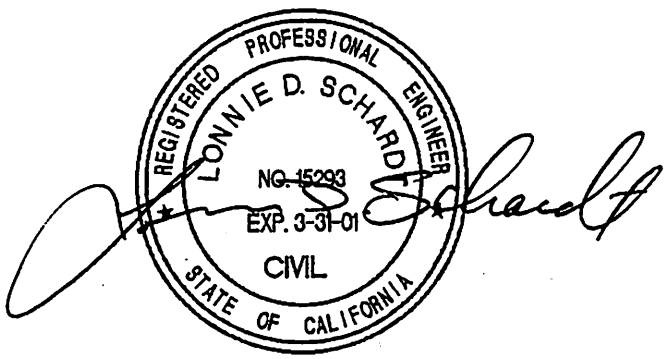
AB3030 Groundwater Management Plan

Madera Irrigation District

Boyle Engineering Corporation

Lonnie D. Schardt, PE Project Manager
Kassy D. Smith, EIT Project Engineer



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May 1999

SECTION 3-8

BOYLE 1044 E. Herndon Avenue, Suite 108, Fresno, CA 93720

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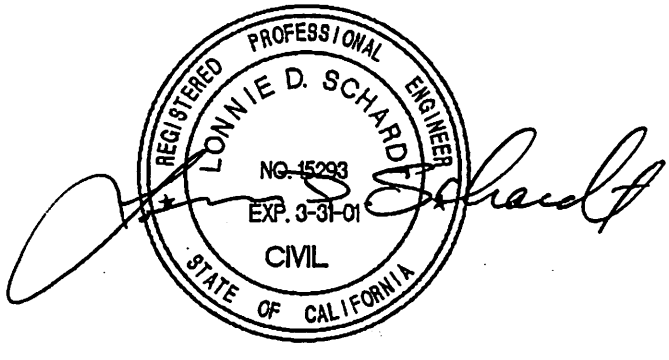

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Section 1
Introduction

1.1 Legal Authority

In some portions of California, groundwater represents an easily accessible, inexpensive alternative to surface water. Because the groundwater source is easily accessible, it has been heavily relied upon to meet supplemental water supply needs. Excessive use of groundwater has led to land subsidence, groundwater quality deterioration, and overdraft in some areas. Overdraft is the condition whereby the groundwater is extracted in quantities exceeding the long-term recharge replenishment capability of the groundwater basin.

In 1992, the California Assembly took action to address the lack of coordinated groundwater resource management in the State Assembly Bill 3030 (Water Code Sections 10750-10755) which provides the legislative authority for local water agencies to manage groundwater resources specifically. AB3030 enables local water agencies, such as the Madera Irrigation District (District), to develop and implement a groundwater management plan (GMP). The purpose of any GMP is to establish the role of the local agency in managing the local groundwater resources so as to maximize the water supply and to protect the quality of the supply.

The law contains 12 components that may be included in the GMP. Each component may play some role in evaluating or operating a groundwater basin so that groundwater can be managed to maximize the total water supply while protecting groundwater quality. Following the development of any GMP, the District must plan for a period of at least 35 days so as to allow for protests against the implementation of the plan to be filed. If the majority does not protest within the 35-day review period, the GMP can be adopted and implemented.

1.2 Past Groundwater Management Practices

The District works closely with the California Department of Water Resources and the Bureau of Reclamation to monitor the groundwater level and quality within the District. Twice a year (once in the spring, once in the fall), the District measures the depth to the static water level in several wells throughout the District. These measurements indicate that the static water table averages a decline of approximately 1.25 feet per year. However, the depth to the static water table varies throughout the District. Those areas in the District adjacent to the San Joaquin River have static water levels of 40 to 50 feet, while the deeper static water levels are as much as 200 feet. On the average, the static water level is 82 feet below the ground surface. In an effort to replenish the groundwater supply, the District operates ponds and canals that contribute to the recharge of the groundwater. Water is routed through natural channels such as the Fresno River, the channel below the Fanchi weir, and Cottonwood Creek,

when available, even when there are no riparian diversions. A list of the designated groundwater recharge facilities is provided below:

Name	Location[1] Township/Range/Section	Area (acres)
Lake Madera	T10S/R18E/S34	300
Airport Pit	T11S/R17E/S10	12
Burgess Pond	T11S/R18E/S32	5
Pistoresi Pond	T11S/R17E/S28	10
Allende Pond	T12S/R18E/S15	5
Russell Pond	T12S/R18E/S08	19
Dirt/Beeman Pond	T12S/R18E/S17	9
Hospital Pond	T11S/R18E/S30	3

[1]See Figure 1-1 for the locations of these recharge basins.

Water used for groundwater recharge is taken from the Fresno and San Joaquin Rivers. In addition to the recharge basins mentioned above, groundwater recharge is accomplished through the use of natural channels, unlined canals, and agricultural lands.

1.3 Goals of the Groundwater Management Plan

The District plans to develop a groundwater management program that is consistent with the following mission statement:

> *The District's primary mission is to obtain and manage affordable surface and groundwater supplies in a manner which will ensure the long-term viability of irrigated agriculture in the District.*

The District recognizes that groundwater is a major factor in being able to fulfill its mission statement. As a result, the District is preparing a groundwater management plan, the primary goal of which is to define the role of the District in managing the local groundwater resources so as to maximize the total water supply and protect the quality of the supply. To accomplish this goal, the District intends to evaluate and implement programs that will preserve the long-term viability of the groundwater resources within and adjacent to the District.

Other primary goals of this GMP are listed below:

- Ensure the long-term availability of high-quality groundwater.
- Maintain local control of groundwater resources within the District.
- Minimize the cost of groundwater use.

- Prohibit the net export of groundwater from the District and use of groundwater to replace surface water removed from the District as a result of a transfer.
- Minimize the impacts of groundwater pumping, including subsidence, overdraft, and soil productivity.
- Prevent unnecessary restrictions on the private use of the District's groundwater resources.
- Ensure coordination between the District, local, and regional groundwater management activities.
- Ensure efficient use of the District's groundwater resources and minimize deep percolation in areas where it may contribute to the shallow groundwater problem through the use of an effective water conservation and management program.
- Ensure that the District's water users understand the steps they can take to protect and enhance their groundwater supply.
- Encourage water conservation by the farmers, which includes providing information on efficient irrigation practices.
- Support the programs for the agricultural reuse of reclaimed water.
- Coordinate with other local irrigation districts and the city and county of Madera to preserve local water rights.

Section 2
Description of Groundwater Management Plan Area

2.1 Description of District

The Madera Irrigation District encompasses an area of 128, 924 acres on the San Joaquin valley floor in Madera County. The District varies in width from five to thirteen miles. It is bounded to the south by the San Joaquin River with the northern boundary at approximately 10 miles north of the City of Madera. The Eastern boundary varies from Highway 99 to 1-1/2 miles east of Highway 99. In addition, there are several remote island areas. Figure 2-1 shows the general location of the District. Within the District boundaries there is an extensive open flow canal system extending approximately 315 miles. In addition, there are approximately 115 miles of pipelines that are used to convey the water throughout the District.

2.2 History

Madera Irrigation District was formed in 1920 with approximately 350,000 acres encompassing the District. The formation was the effort of a 40-member committee organized to bring water to the Madera area. The District purchased a site for Friant Dam and filed for accompanying water rights. These actions were followed by several years of litigation with Miller and Lux and of negotiations with the State Water Authority. These efforts failed leading the District to contract with the United States Bureau of Reclamation. This contract granted the District a guaranteed water supply of a maximum of 270,000-acre feet per year, for an area of 172,000 acres.

Several times since the formation of the District, the area boundary has fluctuated. In 1950, approximately 46,000 acres were excluded from the District to permit the formation of the neighboring Chowchilla Water District reducing the gross area to 112,500 acres, of which 94,500 acres is irrigable area. In 1975, the District added 15,000 acres as required by a contract with the Bureau that provided 24,800-acre feet on average from Hidden Dam. In 1983, the District joined the Mid Valley Water Authority in an effort to obtain additional water supplies for the District.

2.3 Location/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 distributions. The open flow canals are comprised of approximately 90 miles of unlined canals and

225 miles of the Bureau of Reclamation built "lined" canals. The pipelines range in size from 12 inches to 84 inches with about half of the pipelines being cast in place. The open flow laterals range in capacity from 5 cfs to 340 cfs. Many of the non-piped laterals have been in use for over 100 years.

With the exception of a few small pump stations, the distribution system is a gravity system. However, there are approximately 1,600 turnouts, and about one-third are equipped with grower lift pumps in order to obtain adequate on-farm flow. There are no reservoirs or regulating reservoirs located within the District.

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 Fanchi Diversion Weir on the east side of the District. This provides service to approximately 45,000 acres. The Fresno River is also the conveyance to direct pump dwellers, the Island Tract pumping plant service area, and riparian users.

2.4 Size

The District encompasses an area of 128,294 acres on the San Joaquin Valley floor in Madera County. The District generally varies from 5 to 13 miles in width bounded on the south by the San Joaquin River, with the northern boundary approximately 10 miles north to the city of Madera. The eastern boundary varies from Highway 99 to 1.5 miles east of the highway. There are several remote island areas that are also included.

2.5 Terrain and Soils

Lands in the District are gently sloping from northeast to southwest, with a fall of approximately 5 feet per mile. The District can be divided into two major segments in terms of terrain and soils:

- Recent alluvial fans and floodplains
- Older alluvial fans and terraces

The soils of the recent alluvial fans and floodplains cover the area from the Fresno River south to the San Joaquin River and primarily consist of the Traver-Chino and the Hanford-Tujunga types of soil. These soils are categorized as Class 1 and Class 2 soils and exhibits high surface and subsurface permeability.

The soils of the older fans and terraces cover the 10-mile-wide area from the Fresno River north to the District's northern boundary. The predominant soils classification for this area is of the San Joaquin-Madera association. They are generally classified as Class 3, 4, and 5, and generally exhibit low permeability at both the surface and subsurface levels.

2.6 Climate

Annual precipitation in the District averages about 10.3 inches, the majority of which falls during the months of November through April. Summer maximum temperatures frequently exceed 100°F, and winter temperatures vary from the high 30s to low 40s at night to the low 50s during the day. Normally, the frost period is between November and mid-March.

Although the climate in the District is generally dry with mild winters and hot summers, humidity can be as high as 90 to 100 percent during the early morning in December and January. Inversion layers accompanied by "Tule fog" are not uncommon during the winter months.

2.7 Water Supply

Since the majority of the precipitation falls in the winter, most landscaping, crops, and agriculture are dependent upon irrigation during the growing season. The District's main source of water is through water diversions from Friant Dam. Other sources of water for the District include Hidden Dam as well as from water rights on the Fresno River, including Big Creek Diversion from the Merced River watershed and the Soquel Diversion from the San Joaquin watershed.

In 1951, the District negotiated a contract with the Bureau of Reclamation (Bureau) for the water from Friant Dam. The contract provided for 85,000 AF of Class I water and 186,000 AF of Class II water. Class I is a relatively firm supply, whereas Class II is on an as-available basis and its quantity varies from year to year. All water supplied under this contract with the Bureau is through the Friant-Kern and Madera canals, which redistribute the waters of the San Joaquin River downstream of the Friant Dam. On the average, 100 percent of the Class I and 48 percent of the Class II water is provided to the District annually.

Water supplied to the District under the Hidden Dam contract with the Bureau is for the conservation yield of the project. However, the project has stringent flood control criteria that precludes any realistic carryover storage or early season storage.

The Big Creek and Soquel Diversions provide an average annual supply of 10,000 AF and 9,700 AF, respectively. The Fresno River adjudicated and appropriative average annual supply is approximately 20,000 AF and is inclusive of the Big Creek and Soquel diversions.

The following table summarizes the amount of water the District has been supplied from the various sources over the 10-year period of 1988 to 1997.

Year	Water Supplied to District[1] (AF)
1988	92,162
1989	110,801
1990	79,573
1991	122,090
1992	98,962
1993	330,248
1994	123,084
1995	327,376
1996	307,266
1997	295,302

[1]The water supplied includes transfers in and out of the supply and spill lost while in the San Joaquin River.

The total amount of water supplied to the District on an average annual basis is 188,686 AF from the various sources based on this 10-year period. Despite the amount of water available per year, the District is only able to provide a supplemental water supply to its users, all of which are agricultural.

2.8 Water Demand

The total water demand for the District varies from year to year. Climate is the major cause of this variation. In very wet years, the water demand on the District is significantly less than during drought years. The District reports that the water deliveries from 1988 through 1997 are as shown in the table below.

Year	Water Delivered to Growers (AF)
1988	54,592
1989	62,096
1990	46,828
1991	79,700
1992	62,896
1993	154,290
1994	72,141
1995	129,298
1996	138,909
1997	154,821

The average total grower deliveries for the 10-year period of 1988 to 1997 is 95,557 AFY. This water delivered to the growers originates at one of the District's sources for surface water supply. Additional water required for the farming of crops within the District is extracted from the groundwater table.

The water provided to growers is used for a variety of different crops. Cropping patterns within the District have changed drastically with time. Table 2-1 provides a list of crops grown within the District as well as the number of acres of that crop per year. The table ranges in time from 1962 to the latest available data in 1997. This data is supplied annually to the District in the annual crop survey. In addition, Table 2-1 provides the 5-year average number of acres for each crop for the 5-year period of 1993 to 1997. The average number of acres of irrigated farmland for this period is 168,779. However, the number of acres designated for agriculture has continuously increased since 1962 with an average yearly increase of approximately 2 percent. The continuous increase in the amount of farmland can be attributed to the growth of the District.

Table 2-2 provides a list of the different crops grown within the District as well as the average amount of water applied to the crop per year and the average total amount of water applied per year. The average number of crops for the period of 1993 to 1997 was used in determining an average crop water demand per year. From 1993 to 1997, the number of acres per crop has been relatively constant as compared to earlier years as shown in Table 2-1. The total annual water applied to the various crops throughout the District is 318,740 AF as shown in Table 2-2. There are a variety of sources used to supply this amount of water to the crops. The various sources include the following:

- Surface water delivered from the District
- Groundwater extracted from the groundwater table
- Precipitation

Another factor that affects the water demand for the District is urban growth. The majority of the city of Madera is included within the boundaries of the District and has continuously urbanized with time. Table 2-3 shows the number of acres of urban/industrial land within the District. As shown in the table, it is apparent that the acres of urban/industrial land has increased significantly since 1962. The District has changed its boundaries several times since the original boundaries. Therefore, the amount of land designated as urban/industrial has continuously changed. As urbanization continues in the areas surrounding the city of Madera, land that at one time was primarily agricultural has been converted to developed land. This reduces the amount of water used by crops each year as well as the recharge of the groundwater basin.

Figure 2-2 shows the increase in urban/industrial land for the period 1992 to 1997. For this time period, there has been a continuous increase in the amount of urban land. As shown on Figure 2-2, the projected amount of urban land in the year 2000 is approximately 14,200 acres; and in 2010, the amount of urban land is projected to be as much as 17,500 acres. This is a projected increase of approximately 3 percent per year for the next 12 years. The continuous urban growth will impact the condition of the groundwater basin.

Table 2-1
Madera Irrigation District
Groundwater Management Plan
Summary of Crop Demand

Year	Grains	Rice	Cotton	Sugar Beets	Corn	Other Field	Alfalfa	Pasture	Tomatoes	Almonds/ Pistachios	Other/ Truck	Grapes	Citrus/ Olives	Deciduous	Total Acres
	Acres														
1952	6460	0	38616	0	83	241	14217	14798	0	116	1695	18501	0	2069	74358
1962	4702	0	23731	260	2494	980	13839	14535	0	1267	1537	28381	28	3879	99254
1972	3210	0	11994	40	3083	2217	11218	12766	0	6118	1686	40009	619	3769	129934
1973	3063	0	11871	0	4371	1568	8521	13469	0	6501	103	42773	629	3652	134254
1974	4511	0	13954	163	3070	2934	8057	12080	0	7520	54	43953	587	3779	135946
1975	11149	0	8604	237	3478	278	8357	11224	0	8642	209	44209	582	3759	137250
1976	10696	0	8638	321	2867	218	8506	11148	0	8699	83	44556	583	4611	139360
1977	5129	0	13530	54	1951	507	7987	10915	0	8927	2	45348	709	4842	141486
1978	5908	0	12087	0	4488	1846	6079	11298	0	9308	62	46656	554	4929	145614
1979	6262	0	13375	0	2143	1119	4169	9613	0	10504	70	48379	551	4802	147838
1980	7206	0	10947	0	3826	921	3744	8090	0	11252	50	50509	565	5034	151000
1981	6101	0	8953	0	3945	877	3137	7252	0	12211	65	52338	568	5012	154892
1982	8907	0	7244	0	1942	1600	2568	5861	0	13304	433	53933	564	5380	158950
1987	3802	0	6531	0	2704	972	1638	4434	0	13758	907	53819	923	5661	159004
1992	3698	0	4863	0	1795	114	1819	3087	77	15673	893	53182	1285	6651	161696
1993	2485	0	3939	0	3172	0	1461	3481	172	15876	811	53817	1340	6634	164262
1994	1525	0	4223	0	1664	0	1113	3647	3	17093	1163	52897	1447	6748	165996
1995	3431	0	4432	0	1807	0	1056	3716	10	16508	1318	54180	675	7339	167492
1996	3320	0	3122	0	1966	398	956	3981	10	17487	1408	54755	643	7500	171568
1997	941	0	2072	0	3632	207	1085	4451	7	18328	1285	54765	905	7548	174578
5-year Average, Acres	2340	0	3558	0	2448	121	1134	3855	40	17058	1197	54083	1002	7154	168779

Table 2-2
Madera Irrigation District
Groundwater Management Plan
Summary of Five-Year Average Annual Crop Water Requirements

Crops	Five-Year Average Annual Area[1] (acres)	Unit Water Applied[2] (AF/ac)	Annual Total Water Applied (AF)
Grains	2,340	1.3	3,042
Rice	0	--	0
Cotton	3,558	3.3	17,741
Sugar Beets	0	3.2	0
Corn	2,448	2.8	6,855
Other Field	1,211	2.9	351
Alfalfa	1,134	4.5	5,103
Pasture	3,855	4.5	17,348
Tomatoes	40	3.0	120
Other Truck	1,197	2.2	2,634
Almonds/Pistachios	17,058	3.1	52,880
Grapes	54,083	3.6	194,699
Citrus/Olives	1,002	2.5	2,505
Deciduous	7,154	3.0	21,462
Totals			318,740

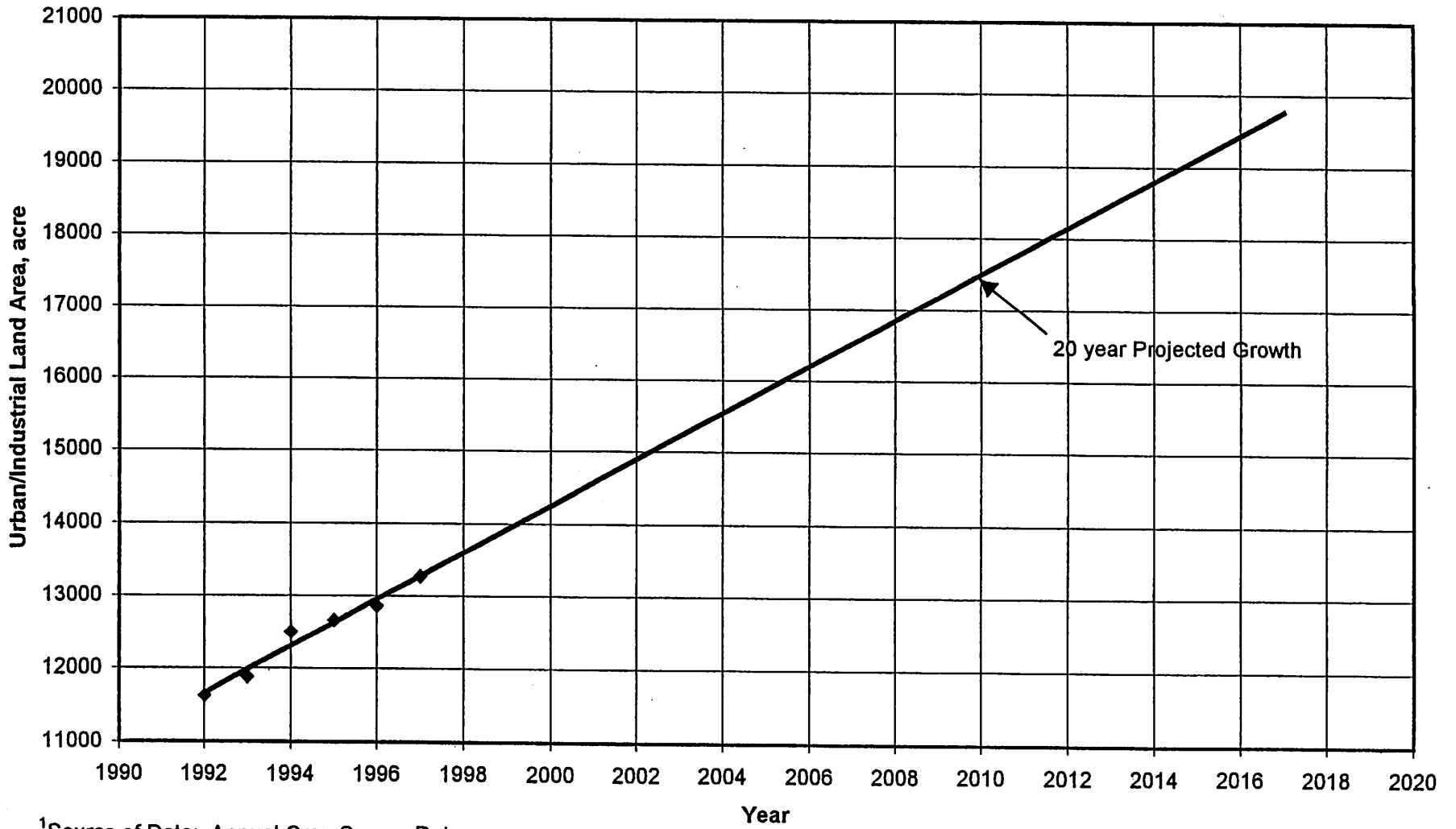
[1]Summary of Crop Acres provided by California Department of Water Resources.
[2]Unit applied water values provided by California Department of Water Resources.

Table 2-3
Madera Irrigation District
Groundwater Management Plan
Urban Growth Within the District

Year	Urban/Industrial Land Area (acres)
1962	9824
1972	11008
1973	11278
1974	11300
1975	11417
1976	11449
1977	11632
1978	11836
1979	12020
1980	11785
1981	11346
1982	12194
1987	10727
1992	11631
1993	11881
1994	12502
1995	12666
1996	12862
1997	13279

[1]Farmsteads were excluded from urban/industrial land area after 1987. Prior to 1987, farmsteads were incorporated into urban land area.

Figure 2-2
Madera Irrigation District
Groundwater Management Plan
Urban/Industrial Land Area Vs. Year[1]



[1]Source of Data: Annual Crop Survey Data

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2.9 Groundwater Quality

Groundwater quality is influenced by various factors such as the quality of watershed runoff, the mineral content of soils, land use practices such as fertilizer and pesticide application, and localized waste disposal practices. The use of groundwater for domestic and agricultural purposes is only feasible if it is of an acceptable quality. As a result, this GMP includes provisions to help maintain the groundwater at an acceptable quality.

Groundwater quality within the Madera groundwater basin is currently not monitored by the District. The only parameter that is monitored is the depth to static water level. However, between 1959 and 1989, the quality of the groundwater was monitored by the United States Bureau of Reclamation. Table 2-4 lists all the constituents that were measured as well as the range and average values for the period of record. In addition, Table 2-4 provides the current EPA standards for drinking water parameters. For the period of record between 1959 and 1989, the groundwater within Madera Irrigation District is of excellent quality as it does not exceed any of the maximum contaminant levels for secondary drinking water standards.

However, in recent years, the groundwater in areas within the District boundaries has experienced problems with DBCP and salt brine contamination. The salt brine plume is located in the vicinity of the Tri-Valley Growers olive plant (Oberti Olives) in the Avenue 13/Road 26 area. Remediation activities to correct this problems are being taken by Tri-Valley under the regulatory direction of the Regional Water Quality Control Board. There is a large plume of DBCP that underlies the District. The apex of the DBCP plume is located at Avenue 12 near Highway 99 and flows southwesterly through the basin. The DBCP plume was initially discovered in 1979 by the County of Madera Public Health officials. In several places, a large concentration of DBCP was found. In 1993, another study was done to determine whether the plume continued to exist and the concentration of DBCP in the groundwater. The results of the 1993 study indicated that the plume continues to move in a southwest direction. However, the concentration of DBCP in the groundwater had significantly decreased.

2.10 Groundwater Monitoring

Madera Irrigation District monitors an average of 229 wells located throughout the District twice a year. The semiannual well measurement programs are conducted in October and February of each year. These dates were selected because they best characterize the maximum depressed and recovery levels associated with the growing season. The measurements are accomplished by sounding each well in a static condition. This information enables the District to monitor groundwater trends and estimate District-wide pumped groundwater quantities. It also allows the District to calculate seasonal application efficiency more accurately. Fifteen of the monitored wells were selected to be representative of the groundwater levels within the District. Table 2-5 provides the static water level for the 10-year period of 1989 to 1998 for the spring season. The water levels for the fall are listed in Table 2-6 for the same 10-year period. The approximate location of the measured wells can be found on Figure 2-3.

Table 2-4
Madera Irrigation District
Groundwater Management Plan
Summary of Groundwater Quality[1]

Constituent	Unit	Range	Average	EPA Standard Drinking Water[2]
Specific Conductance	µmhos	126-1,370	569	900
Total Dissolved Solids	mg/L	79-989	361	500
Aluminum	mg/L	<0.010-0.020	<0.010	0.2
Arsenic	mg/L	0.001-0.003	0.00156	1,000
Barium	mg/L	0.052-0.180	0.0888	1.0
Bicarbonate	mg/L	52-490	169	N/A
Boron	µg/L	0-900	80.8	–
Bromide	mg/L	0.05-0.35	0.14	–
Cadmium	mg/L	<0.001—0.001	<0.001	0.005
Calcium	mg/L	10.0-150	42.7	N/A
Chloride	mg/L	8-250	53.2	250
Chromium	mg/L	<0.001-0.008	0.0045	0.5
Cobalt	µg/L	<1-1	<1	–
Copper	mg/L	<0.001-0.003	0.0014	1.0
Fluoride	mg/L	0-0.30	0.10	1.4
Iodide	µg/L	1-11	3.1	–
Iron	mg/L	0-0.023	0.0061	0.3
Lead	µg/L	<1-<5	<5	Lead & Copper Rule
Lithium	µg/L	<4-25	12.4	–
Magnesium	mg/L	2.1-34	12.5	N/A
Manganese	mg/L	<0.001-0.005	0.0013	0.05
Mercury	µg/L	<0.1-<0.1	<0.1	–
Molybdenum	µg/L	<1-4	1.2	–
Nickel	mg/L	<0.001-0.001	<0.001	0.1
Nitrate	mg/L	0-53	19.0	45
Nitrate & Nitrite	mg/L	2.3-12	6.7	–
Phosphorus	mg/L	0.03-0.13	0.08	–
Potassium	mg/L	0-14	4.5	–
Selenium	mg/L	<0.001-0.001	<0.001	0.05
Silver	mg/L	<0.001	<0.001	0.1
Sodium	mg/L	10-110	38.5	N/A
Strontium	µg/L	120-830	362	–
Sulfate	mg/L	0-63	15.0	600
Vanadium	µg/L	1-30	14.3	–
Zinc	mg/L	0.005-0.098	0.0332	5.0

[1]Data as reported in the U.S. Bureau of Reclamation's Irrigation Suitability Land Classification Report, September 1993.

[2]SecondaryWater Quality Standards as required by California Safe Drinking Water Act.

Table 2-5
Madera Irrigation District
Groundwater Management Plan
Summary of Spring Depth to Groundwater of Representative Wells[1]

MID Lic. No.	State Well No.	Depth to Groundwater									
		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
19	T10S/R16E/S26-B1	144.8	139.0	150.0	153.0	164.2	160.0	168.4	165.1	160.0	156.0
34	T10S/R17E/S34-A1	147.8	141.2	151.1	156.0	170.0	164.6	169.4	176.4	182.1	183.7
37	T10S/R18E/S07-D1	170.0	155.0	161.6	166.6	176.2	178.7	179.2	178.6	182.6	184.0
62	T11S/R16E/S15-L1	98.1	94.6	98.1	102.0	109.6	109.8	110.0	106.3	105.2	102.1
84	T11S/R17E/S16-H1	96.1	101.0	108.2	110.2	115.9	117.2	120.0	121.6	121.7	121.1
86	T11S/R17E/S18-B1	90.2	93.2	104.6	105.2	111.8	110.0	115.0	112.2	110.6	108.6
88	T11S/R17E/S24-D2	98.4	101.1	128.0	124.1	130.7	134.3	134.9	132.9	131.5	130.6
98	T11S/R18E/S18-A1	73.0	--	--	--	84.1	82.4	82.6	80.5	78.3	78.2
105	T11S/R18E/S31-A3	92.2	97.5	102.9	104.7	106.3	110.0	110.9	110.0	112.1	110.0
133	T12S/R17E/S18-H1	80.8	93.0	99.8	101.2	108.7	102.7	105.6	102.0	101.6	98.6
151	T12S/R17E/S32-H1	69.8	75.9	88.0	88.9	90.1	82.4	85.1	83.1	81.0	77.2
172	T12S/R18E/S13-R1	93.8	103.2	108.3	110.6	113.0	103.2	104.6	104.0	103.0	102.3
186	T12S/R18E/S26-R1	76.5	81.7	90.0	92.3	97.9	90.0	94.2	89.1	86.2	81.8
190	T12S/R18E/S31-J1	66.5	72.5	86.3	86.9	93.0	86.2	89.6	86.4	85.1	81.0
209	T12S/R20E/S18-N1	137.7	151.8	160.5	165.0	169.2	161.7	166.4	168.6	166.0	168.4

[1]Measurements as reported in Madera Irrigation District - Semiannual Groundwater Report, Spring 1998.

Table 2-6
Madera Irrigation District
Groundwater Management Plan
Summary of Fall Depth to Groundwater[1]

MID Lic. No.	State Well No.	Depth to Groundwater									
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
19	T10S/R16E/S26-B1	141.1	144.8	159.0	166.6	172.2	162.4	178.2	172.8	177.4	180.6
34	T10S/R17E/S34-A2	147.0	147.8	157.3	159.1	176.3	164.0	183.1	184.6	192.8	192.9
37	T10S/R18E/S07-C1	--	170.0	197.3	197.8	171.1	200.0	207.4	190.0	207.6	209.5
62	T11S/R16E/S15-L1	91.5	98.1	108.7	112.7	115.6	112.5	117.2	108.6	114.0	112.6
84	T11S/R17E/S16-H1	114.7	116.2	124.9	126.7	133.3	127.3	135.2	135.1	137.3	148.0
86	T11S/R17E/S18-B1	103.2	109.1	118.1	120.1	122.3	118.4	124.6	120.0	127.3	127.5
88	T11S/R17E/S24-D2	110.0	112.9	138.6	142.2	142.6	143.6	138.2	134.6	138.1	138.7
98	T11S/R18E/S18-A1	--	--	--	--	89.2	84.1	93.7	85.0	85.0	84.6
105	T11S/R18E/S31-A3	100.0	104.2	115.0	117.4	119.7	115.4	120.1	115.5	117.2	113.4
133	T12S/R17E/S10-H1	87.0	91.6	100.5	107.5	110.9	108.2	111.1	107.7	108.0	105.6
151	T12S/R17E/S32-H1	73.1	86.0	91.3	93.9	97.0	93.4	96.1	88.4	87.1	85.4
172	T12S/R18E/S13-R1	99.7	107.7	112.0	114.0	116.6	106.7	110.3	107.4	105.2	105.5
186	T12S/R18E/S26-R1	86.5	91.5	96.2	98.9	103.3	96.1	105.0	97.3	95.2	93.6
190	T12S/R18E/S31-J1	81.9	87.9	92.8	96.7	100.1	92.0	101.7	96.8	96.6	89.4
209	T12S/R20E/S18-N1	142.3	164.2	174.2	178.9	180.8	170.1	182.7	177.5	179.6	183.0

[1]Measurements as reported in Madera Irrigation District - Semiannual Groundwater Report, Fall 1998.

groundwater trends and estimate District-wide pumped groundwater quantities. Following the measurements, the District produces a semiannual groundwater report that identifies the conditions of the groundwater basin the past six months.

The Spring 1998 Groundwater Report showed a collective recovery of water in the basin and in adjacent lands. The annual recovery, to a large measure, can be attributed to the immediate past three years' abundant precipitation, San Joaquin River watershed yield, and the corresponding availability of surface water supply. The surface water resource significantly decreases agricultural demands for extraction from the groundwater basin to satisfy consumptive crop uses. However, the basin continues to be in an overdraft state, which resulted from the droughts between 1987 and 1992 and between 1976 and 1977. In addition, the high cost of surface water compared to groundwater pumping costs have resulted in greater groundwater use than might be expected. In certain areas, the basin groundwater level is on average 40 feet, with a maximum of 100 feet below the measured levels preceding the drought years.

The weighted data for spring 1998 reflects an annual recovery in static water levels of 0.47 feet. This data reflects a two-year increase in groundwater levels of 1.23 feet, or a basin recovery of 18,600 acre-feet for the two-year period. Of the 229 measured wells, 176 reflected elevated static levels from common data of 1997. The well level changes range from a recovery of 14.8 feet to a maximum decline of 11.0 feet.

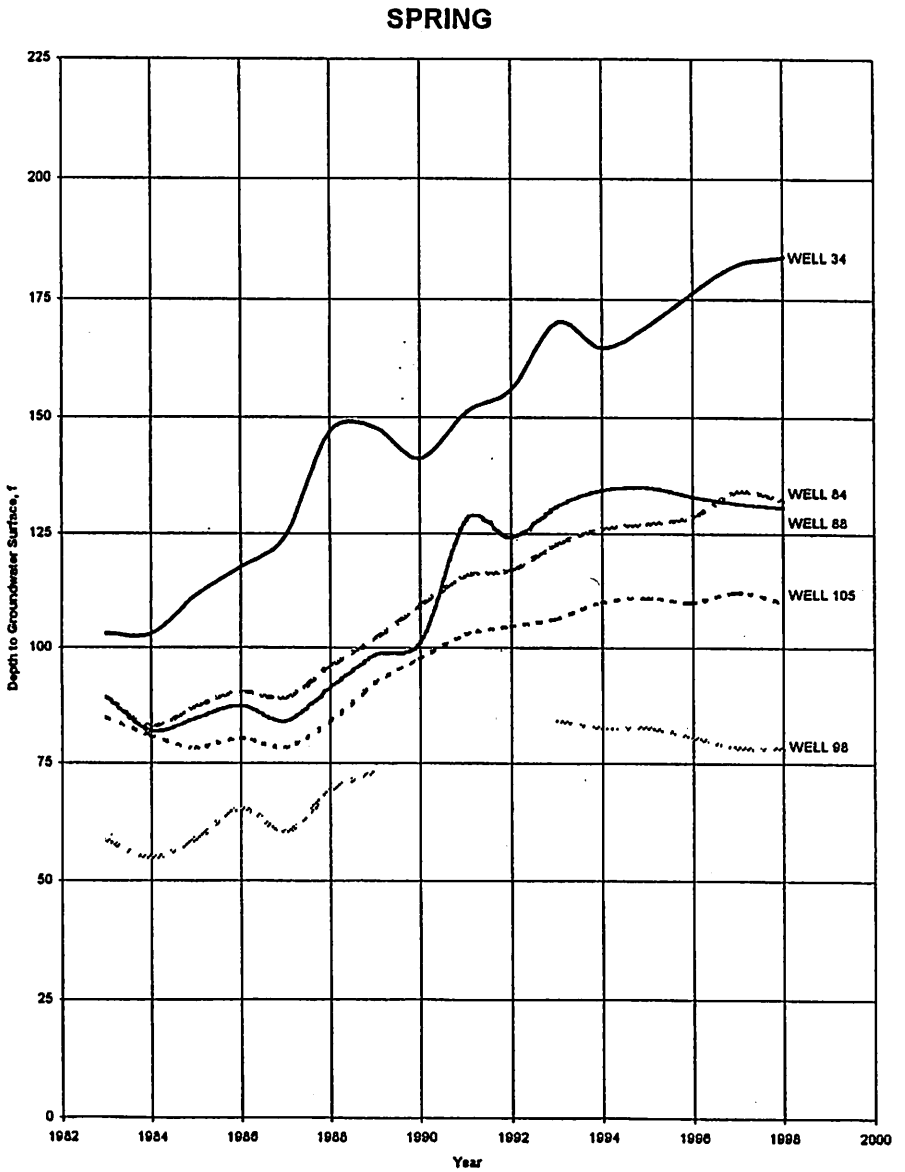
Each year, the Department of Water Resources produces a map entitled *Lines of Equal Elevation in Static Water Level*. This identifies areas of depth to groundwater that are the same. In general, the areas surrounding the city of Madera have experienced a decline in the elevation of the groundwater. This can be attributed to the urban development within and surrounding the city of Madera. Five wells within and surrounding the city of Madera were selected to be representative of the conditions of the groundwater basin within the city. Figure 3-3 shows the variation in the depth to groundwater of these five wells for both the spring and fall seasons. The graph demonstrates the fluctuations in the groundwater table from 1992. Figure 3-4 shows the projected groundwater elevations for the five wells. Urban growth continues to have a negative impact on the groundwater basin that underlies the city of Madera.

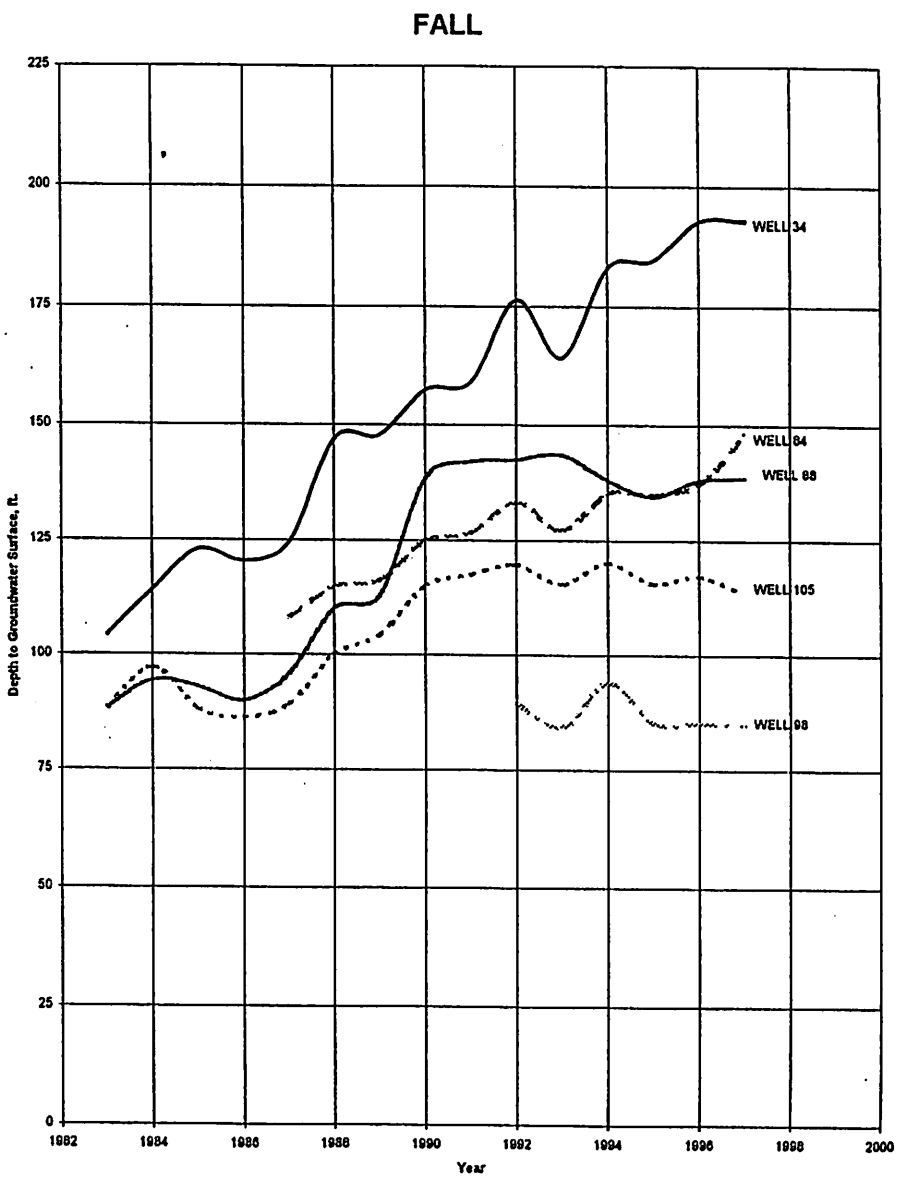
In contrast, the areas near the San Joaquin River and the Fresno River fluctuate depending on weather patterns. In recent years, the groundwater elevation in these areas has significantly increased. Figure 3-5 shows the spring and fall depth to groundwater from 1992 to present, and Figure 3-6 shows the projected groundwater elevations for the five wells. These five wells were selected to be a representative sample for the areas of the basin that lie near the perimeter of the District boundary. In comparing the depth to groundwater for wells near the city of Madera and the depth for wells along the San Joaquin River, it is apparent that the basin underlying the city is in a much more serious state of overdraft.

3.4 Areas of Concern

The primary concern of the District is the continuous decline in the elevation of the groundwater that is a result of urban growth within the District. A related concern is the increase in the cost of surface water

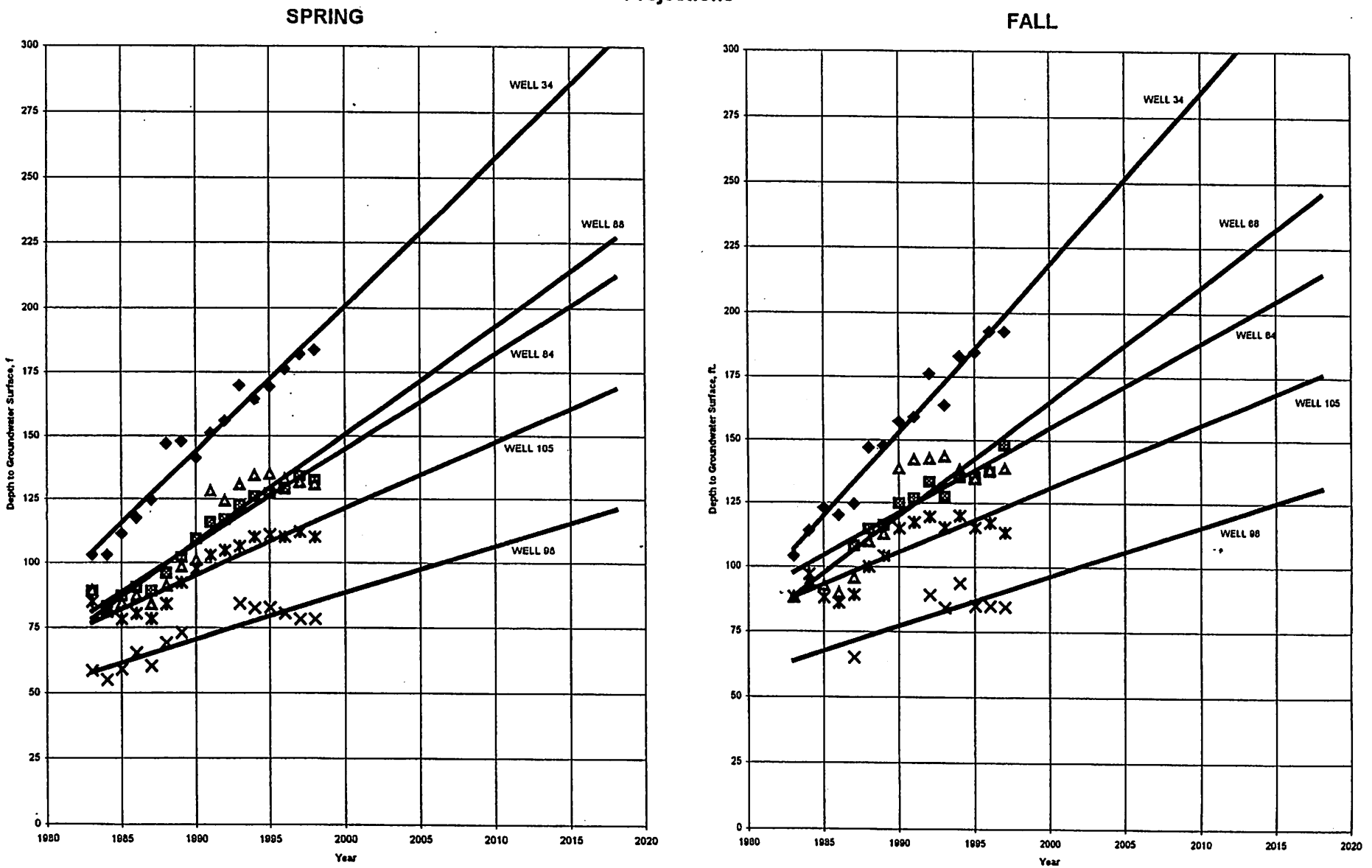
Figure 3-3
Madera Irrigation District
Groundwater Management Plan
Depth to Groundwater Surface of Representative Wells Near City vs. Year[1]





[1]Source of Data: MID Groundwater Survey Data Base

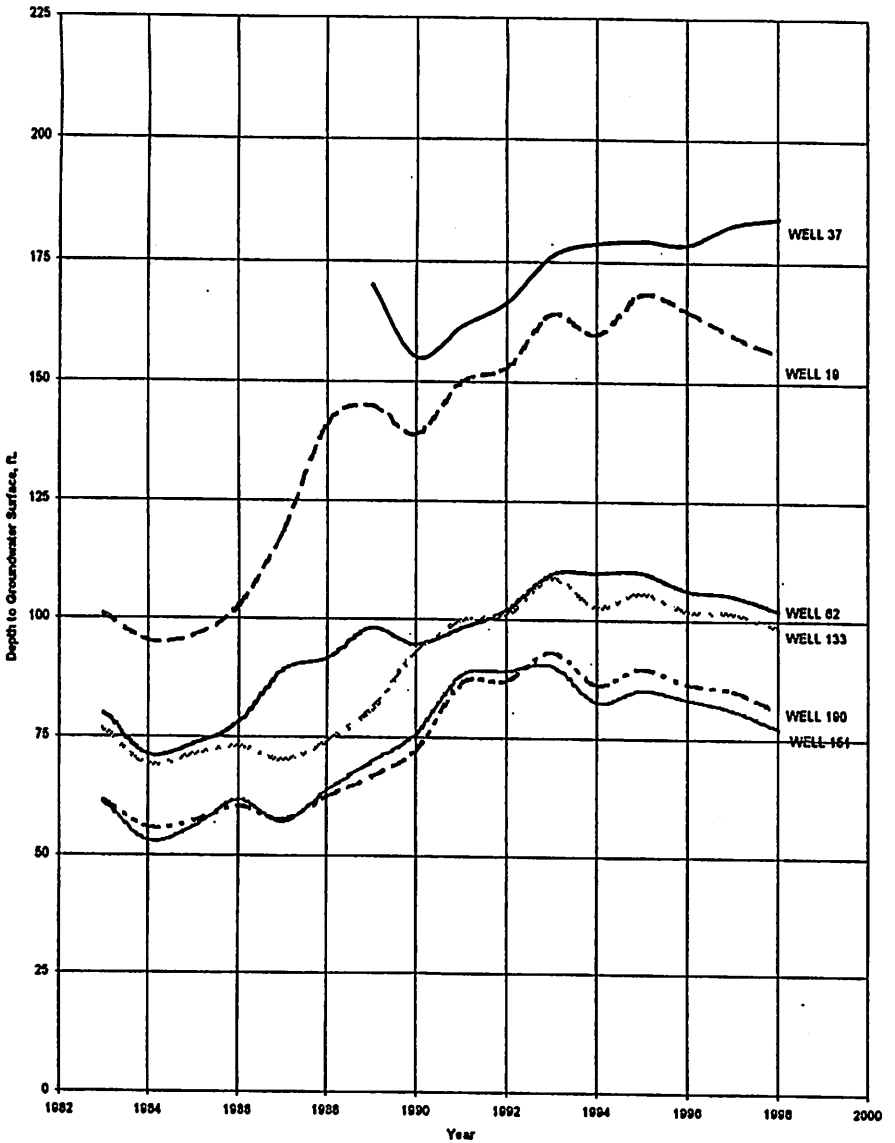
Figure 3-4
Madera Irrigation District
Groundwater Management Plan
Depth to Groundwater Surface of Representative Wells Near City vs. Year[1]
Projections



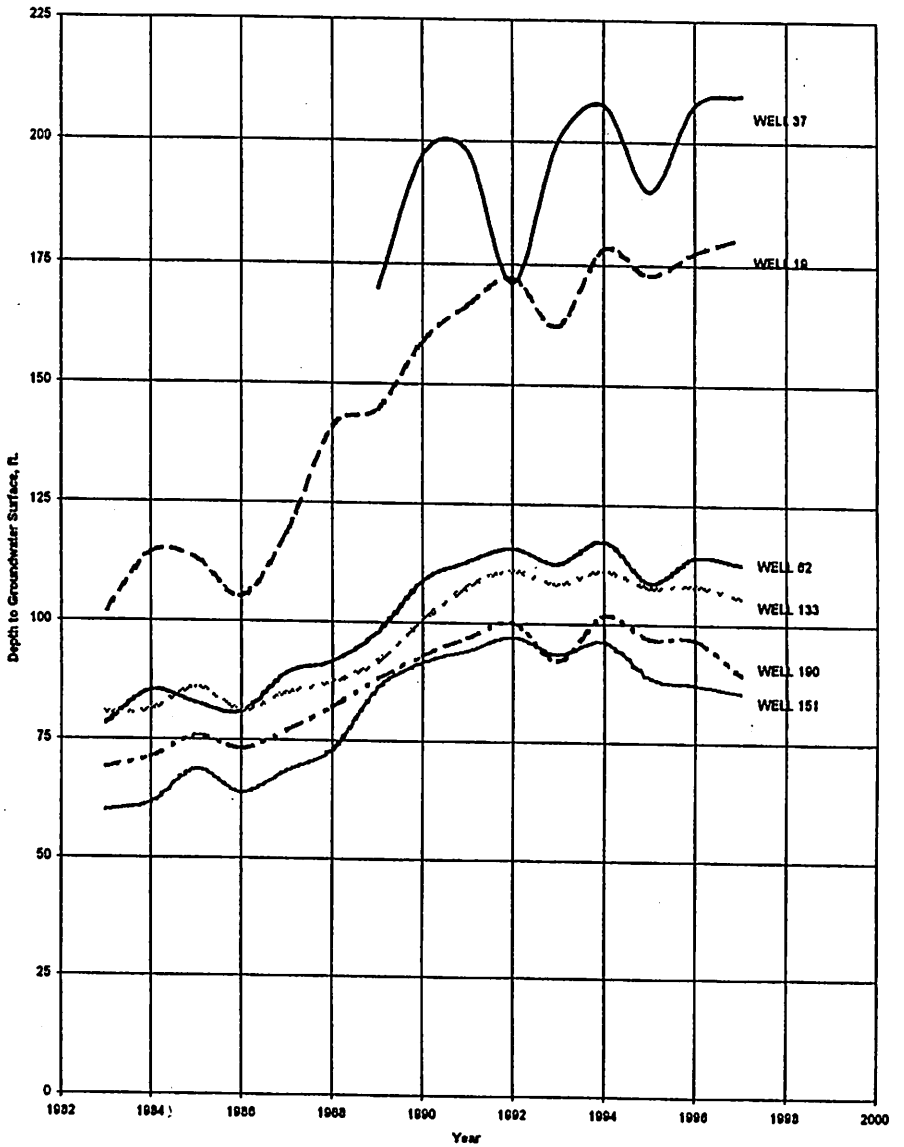
[1]Source of Data: MID Groundwater Survey Data Base

Figure [illegible]
Madera Irrigation District
Groundwater Management Plan
Depth to Groundwater Surface of Representative Wells Near Perimeter of District vs. Year[1]

SPRING



FALL

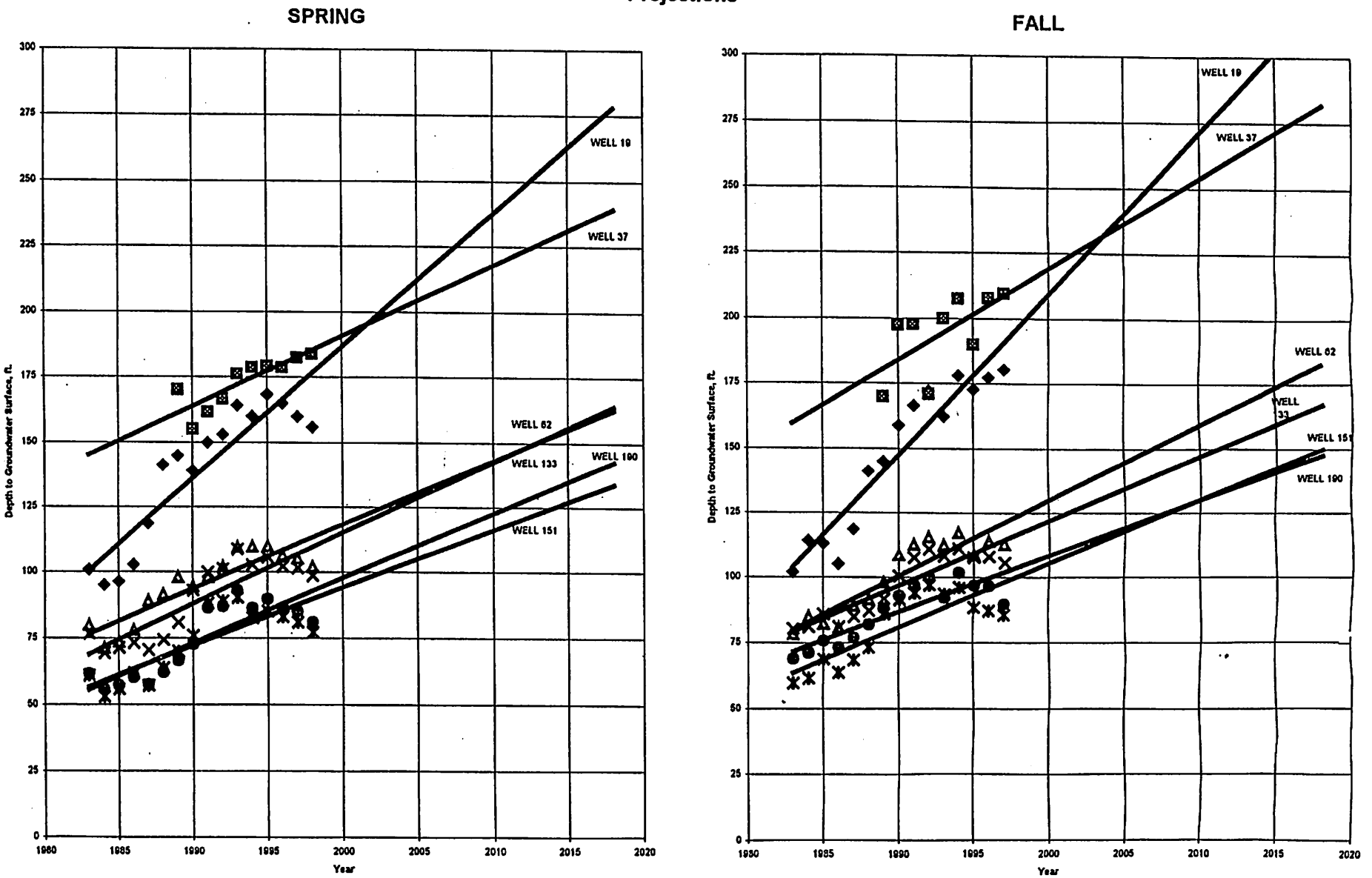


[1]Source of Data: MID Groundwater Survey Data Base

FRM5010101 9/14/98
fig3-3,3-5.xls

BOYLE

Figure 3-6
Madera Irrigation District
Groundwater Management Plan
Depth to Groundwater Surface of Representative Wells Near Perimeter of District vs. Year[1]
Projections



[1]Source of Data: MID Groundwater Survey Data Base

FRM5010101 9/14/98
fig3-4,3-6.xls

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supplied to the District's users. In addition, some of the increased cost in surface water can be attributed to urban growth and the use of groundwater in areas that no longer contribute to recharge.

Agricultural and municipal agencies within the basin are concerned about maintaining adequate supplies of groundwater within the basin. Groundwater is the primary source of water for municipal and agricultural users in the basin. Many agencies like the District are concerned about the continued decline of groundwater levels. The municipalities are especially concerned about the supplies needed to meet the demand as their urban area continues to expand.

An equally important concern that many agencies have expressed is the quality of the groundwater. Currently, the groundwater basin has relatively good quality as discussed in Section 2.9. The concern is in maintaining the quality of groundwater. These items, such as saline intrusion and well construction, are addressed in Section 4 of this GMP.

Section 4
Plan Items

4.1 General

A successful GMP identifies items that may at some time affect the quality of the groundwater basin. Items should be identified despite whether the item is currently a problem. In addition, it is important for all districts and jurisdictions that control areas within the Madera Groundwater Basin to coordinate efforts to protect the basin. The following sections outline several plan items that should be considered when evaluating the condition of the basin.

4.2 Control of Saline Water Intrusion

Permanent degradation of good quality groundwater can occur if poor quality groundwater migrates into aquifer zones containing better quality water. Any degradation in the water quality can seriously affect the usability of the groundwater for various uses. Wide variations in the quality of groundwater, especially in the upper water-bearing zones of the aquifer, can result from soil conditions, soil types, geologic structure, irrigation practices, and irrigation water quality. Increased groundwater pumping can alter historical flow patterns and cause poor quality groundwater to mix with and contaminate the better quality groundwater.

Currently, saline groundwater intrusion is not a problem with the Madera Groundwater Basin. Therefore, the initial focus will be on monitoring the quality of the groundwater. If water quality changes occur, the cause will be investigated by the Regional Water Quality Control Board, and remedial action will be taken by the responsible party under the regulatory direction of the Regional Water Quality Control Board.

4.3 Identification and Management of Wellhead Protection Areas and Recharge Areas

The Federal Wellhead Protection Program (WPP) was established by Section 1428 of the Safe Drinking Water Act Amendments of 1986 and is designed to protect groundwater resources of public drinking water from contamination. This will minimize the need for costly treatment to meet drinking water standards. A wellhead protection area (WPA), as defined by the 1986 Amendments, is *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 or wellfield.* The basic task of wellhead and recharge area protection is the identification of zones around public water supply wells and groundwater recharge areas where land use must be controlled to minimize the possibility of contamination of the drinking water supply.

Madera Irrigation District does not provide public drinking water to its users. Therefore, WPAs are not currently applicable to this plan.

4.4 Responsibility for the Mitigation of Contaminated Groundwater

Groundwater contamination can originate from many sources or activities. Generally, once the groundwater table becomes contaminated, the cleanup of the contaminant is very complex and expensive. There are several agencies that play a role in mitigating groundwater contamination. Among them is the California Regional Water Quality Control Board (RWQCB), the California Department of Toxic Substances Control (DTSC), and the U.S. Environmental Protection Agency (EPA). Each agency has its own regulatory authorities and expertise to contribute to the mitigation and the degree to which each agency participant is dependent upon the nature of the problem. The primary role of the Madera Irrigation District is to report any contamination that they become aware of to the proper regulatory agency.

4.5 Administration of a Well Abandonment and Well Destruction Program

State regulations require that all unused or inactive wells be properly maintained as defined by the *Water Well Standards: State of California DWR Bulletins 74-871 and 74-90.* State regulations also require all inactive wells that are not being properly maintained to be properly destroyed. Improperly maintained wells act as a means for mixing of groundwater of different quality. Wells that are unpumped create a much greater threat than those wells that are periodically pumped. This is due in part to the fact that pumping will normally remove contaminants that may have migrated during idle periods.

Madera County has a similar ordinance regarding well destruction. The enforcement of this ordinance will remain in the control of Madera County.

4.6 Mitigation of Overdraft Conditions

Groundwater overdraft can lead to a variety of problems that include land subsidence and an increase in the cost of pumping. Overlooking overdraft can result in a limited supply of water during drought years, which would severely impact the long-term viability of the District, which is predominantly agriculture. Groundwater overdraft is due to an imbalance in the rates of extraction and replenishment. Several methods will help in the correction of overdraft. These methods are as follows:

- A decrease in the amount of extraction to match the rate of replenishment
- Increase in the replenishment to match or exceed the extraction
- Balance replenishment and extraction of the groundwater

Currently, the District is defined as being in a condition of overdraft, which is apparent from the observed decline in the depth to groundwater. Factors that affect the future rate of overdraft include the following:

- The future water demand within and adjacent to the District
- Future pumping rates within and adjacent to the District

Several mitigative measures can be taken to limit the overdraft problems. One such measure is for the District to increase the number of recharge areas maintained by the District. The District will actively pursue the acquisition of land that will be designated as groundwater recharge basins. In addition, the District will continue to support unlined canals and natural streams, such as the Fresno River, the channel under Fanchi weir, and Cottonwood Creek, as a means of conveying large amounts of surface water to the growers.

Another mitigative measure is to increase and modify the irrigation practices and efficiencies. This may be the most practical way to manage the District's groundwater extractions. This will reduce water use with minimal impacts to land use and the significant economic impacts are less likely to result from this approach. The efficiency of irrigation systems can vary significantly based on physical site conditions, climate, method of irrigation, irrigation system design, and management. There are several steps that can be taken that will result in a higher irrigation efficiency. These steps generally fall into two categories. These are:

- Installation/retrofitting of existing systems with improved equipment/technology and/or installing new systems using technology on existing or proposed future plantings.

- Implementing improved irrigation water management procedures of existing irrigation systems.

Several items will be actively supported by the District in an attempt to increase the irrigation efficiency. These items are listed below.

- Installation of flow meters will provide useful information needed to determining irrigation efficiency.

- Modification of the irrigation frequency and the duration will also help. During irrigation it is important to consider both the soil moisture conditions and the drop water requirements. The correct time to stop irrigation is when the soil reservoir has been filled and the water requirement for the crops has been satisfied.

- Improve the application uniformity used during irrigation. Irrigation systems will be designed to best utilize the available water and minimize the amount of water lost to runoff.

Another mitigative measure to correct the overdraft problem is to import additional surface water supply. The District will actively seek to make its sources of surface water more available. They will coordinate with surrounding districts and regulatory agencies in an attempt to acquire additional surface water supply. The more dependable surface water is, the less dependent the farmer will be to the groundwater.

In addition to acquiring additional surface water supply, the District will explore alternatives to be able to offer the growers economic incentives to use less groundwater. Again, the District will work with

local regulatory agencies in an attempt to be able to provide adequate surface water at an economically feasible cost.

4.7 Replenishment of Groundwater Levels and Storage

The District currently achieves groundwater replenishment using several different methods, including the following:

- The District currently has eight designated recharge basins, as shown on Figure 1-1, that are used to replenish the water levels within the District.
- There are currently 90 miles of unlined canals within the District's distribution/conveyance system. In addition, there are 102 miles of natural streams. Both the unlined canals and natural streams convey a large amount of water. A percentage of this water percolates and reaches the groundwater table.
- A percentage of the water applied to the fields of irrigation will percolate and reach the groundwater table.

To increase the replenishment of the groundwater table, additional surface water must be absorbed within the basin either by increasing surface water irrigation or by direct recharge areas. This will be accomplished by the District actively pursuing additional land designated for groundwater recharge. In addition, the District will encourage farmers to use surface water instead of groundwater. This is accomplished by investigating pricing mechanisms that will give the farmer an economic incentive to use the surface water when available.

The District currently monitors well water levels in about 229 wells located throughout the District. These measurements are taken once in the spring and once in the fall and are reported to the Bureau of Reclamation, as discussed in Section 2.10. The purpose of this water level monitoring is to identify areas of overdraft and provide information that will allow computation of the changes in groundwater quality and storage.

4.8 Monitoring of Groundwater Extracted by Water Producers

Monitoring the groundwater extracted by the water producers is best accomplished by placing flow meters on all the irrigation wells used to pump groundwater to the surface for irrigation. The District will recommend to landowners that an adequate flow meter be placed on their irrigation wells. The flow meter totalizer will indicate the total amount of water that was pumped. Growers will know their water use and can use this information for on-farm water conservation. In addition, the District will encourage the landowners to make this information available to the District. The District will implement this monitoring program as part of this GMP.

4.9 Facilitating Conjunctive Use Operations

Conjunctive use operation of a groundwater basin is defined in DWR Bulletin 118-80 as:

> *Operation of a groundwater basin in coordination with a surface water reservoir system. The basin is intentionally recharged in years of above average precipitation so groundwater can be extracted in years of below average precipitation when surface water supplies are below normal.*

In some years, the surface water supply is greater than the basin water demand; in other years. The surface water supply is less than the basin water demand. In wet years, surface water is used to recharge the groundwater basin with recharge being achieved either directly by surface recharge or by using surface water instead of groundwater whenever possible.

The District is in a conjunctive use program with the Bureau of Reclamation. Both agencies will work together to achieve the goals of this GMP.

4.10 Identification of Well Construction Policies

Improperly constructed wells serve as a primary means for contaminating the groundwater. Contaminated groundwater results from the mixing of water between aquifers with differing quality. Madera County has enacted and is responsible for enforcing the County Well Ordinance that regulates well construction. When a new well is drilled, a well construction permit is required, and a well driller's report must be filed with the Department of Water Resources and the County. This will ensure proper construction of wells within the District.

4.11 Construction and Operation of Groundwater Management Facilities

The District will actively pursue additional lands to be used as recharge facilities. Where possible, recharge activities will be coordinated with flood control activities. Following acquisition of land, the District would construct recharge basins that would maximize the amount of recharge of the groundwater table. These facilities would be located in areas where extraction can occur in times of limited surface supply. Such extraction would be conducted in a manner that allows incorporation of groundwater into District distribution facilities and only to the extent that there are no unreasonable adverse impacts on landowners and growers in the District. Trained District personnel will operate the facilities.

4.12 Development of Relationships with Federal, State, and Local Regulatory Agencies

Relationships between the groundwater management districts and the various regulatory agencies is an important part of an effective plan. The plan will be submitted to the Department of Water Resources

and the RWQCB. Groundwater management activities will be coordinated with these regulatory agencies and the agencies that also are a part of the Madera Groundwater Basin.

4.13 Review of Land Use Plans and Coordination with Land Use Planning Agencies

An important components of developing a groundwater management plan is the review of land use plans for the surrounding area or basin and coordinating efforts with regional and local land use planning agencies. Urbanization has a significant impact on groundwater management. It is important to plan for the impacts a developing area can have on the groundwater basin by compensating in other areas within the District. Compensation can be in a variety of forms, including adding recharge basins, importing additional surface water supplies, and limiting pumping within the developed area. Within developing areas, recharge basins should be planned for prior to development. Madera Irrigation District will work closely with Madera County and the City of Madera in evaluating land use plans to ensure the groundwater table is protected.

SECTION 5: GROUNDWATER EXPORTATION, GROUNDWATER BANKING, IMPORTATION OF FOREIGN WATER, AND USE OF DISTRICT FACILITIES FOR SUCH PURPOSES

Chapter .100
Rules and Regulations Pertaining to Groundwater Banking; Importation of Foreign Water For the Purpose of Groundwater Banking; Exportation of Groundwater Outside the District; and Use of District Facilities for such Purposes.

.100.010 PURPOSE AND INTENT.

A. The lands within Madera Irrigation District ("District") are heavily dependent upon groundwater. The groundwater basin(s) underlying the District and surrounding areas are severely overdrafted.

B. It is essential to the continued prosperity of the landowners and water users within the District that the quality and quantity of the groundwater supply be maintained to meet the demands of District landowners and water users.

C. Areas within the District are or could be or become subject to land subsidence due to the extraction of groundwater.

D. The direct or indirect transfer of groundwater outside the District may have significant environmental impacts on the area within the District including, but not limited to, increased groundwater overdraft; land subsidence; uncontrolled movement of contaminated groundwater; uncontrolled movement of poor quality or contaminated groundwater; the lowering of groundwater levels; increased groundwater or soil degradation; and loss of aquifer capacity due to land subsidence.

E. The direct or indirect transfer of groundwater outside the District may have significant economic impacts on areas within the District including, but not limited to, loss of arable agricultural land; increased pumping costs due to lowered groundwater levels; increased groundwater quality treatment costs due to movement of contaminated or poor quality groundwater; replacement of wells due to declining groundwater levels, and replacement of damaged wells, conveyance facilities, roads, bridges and other structures due to land subsidence.

F. The importation of water originating outside of Madera County (whether or not conveyed through or pooled with facilities located in or adjacent to Madera County) for the purpose of Groundwater Banking such water ("Foreign Water") could, if unregulated, introduce water of an inferior quality into District aquifers, resulting in significant economic and environmental impacts on areas within the District, including, but not limited to, those specified in Paragraphs D. and E., above .

G. As used herein the term "Groundwater Banking" means the percolation, injection, or other recharge of a supply of water for the purpose of later extraction and delivery of such water outside of the District. Groundwater Banking can be reasonable and beneficial if it can be accomplished without:

(1) causing or increasing an overdraft of groundwater underlying the District;

(2) adversely affecting the ability of other groundwater users to use, store, or transmit groundwater within any aquifer(s) underlying the District (for example by utilizing storage that might otherwise be subject to natural or passive recharge and thus depriving other groundwater users of their use of the aquifer and the groundwater derived therefrom) ;

(3) adversely affecting the reasonable and beneficial uses of groundwater by other groundwater users within the District;

(4) resulting in, expanding, or exacerbating degradation of the quality or quantity of surface or groundwater within the District, or groundwater basins and aquifers within the District;

(5) resulting in injury to a water replenishment, storage, restoration, or conveyance project or facility;

(6) adversely affecting the surface or subsurface of neighboring or nearby lands, or the trees, vines, or crops growing or to be grown thereon;

(7) adversely affecting the economy or environment of the area within the District; or

(8) adversely affecting the recharge and storage ability on adjacent lands where passive recharge may take place.

H. For Groundwater Banking projects all or a portion of which will be located within the District, it is essential that the District be the agency that determines whether a permit should be issued to allow groundwater banking, exportation of groundwater, or importation of foreign water, within such areas. Without a permit process which allows public notice, public hearings, and compliance with environmental and other appropriate requirements, there would be no or inadequate local control over such groundwater banking, exportation of groundwater, or importation of foreign water, nor a method to insure that groundwater banking will meet the requirements of Paragraph G., above.

I. The District, as the agency most familiar with local conditions affecting groundwater, should adopt reasonable regulatory measures in relation to exportation of groundwater, Groundwater Banking, and the importation of Foreign Water for the purpose of Groundwater Banking.

J. California Water Code section 1810(d) provides that use of a water conveyance facility to transfer water may be denied if the use of the water conveyance facility will injure any legal user of water, will unreasonably affect fish, wildlife or other in-stream beneficial uses, or will unreasonably affect the overall economy or the environment of the county from which the water is being transferred.

.100.020 TITLE.

These provisions shall be known as "Rules and Regulations Pertaining to Groundwater Banking; Importation of Foreign Water For the Purpose of Groundwater Banking; Exportation of Groundwater Outside the District; and Use of District Facilities for such Purposes."

.100.030 DEFINITIONS

The terms used in this Chapter have the following meanings, unless otherwise expressly provided:

A. "Damage Prevention Plan" means a written plan which specifically details the problems that may occur as a result of the operation of the project and details what actions will be

taken by the Applicant to mitigate or eliminate the problems in order to prevent damage to the site and surrounding properties.

B. "Emergency Action Plan" means a written plan which provides a complete and detailed evaluation of potential project failures that can occur during operation of the project and which details what actions the Applicant will take to prevent or minimize damage to the project and protect the public and surrounding properties.

C. "Exportation of Groundwater" means the extraction of groundwater from any well within the boundaries of the County and located on or under lands subject to this Chapter and used on lands which are outside of the boundaries of the County, unless the lands on which the water is being used are contiguous to the lands where the water is extracted, and are owned by the same landowner.

D. "Foreign Water" means water originating outside of Madera County, whether or not conveyed through or pooled with facilities located in or adjacent to Madera County, which is imported into Madera County for purposes of groundwater banking.

E "Groundwater" means water that occurs beneath the land surface and fills the pore spaces of the alluvium, soil, or rock formation in which it is situated.

F. "Groundwater Banking" means the importation of a surface supply of water that is percolated or injected to groundwater for storage, or placed underground by means of in-lieu recharge, for later extraction and delivery.

G. "Groundwater Management Plan" means a groundwater management plan adopted pursuant to California Water Code section 10750 et seq.

H. "Local water agencies" means public agencies, districts, or mutual water companies located wholly or partly within Madera County which have as their primary function the supplying of water for domestic, agricultural, industrial, or municipal purposes.

I. "Operations and Maintenance Plan" means a written plan which provides complete details of how the Applicant plans to

operate and maintain the project after construction is completed. This Plan must show who will assume the responsibility for the operation and maintenance of the project and provide an organizational chart detailing the job responsibilities of each position shown.

J. "Person" means an individual, partnership, company, corporation, unincorporated association, public agency, or other form of business entity.

K. "Project Monitoring Plan" means a written plan which details how the Applicant will monitor the project site and properties outside of the project boundaries for possible damage from operation of the project.

L. "Project Water Measurement and Water Loss Accountability Plan" means a written plan which details how water into and out of the project will be measured and how the Applicant plans to calculate or otherwise account for project water losses. The Plan must provide details of what types of measuring equipment will be used on the project and where it will be installed.

M. "Safety Action Plan" means a written plan which provides information on who will be responsible for implementing the safety requirements for the project and which also provides details of all project safety requirements, including those needed to protect the public and surrounding properties.

.100.040 LAND SUBJECT TO ARTICLE.

This Chapter shall be applicable to all lands within the District boundaries. If a portion of a Groundwater Banking project lies within the District, and a portion lies outside the boundaries of the District, then this Chapter shall apply to that portion that lies within the boundaries of the District.

.100.050 EXPORTATION OF GROUNDWATER BEYOND DISTRICT BOUNDARIES.

A. REQUIREMENT OF PERMIT:

Except under a permit granted pursuant to this Section, no groundwater extracted from any well within the boundaries of the District and located on or under lands subject to this Chapter, shall be used on lands which are outside of the boundaries of the District, unless the lands on which the water

is being used are contiguous to the lands where the water is extracted, and are owned by the same landowner. A permit is required under this Section whether or not such exportation is pursuant to Groundwater Banking that is also subject to a separate permit under Section __.100.060. A permit for exportation under this Section may cover all exportation of water to a specified water user in amounts specified in the permit for a period not to exceed five years from the granting of the permit, after which a new permit shall be required.

B. APPLICATION FOR PERMIT:

Applications for permits under this Section shall be made to the District on forms provided by the District and shall contain all information and reports required therein. An Application shall be accompanied by a report ("Report") prepared at the applicant's expense by a qualified Registered Civil Engineer or Geologist, versed in geologic and hydraulic testing, which shows:

a. The source of the water to be exported.

b. The quantity and quality of water proposed to be exported.

c. The location to which and purpose for which the water is to be exported, including the reasonable and beneficial use to which the water is to be put.

d. The geologic and hydrologic properties of the aquifers from which extraction will be made, including possibilities or likelihood of subsidence problems.

e. Percolation tests to determine the ability of the aquifer(s) to recharge.

f. Clay layers and their effect on percolation.

g. The applicant's Project Water Measurement and Water Loss Accountability Plan.

h. The applicant's Damage Prevention Plan.

i. The applicant's Project Monitoring Plan.

j. The applicant's Safety Action Plan.

k. The applicant's Emergency Action Plan.

l. The location, size, spacing and depths of extraction wells.

m. Horizontal migration of groundwater from surrounding locations.

n. The means and criteria for determining any effects on surrounding lands and their groundwater supplies.

o. Such other matters as the District may require.

Five copies of the Application, Report, and other information submitted shall be provided.

C. ENVIRONMENTAL IMPACT REPORT:
An Application for extraction permit under this Section is deemed to be a "project" under the California Environmental Quality Act ("CEQA") and its implementing regulations ("CEQA Guidelines"). In order to ensure that decision-makers have sufficient information on the potential impacts of such a project, the preparation and certification of an Environmental Impact Report ("EIR") is hereby required for each such project application. The EIR must conform to CEQA, CEQA Guidelines, and all District requirements. The EIR shall be prepared, and shall be paid for by the applicant, in accordance with the District's CEQA implementation procedures.

D. ADDITIONAL STUDIES AND REQUIREMENTS:
If, after receiving the Report as required by Paragraph B., above, and before or after receiving the EIR, the District Engineer desires more information, he or she may require preparation by applicant, at applicant's expense, of any additional geologic or hydrologic studies, or other information or studies, that he or she deems necessary to obtain information needed in order to make a recommendation on the application. The Engineer may review the application with potentially affected landowners and water users, with the staff of applicable local, state and federal agencies and with, and with the Madera County Water Oversight Committee.

E. REVIEW OF APPLICATION.

After reviewing the Application, Report, Environmental Impact Report, and any additional studies and other information required under Paragraph D., above, the District Engineer shall prepare a written report, with all comments attached thereto, in which he or she either shall recommend denial of the permit, or granting the permit with suggested conditions for the project. The written report also shall include recommendations concerning the adequacy of the EIR. All documents shall be filed with the Secretary of the Board.

F. FINDINGS REQUIRED FOR PERMIT APPROVAL OR DENIAL BY THE BOARD:

The permit may only be approved if the District finds that the proposed extraction and exportation will not have detrimental impacts on the District by determining that:

(1) The extraction and exportation will not cause or increase an overdraft on parts or all of the groundwater basins underlying the District.

(2) The extraction and exportation will not adversely affect the ability of other groundwater users to use, store, or transmit groundwater within any aquifer(s) underlying the District.

(3) The extraction and exportation will not adversely effect the reasonable and beneficial uses of groundwater by other groundwater users within the District.

(4) The extraction and exportation will not result in, expand, or exacerbate degradation of the quality or quantity of surface or groundwater within the District, or groundwater basins and aquifers within the District.

(5) The extraction and exportation will not result in injury to a water replenishment, storage, restoration, or conveyance project or facility;

(6) The extraction and exportation will not adversely affect the overall economy or environment of the area within the District.

If the Board determines that one or more of the findings required by this Section cannot be made, the Board shall deny the permit application. The basis for any such denial shall be reflected in the Board's official record of proceedings.

G. RE-APPLICATION AFTER BOARD DENIAL:
Re-application for a permit that has been denied by the Board may not be filed until one year after the date of denial.

H. PAYMENT OF FEES.
The applicant at the time of filing shall pay such fees as are or may be established by the Board for processing the application and the giving and publication of required notices.

I. NOTICE TO LANDOWNERS:
Upon the filing of an application with the District, the District shall give written notice to all owners of lands located within five miles of the exterior boundaries of the proposed extraction site, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District. In addition thereto, the District shall cause to be published pursuant to Government Code §§ 6060 and 6061.3 a notice that the application has been filed, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District. The District shall retain one copy of the application documents, EIR, and any comments or reports thereon and make them available for public inspection and copying in accordance with the Public Records Act.

J. NOTICED PUBLIC HEARING:
No permit shall be issued without a noticed public hearing before the Board pursuant to Government Code §§ 6060 and 6061.3. The notice shall be given by the Secretary of the Board after completion and filing of the Engineer's Report and the environmental review process. The notice shall specify the time and place of the hearing, the location from which the water is proposed to be extracted and exported, and a general description of the project and that any interested person may submit evidence at the hearing. At least fifteen days must

elapse between filing the documents with the Secretary of the Board and the date of the hearing.

K. PROCEDURES FOR CONDUCTING HEARING:
At the hearing, the Application, Report, Environmental Impact Report, additional submittals, comments from the public and the Engineer's Recommendation shall become evidence. The applicant and members of the public, or their representatives, may testify and introduce evidence in favor of, or in opposition to, the project.

L. DECISION AFTER HEARING.
At the conclusion of the hearing, the Board shall approve the application and grant the permit if the Board makes the findings set forth in Paragraph F., above, subject to the terms and provisions authorized in Paragraph M., below. If the Board is unable to make the findings set forth in Paragraph F., above, then the application shall be denied and no permit shall be issued. The Board shall direct that written findings are prepared in conformity with its decision and shall adopt said findings when prepared.

M. TERMS AND CONDITIONS OF PERMIT:
If an application is approved, the Board may impose such terms and conditions thereon as the Board deems necessary to prevent adverse effects on the aquifer(s), the quality and quantity of the groundwater supply, adjacent or neighboring lands, or the environment.

N. REVOCATION OF PERMIT:
Any violation of the terms and conditions of the permit will constitute grounds for revocation of the permit after a duly noticed public hearing thereon held in the manner described in the preceding Paragraphs.

O. INSPECTIONS:
If an application is approved and a permit granted, then the applicant's acceptance of the permit shall constitute the applicant's consent for the District Engineer, or his representatives, at any reasonable time, and from time to time, to enter the project site and make such observations and measurements as are deemed necessary to assure that the project is being carried out under the terms of the permit.

c. The method of placement of water to be banked

d. The quantities of groundwater to be extracted.

e. The geologic and hydrologic properties of the aquifers into which recharge will occur and from which extraction will be made, including possibilities or likelihood of subsidence problems.

f. Percolation tests to determine the ability of the aquifer(s) to recharge.

g. Clay layers and their effect on percolation.

h. Design of spreading areas.

i. The applicant's Operations and Maintenance Plan.

j. The applicant's Project Water Measurement and Water Loss Accountability Plan.

k. The applicant's Damage Prevention Plan.

l. The applicant's Project Monitoring Plan.

m. The applicant's Safety Action Plan.

n. The applicant's Emergency Action Plan.

o. The location, size, spacing and depths of extraction wells.

p. Horizontal migration of groundwater from surrounding locations.

q. The means and criteria for determining any effects on surrounding lands and their groundwater supplies.

r. Such other matters as the District may require.

Five copies of the Application, Report, and other information submitted shall be provided.

C. ENVIRONMENTAL IMPACT REPORT:
An Application for Groundwater Banking under this Section is deemed to be a "project" under the California Environmental Quality Act ("CEQA") and its implementing regulations ("CEQA Guidelines"). In order to ensure that decision-makers have sufficient information on the potential impacts of such a project, the preparation and certification of an Environmental Impact Report ("EIR") is hereby required for each such project application. The EIR must conform to CEQA, CEQA Guidelines, and all District requirements. The EIR shall be prepared, and shall be paid for by the applicant, in accordance with the District's CEQA implementation procedures.

D. ADDITIONAL STUDIES AND REQUIREMENTS:
If, after receiving the Report as required by Paragraph B., above, and before or after receiving the EIR, the District Engineer desires more information, he or she may require preparation by applicant, at applicant's expense, of any additional geologic or hydrologic studies, or other studies or information, that he or she deems necessary to obtain information needed in order to make a recommendation on the application. The Engineer may review the application with potentially affected landowners and water users, with the staff of applicable local, state and federal agencies, and with the Madera County Water Oversight Committee.

E. REVIEW OF APPLICATION.
After reviewing the Application, Report, Environmental Impact Report, and any additional studies and other information required under Paragraph D., above, the District Engineer shall prepare a written report, with all comments attached thereto, in which he or she either shall recommend denial of the permit, or granting the permit with suggested conditions for the project. The written report also shall include recommendations concerning the adequacy of the EIR. All documents shall be filed with the Secretary of the Board.

F. FINDINGS REQUIRED FOR PERMIT APPROVAL OR DENIAL BY THE BOARD:
The permit may only be approved if the District finds that the proposed Groundwater Banking project will not have detrimental impacts on the District by determining that:

(1) The project will not adversely affect the ability of other groundwater users to use, store, or transmit groundwater within any aquifer(s) underlying the District (for example by utilizing storage that might otherwise be subject to natural or passive recharge and thus depriving other groundwater users of their use of the aquifer and the groundwater derived therefrom).

(2) The project will not adversely affect the reasonable and beneficial uses of groundwater by other groundwater users within the District.

(3) The project will not result in, expand, or exacerbate degradation of the quality or quantity of surface or groundwater within the District, or groundwater basins and aquifers within the District.

(4) The project will not result in injury to a water replenishment, storage, restoration, or conveyance project or facility.

(5) The project will not adversely affect the surface or subsurface of neighboring or nearby lands, or the trees, vines, or crops growing or to be grown thereon.

(6) The project will not adversely affect the overall economy or environment of the District.

(7) The project will not cause or increase an overdraft of groundwater underlying the District.

(8) The project will not adversely affect the storage ability on adjacent lands where passive recharge may take place.

If the Board determines that one or more of the findings required by this Section cannot be made, the Board shall deny the permit application. The basis for any such denial shall be reflected in the Board's official record of proceedings.

G. RE-APPLICATION AFTER BOARD DENIAL:
Re-application for a permit that has been denied by the Board may not be filed until one year after the date of denial.

H. PAYMENT OF FEES.
The applicant at the time of filing shall pay such fees as are or may be established by the Board for processing the application and the giving and publication of required notices.

I. NOTICE TO LANDOWNERS:
Upon the filing of an application with the District, the District shall give written notice to all owners of lands located within the District which are located within five miles of project site, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District. In addition thereto, the District shall cause to be published pursuant to Government Code §§ 6060 and 6061.3 a notice that the application has been filed, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District. the District shall retain one copy of the application documents, EIR, and any comments or reports thereon and make them available for public inspection and copying in accordance with the Public Records Act.

J. NOTICED PUBLIC HEARING:
No permit shall be issued without a noticed public hearing before the Board pursuant to Government Code §§ 6060 and 6061.3. The notice shall be given by the Secretary of the Board after completion and filing of the Engineer's Report and the environmental review process. The notice shall specify the time and place of the hearing, a general description of the proposed importation and that any interested person may submit evidence at the hearing. At least fifteen days must elapse between filing the documents with the Secretary of the Board and the date of the hearing.

K. PROCEDURES FOR CONDUCTING HEARING:
At the hearing, the Application, Report, Environmental Impact Report, additional submittals, comments from the public and the Engineer's Recommendation shall become evidence. The applicant and members of the public, or their representatives, may testify and introduce evidence in favor of, or in opposition to, the project.

L. DECISION AFTER HEARING.
At the conclusion of the hearing, the Board shall approve the application and grant the permit if the Board makes the findings set forth in Paragraph F., above, subject to the terms and provisions authorized in Paragraph M., below. If the Board is unable to make the findings set forth in Paragraph F., above, then the application shall be denied and no permit shall be issued. The Board shall direct that written findings are prepared in conformity with its decision and shall adopt said findings when prepared.

M. TERMS AND CONDITIONS OF PERMIT:
If an application is approved, the Board may impose such terms and conditions thereon as the Board deems necessary to prevent adverse effects on the aquifer(s), the quality and quantity of the groundwater supply, adjacent or neighboring lands, or the environment. Since direct or other subsurface injection of water into an aquifer entails an inherent risk of irreparable contamination due to the lack of natural filtering resulting from percolation, the permit shall prohibit the use of direct or other subsurface injection.

N. REVOCATION OF PERMIT:
Any violation of the terms and conditions of the permit will constitute grounds for revocation of the permit after a duly noticed public hearing thereon held in the manner described in the preceding Paragraphs.

O. INSPECTIONS:
If an application is approved and a permit granted, then the applicant's acceptance of the permit shall constitute the applicant's consent for the District Engineer, or his representatives, at any reasonable time, and from time to time, to enter the project site(s) and make such observations and measurements as are deemed necessary to assure that the project is being carried out under the terms of the permit.

P. DECISION OF BOARD FINAL:
The decision of the Board in any matter set forth herein, other than criminal penalties, shall be final upon its adoption of written findings.

Q. JUDICIAL REVIEW:
Any judicial action to set aside, annul, or vacate any decision or action taken by the Board pursuant to this Chapter shall be filed pursuant to California Code of Civil Procedure Section 1094.5 and within the time limits prescribed in California Code of Civil Procedure section 1094.6.

.100.070 IMPORTATION OF FOREIGN WATER FOR GROUNDWATER BANKING.

A. REQUIREMENT OF PERMIT:
Except under a permit granted pursuant to this Section, no person may import Foreign Water for the purpose of Groundwater Banking within the boundaries of the District and located on or under lands subject to this Chapter. A permit is required under this Section whether or not such importation is pursuant to Groundwater Banking that is also subject to a separate permit under Section __.100.060. A permit for importation under this Section may cover all importation of water from a specified water source (designated by specific location and type) in amounts specified in the permit for a period not to exceed five years from the granting of the permit, after which a new permit shall be required.

B. APPLICATION FOR PERMIT:
Applications for permits under this Section shall be made to the District on forms provided by the District and shall contain all information and reports required therein. An Application shall be accompanied by a report ("Report") prepared at the applicant's expense by a qualified Registered Civil Engineer or Geologist, versed in geologic and hydraulic testing, which shows:

a. The source of the water to be imported.

b. The quantity and quality of water proposed to be imported.

c. The manner in which the water is to be conveyed to the Groundwater Banking facility, including the specific location of conveyance facilities, and copies of all permits and agreements showing consent for the use of such conveyance facilities.

d. The proposed method of placement of water to be imported and banked

e. The physical, and where applicable the geologic and hydrologic, properties of the conveyance facilities, including possibilities or likelihood of contamination or degradation problems.

f. The applicant's Project Water Measurement and Water Accountability Plan.

g. The applicant's Damage Prevention Plan.

h. The applicant's Project Monitoring Plan.

i. The applicant's Safety Action Plan.

j. The applicant's Emergency Action Plan.

k. The means and criteria for determining any effects on lands surrounding or neighboring all conveyance facilities and on their groundwater or surface water supplies.

l. The means and criteria for determining any effects on all other water supplies into which the proposed Foreign Water may be commingled while being conveyed, such as in a pool or reservoir.

m. Such other matters as the District may require.

Five copies of the Application, Report, and other information submitted shall be provided.

C. ENVIRONMENTAL IMPACT REPORT:

An Application for Foreign Water Importation Permit under this Section is deemed to be a "project" under the California Environmental Quality Act ("CEQA") and its implementing regulations ("CEQA Guidelines"). In order to ensure that decision-makers have sufficient information on the potential impacts of such a project, the preparation and certification of an Environmental Impact Report ("EIR") is hereby required for each such project application. The EIR must conform to CEQA, CEQA Guidelines, and all District requirements. The EIR shall be prepared, and shall be paid for by the applicant,

in accordance with the District's CEQA implementation procedures.

D. ADDITIONAL STUDIES AND REQUIREMENTS:
If, after receiving the Report as required by Paragraph B., above, and before or after receiving the EIR, the District Engineer desires more information, he or she may require preparation by applicant, at applicant's expense, of any additional geologic or hydrologic studies, or other studies or information, that he or she deems necessary to obtain information needed in order to make a recommendation on the application. The Engineer may review the application with potentially affected landowners and water users, with the staff of applicable state and federal agencies, and with the Madera County Water Oversight Committee.

E. REVIEW OF APPLICATION.
After reviewing the Application, Report, Environmental Impact Report, and any additional studies and other information required under Paragraph D., above, the District Engineer shall prepare a written report, with all comments attached thereto, in which he or she either shall recommend denial of the permit, or granting the permit with suggested conditions for the project. The written report also shall include recommendations concerning the adequacy of the EIR. All documents shall be filed with the Secretary of the Board.

F. FINDINGS REQUIRED FOR PERMIT APPROVAL OR DENIAL BY THE BOARD:
The permit may only be approved if the District finds that the proposed importation of Foreign Water will not have detrimental impacts on the District by determining that:

(1) The importation will not adversely affect the ability of other groundwater users to use, store, or transmit groundwater within any aquifer(s) underlying the District.

(2) The importation will not adversely affect the reasonable and beneficial uses of groundwater by other groundwater users within the District.

(3) The importation will not result in, expand, or exacerbate degradation of the quality or quantity of surface or groundwater within the District, or groundwater basins and aquifers within the District.

(4) The importation will not result in injury to a water replenishment, storage, restoration, or conveyance project or facility.

(5) The project will not adversely affect the surface or subsurface of neighboring or nearby lands, or the trees, vines, or crops growing or to be grown thereon.

(6) The importation will not adversely affect the overall economy or environment of the District.

(7) The existing qualities of the underground aquifers will not be degraded by the importation.

(8) The importation will not adversely affect the storage ability on adjacent lands where passive recharge may take place.

If the Board determine that one or more of the findings required by this Section cannot be made, the Board shall deny the permit application. The basis for any such denial shall be reflected in the Board's official record of proceedings.

G. RE-APPLICATION AFTER BOARD DENIAL:
Re-application for a permit that has been denied by the Board may not be filed until one year after the date of denial.

H. PAYMENT OF FEES.
The applicant at the time of filing shall pay such fees as are or may be established by the Board for processing the application and the giving and publication of required notices.

I. NOTICE TO LANDOWNERS:
Upon the filing of an application with the District, the District shall give written notice to all owners of lands located within the District which are located within five miles of any conveyance facilities that are within or adjacent to the District, setting forth the name of the applicant, a description of the project, a description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District. In addition thereto, the District shall cause to be published pursuant to Government Code §§ 6060 and 6061.3 a notice that the application has been filed, setting forth the name of the applicant, a description of the project, a

description or map of the land involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District. The District shall retain one copy of the application documents, EIR, and any comments or reports thereon and make them available for public inspection and copying in accordance with the Public Records Act.

J. NOTICED PUBLIC HEARING:
No permit shall be issued without a noticed public hearing before the Board pursuant to Government Code §§ 6060 and 6061.3. The notice shall be given by the Secretary of the Board after completion and filing of the Engineer's Report and the environmental review process. The notice shall specify the time and place of the hearing, a general description of the proposed importation and that any interested person may submit evidence at the hearing. At least fifteen days must elapse between filing the documents with the Secretary of the Board and the date of the hearing.

K. PROCEDURES FOR CONDUCTING HEARING:
At the hearing, the Application, Report, Environmental Impact Report, additional submittals, comments from the public and the Engineer's Recommendation shall become evidence. The applicant and members of the public, or their representatives, may testify and introduce evidence in favor of, or in opposition to, the project.

L. DECISION AFTER HEARING.
At the conclusion of the hearing, the Board shall approve the application and grant the permit if the Board makes the findings set forth in Paragraph F., above, subject to the terms and provisions authorized in Paragraph M., below. If the Board is unable to make the findings set forth in Paragraph F., above, then the application shall be denied and no permit shall be issued. The Board shall direct that written findings are prepared in conformity with its decision and shall adopt said findings when prepared.

M. TERMS AND CONDITIONS OF PERMIT:
If an application is approved, the Board may impose such terms and conditions thereon as the Board deems necessary to prevent adverse effects on the aquifer(s), the quality and quantity of the groundwater supply, adjacent or neighboring lands, or the environment.

N. REVOCATION OF PERMIT:
Any violation of the terms and conditions of the permit will constitute grounds for revocation of the permit after a duly noticed public hearing thereon held in the manner described in the preceding Paragraphs.

O. INSPECTIONS:
If an application is approved and a permit granted, then the applicant's acceptance of the permit shall constitute the applicant's consent for the District Engineer, or his representatives, at any reasonable time, and from time to time, to enter the project site(s) and make such observations and measurements as are deemed necessary to assure that the project is being carried out under the terms of the permit.

P. DECISION OF BOARD FINAL:
The decision of the Board in any matter set forth herein, other than criminal penalties, shall be final upon its adoption of written findings.

Q. JUDICIAL REVIEW:
Any judicial action to set aside, annul, or vacate any decision or action taken by the Board pursuant to this Chapter shall be filed pursuant to California Code of Civil Procedure Section 1094.5 and within the time limits prescribed in California Code of Civil Procedure section 1094.6.

.100.080 DISTRICT CONVEYANCE FACILITIES:

A. REQUIREMENT OF PERMIT:
In order to avoid injury to any legal user of water, and to avoid unreasonably affecting the overall economy or the environment of Madera county, no person may use any District-owned conveyance facility as a part of, or in connection with, Groundwater Banking for which a permit is required under this Chapter, or the importation of Foreign Water for which a permit is required under this Chapter, or the exportation of groundwater for which a permit is required under this Chapter, except under a permit granted pursuant to this Section. A permit is required under this Section whether or not such use is in connection with groundwater banking, importation of foreign water, or exportation of groundwater for which a separate permit or permits are required under other Sections of this Chapter. A permit for use of a district conveyance facility under this Section may cover all importation of water from a specified water source (designated by specific location and type) in amounts specified in the

permit for a period not to exceed two years from the granting of the permit, after which a new permit shall be required.

B. APPLICATION FOR PERMIT:
Applications for permits under this Section shall be made to the District on forms provided by the District and shall contain all information and reports required therein. An Application shall be accompanied by a report ("Report") prepared at the applicant's expense by a qualified Registered Civil Engineer or Geologist, versed in geologic and hydraulic testing, which shows:

a. The source of the water to be conveyed through the conveyance facility.

b. The quantity and quality of water proposed to be conveyed.

c. The manner in which the water is to be delivered to and withdrawn from the District conveyance facility and how the water is to conveyed from its source to the District's conveyance facility.

d. The physical, and where applicable the geologic and hydrologic, properties of the conveyance facilities through which the water will be delivered into the District's conveyance facilities, including possibilities or likelihood of contamination or degradation problems.

e. The applicant's Project Water Measurement and Water Accountability Plan.

f. The applicant's Damage Prevention Plan.

g. The applicant's Project Monitoring Plan.

h. The applicant's Safety Action Plan.

i. The applicant's Emergency Action Plan.

j. The means and criteria for determining any effects on lands within the District and otherwise surrounding or neighboring all conveyance facilities and on their groundwater or surface water supplies.

k. The means and criteria for determining any effects on all other water supplies with which the water proposed to be conveyed may be commingled while being conveyed.

l. The means and criteria for determining any effects of the use of the District conveyance facility on any other legal user of water conveyed or to be conveyed through such facilities.

m. The means and criteria for determining any effects of the use of the District conveyance facility on fish, wildlife, other instream beneficial uses, or the environment within the District and within Madera County.

n. The means and criteria for determining any effects of the use of the District conveyance facility on the economy within the District and within Madera County.

o. Such other matters as the District may require.

Five copies of the Application, Report, and other information submitted shall be provided.

C. ENVIRONMENTAL IMPACT REPORT:
An Application for Use of District Conveyance Facility under this Section is deemed to be a "project" under the California Environmental Quality Act ("CEQA") and its implementing regulations ("CEQA Guidelines"). In order to ensure that decision-makers have sufficient information on the potential impacts of such a project, the preparation and certification of an Environmental Impact Report ("EIR") is hereby required for each such project application. The EIR must conform to CEQA, CEQA Guidelines, and all District requirements. The EIR shall be prepared, and shall be paid for by the applicant, in accordance with the District's CEQA implementation procedures.

D. ADDITIONAL STUDIES AND REQUIREMENTS:
If, after receiving the Report as required by Paragraph B., above, and before or after receiving the EIR, the District

Engineer desires more information, he or she may require preparation by applicant, at applicant's expense, of any additional physical, geologic or hydrologic studies, or other studies or information, that he or she deems necessary to obtain information needed in order to make a recommendation on the application. The Engineer may review the application with potentially affected landowners and water users, with the staff of applicable state and federal agencies, and with the Madera County Water Oversight Committee.

E. REVIEW OF APPLICATION.

After reviewing the Application, Report, Environmental Impact Report, and any additional studies and other information required under Paragraph D., above, the District Engineer shall prepare a written report, with all comments attached thereto, in which he or she either shall recommend denial of the permit, or granting the permit with suggested conditions for the project. The written report also shall include recommendations concerning the adequacy of the EIR. All documents shall be filed with the Secretary of the Board.

F. FINDINGS REQUIRED FOR PERMIT APPROVAL OR DENIAL BY THE BOARD:

The permit may only be approved if the District finds that the proposed use of District conveyance facility will not:

(1) Injure any legal user of water.

(2) Unreasonably affect the delivery of water to any District landowners.

(3) Unreasonably affect fish, wildlife, or other instream beneficial uses.

(4) Unreasonably affect the overall economy of the county from which the water is to be transferred.

(5) Unreasonably affect the environment of the county from which the water is to be transferred.

If the Board determines that one or more of the findings required by this Section cannot be made, the Board shall deny the permit application. The basis for any such denial shall be reflected in the Board's official record of proceedings.

G. RE-APPLICATION AFTER BOARD DENIAL:
Re-application for a permit that has been denied by the Board may not be filed until one year after the date of denial.

H. PAYMENT OF FEES.
The applicant at the time of filing shall pay such fees as are or may be established by the Board for processing the application and the giving and publication of required notices.

I. NOTICE TO LANDOWNERS:
Upon the filing of an application with the District, the District shall give written notice to all owners of lands located within the District which are located within five miles of any conveyance facilities that are within or adjacent to the District, setting forth the name of the applicant, a description of the applicant's proposal, a description or map of the District facility involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District. In addition thereto, the District shall cause to be published pursuant to Government Code §§ 6060 and 6061.3 a notice that the application has been filed, setting forth the name of the applicant, a description of the applicant's proposal, a description or map of the District facility involved, and a statement that all documents submitted in connection with the application are public records subject to inspection at the office of the District. The District shall retain one copy of the application documents, EIR, and any comments or reports thereon and make them available for public inspection and copying in accordance with the Public Records Act.

J. NOTICED PUBLIC HEARING:
No permit shall be issued without a noticed public hearing before the Board pursuant to Government Code §§ 6060 and 6061.3. The notice shall be given by the Secretary of the Board after completion and filing of the Engineer's Report and the environmental review process. The notice shall specify the time and place of the hearing, a general description of the proposed importation and that any interested person may submit evidence at the hearing. At least fifteen days must elapse between filing the documents with the Secretary of the Board and the date of the hearing.

K. PROCEDURES FOR CONDUCTING HEARING:
At the hearing, the Application, Report, Environmental Impact Report, additional submittals, comments from the public and the Engineer's Recommendation shall become evidence. The applicant and members of the public, or their representatives, may testify and introduce evidence in favor of, or in opposition to, the project.

L. DECISION AFTER HEARING.
At the conclusion of the hearing, the Board shall approve the application and grant the permit if the Board makes the findings set forth in Paragraph F., above, subject to the terms and provisions authorized in Paragraph M., below. If the Board is unable to make the findings set forth in Paragraph F., above, then the application shall be denied and no permit shall be issued. The Board shall direct that written findings are prepared in conformity with its decision and shall adopt said findings when prepared.

M. TERMS AND CONDITIONS OF PERMIT:
If an application is approved, the Board may impose such terms and conditions thereon as the Board deems necessary to prevent adverse effects described in Paragraph F, above.

N. REVOCATION OF PERMIT:
Any violation of the terms and conditions of the permit will constitute grounds for revocation of the permit after a duly noticed public hearing thereon held in the manner described in the preceding Paragraphs.

O. INSPECTIONS:
If an application is approved and a permit granted, then the applicant's acceptance of the permit shall constitute the applicant's consent for the District Engineer, or his representatives, at any reasonable time, and from time to time, to enter the applicant's site(s) and make such observations and measurements as are deemed necessary to assure that the applicant's proposed use is being carried out under the terms of the permit.

P. DECISION OF BOARD FINAL:
The decision of the Board in any matter set forth herein, other than criminal penalties, shall be final upon its adoption of written findings.

Q. JUDICIAL REVIEW:
Any judicial action to set aside, annul, or vacate any decision or action taken by the Board pursuant to this Chapter shall be filed pursuant to Cal. Code of Civil Procedure Section 1094.5 and within the time limits prescribed in Cal. Code of Civil Procedure section 1094.6.

.100.090 PENALTIES FOR VIOLATION:

These rules and regulations are enacted to secure distribution of water in accordance with determined rights within the District pursuant to California Water Code Section 22085. Supervision and enforcement of these regulations shall be by District watermasters appointed under Water Code Section 22081. The District may elect to proceed with any or all of the following remedies for violation of this Chapter:

(a) A civil action against the violator for damages and/or injunctive relief.

(b) A misdemeanor criminal action against any violator who willfully and without authority closes, changes, or interferes with any headgate, waterbox, or measuring device while it is under the control of the watermaster, or who willfully takes, uses, or conveys water which has been denied him by the watermaster as not allowed under permit or in violation of the provisions of this Ordinance is guilty of a misdemeanor pursuant to Water Code Section 22088. Under Water Code Section 22089.5, a watermaster has the power to arrest any person violating any of the provisions of this article and to give him into the custody of the sheriff or other competent police officer within the county, and immediately thereafter make a complaint before a magistrate against the person so arrested. Every person who violates any of the provisions of this article is guilty of a misdemeanor and is punishable by a fine of not less than twenty-five dollars ($25), nor more than two hundred fifty dollars ($250), or by imprisonment in the county jail for not less than 10 days nor more than six months, or by both such fine and imprisonment pursuant to Water Code Section 22089.

(c) A referral to the Madera County District Attorney for prosecution of a misdemeanor criminal action against any violator without authority of the owner or managing agent, and with intent to defraud, take water from any canal, ditch, flume, or reservoir used for the purpose of holding or conveying is guilty of a misdemeanor under California Penal Code Section 592. If the total retail value of all the water taken is more than

four hundred dollars ($400), or if the defendant has previously been convicted of an offense under Penal Code Section 592 or any former section that would be an offense under Section 592, or of an offense under the laws of another state or of the United States that would have been an offense under this section if committed in this state, then the violation is punishable by imprisonment in the county jail for not more than one year, or in the state prison.

__.100.100 SEVERABILITY:

If any section, subsection, sentence, clause or phrase of this Chapter is for any reason held to be illegal, invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions hereof. The Board hereby declares it would have passed this Chapter and each section, subsection, sentence, clause or phrase hereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses or phrases are declared illegal, invalid or unconstitutional.

Irrigation Policy

MADERA IRRIGATION DISTRICT
CROP WATER DISTRIBUTION POLICY

CROPWATER,SCHED005.DOC

APPROVED BY THE BOARD OF DIRECTORS ON MARCH 2, 1993.

OFFICE HOURS:
****

MONDAY THROUGH FRIDAY	6:30 A.M. - 5:00 P.M.
SATURDAYS AND HOLIDAYS	7:00 A.M. - 4:00 P.M.
SUNDAYS	7:00 A.M. - 10:00 A.M.

APPLICATION PERIOD--8:00 A.M. TO 5:00 P.M.
****

REGULAR APPLICATION PERIOD--MONDAY THRU FRIDAY	MARCH 4 THRU MARCH 31
LATE APPLICATION PERIOD--MONDAY THRU FRIDAY	APRIL 1 THRU SEASON
LATE APPLICATION PENALTY	$2.00 PER ACRE FOOT ON MANDATORY ALLOCATION.

ALLOCATION:
****

MANDATORY ALLOCATION ON CATEGORY 2 LANDS	1.00 ACRE FOOT PER ACRE
DOWN PAYMENT REQUIRED AT TIME OF APPLICATION	25% OF MANDATORY ALLOCATION.

WATER SEASON:
****

SYSTEM PRIMING	MARCH 4TH
DELIVERIES BEGIN	MARCH 8TH
DELIVERIES END (APPROXIMATELY)	SEPTEMBER 30TH
WATER ORDERS ACCEPTED	MARCH 8TH

CROP WATER TOLLS:	FIRST A/F	NEXT A/F	MARCH A/F
**********	---------	---------	---------
COST OF SERVICE WATER	$ 40.00	$ 30.00	$ 20.00
R.R.A. FULL COST 202 WATER	$ 55.00	$ 45.00	$ 20.00
R.R.A. FULL COST 205 WATER	$ 65.00	$ 55.00	$ 20.00
SUBORDINATE COST OF SERVICE WATER	$ 50.00	$ 40.00	$ 30.00
SUBORDINATE FULL COST 202 WATER	$ 60.00	$ 50.00	$ 30.00
SUBORDINATE FULL COST 205 WATER	$ 70.00	$ 60.00	$ 30.00

NOTES:
******

1. ALL OF THE ABOVE WATER TOLLS INCLUDE $7.00 PER ACRE FOOT TO SATISFY THE REQUIREMENTS OF HR-429 (PL 102-575) AUTHORED BY MILLER-BRADLEY AND EFFECTIVE ON OCTOBER 30, 1992.

2. RECLAMATION REFORM ACT FORMS WILL BE ACCEPTED FROM 8:00 A.M. TO 5:00 P.M. ON MONDAY THROUGH FRIDAY EXCLUDING HOLIDAYS.

CROP WATER TRANSFERS:
****

CROP WATER TRANSFERS MAY BE MADE FROM GROWER TO GROWER AS ALLOWED IN PREVIOUS YEARS. APPROPRIATE TRANSFER FORMS MUST BE COMPLETED PRIOR TO ANY SUCH TRANSFER. WHEN POSSIBLE, BOTH PARTIES SHOULD APPEAR TOGETHER TO EXECUTE THE TRANSFER DOCUMENT. IF THIS IS NOT POSSIBLE, THE TRANSFEREE SHOULD SIGN THE DOCUMENT FIRST AND THE TRANSFEROR SHOULD THEN COMPLETE THE DOCUMENT.

CROP WATER DISTRIBUTION POLICY

FLAT RATE WATER:
****

	RATES	50% DOWN
FROM 0.01 ACRES THROUGH 1.49 ACRES	$ 70.00	$ 35.00
FROM 1.50 ACRES THROUGH 2.49 ACRES	$ 130.00	$ 65.00
FROM 2.50 ACRES THROUGH 3.49 ACRES	$ 185.00	$ 92.50
FROM 3.50 ACRES THROUGH 4.49 ACRES	$ 240.00	$ 120.00
FROM 4.50 ACRES THROUGH 5.49 ACRES	$ 300.00	$ 150.00
FROM 5.50 ACRES THROUGH 5.99 ACRES	$ 355.00	$ 177.50

FLAT RATE USERS MUST PAY 50% DOWN AT TIME OF APPLICATION. THE BALANCE WILL BE BILLED ON JULY 1 AND WILL BECOME DELINQUENT ON JULY 20.

FLAT RATE USERS MUST RECOGNIZE A MINIMUM FIFTEEN (15) DAY PERIOD BETWEEN IRRIGATIONS.

PAYMENTS FOR CROP WATER:
****

PAYMENTS FOR CROP WATER ARE DUE UPON RECEIPT OF BILLINGS AND WILL BECOME DELINQUENT ON THE 20TH OF THE MONTH FOLLOWING THE MONTH OF USAGE. THE PENALTY FOR DELINQUENT CROP WATER PAYMENTS IS 1-1/2% PER MONTH WITH A MINIMUM CHARGE OF $1.00 ON EACH ACCOUNT EACH MONTH.

PREREQUISITES FOR CROP WATER DELIVERY:
****

1. CROP WATER APPLICATION MUST BE SIGNED BY THE LAND OWNER OR OR AN AUTHORIZED AGENT OF THE LAND OWNER.

2. ALL DELINQUENT CROP WATER MUST BE PAID IN FULL.

3. ALL DELINQUENT GENERAL AND SPECIAL ASSESSMENTS MUST BE PAID IN FULL.

4. OUTSTANDING CERTIFICATES OF SALE MUST BE REDEEMED.

5. RECLAMATION REFORM ACT FORMS MUST BE CURRENT AND ON FILE WITH THE DISTRICT.

6. A TENANT MAY RECEIVE CROP WATER, PRIOR TO THE SIGNATURE OF THE LANDOWNER OR AN AUTHORIZED AGENT OF THE LANDOWNER ON THE APPLICATION, AFTER MAKING A DEPOSIT WITH THE DISTRICT OF 50% OF THE MANDATORY ALLOCATION ON SUCH PARCEL, MULTIPLIED BY THE APPLICABLE WATER RATE. TENANT, WITH SUCH DEPOSIT, MAY EXECUTE THE APPLICATION AS AN INTERIM MEASURE UNTIL SUCH TIME AS THE SIGNATURE OF THE LANDOWNER OR AN AUTHORIZED AGENT THEREOF IS OBTAINED, AND MAY CONTINUE TO RECEIVE WATER AS LONG AS THERE IS A PREPAID BALANCE REMAINING IN THE TENANT'S DEPOSIT ACCOUNT.

Distribution System

TABLE II-2

MADERA IRRIGATION DISTRICT
CANAL SYSTEM LISTING
MAY 1992

CANAL NAME	DESCRIPTION	LENGTH (FT.)	Q (C.F.S.)	DISCHARGE
MADERA CANAL	CONCRETE LINED	32,314	1,275	LATERAL 6.2
MADERA CANAL	CONCRETE LINED	8,289	1,075	
MADERA CANAL	CANAL	28,354	1,075	HILDRETH CREEK
MADERA CANAL	CANAL	30,360	1,075	FRESNO RIVER
MADERA CANAL	CANAL	28,195	1,000	DRY CREEK
MADERA CANAL	CANAL	32,736	750	BERENDA CREEK
MADERA CANAL	CANAL	9,821	750	LATERAL 32.2
MADERA CANAL	CANAL	19,800	750	ASH SLOUGH
LATERAL 6.2	CANAL	51,500	340	
LATERAL 6.2	CANAL	24,465	278	
LATERAL 6.2	CANAL	12,973	201	
LATERAL 6.2	CANAL	1,825	125	
LATERAL 6.2	CANAL	12,579	75	
LATERAL 6.2	CANAL	8,099	60	
LATERAL 6.2	CANAL	2,619	45	
LATERAL 6.2 WASTEWAY	CANAL	3,871	15	SAN JOAQUIN RIVER
LATERAL 6.2 EXTENSION	48" C.I.P.	8,067	40	
LATERAL 6.2 EXTENSION	48" C.I.P.	2,013	35	
LATERAL 6.2 EXTENSION	42" C.I.P.	5,192	30	
LATERAL 6.2 EXTENSION	42" C.I.P.	1,972	25	
LATERAL 6.2 EXTENSION	36" C.I.P.	3,449	25	
LATERAL 6.2 EXTENSION	36" C.I.P.	2,668	20	
LATERAL 6.2 EXTENSION	36" C.I.P.	1,285	15	
LATERAL 6.2 EXTENSION	30" C.I.P.	3,998	15	
LATERAL 6.2 WASTEWAY	CANAL	2,554	15	GRAVELY FORD W.D. PIPELINE OR S.
LATERAL 6.2 - 20.6	30" C.I.P.	1,212	5	
LATERAL 6.2 - 21.1	30" C.I.P.	2,684	10	
LATERAL 6.2 - 9.2	CANAL	13,985	85	
LATERAL 6.2 - 9.2	66" P.C.P.	5,861	85	
LATERAL 6.2 - 9.2	CANAL	7,353	75	
LATERAL 6.2 - 9.2	CANAL	6,561	45	
LATERAL 6.2 - 9.2	CANAL	5,748	30	
LATERAL 6.2 - 9.2	CANAL	273	15	
LATERAL 6.2 - 9.2 - 3.2	36" P.C.P.	580	30	
LATERAL 6.2 - 9.2 - 3.2	CANAL	12,570	30	
LATERAL 6.2 - 9.2 - 3.2 WASTEWAY	CANAL	3,093	15	LATERAL 6.2
LATERAL 6.2 - 9.2 - 3.2 - 1.7	CANAL	1,332	15	
LATERAL 6.2 - 9.2 - 4.5	CANAL	1,585	15	
LATERAL 6.2 - 9.2 - 5.0	CANAL	5,690	45	
LATERAL 6.2 - 9.2 - 5.0	48" P.C.P.	3,459	45	
LATERAL 6.2 - 9.2 - 5.0	CANAL	6,366	30	
LATERAL 6.2 - 9.2 - 5.0	30" P.C.P.	184	30	
LATERAL 6.2 - 9.2 - 5.0	24" P.C.P.	263	15	
LATERAL 6.2 - 9.2 - 5.0	CANAL	3,688	15	
LATERAL 6.2 - 9.2 - 5.0	30" P.C.P.	195	15	
LATERAL 6.2 - 9.2 - 5.0	24" P.C.P.	350	15	
LATERAL 6.2 - 9.2 - 5.0	CANAL	25	15	
LATERAL 6.2 - 9.2 - 5.0 - 1.7	36" P.C.P.	4,005	15	
LATERAL 6.2 - 9.2 - 5.0 - 3.0	CANAL	2,723	15	

MADERA IRRIGATION DISTRICT
CANAL SYSTEM LISTING
MAY 1992

CANAL NAME	DESCRIPTION	LENGTH (FT.)	Q (C.F.S.)	DISCHARGE
LATERAL 6.2 - 9.2 - 7.4	CANAL	5,125	15	
LATERAL 6.2 - 10.7	CANAL	4,034	15	
LATERAL 6.2 - 13.4	CANAL	2,464	15	
LATERAL 6.2 - 14.0	30" P.C.P.	3,100	15	
LATERAL 6.2 - 14.0	CANAL	10,153	15	
LATERAL 6.2 - 14.0	36" P.C.P.	3,898	15	
LATERAL 6.2 - 14.5	CANAL	4,080	30	
LATERAL 6.2 - 14.5	42" P.C.P.	720	30	
LATERAL 6.2 - 14.5	CANAL	1,600	30	
LATERAL 6.2 - 14.5	42" P.C.P.	700	30	
LATERAL 6.2 - 14.5	CANAL	1,649	30	
LATERAL 6.2 - 14.5	CANAL	9,827	15	
LATERAL 6.2 - 14.5 - 0.5	CANAL	5,185	30	
LATERAL 6.2 - 14.5 - 0.5	36" C.I.P.	6,560	15	
LATERAL 6.2 - 14.5 - 0.5	CANAL	1,329	15	
LATERAL 6.2 - 14.5 - 0.5 - 1.0	36" C.I.P.	1,670	10	
LATERAL 6.2 - 14.5 - 0.5 - 1.0	30" C.I.P.	1,028	5	
LATERAL 6.2 - 14.5 - 0.5 - 1.8	30" C.I.P.	1,331	10	
LATERAL 6.2 - 14.9	36" C.I.P.	5,346	15	
LATERAL 6.2 - 14.9	30" C.I.P.	2649	15	
LATERAL 6.2 - 15.9	CANAL	7,330	45	
LATERAL 6.2 - 15.9	48" C.I.P.	782	45	
LATERAL 6.2 - 15.9	CANAL	1,287	45	
LATERAL 6.2 - 15.9	42" C.I.P.	1,304	35	
LATERAL 6.2 - 15.9	42" C.I.P.	2,683	30	
LATERAL 6.2 - 15.9	42" C.I.P.	2,611	25	
LATERAL 6.2 - 15.9	36" C.I.P.	1,686	20	
LATERAL 6.2 - 15.9	36" C.I.P.	6,669	20	
LATERAL 6.2 - 15.9	30" C.I.P.	5,052	15	
LATERAL 6.2 - 15.9 - 2.0	30" C.I.P.	145	15	
LATERAL 6.2 - 15.9 - 2.0	CANAL	135	15	
LATERAL 6.2 - 15.9 - 2.0	CANAL	254	10	
LATERAL 6.2 - 15.9 - 3.5 WW	30" C.I.P.	2,628	10	
LATERAL 6.2 - 15.9 WW TO 16.9	CANAL	2,782	15	
LATERAL 6.2 - 16.9	CANAL	13,323	60	
LATERAL 6.2 - 16.9	CANAL	15,955	45	
LATERAL 6.2 - 16.9	CANAL	13,238	30	
LATERAL 6.2 - 16.9	CANAL	7,994	15	
LATERAL 6.2 - 16.9 WW	CANAL	9,322	15	
LATERAL 6.2 - 16.9 - 7.0	CANAL	5,151	15	
LATERAL 6.2 - 18.4	CANAL	1,334	60	
LATERAL 6.2 - 18.4	54" C.I.P.	1,340	60	
LATERAL 6.2 - 18.4	CANAL	6,695	60	
LATERAL 6.2 - 18.4	CANAL	8,106	45	
LATERAL 6.2 - 18.4	48" C.I.P.	2,518	40	
LATERAL 6.2 - 18.4	48" C.I.P.	8,000	35	
LATERAL 6.2 - 18.4	42" C.I.P.	4,039	30	
LATERAL 6.2 - 18.4	42" C.I.P.	1,320	25	
LATERAL 6.2 - 18.4	36" C.I.P.	7,917	20	

MADERA IRRIGATION DISTRICT
CANAL SYSTEM LISTING
MAY 1992

CANAL NAME	DESCRIPTION	LENGTH (FT.)	Q (C.F.S.)	DISCHARGE
LATERAL 6.2 - 18.4	30" C.I.P.	5,637	15	
LATERAL 6.2 - 18.4	30" C.I.P.	989	5	
LATERAL 6.2 - 18.4 - 6.0	30" C.I.P.	666	15	
LATERAL 6.2 - 18.4 - 6.0	30" C.I.P.	1,915	10	
LATERAL 6.2 - 18.4 - 8.5	30" C.I.P.	2,562	10	
FRESNO RIVER	RIVER	64,416	500	FRANCHI WEIR & MAIN CANAL
ISLAND TRACT	24" R.C.P.	1,655	12	
ISLAND TRACT	24" R.C.P.	824	10	
ISLAND TRACT	21" R.C.P.	1,331	8	
ISLAND TRACT	21" R.C.P.	1,582	7	
ISLAND TRACT	18" R.C.P.	1,136	6	
ISLAND TRACT	15" R.C.P.	1,987	4	
ISLAND TRACT	15" R.C.P.	870	3	
ISLAND TRACT	12" R.C.P.	345	3	
ISLAND TRACT - LAT 0.3	15" R.C.P.	2,582	3	
ISLAND TRACT - LAT 0.3	12" R.C.P.	8	3	
MAIN	CANAL	23,760	300	
LATERAL MAIN I	CANAL	8,000	100	
LATERAL MAIN I	2 X 54" P.C.P.	1,000	100	
LATERAL MAIN I	2 X 48" P.C.P.	450	100	
LATERAL MAIN I	2 X 48" CORRIG.	500	100	
LATERAL MAIN I	CANAL	450	100	
LATERAL MAIN I	2 X 54" P.C.P.	900	100	
LATERAL MAIN I	60" P.C.P.	1,363	80	
LATERAL MAIN I	66" P.C.P.	3,000	80	
LATERAL MAIN I	CANAL	1,050	75	
LATERAL MAIN I	54" P.C.P.	330	50	
LATERAL MAIN I	CANAL	31,680	35	SECTION 8 CANAL AND COTTONWOOD CR
LATERAL MAIN I - STOCKTON	48" P.C.P.	5,250	35	
LATERAL MAIN I - STOCKTON	42" C.I.P.	1,200	35	
LATERAL MAIN I - STOCKTON	21" P.C.P.	9,500	9	
LATERAL MAIN I - STOCKTON	18" P.V.C.	2,500	4	FRESNO RIVER
LATERAL MAIN I - CLARK	21" P.C.P.	8,500	9	
LATERAL MAIN I - COLONY	48" P.C.P.	2,250	35	
LATERAL MAIN I - COLONY	36" C.I.P.	6,688	25	
LATERAL MAIN I - COLONY	CANAL	7,744	10	
LATERAL MAIN I - COLONY NO. 1	18" P.C.P.	2,112	4	
LATERAL MAIN I - COLONY NO. 2	18" P.C.P.	1,760	4	
LATERAL MAIN I - COLONY EXT.	CANAL	10,560	17	
LATERAL MAIN I - COLONY EXT.	36" C.I.P.	2,640	17	
LATERAL MAIN I - COLONY EXT.	CANAL	10,560	17	
LATERAL MAIN I - COLONY EXT. LATERAL	CANAL	5,280	10	
LATERAL MAIN I - CHINA GARDEN	42" P.C.P.	3,608	20	
LATERAL MAIN I - CHINA GARDEN	39" P.C.P.	2,640	15	
LATERAL MAIN I - CHINA GARDEN	36" P.C.P.	3,960	10	
LATERAL MAIN I - CHINA GARDEN	CANAL	1,760	5	
LATERAL MAIN I - DESMOND	36" C.I.P	10,447	20	
LATERAL MAIN I - DESMOND	CANAL	2,640	10	
LATERAL MAIN I - DESMOND	18" P.C.P	2,640	3	SCHMITZ CANAL

MADERA IRRIGATION DISTRICT
CANAL SYSTEM LISTING
MAY 1992

CANAL NAME	DESCRIPTION	LENGTH (FT.)	Q (C.F.S.)	DISCHARGE
LATERAL MAIN I - DESMOND LATERAL	16" P.C.P	1,058	5	
LATERAL MAIN I - DESMOND LATERAL	14" P.C.P	1,497	3	
LATERAL MAIN I - 3.0	30" C.I.P	1,900	15	
LATERAL MAIN I - 3.0	27" P.C.P	920	10	
LATERAL MAIN I - 3.0	20" P.C.P.	1,100	8	
LATERAL MAIN I - 3.0	20" P.C.P.	1,300	8	
LATERAL MAIN I - 3.0	16" P.C.P.	1,300	5	
LATERAL MAIN I - 3.0	12" P.C.P.	650	5	
LATERAL MAIN I - SCHMITZ	36" C.I.P	2,799	25	
LATERAL MAIN I - SCHMITZ	30" C.I.P	1,320	25	
LATERAL MAIN I - SCHMITZ	CANAL	6,776	15	HUGHES CANAL
LATERAL MAIN I - SANDERSON	CANAL	3,944	10	
LATERAL MAIN I - SANDERSON	12" P.V.C.	660	3	
LATERAL MAIN I - CODY	36" P.C.P	9,152	25	
LATERAL MAIN I - CODY	24" P.C.P	1,320	12	
LATERAL MAIN I - CODY	24" P.C.P	3,680	6	
LATERAL MAIN I - CODY	16" P.C.P	2,640	3	LATERAL 24.2
LATERAL MAIN I - CODY LATERAL	20" P.C.P	1,320	12	
LATERAL MAIN I - CODY LATERAL	18" P.C.P	2,811	5	
LATERAL MAIN I - 5.4	14" P.C.P	642	3	
LATERAL MAIN I - BUTIN	30" P.C.P	440	10	
LATERAL MAIN I - BUTIN	27" TECHITE	20	10	
LATERAL MAIN I - BUTIN	CANAL	124	10	
LATERAL MAIN I - BUTIN	18" P.C.P	96	10	
LATERAL MAIN I - BUTIN	CANAL	1,320	10	
LATERAL MAIN I - BUTIN	18" P.C.P	640	10	
LATERAL MAIN I - BUTIN	CANAL	9,720	8	COTTONWOOD CREEK
LATERAL MAIN I - BUTIN - CONLEY	20" P.C.P	660	5	
LATERAL MAIN I - BUTIN - CONLEY	18" P.C.P	1,302	5	
LATERAL MAIN I - LINVILLE	CANAL	4,297	5	
LATERAL MAIN I - LINVILLE	16" P.C.P	1,320	4	
LATERAL MAIN I - 6.2	CANAL	1,006	15	
LATERAL MAIN I - 6.2	36" C.I.P	389	15	
LATERAL MAIN I - 6.7	36" C.I.P	1,260	15	
LATERAL MAIN I - 6.7	30" C.I.P	1,318	10	
LATERAL MAIN I - SECTION 8	CANAL	10,560	50	
LATERAL MAIN I - SECTION 8	CANAL	5,280	10	
LATERAL MAIN I - SECTION 8 NORTH LAT.	30" P.C.P	5,280	20	
LATERAL MAIN I - SECTION 8 NORTH LAT.	CANAL	2,640	10	
LATERAL MAIN I - SECTION 8 LATERAL	36" C.I.P	3,960	10	
MAIN -HOSPITAL	36" C.I.P	1,320	15	
MAIN -HOSPITAL	CANAL	12,144	125	
MAIN -HOSPITAL	18" P.C.P.	5,280	3	DESMOND PIPELINE
MAIN -HOSPITAL LATERAL	CANAL	3,520	10	
MAIN -HOSPITAL LATERAL	30" P.C.P.	7,284	10	
MAIN -HOSPITAL LATERAL	24" P.V.C.	1,378	8	
MAIN -HOSPITAL LATERAL	12" P.V.C.	1,920	5	
MAIN -HOSPITAL LATERAL	12" P.V.C.	685	5	
MAIN -HOSPITAL LATERAL	10" P.V.C.	831	3	

MADERA IRRIGATION DISTRICT
CANAL SYSTEM LISTING
MAY 1992

CANAL NAME	DESCRIPTION	LENGTH (FT.)	Q (C.F.S.)	DISCHARGE
MAIN -HOSPITAL LATERAL	10" P.V.C.	389	3	
MAIN -HOSPITAL LATERAL	10" P.V.C.	2,640	3	
MAIN -HELY	CANAL	200	80	COTTONWOOD CREEK
MAIN -HELY	36" P.C.P.	990	10	
MAIN -HELY	20" P.C.P.	1,260	10	
MAIN -HELY	CANAL	2,100	10	
LATERAL MAIN II	CANAL	5,280	245	
LATERAL MAIN II	CANAL	5,600	175	
LATERAL MAIN II	CANAL	5,600	100	
LATERAL MAIN II	CANAL	8,800	65	COTTONWOOD CREEK
LATERAL MAIN II - 0.2	36" C.I.P.	1,999	10	
LATERAL MAIN II - 2.3	CANAL	1,400	15	
LATERAL MAIN II - 2.3	36" C.I.P.	43	10	
LATERAL MAIN II - 2.3	30" C.I.P.	4,321	5	
LATERAL MAIN II - BURGESS	CANAL	838	20	
LATERAL MAIN II - BURGESS	36" C.I.P.	932	20	
LATERAL MAIN II - BURGESS	CANAL	2,810	20	
LATERAL MAIN II - BURGESS	CANAL	2,856	12	
LATERAL MAIN II - BURGESS	30" C.I.P.	430	12	
LATERAL MAIN II - BURGESS	CANAL	3,055	10	
LATERAL MAIN II - BURGESS	24" Techite	50	3	
LATERAL MAIN II - BURGESS	18" P.C.P.	2,642	3	HUGHES CANAL
LATERAL MAIN II - BURGESS LATERAL	CANAL	1,943	8	
LATERAL MAIN II - HUGHES	CANAL	9,768	20	
LATERAL MAIN II - HUGHES	36" C.I.P.	5,300	20	
LATERAL MAIN II - HUGHES	CANAL	7,920	20	BUTIN CANAL
LATERAL MAIN II - HUGHES LATERAL	24" P.C.P.	300	5	
LATERAL MAIN II - HUGHES LATERAL	CANAL	3,328	5	
LATERAL MAIN II - HUGHES LATERAL	21" P.C.P.	1,311	5	
LATERAL MAIN II - HUGHES LATERAL	CANAL	2,112	5	
LATERAL MAIN II - HUGHES LATERAL	18" P.C.P.	1,320	3	
LATERAL MAIN II - KENNEY	CANAL	1,896	12	
LATERAL MAIN II - KENNEY	CANAL	5,416	12	
LATERAL MAIN II - RIPPERDAN	CANAL	9,032	35	
LATERAL MAIN II - RIPPERDAN	CANAL	19,056	22	
LATERAL MAIN II - RIPPERDAN	36" TECHITE	2,640	20	
LATERAL MAIN II - RIPPERDAN	18" P.C.P.	1,980	10	
LATERAL MAIN II - RIPPERDAN - 1.8	CANAL	660	45	
LATERAL MAIN II - RIPPERDAN - 1.8	30" C.I.P.	1,320	35	
LATERAL MAIN II - RIPPERDAN - 1.8	24" P.C.P.	1,320	20	
LATERAL MAIN II - RIPPERDAN - 1.8	20" P.C.P.	7,920	10	
COTTONWOOD CREEK	CREEK	16,896	275	
COTTONWOOD CREEK	CREEK	8,800	200	
COTTONWOOD CREEK	CREEK	9,152	100	
COTTONWOOD CREEK	CREEK	15,840	60	GRAVELLY FORD WATER DIST.
COTTONWOOD CREEK LATERAL	CANAL	2,632	30	
COTTONWOOD CREEK LATERAL	48" C.I.P.	666	20	
COTTONWOOD CREEK LATERAL	42" C.I.P.	4,953	15	
COTTONWOOD CREEK LATERAL	36" C.I.P.	2,379	15	

MADERA IRRIGATION DISTRICT
CANAL SYSTEM LISTING
MAY 1992

CANAL NAME	DESCRIPTION	LENGTH (FT.)	Q (C.F.S.)	DISCHARGE
COTTONWOOD CREEK LATERAL SOUTH	CANAL	6,459	10	
MORDECAI	42" TECHITE	1,320	20	
MORDECAI	36" TECHITE	1,320	20	
HARGROVE	CANAL	9,990	30	
HARGROVE NO. 1	18" P.C.P	2,640	5	
HARGROVE NO. 2	16" P.C.P.	1,320	3	
HARGROVE NO. 5	18" TECHITE	5,280	5	
HARGROVE NO. 5	18" P.C.P	5,280	5	
BORDENAVE	36" TECHITE	5,280	15	
BORDENAVE	18" P.C.P	1,320	5	
BORDENAVE SPILL	18" P.C.P	2,640	5	
LaVINA	18" P.C.P	2,640	5	
SCHUBERT	30" C.I.P.	2,640	12	
SCHUBERT	24" C.I.P.	2,640	5	
SCHUBERT	18" P.C.P	2,640	5	
SCHUBERT LATERAL	18" P.C.P	2,000	5	
GALEENER	CANAL	2,640	10	
GALEENER	21" P.C.P	2,640	12	
GALEENER	18" P.C.P	5,280	10	
GALEENER	36" C.I.P.	5,280	12	
GALEENER LATERAL	18" P.C.P	4,000	5	
LATERAL 24.2	CANAL	30,270	140	
LATERAL 24.2	84" P.C.P.	5,336	125	FRESNO RIVER
LATERAL 24.2	CANAL	23,292	100	21.1 EAST PIPELINE
LATERAL 24.2 - 8.9	CANAL	4,736	30	
LATERAL 24.2 - 8.9	48" C.I.P.	578	30	
LATERAL 24.2 - 8.9	CANAL	2,577	15	
LATERAL 24.2 - 8.9	36" C.I.P.	3,912	15	
LATERAL 24.2 - 8.9 - 1.0	36" C.I.P.	1,600	15	
LATERAL 24.2 - 8.9 - 1.0	CANAL	3,685	15	
LATERAL 24.2 - 9.0	CANAL	8,996	30	
LATERAL 24.2 - 9.0	42" C.I.P.	1,604	20	
LATERAL 24.2 - 9.0	36" C.I.P.	1,054	15	
LATERAL 24.2 - 9.0	CANAL	2,586	15	
LATERAL 24.2 - 9.0	36" C.I.P.	6,952	15	
LATERAL 24.2 - 9.0	30" C.I.P.	4,090	10	LATERAL 32.2
LATERAL 24.2 - 9.0 - 1.7	36" C.I.P.	2,615	15	
LATERAL 24.2 - 9.0 - 2.2	36" C.I.P.	2,937	15	
LATERAL 24.2 - 9.0 - 2.2	30" C.I.P.	668	15	
LATERAL 24.2 - 9.0 - 3.3	30" C.I.P.	1,514	15	
LATERAL 24.2 - 10.0	30" C.I.P.	1,544	15	
LATERAL 24.2 - 11.0	CANAL	2,658	30	
LATERAL 24.2 - 13.2	CANAL	17,936	45	
LATERAL 24.2 - 13.2	CANAL	3,705	30	
LATERAL 24.2 - 13.2	48" C.I.P.	1,309	25	
LATERAL 24.2 - 13.2	42" C.I.P.	3,950	20	
LATERAL 24.2 - 13.2	36" C.I.P.	6,990	15	
LATERAL 24.2 - 13.2	30" C.I.P.	2,580	15	
LATERAL 24.2 - 14.2	CANAL	1,307	15	

MADERA IRRIGATION DISTRICT
CANAL SYSTEM LISTING
MAY 1992

CANAL NAME	DESCRIPTION	LENGTH (FT.)	Q (C.F.S.)	DISCHARGE
LATERAL 24.2 - 14.2	30" P.C.P.	514	15	
LATERAL 24.2 - 14.2	CANAL	512	15	
LATERAL 24.2 - 14.2	SYPHON	643	15	
LATERAL 24.2 - 14.2	CANAL	880	15	
LATERAL 24.2 - 14.2	36" C.I.P.	2,112	15	
LATERAL 24.2 - 14.2	CANAL	3,286	15	
LATERAL 24.2 - 14.3	CANAL	2,592	15	FRESNO RIVER
LATERAL 24.2 - 17.0	CANAL	10,648	25	
LATERAL 24.2 - 17.0	36" C.I.P.	6,060	15	
LATERAL 24.2 - 17.0 - 2.3	36" C.I.P.	3,081	15	
LATERAL 24.2 - 17.0	CANAL	12,300	10	
LATERAL 24.2 - 17.6	15" P.C.P.	3,053	4	
LATERAL 24.2 - 19.5	CANAL	5,500	45	
LATERAL 24.2 - 19.5	48" C.I.P.	1,500	30	
LATERAL 24.2 - 19.5	42" C.I.P.	1,000	30	
LATERAL 24.2 - 19.5	42" C.I.P.	1,600	25	
LATERAL 24.2 - 19.5	36" C.I.P.	1,173	25	
LATERAL 24.2 - 19.6	CANAL	9,328	15	
LATERAL 24.2 - 21.1 WEST	30" C.I.P.	2,700	8	
LATERAL 24.2 - 21.1 SOUTH	30" C.I.P.	1,322	4	
LATERAL 24.2 - 21.1 EAST	30" C.I.P.	2,656	18	LATERAL MAIN I
LATERAL 24.2	CREEK	39,245	230	LATERAL 24.2 AND DRY CREEK
DRY CREEK	CREEK	33,400	100	
DRY CREEK	CREEK	33,480	50	FRESNO RIVER (OLD AND NEW CHANNELS)
DRY CREEK LATERAL	30" C.I.P.	1,320	18	
DRY CREEK LATERAL	CANAL	5,680	18	
DRY CREEK LATERAL	18" P.C.P.	5,600	5	
AIRPORT	48" C.I.P.	800	25	
AIRPORT	CANAL	10,560	25	AIRPORT 1.0 W. OR LATERAL 24.2 - 13
AIRPORT 1.0 WEST	CANAL	2,616	15	
AIRPORT 1.0 WEST	36" C.I.P.	2,684	15	
AIRPORT 1.0 WEST	30" C.I.P.	2,841	15	
AIRPORT 1.0 EAST	24" P.C.P.	5,317	10	
DIXIELAND	CANAL	7,748	63	
DIXIELAND	CANAL	6,588	49	
DIXIELAND	CANAL	10,129	35	
DIXIELAND	36" Techite	840	26	
DIXIELAND	CANAL	8,516	26	
DIXIELAND	36" Techite	350	26	
DIXIELAND	CANAL	2,746	26	
DIXIELAND	CANAL	12,116	16	BERENDA DRAIN
LATERAL 32.2	CANAL	51,380	182	
LATERAL 32.2	CANAL	2,550	85	
LATERAL 32.2	CANAL	2,950	75	
LATERAL 32.2	60" C.I.P.	3,312	75	
LATERAL 32.2	CANAL	8,412	75	
LATERAL 32.2	CANAL	4,200	45	
LATERAL 32.2	CANAL	6,244	30	DIXIELAND CANAL OR DRY CREEK

Water Report
Billing Statement

SECTION 1-G

WATER DELIVERY REPORT

Name _____ Date 6-18-00

A/C No. 8359 Ditch No. 332 T.O. No. 22 Tag No. _____

Ditch 13.2 Crop _____

Time On 8AM Date 6-18

Time Off 8AM Date 6-25

168 Hours at Q. of 3.18 C.F.S. _____

Meter _____ Pump _____ Calco _____ CMM _____ Weir —

MEASUREMENT NOTES Acres _____

Date	Rev.	Sec.	Meter Reading	See Remarks	Q
6-18					2.75
6-19					3.25
6-20					3.50
6-21					3.00
6-22					3.25
6-23					3.50
6-24					300

REMARKS _____

44.13 TOM

	Meter Stop	
	Meter Start	
Acre Feet 44.13		Dwight Ditchtender

CROP WATER STATEMENT
FOR THE MONTH OF JUNE

ACCOUNT # 8359

TURNOUT	DITCH	TAG	DATE	WATER TYPE	USAGE	RATE	TOTAL
100/07S	100	2359	6/7/00	SUB	59.96		
100/07S	100	2715	6/12/00	SUB	83.14		
100/07S	100	2879	6/20/00	SUB	15.32		
100/07S	100	3462	6/26/00	SUB	15.04		
100/07S	100	3463	6/26/00	SUB	85.24		
100/07S	100	3809	6/30/00	SUB	55.40		
	JUNE USE		Subordinate Cost of Service(regu		314.10	48.00	15,076.80
332/18A	332	2716	6/12/00	REG	45.38		
332/18A	332	2880	6/20/00	REG	26.77		
	JUNE USE		Cost of Service (regular)		72.15	31.00	$2,236.65
332/20	332	2717	6/12/00	REG	33.50		
332/20	332	3038	6/20/00	REG	52.85		
332/20	332	3465	6/26/00	REG	43.76		

ACCOUNT SUMMARY	
Beginning Balance	10,253.76
Payments Received	-10,253.76
Adjustments	0.00
Penalty	0.00

DELIVERY SUMMARY	
AF Current	630.98
AF Y-T-D	2,579.71

TOTAL BALANCE DUE: **$24,900.08**

A PENALTY OF 1.5% WILL BE ADDED TO THE BALANCE IF NOT PAID BY
PLEASE RETURN THIS PORTION WITH YOUR REMITTANCE

ACCOUNT # [redacted] 8359

AMOUNT DUE: **$24,900.08**

REMITTANCE AMT: _____

REMIT TO:

Rainfall Data

SECTION 1-d

PRECIPITATION IN MADERA, CALIFORNIA
COMPILED MONTHLY, SEASONAL, AND AVERAGE

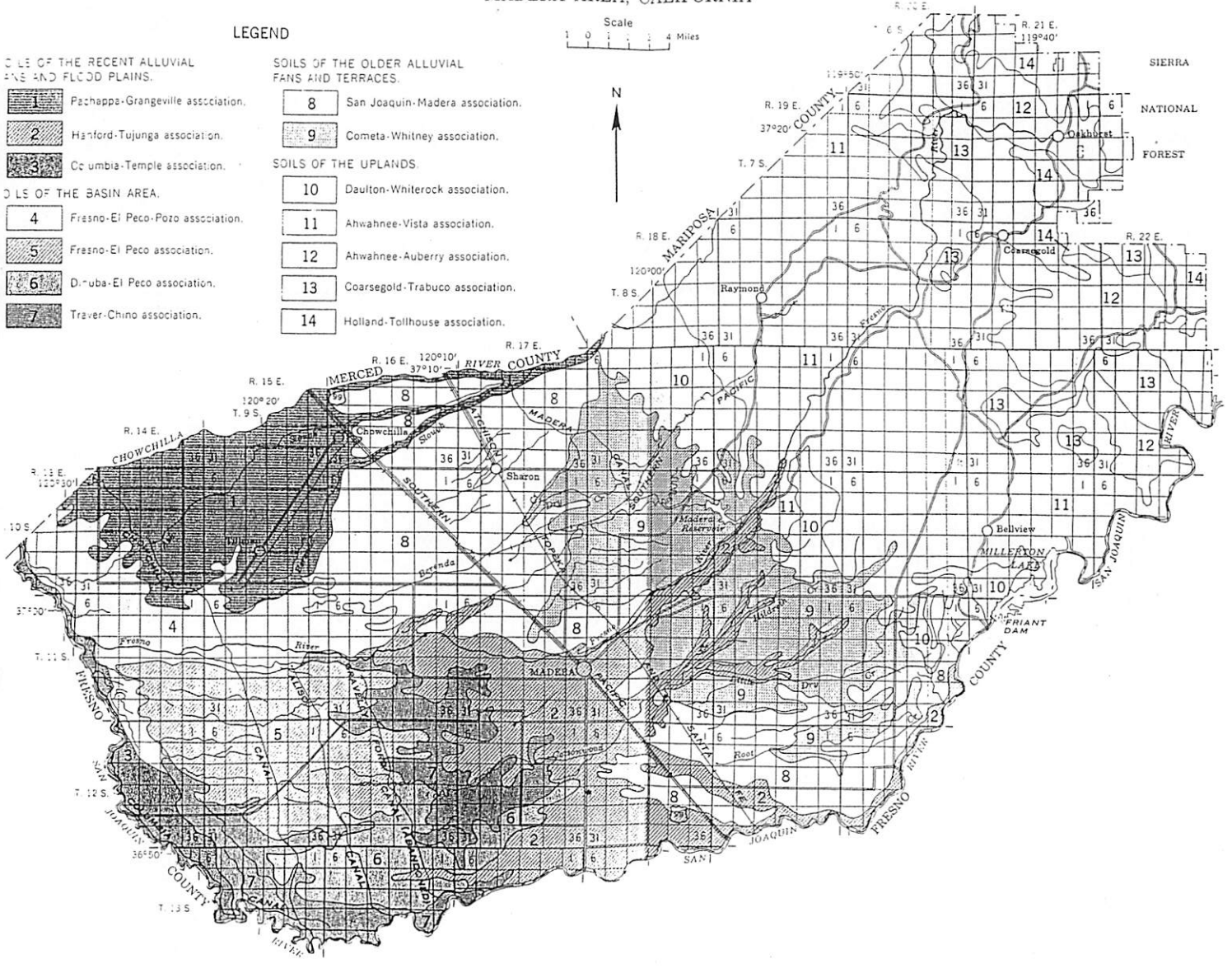
SEASON	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SEASONAL TOTAL
1899-1900	0.00	0.05	0.00	2.30	1.02	0.80	1.40	0.07	0.82	1.79	1.05	0.00	9.30
1900-01	0.00	0.00	0.00	0.90	3.64	0.40	2.66	4.34	0.50	0.62	0.57	0.05	13.68
1901-02	0.00	0.00	0.73	0.42	1.67	0.25	0.60	3.19	1.66	0.91	0.38	0.00	9.81
1902-03	0.00	0.00	0.00	0.35	1.14	1.67	1.55	0.78	2.49	0.38	0.00	0.00	8.36
1903-04	0.00	0.00	0.00	0.00	0.95	0.62	0.69	2.69	2.47	0.90	0.00	0.00	8.32
1904-05	0.00	0.00	0.09	0.22	1.29	1.08	1.30	1.40	2.29	0.72	1.20	0.00	9.59
1905-06	0.00	0.00	0.00	0.00	0.97	0.33	2.16	2.21	5.01	0.71	2.21	0.09	13.69
1906-07	0.00	0.00	0.00	0.00	0.96	3.61	2.70	0.48	1.35	1.11	0.00	0.00	10.21
1907-08	0.00	0.00	0.00	0.06	0.00	1.75	2.35	2.20	1.04	0.52	0.32	0.00	8.24
1908-09	0.00	0.00	0.00	0.00	0.97	0.72	2.95	0.77	1.42	0.00	0.00	0.00	6.83
1909-10	0.00	0.00	0.00	0.67	0.93	5.00	0.67	0.50	1.40	0.49	0.00	0.00	9.66
1910-11	0.00	0.00	0.75	0.80	0.00	0.26	5.92	0.95	1.40	0.85	0.00	0.00	10.93
1911-12	0.00	0.00	0.00	0.00	0.06	0.84	0.35	0.00	2.72	1.81	0.40	0.00	6.18
1912-13	0.00	0.00	0.00	0.00	1.00	0.00	0.75	1.55	1.09	1.60	0.40	0.00	6.39
1913-14	0.30	0.00	0.00	0.00	1.05	0.62	4.76	1.39	0.35	0.00	0.00	0.00	8.47
1914-15	0.00	0.00	0.00	0.21	0.00	1.30	3.43	4.56	0.67	0.28	1.74	0.00	12.19
1915-16	0.00	0.00	0.00	0.00	0.00	1.95	6.64	3.90	2.75	0.00	0.00	0.00	15.24
1916-17	0.00	0.15	0.00	1.65	0.45	2.48	1.41	2.42	0.71	0.45	0.00	0.00	9.72
1917-18	0.00	0.00	0.00	0.00	0.00	0.00	0.75	3.95	4.20	0.00	0.00	0.00	8.90
1918-19	0.00	0.00	0.75	0.00	2.75	0.93	0.00	2.55	1.00	0.00	0.00	0.00	7.98
1919-20	0.00	0.00	0.00	0.00	0.00	0.48	0.95	1.25	2.20	1.00	0.00	0.00	5.88
1920-21	0.00	0.00	0.00	1.40	1.68	1.45	2.43	1.00	1.93	0.00	1.22	0.00	11.11
1921-22	0.00	0.00	0.00	0.00	0.52	4.66	3.07	2.24	2.82	0.15	0.96	0.00	14.42
1922-23	0.00	0.00	0.00	0.55	1.77	2.26	1.72	0.53	0.05	2.98	0.38	0.20	10.44
1923-24	0.00	0.00	0.52	0.18	0.00	0.68	1.13	0.70	1.87	0.41	0.00	0.00	5.49
1924-25	0.00	0.00	0.00	0.50	0.83	1.99	1.04	1.46	2.02	0.79	1.01	0.00	9.64
1925-26	0.00	0.00	0.00	0.22	0.39	0.83	1.22	1.52	0.43	1.70	0.00	0.03	6.34
1926-27	0.00	0.00	0.00	0.10	2.46	0.93	2.06	3.23	1.06	0.44	0.00	0.00	10.28
1927-28	0.00	0.00	0.08	2.46	1.45	1.17	0.44	0.87	1.89	0.73	0.12	0.00	9.21
1928-29	0.00	0.00	0.00	0.00	2.44	1.39	1.43	0.58	0.93	1.66	0.00	0.75	9.18
1929-30	0.00	0.00	0.13	0.00	0.00	0.32	2.29	1.79	0.79	0.40	0.35	0.00	6.07
1930-31	0.00	0.00	0.19	0.07	1.11	0.00	2.50	1.22	0.84	0.35	0.58	0.85	7.71
1931-32	0.00	0.04	0.16	0.00	1.04	4.43	1.65	1.07	0.46	0.08	0.29	0.00	9.22
1932-33	0.00	0.00	0.00	0.00	0.20	0.98	3.12	0.64	1.31	0.09	0.43	0.14	6.91
1933-34	0.00	0.00	0.00	0.49	0.00	1.97	0.22	2.76	0.08	0.00	0.09	0.14	5.75
1934-35	0.00	0.00	0.05	0.58	3.23	2.60	3.35	2.41	3.69	3.27	0.00	0.00	19.18
1935-36	0.00	0.00	0.08	1.45	1.09	0.68	1.18	5.83	1.72	0.42	0.05	0.00	12.70
1936-37	0.00	0.00	0.00	2.78	0.00	2.70	0.98	1.63	3.46	0.55	0.00	0.00	12.10
1937-38	0.00	0.00	0.00	0.02	0.33	2.47	2.37	4.90	5.06	2.14	0.00	0.00	17.29
1938-39	0.04	0.00	0.12	0.76	0.12	1.45	1.96	0.91	1.85	0.21	0.55	0.04	8.01
1939-40	0.00	0.01	0.83	0.87	0.06	0.26	5.30	3.25	1.27	0.28	0.00	0.00	12.13
1940-41	0.00	0.00	0.00	0.48	0.05	5.60	2.08	4.76	2.52	4.20	0.08	0.00	19.77
1941-42	0.00	0.00	0.00	1.03	0.97	4.10	1.81	1.42	1.06	1.94	0.79	0.00	13.12
1942-43	0.00	0.00	0.00	0.00	0.68	1.26	1.75	1.10	3.23	0.85	0.00	0.00	8.87
1943-44	0.00	0.00	0.00	0.22	0.55	1.69	2.20	3.55	0.27	1.52	0.24	0.18	10.42
1944-45	0.00	0.00	0.05	0.42	2.37	1.28	0.19	2.49	2.63	0.15	0.11	0.04	9.73
1945-46	0.00	0.18	0.00	0.74	1.37	1.66	0.52	1.78	1.56	0.00	0.37	0.00	8.18
1946-47	0.09	0.00	0.00	0.42	2.18	1.82	0.29	1.13	0.63	0.94	0.18	0.02	7.70
1947-48	0.00	0.00	0.06	0.73	0.54	0.51	0.02	0.81	3.69	2.70	1.39	0.04	10.49
1948-49	0.00	0.00	0.00	0.56	0.08	1.33	1.00	0.98	3.08	0.00	0.87	0.00	7.90
1949-50	0.00	0.00	0.00	0.00	1.26	1.17	2.40	1.52	1.63	0.81	0.10	0.00	8.89
1950-51	0.00	0.00	0.16	0.00	2.33	1.48	2.25	1.90	0.61	1.21	0.05	0.00	9.99
1951-52	0.00	0.00	0.00	0.28	0.71	3.33	3.28	0.78	2.19	1.51	0.00	0.00	12.08
1952-53	0.00	0.00	0.06	0.07	2.09	3.95	0.72	0.40	0.60	0.93	0.42	0.34	9.58
1953-54	0.00	0.00	0.00	0.00	0.30	1.45	1.51	1.15	2.16	0.41	0.35	0.42	7.75
1954-55	0.00	0.00	0.00	0.00	0.91	2.00	3.22	0.89	0.11	1.82	1.19	0.00	10.14
1955-56	0.00	0.00	0.00	0.05	1.10	5.91	2.17	0.65	0.01	2.79	1.24	0.00	13.92
1956-57	0.00	0.00	0.04	0.72	0.00	0.31	1.87	1.20	1.14	1.33	2.08	0.14	8.83
1957-58	0.00	0.00	0.00	1.10	0.86	1.37	2.65	3.57	4.53	2.87	0.63	0.03	17.61
1958-59	0.38	0.00	0.14	0.11	0.24	0.17	2.04	2.27	0.01	0.42	0.06	0.00	5.84
1959-60	0.00	0.00	1.68	0.00	0.00	0.50	2.68	2.08	0.56	1.28	0.00	0.00	8.78
1960-61	0.00	0.00	0.00	2.42	0.00	0.17	1.90	0.69	1.25	0.86	1.49	0.05	8.83
1961-62	0.00	0.18	0.00	0.02	2.02	1.42	1.42	5.30	0.85	0.01	0.07	0.00	11.29
1962-63	0.00	0.00	0.00	0.47	0.10	1.19	1.10	2.34	1.40	2.71	0.61	0.00	9.92
1963-64	0.00	0.01	0.23	1.45	2.38	0.24	0.61	0.01	1.50	0.70	0.42	0.27	7.82
1964-65	0.00	0.12	0.00	1.08	1.75	4.13	1.14	0.52	0.64	1.59	0.00	0.00	10.97
1965-66	0.00	0.06	0.00	0.21	3.83	1.60	0.83	0.84	0.05	0.19	0.23	0.03	7.87
1966-67	0.08	0.00	0.01	0.00	1.41	3.23	2.46	0.21	1.60	4.22	0.22	0.20	13.64
1967-68	0.00	0.00	0.01	0.00	1.21	1.62	0.93	1.43	1.75	1.07	0.21	0.00	8.23
1968-69	0.00	0.00	0.00	1.25	2.31	2.69	5.57	4.00	1.47	1.59	0.08	0.00	18.96
1969-70	0.03	0.00	0.17	0.47	0.90	1.30	3.54	0.78	1.86	0.21	0.00	0.14	9.40
1970-71	0.00	0.00	0.00	0.09	1.98	2.65	0.42	0.35	0.80	0.98	1.59	0.00	8.86
1971-72	0.00	0.00	0.04	0.04	0.80	1.83	0.12	0.57	0.00	0.48	0.06	0.05	3.99
1972-73	0.01	0.00	0.08	0.53	4.14	1.62	2.13	3.97	3.20	0.30	0.01	0.02	16.01
1973-74	0.00	0.00	0.00	1.29	1.04	2.27	2.62	0.47	1.84	0.71	0.00	0.00	10.24
1974-75	0.00	0.00	0.00	1.12	0.61	1.45	0.39	1.26	2.03	1.53	0.00	0.00	8.39
1975-76	0.00	0.14	0.17	1.15	0.24	0.15	0.09	3.69	0.65	1.75	0.02	0.09	8.14
1976-77	0.06	0.27	0.93	0.16	0.85	0.83	0.87	0.26	1.20	0.00	0.92	0.37	6.72
1977-78	0.00	0.00	0.00	0.02	0.43	3.11	2.90	4.08	4.96	3.59	0.00	0.00	19.09
1978-79	0.01	0.00	1.58	0.00	2.90	0.79	4.02	2.72	1.68	0.11	0.10	0.00	13.91
1979-80	0.00	0.00	0.00	0.62	0.99	1.50	3.69	2.79	1.41	0.39	0.14	0.00	11.53
1980-81	0.00	0.00	0.00	0.13	0.25	0.39	2.49	0.81	3.92	0.86	0.00	0.00	8.85
1981-82	0.00	0.00	0.00	0.73	1.88	0.67	1.72	1.34	4.10	2.24	0.00	0.16	12.84
1982-83	0.03	0.03	0.75	1.24	3.12	1.70	4.65	3.28	5.79	1.26	0.67	0.00	22.52
1983-84	0.00	0.03	0.29	0.76	2.31	2.58	0.38	1.58	0.44	0.10	0.01	0.29	8.77
1984-85	0.01	0.00	0.00	0.75	2.08	2.17	0.61	0.47	1.58	0.57	0.00	0.24	8.48
1985-86	0.08	0.09	0.11	0.66	2.52	0.91	1.00	2.98	2.92	0.49	0.02	0.00	11.78
1986-87	0.00	0.00	0.25	0.00	0.00	0.97	1.70	2.07	2.65	0.18	0.05	0.00	7.87
1987-88	0.00	0.00	0.00	2.21	0.61	1.51	0.84	0.49	0.92	1.79	0.16	0.02	8.55
1988-89	0.00	0.00	0.00	0.00	1.38	2.08	0.30	1.08	2.00	0.11	0.20	0.00	7.15
1989-90	0.00	0.04	1.01	0.65	0.43	0.02	2.19	1.37	0.71	1.32	1.98	0.00	9.72
1990-91	0.00	0.00	0.08	0.00	0.48	0.71	0.13	0.97	7.25	0.14	0.02	0.00	9.78
1991-92	0.00	0.00	0.00	0.71	0.14	1.05	1.63	3.89	2.07	0.00	0.00	0.00	9.49
1992-93	0.04	0.00	0.00	1.32	0.00	2.88	5.81	2.40	2.77	0.25	0.38	0.68	16.53
1993-94	0.00	0.00	0.00	0.09	1.00	1.24	1.63	1.66	0.50	1.59	2.27	0.00	9.98
1994-95	0.00	0.00	0.12	1.43	1.67	1.32	5.44	0.74	5.45	1.07	1.40	0.53	19.17
1995-96	0.02	0.00	0.00	0.00	0.00	2.41	2.08	3.74	1.98	0.85	0.55	0.27	11.90
1996-97	0.00	0.00	0.00	1.99	2.66	4.66	5.09	0.14	0.01	0.00	0.00	0.00	14.55
1997-98	0.00	0.00	0.15	0.03	2.21	1.61	3.73	5.58	3.54	2.19	1.19	0.75	20.98
1998-99	0.00	0.00	0.18	0.24	0.36	1.15	2.10	1.37	0.58	1.28	0.04	0.04	7.34
1999-00	0.00	0.00	0.00	0.00	0.54	0.08	3.19	4.99	1.48	1.22	0.08	0.44	12.02
2000-01	0.00	0.00	0.14	2.54	0.05	0.18	2.28	1.79					
TOTAL	1.18	1.40	12.83	52.27	109.69	163.30	201.56	191.35	184.09	98.97	39.64	8.14	1064.4
MEAN	0.012	0.014	0.132	0.539	1.131	1.684	2.078	1.973	1.898	1.020	0.409	0.084	10.6
PERCENT	0.11	0.13	1.21	4.91	10.31	15.34	18.94	17.98	17.29	9.30	3.72	0.76	100.00

MADERA IRRIGATION DISTRICT
Daily Weather Data for Station # 145 - Madera, California
CIMIS Project in Region SJV (San Joaquin Valley)
2000

2000 DATE	ETo Inches	PRECIP Inches	SOLAR RAD Ly/dy	VAPOR AVE mBars	AIR TEMPERATURE MAX ----Fahrenheit----	AIR TEMPERATURE MIN ----Fahrenheit----	AIR TEMPERATURE AVE ----Fahrenheit----	REL. HUMIDITY MAX --%--	REL. HUMIDITY MIN --%--	REL. HUMIDITY AVE --%--	DEW PT F	WIND AVE mph	WIND RUN mi	AVE SOIL F
January Totals:	0.96	2.84	4,625	291.0	1800	1193	1474	2953	1888	2522	1306	115.5	2764	1546
January Averages:	0.03	0.09	149	9.4	58	38	48	95	61	81	42	3.7	89	50
February Totals:	1.64	4.36	6718	303.4	1782	1227	1491	2753	1722	2337	1323	144.5	3464	1559
February Averages:	0.06	0.15	232	10.5	61	42	51	95	59	81	46	5.0	119	54
March Totals:	3.71	1.39	13,685	2147.5	2039	1273	1643	2871	1443	2,197	1,344	149.9	3,598	1,730
March Averages:	0.12	0.04	441	69.3	66	41	53	93	47	71	43	4.8	116	56
April Totals:	5.38	1.01	16867	1146.4	2236	1361	1794	2721	1045	1839	1384	158.2	3792	1926
April Averages:	0.18	0.03	562	38.2	75	45	60	91	35	61	46	5.3	126	64
May Totals:	7.18	0.08	19,539	375.9	2486	1608	2054	2661	998	1690	1515	186.3	4474	2108
May Averages:	0.23	0.00	630	12.1	80	52	66	86	32	55	49	6.0	144	68
June Totals:	8.29	0.52	21319	425.9	2693	1736	2230	2433	816	1468	1604	163.3	3921	2216
June Averages:	0.28	0.02	711	14.2	90	58	74	81	27	49	53	5.4	131	74
July Totals:	8.32	0.00	21468	435.4	2751	1736	2251	2589	875	1587	1656	173.5	4160	2316
July Averages:	0.27	0.00	693	14.0	89	56	73	84	28	51	53	5.6	134	75
August Totals:	7.40	0.00	18463	445.5	2834	1791	2308	2531	824	1535	1676	145.3	3488	2360
August Averages:	0.24	0.00	596	14.4	91	58	74	82	27	50	54	4.7	113	76
September Totals:	5.25	0.00	14427	394.0	2556	1615	2074	2606	899	1629	1549	124.9	3003	2171
September Averages	0.18	0.00	481	13.1	85	54	69	87	30	54	52	4.2	100	72
October Totals:	3.13	2.04	10582	371.5	2270	1436	1847	2871	1368	2182	1523	124	2980	2047
October Averages:	0.10	0.07	353	12.4	76	48	62	96	46	73	51	4.1	99	68
November Totals:	1.34	0.08	6745	253.9	1750	1061	1370	2844	1703	2417	1200	93	2231	1666
November Averages:	0.04	0.00	224.8	8.5	58.3	35.4	45.7	94.8	56.8	80.6	40.0	3.1	74.4	55.5
December Totals:	0.79	0.20	4894	263.4	1716	1071	1352	2976	2106	2717	1242	93.7	2249	1623
December Averages:	0.03	0.01	158	8.5	55	35	44	96	68	88	40	3.0	73	52

Soils

SOIL ASSOCIATION MAP
MADERA AREA, CALIFORNIA



Section 1-C

SOIL SURVEY OF MADERA AREA, CALIFORNIA

SOILS SURVEYED BY LESLIE K. STROMBERG, IN CHARGE, GORDON L. HUNTINGTON, AND EUGENE L. BEGG, CALIFORNIA AGRICULTURAL EXPERIMENT STATION; AND GEORGE K. SMITH, UNITED STATES DEPARTMENT OF AGRICULTURE

REPORT BY RUDOLPH ULRICH, UNITED STATES DEPARTMENT OF AGRICULTURE, AND LESLIE K. STROMBERG, UNIVERSITY OF CALIFORNIA

UNITED STATES DEPARTMENT OF AGRICULTURE AND THE CALIFORNIA AGRICULTURAL EXPERIMENT STATION

THE MADERA AREA consists of the western two-thirds of Madera County. The county is in the geographical center of California and occupies part of the eastern side of the San Joaquin Valley and the western slope of the Sierra Nevada (fig. 1). Madera County is

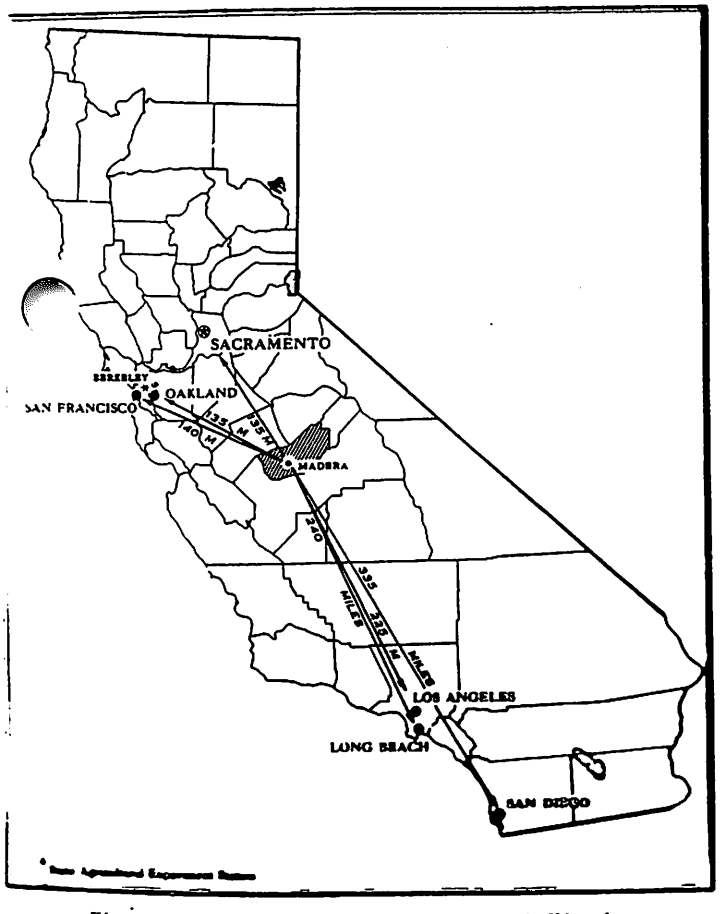


Figure 1.—Location of Madera Area in California.

bounded on the northwest by the Chowchilla River and Madera County; on the west, south, and southeast by the San Joaquin River; and on the east by Mono County. The boundary between Mono and Madera Counties is at the crest of the Sierra Nevada. Madera, the county seat and the largest city, is in the west-central part of the county. It is 140 miles east-southeast of San Francisco, 135 miles southeast of Sacramento, and 21 miles northwest of Fresno.

The total area of the county is approximately 2,148 square miles (1,374,720 acres). Of this, 810 square miles is valley land, 540 square miles is foothill land, and 794 square miles is mountainous land. The valley was surveyed in detail, the foothills in semi-detail, and the mountains in reconnaissance. Only the valley and the foothills are shown on the maps in this report, and only the soils in those parts of the county are described in detail.

Soil Associations

The association of two or more soils in a repeating pattern makes it possible to generalize about the soils of an area and to emphasize one or more outstanding things. Thus, important problems may be highlighted, such as restricted drainage, excess salts or alkali, gravelly or stony materials, or shallowness over claypan, hardpan, or bedrock. Many of these problems are difficult for an individual to deal with, and they are frequently a basis for group action, such as the formation of an irrigation, drainage, or soil conservation district.

There are 14 soil associations in the Madera Area. The colored map at the back of this report, just ahead of the detailed soil map, shows the extent and distribution of each of these important patterns of soils. The Area naturally divides into four major parts. From west to east, and generally increasing in elevation, these four parts are (1) the recent alluvial fans and flood plains, (2) the basin area, (3) the older alluvial fans and terraces, and (4) the uplands. In the first of these parts there are three soil associations, in the second, four soil associations, in the third, two soil associations, and in the fourth, five soil associations. Each major part and each association is described in the following pages.

Soils of the Recent Alluvial Fans and Flood Plains

The recent alluvial fans and flood plains form the nearly level and very gently sloping areas along the drainageways. The elevation ranges from 110 to 400 feet.

The alluvial fans are cone-shaped and slope gently upward toward the uplands. The major fans are those

of the Chowchilla and Fresno Rivers. Only the northern edge of the San Joaquin River fan is in the Madera Area.

Along most of its course, the flood plain of the San Joaquin River is narrow. Flooding is now well controlled by Friant Dam.

The three soil associations in this part of the Area are the following:

1. Pachappa-Grangeville, composed of slightly calcareous, nonsaline and nonalkali to slightly saline-alkali, well-drained, stratified, moderately coarse textured and medium textured soils.
2. Hanford-Tujunga, composed of noncalcareous, nonsaline and nonalkali, well drained and somewhat excessively drained, moderately coarse textured and coarse textured soils.
3. Columbia-Temple, composed of noncalcareous to strongly calcareous, nonsaline-alkali or slightly saline-alkali, imperfectly drained, moderately coarse textured to moderately fine textured soils.

1. Pachappa-Grangeville soil association

This association dominates the Chowchilla River fan in the northwestern part of the Madera Area. There is much variation in the soils within short distances because of stream deposition and stratification. Thin, recent deposits on top of older soil materials are common. As a result of widespread pump irrigation, the soils are now mostly well drained, but much of the acreage was imperfectly drained in the past.

Pachappa and Grangeville soils dominate the association, but Traver, Chino, Fresno, Hanford, and Tujunga soils are also important. The Pachappa soils are brownish sandy loams overlying slightly finer textured, moderately calcareous subsoils. They are slightly saline-alkali in many places. The Grangeville soils are grayish brown and are moderately coarse textured throughout. The subsoil and substratum contain slight amounts of lime and are somewhat mottled. Slight amounts of salts and alkali, mostly in the subsoil and substratum, are also common.

The Traver, Chino, and Fresno soils are between drainageways. For the most part, these soils contain more lime than the Pachappa and Grangeville soils, are more strongly saline-alkali, and are imperfectly drained. The Hanford and Tujunga soils along the drainageways are moderately coarse to coarse in texture, uniform throughout, noncalcareous, and nonsaline and nonalkali.

Shallow-rooted, lime-, salt-, and alkali-tolerant crops are best for these soils. Cotton, alfalfa, small grain, forage crops, and irrigated pasture are the best suited crops. Deep-rooted, normally long-lived crops and crops sensitive to lime, salts, and alkali are likely to be short-lived and uneven in appearance and are unlikely to produce satisfactory yields.

2. Hanford-Tujunga soil association

This association dominates the Fresno and San Joaquin River fans in the south-central part of the Madera Area. Relatively deep and uniform deposits of alluvium derived largely from granitic rocks characterize the area. Natural drainage is good to somewhat excessive. The water table is now well below its former level, as a result of pump irrigation.

On the Fresno River fan Hanford soils dominate, an winding, narrow stringers of coarse-textured Tujung soils occupy the old stream channels. The San Joaqui River fan is similar, except that an unrelated sub stratum high in silt underlies the Hanford soils at mod erate depths. Cottonwood Creek marks the approx mate boundary between the Fresno River fan and t San Joaquin River fan and between the two major var ations in the Hanford soils.

The Hanford soils are pale brown, noncalcareous, an moderately coarse textured. Typically, they are ver deep, except where underlain by the unrelated silt substrata. The Tujunga soils are much like the Hanford soils in appearance, but they were derived fro coarse-textured materials and are much lower in fertil ity, water-holding capacity, and organic matter. Typically, moisture moves very rapidly through the Tujung soils.

The minor soils in this association include the Greenfield, Traver, Chino, Atwater, Grangeville, San Joaquin, and Madera soils. The Greenfield soils are the most important of the included soils. They are similar to the Hanford soils but occupy older and slightly higher terraces, chiefly along the Fresno River, and they hav slightly more clay in the subsoil than in the surface soi

The soils of this association are well suited to a wide range of crops, and they could be intensively used for many crops in addition to those now commonly grown. Deep-rooted, long-lived crops grow well, especially on the Fresno River fan. Somewhat more careful management is required on the San Joaquin River fan, because of the silty substratum. On the Fresno River fan, the most common crops are cotton, alfalfa, small grain, and pasture, and there are small acreages of fruit and nut crops. Grapes are the main crop on the San Joaquin River fan.

Most of the problems of managing the soils in this association result from the contrast in fertility and in water requirements between the Hanford and Tujunga soils.

3. Columbia-Temple soil association

This association occurs along the San Joaquin River flood plain on the western edge of Madera County. The natural drainage was imperfect to poor. Floods occurred almost every year until Friant Dam, further up the San Joaquin River, was built. Pine Flat Dam, on the Kings River in Fresno County, similarly controls floodwaters that enter the San Joaquin River from Fresno Slough at the southwestern corner of the county. Intensive pump irrigation has lowered the water table, and most of this association now has improved surface and subsurface drainage.

Columbia and Temple soils dominate; Foster and Chino soils are also important. The Columbia soils are pale brown, noncalcareous, and moderately coarse textured throughout. They show little change with increasing depth, except for variable mottling in the subsoil and substratum. Generally they are close to the river. The Temple soils are farther from the river, where the movement of water was slower and the finer textured sediments were deposited. The Temple soils are dark colored, mottled, and medium textured to moderately fine textured. They are strongly calcareous in

subsoil. In many places they are slightly saline. Because of the generally imperfect drainage, the lime content, and excess salts and alkali, the best crops for the soils in this association are shallow-rooted, short-lived forage, pasture, row, and grain crops. Alfalfa, cotton, sugar beets, and small grains are the most common crops. Deep-rooted, long-lived crops, such as orchard crops, are not well suited. Temporary or perched water tables, caused by overirrigation or lateral movement of water from higher areas, present serious management problems. Problems caused by excess salts and alkali are also locally important.

Soils of the Basin Area

The basin includes the older alluvial deposits in the western part of the Madera Area. The relief is nearly level to very gently undulating, and the entire area slopes downward very gently from the east toward the west. The elevation ranges from 125 feet to about 165 feet.

This area was probably at the lower end of older alluvial fans, and it received the finer textured, water-transported sediments. Much water-soluble material in the form of lime and soluble salts was also deposited. Winding, shallow, intermittent streams are common, and the pattern of soils is closely related to them.

The four soil associations in this part of the Area are the following:

4 Fresno-El Peco-Pozo, composed of slightly to strongly calcareous, slightly to strongly saline-alkali soils that have a light-colored or dark-colored surface soil and are shallow to moderately deep over a lime-silica hardpan.

5. Fresno-El Peco, composed of slightly to strongly calcareous, slightly to strongly saline-alkali soils that have a light-colored surface soil and are shallow to moderately deep over a lime-silica hardpan.

6. Dinuba-El Peco, composed of slightly calcareous, nonsaline and nonalkali to strongly saline-alkali soils that have a light-colored surface soil, an unrelated silty substratum, and, in places, a thin lime-silica hardpan at a moderate depth.

7. Traver-Chino, composed of slightly to moderately calcareous, nonsaline and nonalkali to strongly saline-alkali soils that have a light-colored or dark-colored surface soil and a subsoil of slightly higher clay content.

4. Fresno-El Peco-Pozo soil association

This association occurs in the northwestern part of the Madera Area. It extends from just south of the Fresno River to the northwestern corner of the Area. It is generally south and west of the Chowchilla River alluvial fan, which is in the Pachappa-Grangeville association. Surface drainage is slow, and, because of the lime-silica hardpan in the subsoil, internal drainage is very slow. General drainage is imperfect, although the water table is now well below its former level because of widespread pump irrigation.

The distinctive characteristic of this association is the contrast between the dark-colored surface horizon of the Pozo soils and the light-colored surface horizon of the Fresno and El Peco soils. There are also differences in microrelief. The Pozo soils are generally in swales or low places along shallow watercourses, and the Fresno and El Peco soils are on slightly higher areas between waterways. The organic-matter content of the Pozo soils is high, but the Fresno and El Peco soils are low to very low in organic matter. Salts and alkali, especially in the surface soil, are less strong in the Pozo soils than in the Fresno and El Peco soils. The presence of a horizon of moderate clay content in the subsoil of the Fresno soils and in the El Peco soils is the principal difference between these two series.

Range has been the principal use of this association until recently, because of the excess salts and alkali and the hardpan. Flooding with surplus surface water diverted by levees increased forage production somewhat. Limited areas were reclaimed; most of these are where the salt and alkali concentrations are least strong. Reclaimed areas are used for irrigated pasture, forage, and grain crops. Until recently, reclamation was limited mainly to removing the excess salts and alkali from the surface soil and planting salt- and alkali-tolerant crops and pasture plants. Little effort was made to break the hardpan or to remove salts and alkali from the subsoil.

There have been two recent developments. The first has been to locate and improve the dark-colored Pozo soils. Improvement has been mostly a matter of leveling the surface to prepare for pump irrigation and planting cotton, forage crops, and pasture. Little if any effort has been made to remove salts and alkali. The second development has been the improvement of the Fresno and El Peco soils by leveling, deep chiseling, and the application of gypsum and other amendments to reduce the accumulation of salts and alkali, improve permeability, and disrupt the hardpan. After improvement, these soils are used mostly for irrigated pasture and forage crops.

5. Fresno-El Peco soil association

This association occurs in the southwestern part of the Area, south of the Fresno River. It is similar to association 4 except that no Pozo soils are present (fig. 2).

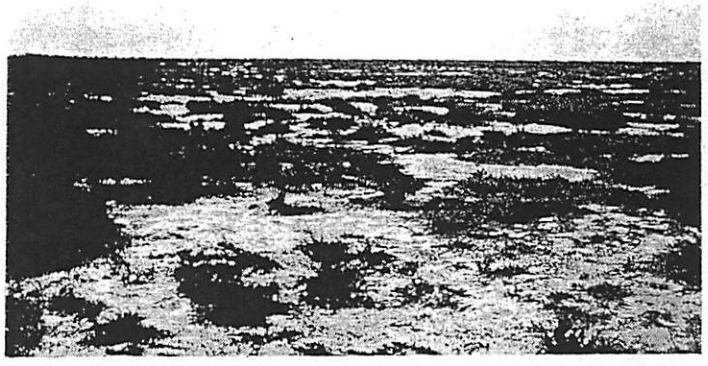


Figure 2.—**Fresno and El Peco fine sandy loams, strongly saline-alkali, 0 to 1 percent slopes, in the Fresno-El Peco soil association.**

Range is the predominant use. The soils are being improved in the same way as the Fresno and El Peco soils in association 4.

6. Dinuba-El Peco soil association

This association occurs in the southwestern part of the Area. It is bordered on the northwest by the Fresno-

El Peco association, and the two associations have many similarities.

The distinctive feature of association 6 is the presence of unrelated silty sediments in the substratum of the Dinuba and El Peco soils. The principal difference between the two soils is that the upper part of this unrelated substratum is cemented with lime and silica in the El Peco soils but not in the Dinuba soils. The Dinuba soils have slightly more clay in the subsoil than in the surface soil, but the El Peco soils are relatively uniform down to the hardpan. The silty substratum or hardpan is usually at a moderate depth. Slight to moderate amounts of excess salts and alkali are present; local areas are strongly affected. Drainage is moderately good to imperfect; internal drainage is slow to very slow.

Irrigated row, forage, grain, and pasture crops are the common crops; grapes are also important on the nonsaline and nonalkali areas. Range is the principal use for the areas where the concentrations of salts and alkali are strong. Reclamation ordinarily requires the use of gypsum and other amendments, deep leaching, and in places deep chiseling to improve water penetration and to disrupt the hardpan.

7. Traver-Chino soil association

This association occurs in two large tracts, one east of the Fresno-El Peco and Dinuba-El Peco soil associations and the other along the San Joaquin River in the southwestern part of the Area. General drainage is good to imperfect. Pumping for irrigation has lowered the water table.

Traver and Chino soils are dominant, and some Dinuba, Fresno, and Wunjey soils are also included. The Traver soils are light colored and moderately coarse textured to medium textured. They have slightly more clay in the subsoil than in the surface soil. The Chino soils are similar but have a dark-colored surface soil, slightly more clay in the subsoil, and a moderately calcareous lower subsoil. Concentrations of salts and alkali vary from slight to strong; the Traver soils are generally the more strongly affected. Some parts of the association are free of excess salts and alkali.

Irrigated row, forage, pasture, and grain crops are commonly grown on the soils less strongly affected by salts and alkali. Strongly affected areas are mostly in range. Deep-rooted tree crops are poorly suited. Reclamation by periodic deep leaching and the application of gypsum and other amendments is usually feasible.

Soils of the Older Alluvial Fans and Terraces

The older alluvial fans and terraces include gently sloping to rolling and hilly areas that have not received fresh deposits of alluvium for a long time. They generally occupy benches or terraces and are rarely if ever flooded. Some areas are so strongly sloping that they are subject to stream cutting and erosion. The elevation ranges from 180 to about 500 feet.

Many changes have occurred in these older alluvial deposits and in the soils formed from them. The distinguishing differences among the soils depend on how stable the surface has been.

The two associations in this part of the Area are the following:

8. San Joaquin-Madera, composed of brownish to reddish-yellow soils that have a claypan subsoil over an indurated iron-silica hardpan.
9. Cometa-Whitney, composed of brownish to reddish-brown soils that have slight to large amounts of clay in the subsoil and lack an iron-silica hardpan.

8. San Joaquin-Madera soil association

This association occurs in the northern and south-central parts of the Area. It is most extensive on the old Chowchilla River fan, in the north, and dominates in much of the area between Chowchilla and Madera. The San Joaquin River fan, in the south, is somewhat less extensive.

The surface conforms to the slope of the old alluvial fan deposits from which the soils in this association were derived. The areas slope gently upward from west to east, and the relief is undulating or hogwallowed.

The San Joaquin and Madera soils differ mainly in color, reaction, and natural fertility. These differences are not marked, nor are they especially important, because the very slowly permeable claypan-hardpan subsoil, comparatively near the surface, is the striking characteristic of these soils and dominates in determining their use and management.

Except where irrigated, this association is used mainly for dryfarmed small grain or for range. Yields of dryfarmed crops are rather low, primarily because of low rainfall, restricted rooting depth, low fertility, and low water-holding capacity. Some of the lower tracts, mostly in the western part of the Area where the pumping lift is not excessive, have been leveled and are used mostly for irrigated pasture. If properly fertilized, irrigated, and seeded to suitable grasses and legumes, the pastures are productive. Disrupting the hardpan by the use of heavy equipment or by blasting has not been extensively attempted. More intensive use depends largely on obtaining additional water, and the pumping lift makes this a serious problem in much of this association.

9. Cometa-Whitney soil association

This association dominates in the central part of the older alluvial fans. In a general way it centers along the Fresno River. Relief is generally more pronounced than in association 8; slopes are stronger and more irregular, and more stream dissection has taken place (fig. 3).

On the gentler slopes, where soil development has more than kept pace with soil removal, the brown to reddish-brown Cometa soils, which have a claypan subsoil at a moderate depth, occur extensively. On the stronger slopes, where surface dissection has been active, are the brownish Whitney soils, which have only a slight accumulation of clay in the subsoil.

This association, like the San Joaquin-Madera, is used mainly for dryfarmed grain or for range. The Cometa soils are used and managed in much the same way as the San Joaquin and Madera soils; the claypan in the Cometa soils is about as restrictive as the claypan-hardpan combination in the San Joaquin and Madera soils.

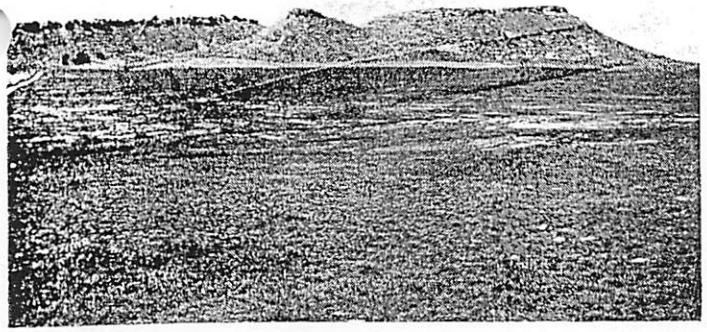


Figure 3.—East side of Little Table Mountain, in the Cometa-Whitney soil association. Remnants of Ione conglomerate cap exposed parts of the underlying Sierran granitic bedrock.

Figure 4.—Typical landscape in the Ahwahnee-Vista soil association.

The Whitney soils tend to be somewhat more productive of small grain, especially in years of favorable rainfall.

Little of this association is irrigated. Irrigation possibilities are limited by the strong, irregular slopes, the variable soil pattern, and the pumping lift.

Soils of the Uplands

The uplands comprise the gently sloping to steep foothills and low mountains of the Sierra Nevada. The elevation ranges from about 500 feet to 3,000 feet or more. Grasses and a few scattered oak trees dominate on the lower lying areas; as elevation and rainfall increase, the grass, tree, and brush cover becomes more abundant. Areas at elevations of more than 3,000 feet, on the eastern edge of the survey Area, are forested. Rainfall increases gradually, with increasing elevation, from about 15 inches to 35 inches.

Largely on the basis of kind of parent rock, amount of rainfall, elevation, and vegetation, the soils of the upland are grouped into the following five soil associations:

10. Daulton-Whiterock, composed of dark-colored to light-colored, shallow soils derived from slate and schist.
11. Ahwahnee-Vista, composed of brown to grayish-brown, moderately deep to deep soils derived from granite.
12. Ahwahnee-Auberry, composed of grayish-brown, deep soils derived from granite.
13. Coarsegold-Trabuco, composed of reddish-brown, moderately deep to deep soils derived from mica schist and basic igneous rocks.
14. Holland-Tollhouse, composed of reddish-brown to grayish-brown, shallow to deep soils derived from granite.

10. Daulton-Whiterock soil association

This association occurs in the lower foothills, mostly in the northern part of the Area near Daulton, but also in smaller tracts extending southeastward toward Friant Dam. Rainfall varies between 15 and 20 inches. The elevation ranges from 500 to 1,000 feet. The vegetation is largely annual grasses and herbs. Slopes range from gentle to steep. Outcrops of vertically tilted, metamorphosed bedrock are common; because of these outcrops, some areas are called tombstone land.

The Daulton and Whiterock soils differ from one another in color and reaction. The Daulton soils are dark grayish brown and slightly acid. The Whiterock soils are light brownish gray and medium to strongly acid. Natural fertility and water-holding capacity are low because the soils are shallow over bedrock.

Range is almost the only use made of this association. Possibilities for range improvement are limited.

11. Ahwahnee-Vista soil association

This association dominates on the lower foothills. It occupies a belt 10 to 15 miles wide extending from the northern border to the southern border of Madera County. Rainfall varies between 16 and 20 inches. The elevation ranges from 500 to 1,500 feet. The vegetation is chiefly annual grasses and herbs, scattered blue oaks and Digger pines, and patches of brush. Slopes range from gentle to steep. Outcrops of granitic bedrock are common (fig. 4).

The Ahwahnee and Vista soils differ from each other chiefly in color of the surface soil and in reaction. The Vista soils have a brown surface soil, and the Ahwahnee soils have a grayish-brown surface soil. In reaction, the Vista soils are neutral and the Ahwahnee soils are slightly acid. The organic-matter content of the Ahwahnee soils is slightly higher than that of the Vista soils, mostly because of the slightly more effective rainfall and denser vegetative cover.

Because of moderately coarse texture, a moderately deep to locally shallow root zone, moderate to low fertility and water-holding capacity, strong slopes, and outcrops of bedrock, the use of this association is limited largely to woodland range. Control of brush is important in range management. Self-reseeding annual legumes, fertilized with phosphorus and sulfur, will help to improve the range.

12. Ahwahnee-Auberry soil association

This association occupies the higher parts of the foothills, near Oakhurst in the northern part of the Area and along Fine Gold and Little Fine Gold Creeks in the east-central part of the Area. Rainfall varies between 20 and 30 inches. The elevation ranges from about 1,500 to 2,800 feet. The vegetation consists of oaks, Digger pines, and brush and an understory of annual grasses and herbs. A few yellow pines and incense-cedars grow at the higher elevations. Slopes range from gentle to steep. Outcrops of granitic bedrock are common.

Water Analysis

THE TWINING LABORATORIES, INC.
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GEOTECHNICAL ENGINEERING · SAMPLING SERVICES
CONSTRUCTION INSPECTION & MATERIALS TESTING

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PROJECT COVER SHEET

REPORT DATE : September 3, 1998
LABORATORY ID : 698-4790.1-5

INVOICE# 69804790

ATTENTION : Don Roberts
CLIENT Madera Irrigation District
12152 Road 28 1/4
Madera, CA 93637

RECEIVED
SEP
MADE

The Twining Laboratories is accredited by the State of California Department of Health Services for the analysis of Drinking Water, Wastewater and Hazardous Waste under Certificate No. 1371.

In accordance with your instructions, the samples submitted were analyzed for the components specified. The analytical results are enclosed on the following pages.

Please contact us if you have any questions concerning the analyses or results. Thank you for letting us serve you.

clp

M. C. F. I. SYSTEM
(FRESNO RIVER)

Robert D. Cortez
Laboratory Director
Rev. 1 8/94 (COVER)

REPORT DATE : September 3, 1998
LABORATORY ID : 698-4790.1

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-18-98 at 1100 by Harold Ryan
DATE RECEIVED : 08-18-98 at 1158 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : Bret Nicholson, Noel Tyler & George Barrett
REVIEWED BY : Audra Iknoian

DATE PREPARED : 08-18-98 through 08-28-98
DATE ANALYZED : 08-18-98 through 08-28-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : MAIN @ HOSPITAL WEIR

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	7.1	pH	N/A	150.1
Carbonate (CO_3)	ND	mg/L	1	SM2320B
Bicarbonate (HCO_3)	66	mg/L	1	SM2320B
Chloride (Cl)	5.6	mg/L	2	300.0
Sulfate (SO_4)	2.9	mg/L	2	300.0
Calcium (Ca)	10	mg/L	0.5	200.7
Magnesium (Mg)	2.6	mg/L	0.1	200.7
Sodium (Na)	7.8	mg/L	1	200.7
Potassium (K)	1.8	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2.0	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	130	uS/cm	1	120.1
Total Dissolved Solids (TDS)	64	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.57	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	0.39	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

REPORT DATE : September 3, 1998
LABORATORY ID : 698-4790.2

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-18-98 at 1130 by Harold Ryan
DATE RECEIVED : 08-18-98 at 1158 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : Bret Nicholson, Noel Tyler & George Barrett
REVIEWED BY : Audra Iknoian

DATE PREPARED : 08-18-98 through 08-28-98
DATE ANALYZED : 08-18-98 through 08-28-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : LAT. MAIN #1 @ ROAD 25

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	8.0	pH	N/A	150.1
Carbonate (CO_3)	3.6	mg/L	1	SM2320B
Bicarbonate (HCO_3)	49	mg/L	1	SM2320B
Chloride (Cl)	5.5	mg/L	2	300.0
Sulfate (SO_4)	2.9	mg/L	2	300.0
Calcium (Ca)	10	mg/L	0.5	200.7
Magnesium (Mg)	2.5	mg/L	0.1	200.7
Sodium (Na)	7.8	mg/L	1	200.7
Potassium (K)	1.7	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2.0	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	120	uS/cm	1	120.1
Total Dissolved Solids (TDS)	54	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.57	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	0.34	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

REPORT DATE : September 3, 1998
LABORATORY ID : 698-4790.3

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-18-98 at 1145 by Harold Ryan
DATE RECEIVED : 08-18-98 at 1158 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : Bret Nicholson, Noel Tyler & George Barrett
REVIEWED BY : Audra Iknoian

DATE PREPARED : 08-18-98 through 08-28-98
DATE ANALYZED : 08-18-98 through 08-28-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : STOCKTON @ ROAD 23 1/2

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	7.4	pH	N/A	150.1
Carbonate (CO_3)	ND	mg/L	1	SM2320B
Bicarbonate (HCO_3)	56	mg/L	1	SM2320B
Chloride (Cl)	5.5	mg/L	2	300.0
Sulfate (SO_4)	3.0	mg/L	2	300.0
Calcium (Ca)	10	mg/L	0.5	200.7
Magnesium (Mg)	2.5	mg/L	0.1	200.7
Sodium (Na)	7.8	mg/L	1	200.7
Potassium (K)	1.7	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2.0	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	120	uS/cm	1	120.1
Total Dissolved Solids (TDS)	58	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.57	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	0.33	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

REPORT DATE : September 3, 1998
LABORATORY ID : 698-4790.4

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-18-98 at 1200 by Harold Ryan
DATE RECEIVED : 08-18-98 at 1158 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : Bret Nicholson, Noel Tyler & George Barrett
REVIEWED BY : Audra Iknoian

DATE PREPARED : 08-18-98 through 08-28-98
DATE ANALYZED : 08-18-98 through 08-28-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : HUGHES @ ROAD 25 1/2

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	8.4	pH	N/A	150.1
Carbonate (CO_3)	ND	mg/L	1	SM2320B
Bicarbonate (HCO_3)	56	mg/L	1	SM2320B
Chloride (Cl)	5.6	mg/L	2	300.0
Sulfate (SO_4)	2.8	mg/L	2	300.0
Calcium (Ca)	10	mg/L	0.5	200.7
Magnesium (Mg)	2.5	mg/L	0.1	200.7
Sodium (Na)	7.9	mg/L	1	200.7
Potassium (K)	1.8	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2.0	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	120	uS/cm	1	120.1
Total Dissolved Solids (TDS)	58	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.58	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	0.34	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

REPORT DATE : September 3, 1998
LABORATORY ID : 698-4790.5

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-18-98 at 1215 by Harold Ryan
DATE RECEIVED : 08-18-98 at 1158 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : Bret Nicholson, Noel Tyler & George Barrett
REVIEWED BY : Audra Iknoian

DATE PREPARED : 08-18-98 through 08-28-98
DATE ANALYZED : 08-18-98 through 08-28-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : HARGROVE @ ROAD 24 1/2 & AV. 9

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	7.8	pH	N/A	150.1
Carbonate (CO_3)	ND	mg/L	1	SM2320B
Bicarbonate (HCO_3)	52	mg/L	1	SM2320B
Chloride (Cl)	5.5	mg/L	2	300.0
Sulfate (SO_4)	2.7	mg/L	2	300.0
Calcium (Ca)	9.4	mg/L	0.5	200.7
Magnesium (Mg)	2.4	mg/L	0.1	200.7
Sodium (Na)	7.4	mg/L	1	200.7
Potassium (K)	1.7	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2.0	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	110	uS/cm	1	120.1
Total Dissolved Solids (TDS)	55	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.56	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	0.28	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

ORDER ID # 198872014

THE TWINING LABORATORIES, INC.

2527 FRESNO STREET
FRESNO, CA 93721
(209) 268-7021 FAX:(209) 268-0740

TW

CHAIN OF CUSTODY/ANALYSIS REQUEST

REPORT TO: M.I.D.	INVOICE TO/COPY REPORT: (Circle one)	REGULATOR (Circle one)
ATTENTION: DON ROBERTS	ATTENTION:	State Dept. of Health (DOHS)
NAME: MADERA IRRIGATION DISTRICT	NAME:	Fresno Madera Mariposa
ADDRESS: 12152 Rd 28 1/4	ADDRESS:	Tulare Kings Merced Kern
MADERA, CA 93637		Other:
PHONE: (209) 673-3514		
FAX: (209) 673-0564	CONTRACT / PO #	

COMMENTS	BACTERIOLOGICAL SAMPLES ONLY				PROJECT INFO:
SW - SURFACE WATER	PUBLIC		ROUTINE		
2 SAMPLES @ EACH SITE	SURFACE WATER		REPEAT		
	CONSTRUCTION		REPLACEMENT		PRJ#:
	OTHER		OTHER		MGR:
	PRIVATE				

TURNAROUND REQUESTED: (circle one)

ROUTINE RUSH (Specify Date):

SAMPLED BY (PRINT NAME): HAROLD RYAN

SIGNATURE:

TYPE KEY: Drinking Water DW, Ground Water GW, Other O (Describe in Comments)
Surface Water SW, Storm Water STW, Biosolid BS, Waste Water WW, Solid/Soil SL

ID#	SAMPLE ID	SAMPLED DATE	SAMPLED TIME	TYPE SW	IRRIGATION ANALYSIS	ANALYSIS REQUESTED
1	MAIN @ HOSPITAL WEIR	8/18	11:00 A	X	X	2 X 14 PCD
2	LAT. MAIN #1 @ ROAD 25	8/18	11:30 A	X	X	
3	STOCKTON @ ROAD 23 1/2	8/18	11:45 A	X	X	
4	HUGHES @ ROAD 25 1/2	8/18	12:00 N	X	X	
5	HARGROVE @ ROAD 24 1/2 & AV. 9	8/18	12:15 P	X	X	

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY
Harold Ryan	M.I.D.	8/18/98	12:58 PM	J. Thompson	

THE TWINING LABORATORIES, INC
P.O. Box 1472 • Fresno, CA 93716

INVOICE

Received: 08/18/98
Ordered: 08/18/98
Invoiced: 08/31/98
Payment Due: 09/30/98

Invoice Number: 69804790

Order Number: 69804790

Attn: D. Roberts
Madera Irrigation
12152 Rd. 28 1/4
Madera, CA 93637

Please Remit To:
The Twining Laboratories
P.O. Box 1472
Fresno,CA 93716
Phone: (209) 268-7021

Description	Price	Qty	Extended Price
Irrigation Analyses	126.00	5	$630.00

NOTE:

Order TOTAL: $630.00

THE TWINING LABORATORIES, INC.
ANALYTICAL CHEMISTRY • ENVIRONMENTAL SERVICES
GEOTECHNICAL ENGINEERING • DRILLING SERVICES
CONSTRUCTION INSPECTION & MATERIALS TESTING

PROJECT COVER SHEET

REPORT DATE : June 29, 1998
LABORATORY ID : 897-3643.1-5

INVOICE# 89703643

ATTENTION : Don Roberts
CLIENT Madera Irrigation District
12152 Road 28¼
Madera, CA 93637

The Twining Laboratories is accredited by the State of California Department of Health Services for the analysis of Drinking Water, Wastewater and Hazardous Waste under Certificate No. 1371.

In accordance with your instructions, the samples submitted were analyzed for the components specified. The analytical results are enclosed on the following pages.

Please contact us if you have any questions concerning the analyses or results. Thank you for letting us serve you.

kad 1c: FAX #673-0564

LAT. 6.2 SYSTEM

Benjamin Gulizia
Laboratory Director
Rev. 1 8/94 (COVER)

SECTION 2D

TWINING LABORATORIES, INC.
ANALYTICAL CHEMISTRY • ENVIRONMENTAL SERVICES
GEOTECHNICAL ENGINEERING • DRILLING SERVICES
CONSTRUCTION INSPECTION & MATERIALS TESTING

REPORT DATE : June 29, 1998
LABORATORY ID : 697-3643.1-5

DATE SAMPLED : 06-18-98 at As Listed by H. Ryan
DATE RECEIVED : 06-18-98 at 1100 from H. Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : E. Scott
REVIEWED BY : B. Gullzia

DATE PREPARED : 06-19-98
DATE ANALYZED : 06-19-98

SAMPLE TYPE : Surface Water

CONSTITUENT : pH

LAB ID #	CLIENT SAMPLE ID	RESULT	UNITS	DLR	METHOD
.1	Lateral 6.2 @ 0.25 From HD @ 0910	7.2	pH	N/A	150.1
.2	Lat. 6.2-9.2 @ Av. 9 @ 0940	7.4	pH	N/A	150.1
.3	Lat. 6.2-14.5 @ 14.5-0/6 @ 1005	7.4	pH	N/A	150.1
.4	Lat. 6.2-16.9 @ Rd. 30 @ 1015	7.4	pH	N/A	150.1
.5	Lat. 6.2-18.4 @ Rd. 29½ @ 1030	7.5	pH	N/A	150.1

ND: None Detected
N/A: Not Applicable
DLR: Detection Limit for Reporting purposes

Rev. 2 8/94 (FORM1.INO)

ORDER ID # 697-3643 1-5

THE TWINING LABORATORIES, INC.
2527 FRESNO STREET
FRESNO, CA 93721
(209) 268-7021 FAX:(209) 268-0740

CHAIN OF CUSTODY/ANALYSIS REQUEST

REPORT TO: M.I.D.
ATTENTION: Don Roberts
NAME: MADERA IRRIGATION DISTRICT
ADDRESS: 12152 Road 28 1/4
Madera, CA 93637
PHONE: (209) 673-3514
FAX: (209) 673-0564

INVOICE TO/COPY REPORT: (Circle one)
ATTENTION:
NAME:
ADDRESS:
CONTRACT / PO #

REGULATOR (Circle one)
State Dept. of Health (DOHS)
Fresno Madera Mariposa
Tulare Kings Merced Kern
Other:

COMMENTS: Surface Water

BACTERIOLOGICAL SAMPLES ONLY			
PUBLIC		ROUTINE	
SURFACE WATER		REPEAT	
CONSTRUCTION		REPLACEMENT	
OTHER		OTHER	
PRIVATE			

PROJECT INFO:
PRJ#:
MGR:

TURNAROUND REQUESTED: (circle one)
ROUTINE RUSH (Specify Date):

SAMPLED BY (PRINT NAME): HAROLD RYAN
SIGNATURE: Harold Ryan

TYPE KEY: Drinking Water-DW Ground Water-GW Other-O (Describe in Comments)
Surface Water-SW Storm water-STM Biosolid-BS Waste Water-WW Solid/Soil-SL

ID#	SAMPLE ID	SAMPLED DATE	SAMPLED TIME	TYPE	PX	ANALYSIS REQUESTED
1	LATERAL 6.2 @ 1.2' From [illegible]	6/18	9:10A	SW	X	
2	LAT. 6.2 - 4.2 @ [illegible]	6/18	9:40A	"	X	
3	LAT 6.2 - 14.5 @ 14.5 - 0.5'	6/18	10:05A	"	X	
4	LAT 6.2 - 16.5 @ 2130	6/18	10:15A	"	X	
5	LAT 6.2 - 19.5 @ 1 29 1/2	6/18	10:30A	"	X	
	SLP @ 6.2					

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY
Harold Ryan	Madera Irrigation Dist	6/19/98	11:00A	Jerry D. Bentley	T.E.S.

THE TWINING LABORATORIES, INC.
EST 1898
ANALYTICAL CHEMISTRY · ENVIRONMENTAL SERVICES
GEOTECHNICAL ENGINEERING · SAMPLING SERVICES
CONSTRUCTION INSPECTION & MATERIALS TESTING

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PROJECT COVER SHEET

REPORT DATE : August 19, 1998
LABORATORY ID : 698-4483.1-5

INVOICE# 69804483

ATTENTION : Don Roberts
CLIENT Madera Irrigation District
12152 Road 28 1/4
Madera, CA 93637

RECEIVED
AUG 26 1998
MADERA IRRIGATION DIST.

The Twining Laboratories is accredited by the State of California Department of Health Services for the analysis of Drinking Water, Wastewater and Hazardous Waste under Certificate No. 1371.

In accordance with your instructions, the samples submitted were analyzed for the components specified. The analytical results are enclosed on the following pages.

Please contact us if you have any questions concerning the analyses or results. Thank you for letting us serve you.

mk

LAT. 32.2 System

Robert D. Cortez
Laboratory Director
Rev. 1 8/94 (COVER)

REPORT DATE : August 19, 1998
LABORATORY ID : 698-4483.1

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-04-98 at 0910 by Harold Ryan
DATE RECEIVED : 08-04-98 at 1122 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : B. Nicholson, N. Tyler, G. Barrett
REVIEWED BY : A. Iknoian

DATE PREPARED : 08-04-98 through 08-14-98
DATE ANALYZED : 08-04-98 through 08-14-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : Lat. 32.2 @ 0.25 From HD

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	6.6	pH	N/A	150.1
Carbonate (CO_3)	ND	mg/L	1	SM2320B
Bicarbonate (HCO_3)	9.8	mg/L	1	SM2320B
Chloride (Cl)	ND	mg/L	2	300.0
Sulfate (SO_4)	ND	mg/L	2	300.0
Calcium (Ca)	2.0	mg/L	0.5	200.7
Magnesium (Mg)	0.38	mg/L	0.1	200.7
Sodium (Na)	1.4	mg/L	1	200.7
Potassium (K)	ND	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	22	uS/cm	1	120.1
Total Dissolved Solids (TDS)	8.6	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.24	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	-0.15	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

REPORT DATE : August 19, 1998
LABORATORY ID : 698-4483.2

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-04-98 at 0940 by Harold Ryan
DATE RECEIVED : 08-04-98 at 1122 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : B. Nicholson, N. Tyler, G. Barrett
REVIEWED BY : A. Iknoian

DATE PREPARED : 08-04-98 through 08-14-98
DATE ANALYZED : 08-04-98 through 08-14-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : Lat. 32.2 - 9.9 @ 9.9-0.5

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	6.7	pH	N/A	150.1
Carbonate (CO_3)	ND	mg/L	1	SM2320B
Bicarbonate (HCO_3)	9.8	mg/L	1	SM2320B
Chloride (Cl)	2.1	mg/L	2	300.0
Sulfate (SO_4)	ND	mg/L	2	300.0
Calcium (Ca)	1.9	mg/L	0.5	200.7
Magnesium (Mg)	0.53	mg/L	0.1	200.7
Sodium (Na)	1.5	mg/L	1	200.7
Potassium (K)	ND	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	21	uS/cm	1	120.1
Total Dissolved Solids (TDS)	11	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.25	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	-0.16	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

REPORT DATE : August 19, 1998
LABORATORY ID : 698-4483.3

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-04-98 at 0955 by Harold Ryan
DATE RECEIVED : 08-04-98 at 1122 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : B. Nicholson, N. Tyler, G. Barrett
REVIEWED BY : A. Iknoian

DATE PREPARED : 08-04-98 through 08-14-98
DATE ANALYZED : 08-04-98 through 08-14-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : Lat. 32.2 - 10.2 @ Spill into Berenda

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	6.8	pH	N/A	150.1
Carbonate (CO_3)	ND	mg/L	1	SM2320B
Bicarbonate (HCO_3)	11	mg/L	1	SM2320B
Chloride (Cl)	2.0	mg/L	2	300.0
Sulfate (SO_4)	ND	mg/L	2	300.0
Calcium (Ca)	2.0	mg/L	0.5	200.7
Magnesium (Mg)	0.46	mg/L	0.1	200.7
Sodium (Na)	1.5	mg/L	1	200.7
Potassium (K)	ND	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	20	uS/cm	1	120.1
Total Dissolved Solids (TDS)	11	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.25	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	-0.16	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

REPORT DATE : August 19, 1998
LABORATORY ID : 698-4483.4

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-04-98 at 1010 by Harold Ryan
DATE RECEIVED : 08-04-98 at 1122 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : B. Nicholson, N. Tyler, G. Barrett
REVIEWED BY : A. Iknoian

DATE PREPARED : 08-04-98 through 08-14-98
DATE ANALYZED : 08-04-98 through 08-14-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : Dixieland Canal @ 32.2-13.2 Spill

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	6.8	pH	N/A	150.1
Carbonate (CO_3)	ND	mg/L	1	SM2320B
Bicarbonate (HCO_3)	11	mg/L	1	SM2320B
Chloride (Cl)	2.0	mg/L	2	300.0
Sulfate (SO_4)	ND	mg/L	2	300.0
Calcium (Ca)	2.0	mg/L	0.5	200.7
Magnesium (Mg)	0.44	mg/L	0.1	200.7
Sodium (Na)	1.4	mg/L	1	200.7
Potassium (K)	ND	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	21	uS/cm	1	120.1
Total Dissolved Solids (TDS)	11	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.23	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	-0.14	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

REPORT DATE : August 19, 1998
LABORATORY ID : 698-4483.5

THE TWINING LABORATORIES, INC.

DATE SAMPLED : 08-04-98 at 1025 by Harold Ryan
DATE RECEIVED : 08-04-98 at 1122 from Harold Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : B. Nicholson, N. Tyler, G. Barrett
REVIEWED BY : A. Iknoian

DATE PREPARED : 08-04-98 through 08-14-98
DATE ANALYZED : 08-04-98 through 08-14-98

SAMPLE TYPE : Surface Water

CLIENT SAMPLE ID : Lat. 32.2 @ Spill into SM Creek

IRRIGATION ANALYSIS	RESULT	UNITS	DLR	METHOD
pH	6.6	pH	N/A	150.1
Carbonate (CO_3)	ND	mg/L	1	SM2320B
Bicarbonate (HCO_3)	11	mg/L	1	SM2320B
Chloride (Cl)	2.6	mg/L	2	300.0
Sulfate (SO_4)	ND	mg/L	2	300.0
Calcium (Ca)	2.0	mg/L	0.5	200.7
Magnesium (Mg)	0.44	mg/L	0.1	200.7
Sodium (Na)	1.4	mg/L	1	200.7
Potassium (K)	ND	mg/L	1	200.7
Nitrate (NO_3)	ND	mg/L	2	300.0
Boron (B)	ND	mg/L	0.05	200.7
Specific Conductance (EC)	22	uS/cm	1	120.1
Total Dissolved Solids (TDS)	12	mg/L	1	*
Sodium Absorption Ratio (SAR)	0.23	N/A	N/A	*
Sodium Absorption Ratio (SAR), Adj.	-0.14	N/A	N/A	*

mg/L : milligrams per Liter (parts per million) uS/cm: microSiemens per Centimeter @ 25°C *Western Fertilizer Handbook, 5th Ed.
ND: None Detected DLR: Detection Limit for Reporting purposes SM: Standard Methods, 18th Edition

ORDER ID # 6980448 3 1-5

THE TWINING LABORATORIES, INC.
2527 FRESNO STREET
FRESNO, CA 93721
(209) 268-7021 FAX:(209) 268-0740

TW

CHAIN OF CUSTODY/ANALYSIS REQUEST

REPORT TO: M.I.D.	INVOICE TO/COPY REPORT: (Circle one)	**REGULATOR (Circle one)**
ATTENTION: DON ROBERTS	ATTENTION:	State Dept. of Health (DOHS)
NAME: MADERA IRRIGATION DISTRICT	NAME:	Fresno Madera Mariposa
ADDRESS: 12152 Road 23 1/4	ADDRESS:	Tulare Kings Merced Kern
MADERA, CA 93637		Other:
PHONE: (209) 673-3514		
FAX: (209) 673-0564	CONTRACT / PO #	

COMMENTS	BACTERIOLOGICAL SAMPLES ONLY				PROJECT INFO:
SW - SURFACE WATER	PUBLIC		ROUTINE		
Use earliest Time designated	SURFACE WATER		REPEAT		
on bottle as sample time	CONSTRUCTION		REPLACEMENT		PRJ#:
	OTHER		OTHER		MGR:
	PRIVATE				

TURNAROUND REQUESTED: (circle one)

ROUTINE RUSH (Specify Date):

SAMPLED BY (PRINT NAME): HAROLD RYAN

SIGNATURE:

TYPE KEY: Drinking Water-DW, Ground Water-GW, Other-O (Describe in Comments), Surface Water-SW, Storm water-STM, Biosolid-BS, Waste Water-WW, Solid/Soil-SL

ANALYSIS REQUESTED

IRRIGATION ANALYSIS

ID#	SAMPLE ID	SAMPLED DATE	SAMPLED TIME	TYPE
1				SW
1	LAT. 32.2 @ 0.25 FROM HD	8/4	9:10A 9:15A	X
2	LAT. 32.2 - 9.9 @ 9.9 - 0.5	8/4	9:40A 9:45A	X
3	LAT 32.2 - 10.2 @ SPILL INTO BERMUDA	8/4	7:55A 10:00A	X
4	DIXIELAND CANAL @ 32.2 - 13.2 SPILL	8/4	10:10A 10:15A	X
5	LAT. 32.2 @ SPILL INTO DIXIE CANAL	8/4	10:25A 10:30A	X

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY
	MADERA I.D.	8/4/98	11:22A		

THE TWINING LABORATORIES, INC.
EST. 1898
ANALYTICAL CHEMISTRY • ENVIRONMENTAL SERVICES
GEOTECHNICAL ENGINEERING • DRILLING SERVICES
CONSTRUCTION INSPECTION & MATERIALS TESTING

PROJECT COVER SHEET

REPORT DATE : April 14, 1998
LABORATORY ID : 697-2013.1-4

INVOICE# 69702013

ATTENTION : Don Roberts
CLIENT Madera Irrigation District
12152 Road 28¼
Madera, CA 93637

The Twining Laboratories is accredited by the State of California Department of Health Services for the analysis of Drinking Water, Wastewater and Hazardous Waste under Certificate No. 1371.

In accordance with your instructions, the samples submitted were analyzed for the components specified. The analytical results are enclosed on the following pages.

Please contact us if you have any questions concerning the analyses or results. Thank you for letting us serve you.

ked 1c: FAX #673-0564

LAT. 24.2 System

Benjamin Gulizia
Laboratory Director
Rev. 1 8/94 (COVER)

CORPORATE OFFICE:
2527 Fresno Street
Fresno, CA 93721
(209) 268-7021 • Fax 268-7126

MODESTO
4230 Kiernan Ave., Suite 105
Modesto, CA 95256
(209) 545-1050 • Fax 545-1147

VISALIA
130 North Kelsey St., Suite H6
Visalia, CA 93291
(209) 651-8280 • Fax 651-8288

BAKERSFIELD
3701 Pegasus Drive, Suite 124
Bakersfield, CA 93308
(805) 393-5088 • Fax 393-4643

THE TWINING LABORATORIES, INC.
EST. 1898
ANALYTICAL CHEMISTRY • ENVIRONMENTAL SERVICES
GEOTECHNICAL ENGINEERING • DRILLING SERVICES
CONSTRUCTION INSPECTION & MATERIALS TESTING

REPORT DATE : April 14, 1998
LABORATORY ID : 697-2013.1-4

DATE SAMPLED : 04-10-98 at As Listed by H. Ryan
DATE RECEIVED : 04-10-98 at 1133 from H. Ryan

CLIENT : Madera Irrigation District

ANALYZED BY : E. Scott
REVIEWED BY : B. Gulizia

DATE PREPARED : 04-10-98
DATE ANALYZED : 04-10-98

SAMPLE TYPE : Aqueous

CONSTITUENT : pH

LAB ID #	CLIENT SAMPLE ID	RESULT	UNITS	DLR	METHOD
.1	Madera Canal @ Dry Crk @ 0945	7.7	pH	N/A	150.1
.2	24.2 @ Dry Creek @ 1005	7.5	pH	N/A	150.1
.3	24.2 @ 17.0 Head @ 1025	7.7	pH	N/A	150.1
.4	17.0 @ T.O. #20 @ 1040	7.6	pH	N/A	150.1

ND: None Detected
N/A: Not Applicable
DLR: Detection Limit for Reporting purposes

CORPORATE OFFICE:
2527 Fresno Street
Fresno, CA 93721
(209) 268-7021 • Fax 268-7126

MODESTO
4230 Kiernan Ave., Suite 105
Modesto, CA 95256
(209) 545-1050 • Fax 545-1147

VISALIA
130 North Kelsey St., Suite H6
Visalia, CA 93291
(209) 651-8280 • Fax 651-8288

BAKERSFIELD
3701 Pegasus Drive, Suite 124
Bakersfield, CA 93308
(805) 393-5088 • Fax 393-4643

THE TWINING LABORATORIES, INC.
2527 FRESNO STREET
FRESNO, CA 93721
(209) 268-7021 FAX:(209) 268-0740

CHAIN OF CUSTODY/ANALYSIS REQUEST

REPORT TO:	INVOICE TO/COPY REPORT: (Circle one)	REGULATOR (Circle one)
ATTENTION: Dan Roberts	ATTENTION:	State Dept. of Health (DOHS)
NAME: Madera Irrigation Dist.	NAME:	Fresno Madera Mariposa
ADDRESS: 12152 Road 28 1/4	ADDRESS:	Tulare Kings Merced Kern
Madera, CA 93637		Other:
PHONE: (209) 673-3514		
FAX: (209) 673-0564	CONTRACT / PO #	

COMMENTS	BACTERIOLOGICAL SAMPLES ONLY				PROJECT INFO:
	PUBLIC		ROUTINE		
	SURFACE WATER		REPEAT		
	CONSTRUCTION		REPLACEMENT		PRJ#:
	OTHER		OTHER		MGR:
	PRIVATE				

TURNAROUND REQUESTED: (circle one)
ROUTINE RUSH (Specify Date):

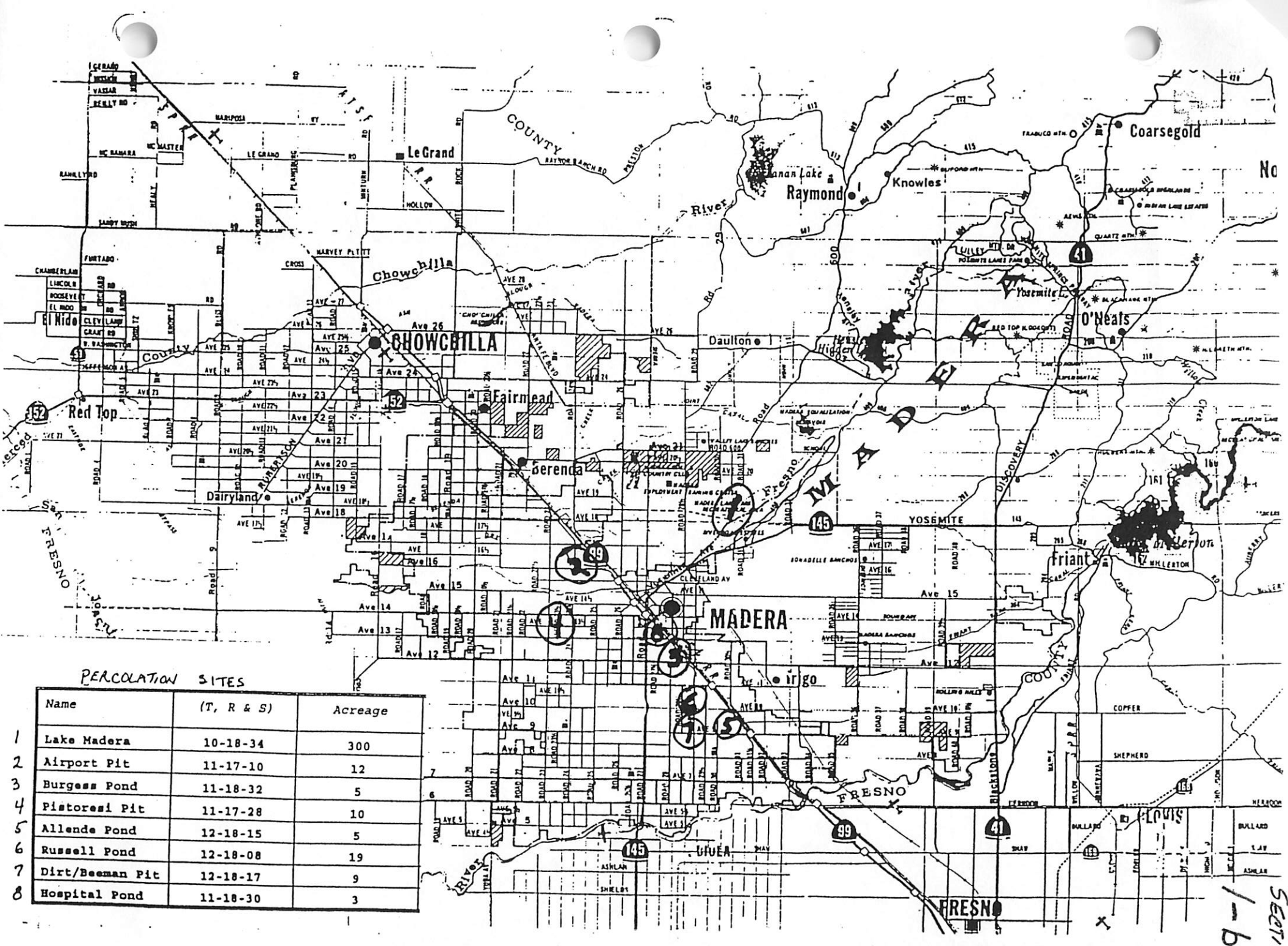
SAMPLED BY (PRINT NAME): Harold Ryan
SIGNATURE: Harold Ryan

TYPE KEY: Drinking Water-DW Ground Water-GW Other-O (Describe In Comments)
Surface Water-SW Storm Water-STM Biosolid-BS Waste Water-WW Solid/Soil-SL

ID#	SAMPLE ID	SAMPLED DATE	SAMPLED TIME	TYPE	ANALYSIS REQUESTED
1	Madera Canal @ Dry Crk	4/10	0945	AQ	X
2	24.2 @ Dry Creek	4/10	1005	AQ	X
3	24.2 @ 17.0 Head	4/10	1025	AQ	X
4	17.0 @ T.O. #20	4/10	1040	AQ	X

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY
Harold Ryan		4/10/98	11:33A	HCH	Twining

Recharge Sites



PERCOLATION SITES

	Name	(T, R & S)	Acreage
1	Lake Madera	10-18-34	300
2	Airport Pit	11-17-10	12
3	Burgess Pond	11-18-32	5
4	Pistoresi Pit	11-17-28	10
5	Allende Pond	12-18-15	5
6	Russell Pond	12-18-08	19
7	Dirt/Beeman Pit	12-18-17	9
8	Hospital Pond	11-18-30	3

Section 1-6

Budgets