sequester carbon and reduce emissions and the reduction of greenhouse gases.

Table-9-4 – Agricultural Practices that Sequester Carbon and or Reduce Emissions of Other Greenhouse Gases

Key Agricultural Practices	Typical Definition and Some Examples	Effect on Greenhouse Gases
Conservation or riparian buffers	Grasses or trees planted along streams and croplands to prevent soil erosion and nutrient runoff into waterways.	Increases carbon storage through sequestration.
Conservation tillage on croplands	Typically defined as any tillage and planting system in which 30% or more of the crop residue remains on the soil after planting. This disturbs the soil less, and therefore allows soil carbon to accumulate. There are different kinds of conservation tillage systems, including no till, ridge till, minimum till, and mulch till.	Increases carbon storage through enhanced soil sequestration may reduce energy-related CO_2 emissions from farm equipment and could affect N_2O positively or negatively.
Grazing land management	Modification to grazing practices that produce beef and dairy products that lead to net greenhouse gas reductions (e.g., rotational grazing).	Increases carbon storage through enhanced soil sequestration, may affect emissions of CH_4 and N_2O.
Biofuel substitution	Displacement of fossil fuels with biomass (e.g., agricultural and forestry wastes, or crops and trees grown for biomass purposes) in energy production, or in the production of energy-intensive products like steel.	Substitutes carbon for fossil fuel and energy-intensive products. Burning and growing of biomass can also affect soil N_2O emissions.

9.5 - Forestry Practices

California’s major water development projects rely on water produced in forested watersheds. Almost all forest management activities can affect water quantity and quality. This strategy focuses on those forest management activities that are designed to improve the availability and quality of water for downstream users, on both publicly and privately-owned forest lands. Examples of forest management activities include vegetation and fuels management to enhance soil moisture, groundwater recharge and streamflow.

The following Table 9-5 provides examples of forestry practices that can sequester carbon and the effects on greenhouse gases.

Table 9-5 - Forestry Practices that Sequester Preserve Carbon

Key Forestry Practices	Typical Definition and Some Examples	Effect on Greenhouse Gases
Afforestation	Tree planting on lands previously not in forestry (e.g., conversion of marginal cropland to trees).	Increases carbon storage through sequestration.
Reforestation	Tree planting on lands that in the more recent past were in forestry, excluding the planting of trees immediately after harvest (e.g., restoring trees on severely burned lands that will demonstrably not regenerate without intervention).	Increases carbon storage through sequestration.
Forest preservation or avoided deforestation	Protection of forests that are threatened by logging or clearing.	Avoids CO_2 emissions via conservation of existing carbon stocks.
Forest management	Modification to forestry practices that produce wood products to enhance sequestration over time (e.g., lengthening the harvest-regeneration cycle, adopting low-impact logging).	Increases carbon storage by sequestration and may also avoid CO_2 emissions by altering management. May generate some N_2O emissions due to fertilization practices.

9.6 - Implement Under Uncertainty

Incorporate regional management strategies into a broader planning context that considers the uncertainties associated with climate change. This can be done in many ways, for example using approaches based on adaptive management, robust decision making, and other decision-support methods. Uncertainty influences every step of a planning process involving climate change, including methods for climate change impact measurement, project selection, implementation, and performance monitoring.

Uncertainty should be a key consideration of most IRWMP activities, from defining and prioritizing objectives to evaluating projects and project portfolios. There are several strategies for planning under uncertainty, and many are not mutually exclusive.

- **Robust Decision Making:** This method involves using performance metric evaluations to identify tradeoffs associated with the various project options and objectives. With the tradeoff information, hedges can be developed from which realistic portfolios can be identified. Iterations are often involved in which portfolios are reevaluated collectively, fine-tuned, and evaluated again (Water Utility Climate Alliance (WUCA), 2010).

- **Adaptive Management:** This method consists of identifying and monitoring the most important uncertainties and translating them into risk triggers or early warning indicators. The values of the variables that constitute early warning indicators can be established deterministically (e.g., a threshold) or probabilistically (e.g., frequency by which a level is exceeded). Adaptive management constructs a flexible path with actions to take when specific triggers occur. This approach is gaining more popularity because the future cannot be accurately predicted (MWD 2010, CDM 2007, DWR 2010a).
- **Other Approaches:** There are many methods for incorporating large uncertainty into the planning process, some of which are variants of RDM and adaptive management. Traditional scenario planning and decision-scaling are among the other methods discussed.

SECTION 10 - STAKEHOLDER INVOLVEMENT

10.1 - Purpose and Overview

This plan serves as a future guide for the public communication and outreach activities of the Madera RWMG.

The goals of stakeholder involvement are to: 1) ensure that interested parties (e.g., members of the public, non-government organizations, and public agencies), and community residents are well-informed of the deliberations and activities of the Madera RWMG and the development of the IRWMP, and 2) encourage participation in the Madera RWMG and IRWMP process from interested parties and residents.

Elements of this overview include objectives and principles, audiences and partners, and key messages and outreach strategies to follow. A brief final element is an evaluation of plan implementation.

The "Community Capacity Assessment Report," which will provide an in-depth overview of DAC and tribal outreach efforts, is being prepared by Sierra Institute in conjunction with Sierra Water Workgroup. This section will be updated after receipt of this document and attached in Appendix C.

10.2 - Objectives and Principles

10.2.1 - OBJECTIVES OF THE MADERA RWMG COMMUNICATION/OUTREACH PLAN:

- Ensure that interested parties and residents are aware of the work, schedule, progress, and deliberations of the Madera RWMG;
- Ensure that interested parties and residents have opportunities to provide input to the Madera RWMG's deliberations;
- Support and engage disadvantaged communities and tribes; two of the highest priority stakeholders in the Region
- Build the Madera RWMG's network, solicit greater feedback and participation in project development and implementation process
- Communicate successes and goals to stakeholders, the general public, and funders
- Showcase the beauty and diversity of the region

10.2.2 - PRINCIPLES

- The Madera RWMG will proactively develop and nurture relationships with new and existing partners by conducting outreach and education activities (see Strategies in Section V).
- The Madera RWMG will partner with interested parties to leverage existing networks and outreach efforts, in an effort to stretch resources.

- The Madera RWMG will make information and materials (e.g. meeting agendas, materials, requests for proposals, other action items) available to stakeholders and the general public on a timely basis to provide ample time to consider information and, as appropriate, provide input and participate.
- The Madera RWMG strives to include participation from the region's many diverse geographic and interest-based audiences and may apply different communication strategies to target different groups.
- The Madera RWMG plans to keep pace with the rapid evolution of information distribution, particularly through online outlets.

10.2.3 - AUDIENCES AND PARTNERS

Water resource issues affect the entire population in a region. Some of the many diverse geographic and interest-based audiences in the region include:

- Disadvantaged communities;
- Landowners;
- Farmers and growers;
- Environmental groups;
- Recreational users;
- California Native American Tribes;
- Developers;
- Community organizations;
- Public agencies;
- Elected officials.

The Madera RWMG has developed lists of specific groups, organizations, and agencies to participate in our integrative regional management process and continues to seek ways to expand the collaborative network and detailed in Appendix D.

To date, the Madera RWMG's outreach and communication strategies have been successful in building a core of partners and participants. These partnerships are critical to maximizing the efficiency and effectiveness of ongoing communication and outreach efforts aimed at expanding the group's network of participants. Additional partners may be solicited as activities are developed.

10.2.4 - KEY MESSAGES

The Madera RWMG will widely distribute the following, but not limited to, key messages across many communication outlets and to broad audiences:

- The Madera Region hydrological subbasins are an important source of clean water for San Joaquin Valley's communities, agriculture, and environment. The region supplies water for abundant recreational opportunities, scenic beauty, irrigation for hundreds of thousands of the nation's riches farmlands, habitat for plants and animals, drinking water, and groundwater replenishment.

- The Madera IRWMP and the Madera RWMG represent a unique opportunity to protect and conserve this unique region's resources with science-based, integrated regional water management;
- The Madera RWMG utilizes a consensus-based process to address regionally significant issues;
- By collaborating as a group, we can develop solutions to issues and challenges that protect and improve the region as a whole. Working together, the group can achieve more than the sum of contributions from its individual participants;
- The group seeks solutions through project planning and development, attracting grant funds, and implementing projects that contribute to the region's sustainability. The group aims to increase the region's capacity to respond positively to social, economic, and environmental challenges, and ultimately, reduce and prevent the need for reactive problem-solving.

10.2.5 - COMMUNICATION AND OUTREACH STRATEGIES

This section identifies communication and outreach strategies that are utilized by the Madera RWMG to enhance communication and collaboration and broaden involvement of all community stakeholders:

- **Madera RWMG website** (www.maderacountywater.com/regional-water-management-group/)**:** A clearinghouse for all information and materials associated with Madera RWMG meetings, information, education, and any other communication and outreach efforts/needs.
- **Email correspondence:** Develop and maintain an email distribution list for all interested parties; this comprehensive list would also have a segmented list of only those parties who have expressed interest in partnering.
- **Press relations:** Proactively develop and regularly utilize relationships with key press and media outlets for the purpose of sharing news and information.
- **Outreach materials:** Develop a standardized series of general promotional and outreach materials, as well as activity-specific and topic-specific materials as needed.
- **Networking:** Madera RWMG members will periodically (e.g., twice a year) brief the geographic or interest-based groups that they serve on, participate in, or recommend, as applicable.
- **Communication to elected officials:** Madera RWMG Coordinator and members conduct an annual round of briefings for elected officials and agency executive officers.
- **Events:** The Madera RWMG hosts public workshops or other public events to support the kickoff of the planning process and the rollout of key deliverables.
- **Social media:** Distribute news and information via Facebook, Twitter, and/or LinkedIn

10.2.6 - EVALUATION

As part of its normal business, the Madera RWMG will evaluate the effectiveness of its communication and outreach efforts on an annual basis and revise this plan accordingly.

Evaluation Keys:

- Check the progress being made toward objectives; and identify and address obstacles to achievement of the objectives;
- Evaluation must be based on measurable progress towards objectives or tasks that have been identified.

Potential Metrics:

- Number of stakeholders on the email list;
- Website traffic
- Feedback from the process;
- Meeting participation;
- Media interactions: number of stories and articles published in various media outlets;
- Number of collaborative inter-regional projects.

10.3 - Native American Tribes Coordination

10.3.1 - CALIFORNIA WATER PLAN TRIBAL ADVISORY COMMITTEE

In November 2011, the DWR extended invitations to Native American Tribes and non-profit organizations serving Native American Tribes to participate in the first ever California Water Plan Tribal Advisory Committee (Tribal AC). The goal of establishing a Tribal AC is to create a forum where Native American Tribes and non-profit organizations serving Native American Tribes can review, comment on, and help to develop the material in the California Water Plan Update 2013 and ensure that these materials include Tribal perspectives on land, water, and culture. This includes implementing and developing strategies to address issues identified at the 2009 Tribal Water Summit; the Water Plan's Strategic Plan, Resource Management Strategies, and Regional Reports; and Tribal water planning concerns in general. The Tribal AC will advise DWR on these matters directly. The Water Plan will also create opportunities for direct discussion between the Tribal AC and the Water Plan State Agency Steering Committee, chaired by DWR.

The Tribal AC consists of members identified by Native American Tribes and CA Native American non-profit organizations to serve as liaisons between the California Water Plan Update 2013 (CWP 2013) and their respective Tribes and/organizations. Additionally, the Tribal AC has 1-3 seats on the Public Advisory Committee for the California Water Plan (Public AC). The primary role of these Tribal AC representatives on the Public AC is for information exchange. These representatives participate in Public AC meetings and are responsible for sharing Tribal AC perspectives (when developed by the Tribal AC in advance), and identifying items of interest to bring back to the Tribal AC. They are responsible for ensuring that the Tribal AC reps on the Public AC are not responsible for documenting the entire minutes of the Public AC, but on ensuring that items that may be of particular interest to Tribal AC or Tribal peoples are flagged to the Public AC and brought to the attention of Tribal AC.

For the purposes of this Tribal Communication Plan, the term "Native American Tribe" signifies all Indigenous Communities of California, including those that are federally non-recognized and federally recognized, and those with allotment lands, regardless of whether they own those lands. Additionally, because some water bodies and Tribal boundaries cross State borders, this Communication Plan includes Indigenous Communities in Oregon, Nevada, and Arizona that are impacted by water in California.

10.3.2 - COMMUNICATION GOALS

- State agencies, local governments, and water purveyors that deal with water resources acknowledge the indigenous and aboriginal rights of Native American Tribes and their water rights, so that Tribes can safely continue their cultural, religious, subsistence, economic, and sustainability practices in perpetuity. (Safely in this context refers to the public health aspects of cultural and religious practices, for example, the ability to eat fish that are not contaminated with mercury and other toxins.)
- State agencies, local governments, and water purveyors acknowledge that Native American Tribes are a viable people comprising government or representative entities with viable concerns and solutions and listened to as individuals and negotiated with on a government-to-government basis.
- Native American Tribes identify likely impacts and effects on interests and resources from water planning and management decisions or projects in advance of decision-making and have adequate time to review associated proposals.
- Native American Tribes bring their authentic and diverse voices, including traditional knowledge, into the CWP Update processes, and into other State planning processes that involve water resources.
- Regular California Tribal Water Summits that include the highest level of decision-makers from State, local, and federal governments are held.
- Native American Tribes from northern, central, and southern California begin to work together to protect their watersheds for habitat, water quality, water supply, and traditional cultural places.
- Identify and outreach to Tribes and Tribal Communities whose water bodies and Tribal boundaries cross into California State borders – ensure that their Tribal perspectives and concerns are being considered for the CWP.
- In planning future California Tribal Water Summits, identify, strategize and prioritize all issues and ideas for program and policy change and/or recommendation.

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Appendix E

The City of
MADERA

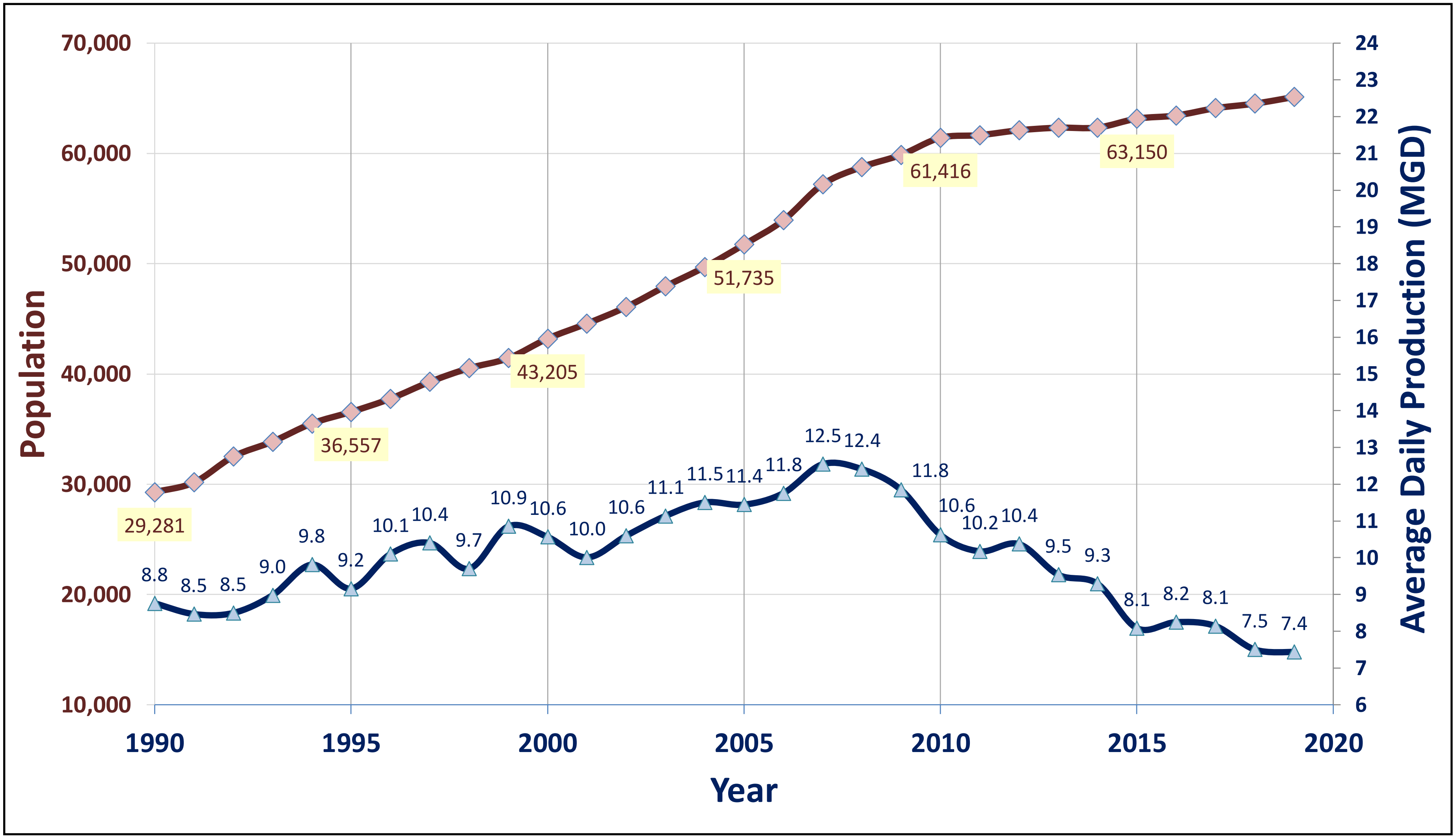
CITY OF MADERA

IMMINENT DEVELOPMENT SUPPLY ANALYSIS

Draft

May 2020

AKEL
ENGINEERING GROUP, INC.



LEGEND

Population

Average Daily Production (MGD)

May 06,2020

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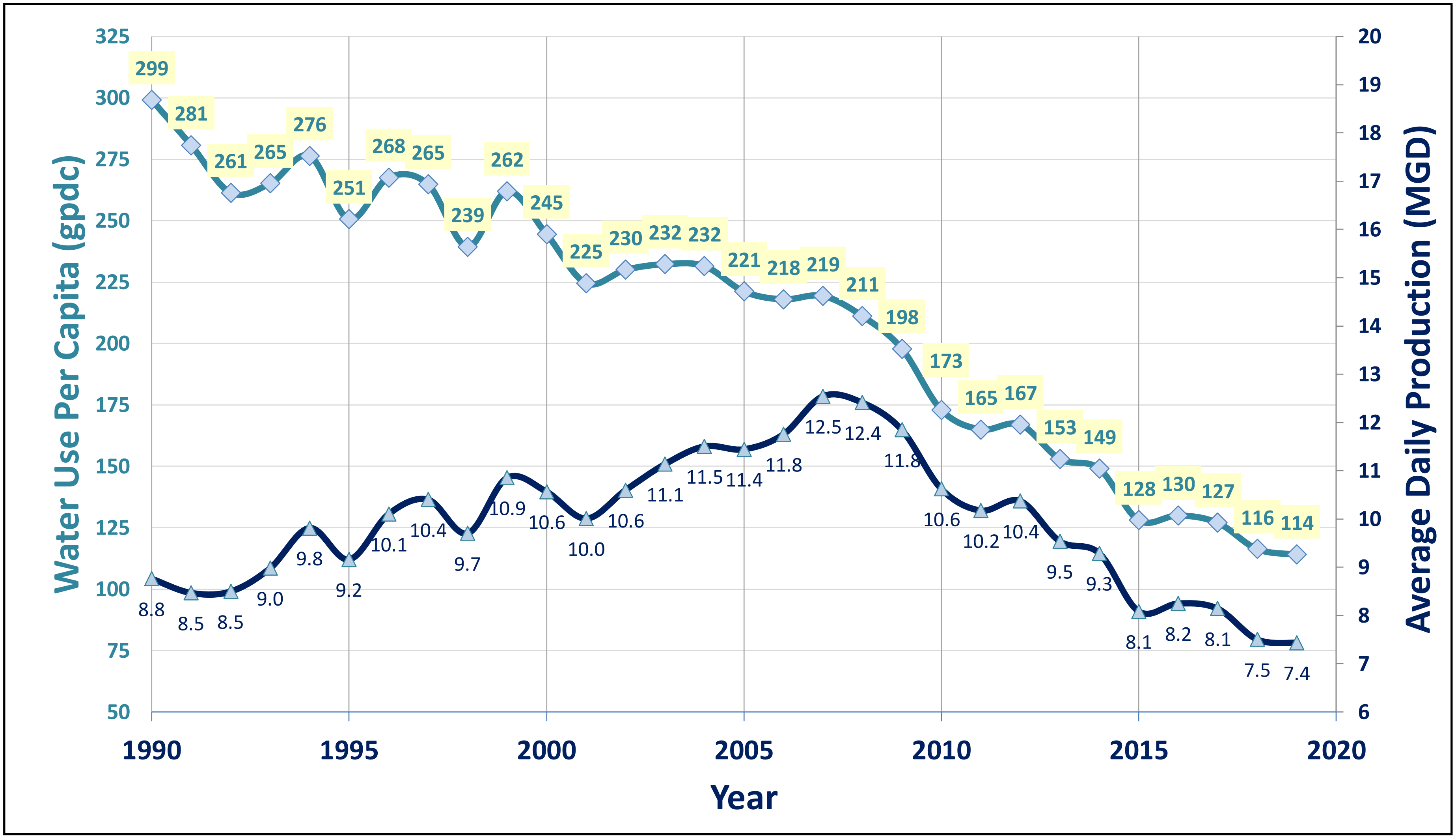
Figure 1

Historical Population vs. Average Daily Production

Imminent Development
Supply Analysis
City of Madera

The City of
MADERA



LEGEND

◆ Per Capita Consumption (gpdc)

▲ Average Daily Production (MGD)

May 06, 2020

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Figure 2

Water Use Per Capita vs.
Average Daily Production
Imminent Development
Supply Analysis
City of Madera

The City of
MADERA

Table 1 Imminent Development Demands

Imminent Development Supply Analysis
City of Madera

PRELIMINARY

Development Number	Development Name	Land Use	Development Information[1]	Development Units	Estimated Non-Residential Area[2]	Demand Factor[3]	Estimated Demands		
							Average Day	Maximum Day	Peak Hour
			(units)	(units)	(acres)	(gpd/units)	(gpm)	(gpm)	(gpm)
Scenario 1 (City-Wide Imminent Development)									
Northwest of HWY-99 and Fresno River									
1	Full Throttle Suspension	Industrial	141,000	SF	4.0	1,000	2.8	5.6	8.4
2	Melanie Meadows Phase II & III	Single Family Residential	172	Lots	-	440	52.6	105.1	157.7
3	Rancho Santa Fe	Single Family Residential	182	Lots	-	440	55.6	111.2	166.8
Northeast of HWY-99 and Fresno River									
4	Bellava and Berk Homes	Single Family Residential	14	Lots	-	440	4.3	8.6	12.8
5	CVI Subdivision	Single Family Residential	19	Lots	-	440	5.8	11.6	17.4
6	Eagle Meadows Apartments	Multi-Family Residential	106	Units	-	230	16.9	33.9	50.8
7	Ellis & D Street Subdivision	Single Family Residential	61	Lots	-	440	18.6	37.3	55.9
8	Sherwood Apartments	Multi-Family Residential	16	Units	-	230	2.6	5.1	7.7
9	Vallarta Supermarket	Commercial	60,000	SF	4.6	1,000	3.2	6.4	9.6
Southwest of HWY-99 and Fresno River									
10	Almond Mukker Medical Offices	Commercial	10,700	SF	0.8	1,000	0.6	1.1	1.7
11	Arco Gas Station	Commercial	11,350	SF	0.9	1,000	0.6	1.2	1.8
12	Camarena Health Almond Campus	Commercial	24,528	SF	1.9	1,000	1.3	2.6	3.9
13	La Spezia II	Single Family Residential	87	Lots	-	440	26.6	53.2	79.8
14	La Spezia III	Single Family Residential	28	Lots	-	440	8.6	17.1	25.7
15	Linden Street Complex	Multi-Family Residential	22	Units	-	230	3.5	7.0	10.5

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							Average Day	Maximum Day	Peak Hour
			(units)	(units)	(acres)	(gpd/units)	(gpm)	(gpm)	(gpm)
16	Miles Chemicals	Industrial	22,020	SF	0.6	1,000	0.4	0.9	1.3
17	Rai Apartments	Multi-Family Residential	138	Units	-	230	22.0	44.1	66.1
18	Sugar Pine Village	Multi-Family Residential	64	Units	-	230	10.2	20.4	30.7
19	Sunset Apartments	Multi-Family Residential	15	Units	-	230	2.4	4.8	7.2
20	Tranpak	Industrial	65,000	SF	1.9	1,000	1.3	2.6	3.9
21	Varvella Estates Phase I	Single Family Residential	77	Lots	-	440	23.5	47.1	70.6
22	Varvella Estates Phase II	Single Family Residential	43	Lots	-	440	13.1	26.3	39.4
Southeast of HWY-99 and Fresno River									
23	610 North E Street Auto Uses	Commercial	14,400	SF	1.1	1,000	0.8	1.5	2.3
24	Adelaide Subdivision	Single Family Residential	19	Lots	-	440	5.8	11.6	17.4
25	Caliber Collision	Commercial	9,825	SF	0.8	1,000	0.5	1.0	1.6
26	Concurrent Enrollment Middle School	Institutional	42,809	SF	1.6	1,000	1.1	2.3	3.4
27	Himat Investments	Commercial	8,600	SF	0.7	1,000	0.5	0.9	1.4
28	Iverywood I	Single Family Residential	134	Lots	-	440	40.9	81.9	122.8
29	Madera Commerce Center	Commercial	15,697	SF	1.2	1,000	0.8	1.7	2.5
30	Madera County Public Health	Commercial	80,460	SF	6.2	1,000	4.3	8.6	12.8
31	Naz Sixplex	Multi-Family Residential	6	Units	-	230	1.0	1.9	2.9
Subtotal							332.3	664.5	996.8
Scenario 2 (Phase 1 Pecan Square Development)									
32	Pecan Square TPM	Single Family Residential	110	DU	-	440	33.6	67.2	100.8
33	Pecan Square TPM	Park	1	Acre	-	330	0.2	0.4	0.5
Subtotal							33.8	67.6	101.4

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PRELIMINARY

Development Number	Development Name	Land Use	Development Information[1]	Development Units	Estimated Non-Residential Area[2]	Demand Factor[3]	Estimated Demands		
			(units)	(units)	(acres)	(gpd/units)	Average Day (gpm)	Maximum Day (gpm)	Peak Hour (gpm)
Scenario 3 (Phase 2 Pecan Square Development)[4]									
34	Pecan Square TPM	Single Family Residential	39	Acre	-	2,250	60.4	120.8	181.2
35	Pecan Square TPM	Multi-Family Residential	8	Acre	-	2,500	14.0	28.1	42.1
36	Pecan Square TPM	Commercial	11	Acre	-	1,000	7.4	14.8	22.1
37	Pecan Square TPM	Park	1	Acre	-	330	0.1	0.3	0.4
Subtotal							81.9	163.8	245.8
Total Demand									
Scenario 1 (City-Wide Imminent Development)							332.3	664.5	996.8
Scenario 2 (Phase 1 Pecan Square Development)							33.8	67.6	101.4
Scenario 3 (Phase 2 Pecan Square Development)							81.9	163.8	245.8
Total Demand							**448.0**	**896.0**	**1,343.9**

AKEL ENGINEERING GROUP, INC.

5/7/2020

Notes:

1. Unless noted otherwise, development information provided by City of Madera Staff May 1, 2020.
2. Building square footage converted to site acreage assuming floor-area-ratios consistent with City of Madera 2009 General Plan
3. Source: City of Madera 2014 Water System Master Plan
4. Development area estimated from aerial imagery.

Table 2 Supply Capacity Evaluation

Imminent Development Supply Analysis
City of Madera

PRELIMINARY

Well No.	Supply Capacity Analysis (November 2019)[1] (gpm)
Supply Capacity Criteria	
Firm Supply Capacity to Meet Peak Hour Demands	
City of Madera Supply Capacity[2]	
15	878
16	Off Line
17	974
18	1,466
20	860
21	1,195
22	1,732
23	1,100
24	850
25	1,328
26	831
27	Off Line
28	934
29	1,039
30	1,318
31	1,495
32	Standby - 1,770
33	1,135
34	926
35 (Loves)	1,100
Total Capacity	20,931
Firm Capacity	19,161

Existing and Imminent Peak Hour Demands	Scenario 1[3] (gpm)	Scenario 2[4] (gpm)	Scenario 3[5] (gpm)
Existing[6,7,8]	15,486	15,486	15,486
City-Wide Imminent Development	997	997	997
Phase 1 Pecan Square Development	-	101	101
Phase 2 Pecan Square Development	-	-	246
Total Peak Hour Demand	16,483	16,584	16,830
Supply vs Demand Evaluation			
Available Firm Capacity (gpm)	19,161	19,161	19,161
Capacity Surplus/Deficiency (gpm)	2,678	2,577	2,331
Recommended New Wells (at 1,300 gpm each)	0	0	0
Remaining New SFR DUs (1,320 gpd/SFR DU)[9]	2,920	2,810	2,540

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Notes:

1. Updated capacities received from City staff May 5, 2020. Well 30 reflects results of 2018 test.
2. Supply assumptions:
   - Well 16 is offline due to suction issues.
   - Well 27 is offline due to water quality concerns.
   - Well 30 is offline and will be back by July 2020, per City Staff email, and therefore is included in supply analysis.
3. Includes Existing Customers, and City-Wide Imminent Development.
4. Includes Existing Customers, City-Wide Imminent Development, and Phase 1 Pecan Square Development.
5. Includes Existing Customers, City-Wide Imminent Development, Phase 1 and Phase 2 Pecan Square Development.
6. Peak Hour Demand = 3.0 x Average Day Demand
7. Existing demand based on Metered Water Deliveries documented in 2019 Public Water System Statistics provided by Cit Staff May 05, 2020.
8. 2019 metered water deliveries balanced to production using unaccounted-for-water percentage documented in City 2018 Water Loss Audit
9. Based on Average Day Demand of 440 gpd/DU (2014 WSMP) and 3.0 Peak Hour factor

Table 3 Fire Flow Analysis

Imminent Development Supply Analysis

City of Madera

PRELIMINARY

Evaluation Results	Required Fire Flow	
	Residential (1,500 gpm for 2 hours)	Commercial (2,500 gpm for 3 hours)
Maximum Pressure (psi)	65.3	65.8
Residual Fire Flow Pressure (psi)	36.6	27.8
Monterey Street 8" Pipe Velocity (ft/s)	3.8	5.9
Pecan Avenue 12" Pipe Velocity (ft/s)	3.4	5.3

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5/15/2020

Notes:

1. Required fire flow based on the fire flow criteria listed in City of Madera 2014 Water System Master Plan.